TECHNICAL MEMORANDUM

INVESTIGATION OF WATER USE, LAND USE, AND THE GROUND WATER MONITOR NETWORK IN HENDRY COUNTY, FLORIDA

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EXECUTIVE SUMMARY

The purpose of this study was to summarize existing land use and water use data and evaluate the existing ground water monitor network. The study utilized existing data from Hendry County and contiguous areas.

Based on 1977 land use data, 51% of Hendry County is developed agriculture, 44% is wetland or forested uplands, and 5% is urban land. Approximately 24% of the study area is under citrus production (1986 data) with an additional 37% of the study area having a high potential for future conversion to citrus.

Water demands are supplied by surface and ground water. The total permitted annual allocation for Hendry County in 1986 exceeds 64.3 billion gallons (BG). Of this total, 33.1 BG is surface water and 31.2 BG is ground water. Present ground water withdrawals are most extensive in southern Hendry County and are expected to increase as land use changes take place. Limited ground water resources occur in western Hendry County and may affect development in this area.

The ground water monitor network operated by the U. S. Geological Survey was analyzed using statistical methods. Twenty-nine wells in the Surficial Aquifer System and 22 Intermediate Aquifer System wells were analyzed to determine; a) whether monitor wells reflected ambient conditions or were influenced by pumpage, b) the spacial variance of the monitor network, and c) the correlation between rainfall and ground water levels for different aquifers.

Of the Hendry County surficial aquifer monitor wells, all but one (HE-861) reflect ambient water level conditions. Of the seven sandstone aquifer monitor wells in Hendry County, three represent ambient conditions, and the remaining four are influenced by agricultural water use. Ambient water level data is important for; a) determining impacts of rainfall shortages on the aquifer without pumpage, b) to provide water level information to calibrate ground water flow models to

predevelopment conditions, and c) to establish background water levels which are used to assess future impacts of growth.

The total spacial variance calculated from the Hendry County monitor network is considered acceptable for the present level of development. However, as agricultural land use changes, some additional wells will be needed to assess the impacts and support management decisions.

Ground water levels in the surficial aquifer respond rapidly. Highest correlation between rainfall and water levels occurs within a period of approximately one to five days depending on the hydraulic properties of the rock units. Highest correlation between water level changes in the surficial aquifer and corresponding changes in the sandstone aquifer occurred with a two month time lag. No correlation was observed to support the premise that water level fluctuations in the sandstone aquifer caused corresponding changes in the Surficial Aquifer System. This suggests that the sandstone aquifer received recharge from the Surficial Aquifer System via downward leakance and that the time scale for this recharge is approximately two months.

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ACKNOWLEDGEMENTS

This report would not have been possible without the assistance and cooperation of many individuals. Henry LaRose of the U. S. Geological Survey office in Ft. Myers provided the information and data on the ground water monitor network. Scott Burns provided input into the statistical analysis section and technical review of the entire report. Diane Bello provided assistance in developing the maps and illustrations used in the report. Finally, the authors would like to thank Hedy Marshall for her endless patience while typing the numerous drafts.

ABSTRACT

The shift in land use in Hendry County from predominantly pasture and range to developed agriculture is causing increased demands on the water resources. In 1984, approximately 24% of the county was in citrus production, and approximately 37% of the county has a high potential for future conversion to citrus production. Because the land with a high potential for conversion is not located near any surface water sources, the increased water demands will require development of the ground water resources. The aquifers that will be heavily developed are the lower Tamiami aquifer and the sandstone aquifer.

A statistical analysis was performed on the existing U. S. Geological Survey ground water monitor network. The network currently in place is adequate for present levels of withdrawal. However, additional monitor wells need to be constructed in certain areas in each aquifer to monitor the effects of ground water levels of the anticipated increased withdrawals.

KEY WORDS: ground water, monitor wells, water levels, variance, correlation

INTRODUCTION

The U. S. Geological Survey (USGS) has been monitoring ground water conditions in Hendry County since the 1940's. The extent of monitoring has varied as stations have been added to and deleted from the network over the years. Water levels are collected by monthly field measurements or continuous recorders and published annually. Water quality data, consisting mainly of conductivity and chloride measurements, is collected on a semi-annual basis.

Early funding for data collection had been provided by Hendry County. However, in the early 1980's the number of wells began to vary due to cutbacks in county funding. Beginning in October 1984, the South Florida Water Management District (SFWMD) provided the funding necessary to maintain a limited monitor network in Hendry County. Additional funding provided by SFWMD in 1986 enabled the USGS to expand the monitor network.

Until recently, the availability of fresh water was not a concern. Lake Okeechobee and the Caloosahatchee River supplied water to much of the area. Ground water supplies were generally adequate to meet demands in areas not readily accessible to surface water. However, recent conversion of rangeland into citrus production has caused significant increases in ground water demands. To assess the long term impacts of land use changes on ground water, it is necessary to evaluate the existing land use and water use data along with the existing monitor network.

Purpose and Scope

This study represents the first phase of a project to develop a comprehensive ground water management plan for Hendry and Glades Counties. The first phase of the study was limited to Hendry County because of the large scale land use changes taking place in the county. Glades County will be investigated separately later in the project.

The purpose of the first phase of this project is to define the physiography, geology, hydrogeology, land use, and water use using existing data. Water level data from all the USGS wells within the study area were analyzed using statistical methods. Possible correlation between ground water levels and rainfall was investigated. Finally, information generated in this report will be used to identify data gaps that will be investigated in later phases of the project. Water quality was not addressed in the first phase of the study because of the sparsity of data.

The second phase of the project will be a general ground water reconnaissance of the area. This phase will include exploratory drilling and aquifer testing. Data generated will be used to quantify the hydrogeologic resources of the area. The third phase of the project will quantify the available ground water resources of the area through the development of numerical flow models.

<u>Description of the Study Area</u>

The study area encompasses all of Hendry County and adjacent areas of Glades, Charlotte, Lee, Collier, Broward, and Palm Beach Counties (Figure 1). Two major bodies of fresh water, Lake Okeechobee and the Caloosahatchee River, fall within the boundaries of the study area. Several large areas of wetland are within the study area and are shown in Figure 1. These areas are:

1. Telegraph Swamp in Charlotte County;
2. Corkscrew Swamp in northern Collier and eastern Lee County;
3. Big Cypress Seminole Indian Reservation in southeastern Hendry County.

Until recently, most of the study area was undeveloped pasture, sugarcane, and vegetable fields. With recent severe freezes destroying a large part of central Florida's citrus production, much of the industry is relocating their citrus operations to Glades, Hendry, Lee, and Collier Counties. In addition, local cattlemen are converting rangeland to a more productive citrus crop. Most of the citrus development has occurred west of State Route (SR) 29, but it is now advancing towards northern and eastern Hendry County.

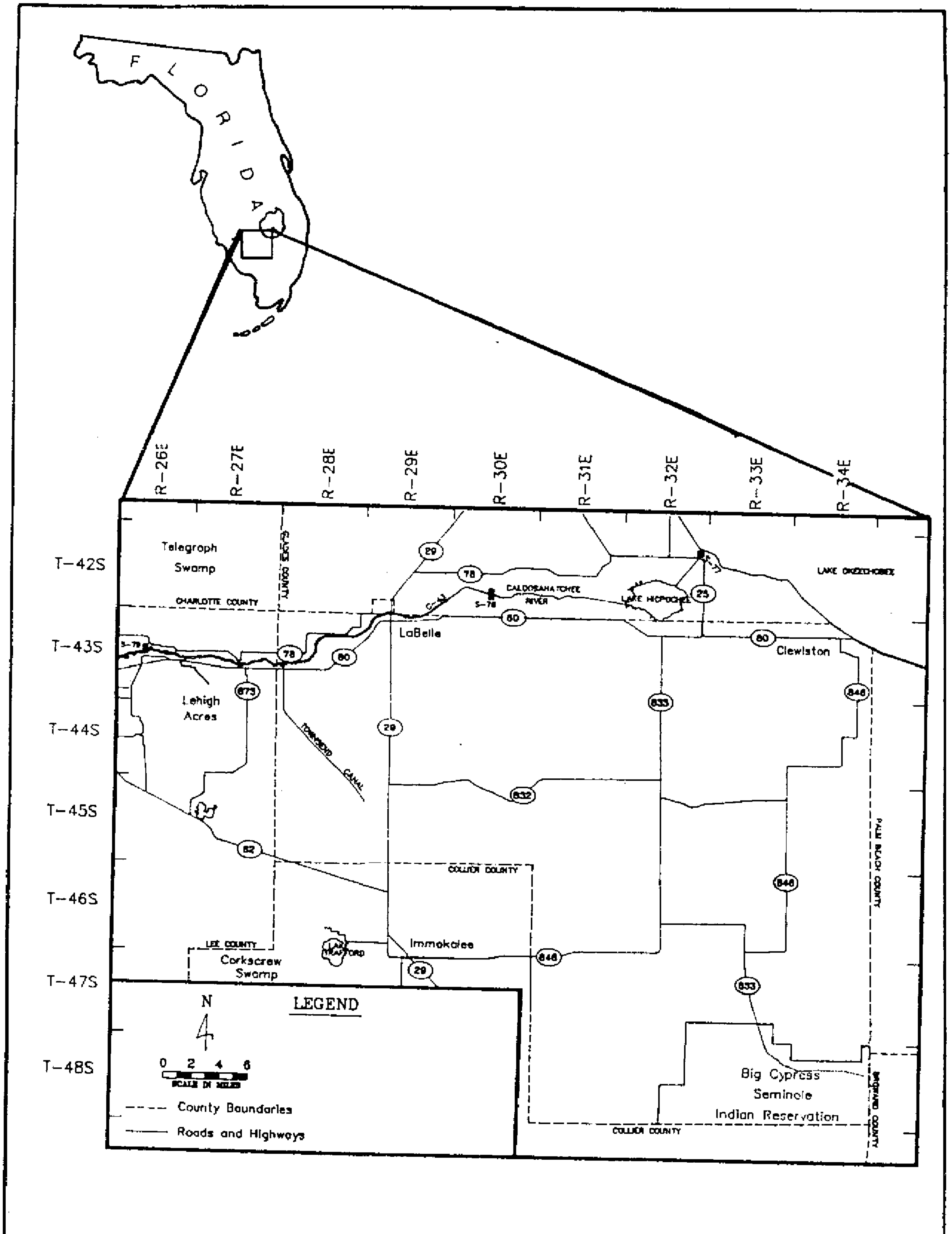


Figure 1 LOCATION OF STUDY AREA

South of Lake Okeechobee, in Hendry and Palm Beach Counties, sugar cane, vegetables and rice are the major crops. Interconnecting canals drain part of this area and provide irrigation water to the agricultural fields.

Several small residential developments, cities, and towns are located within the study area. The cities of LaBelle, Clewiston, Moore Haven, and the town of Immokalee are the primary urban centers within the area. Other growing developments are Lehigh Acres in Lee County and Port LaBelle (not shown in Figure 1), about two miles east of LaBelle.

PHYSIOGRAPHY

Parker and Cooke (1944) defined three physiographic units within the study area: the Sandy Flatlands, the Everglades, and the Big Cypress Swamp (Figure 2). The Sandy Flatlands make up the majority of Hendry and southern Glades Counties. It extends northward into Highlands County, westward to the Gulf of Mexico, and southward into Collier County. The flatlands comprise the highest lands within the study area, with elevations in some areas greater than 50 feet above mean sea level. The Everglades lie along eastern Hendry and western Palm Beach Counties, extending from the southern portion of Lake Okeechobee to the south and southeast. The Big Cypress Swamp occupies a large section of southern Hendry County, and includes part of the Big Cypress Seminole Indian Reservation.

Most of the study area lies within the geologic feature defined by Applin and Applin (1944) as the South Florida Shelf. Adjacent to the South Florida Shelf, extending northwest to southeast is the Broward Syncline. This low structural feature extends from the southern portion of Lake Okeechobee southeastward through Palm Beach and Broward Counties and provides natural drainage into the Everglades. More information on these geologic structures is found in Puri and Vernon (1964).

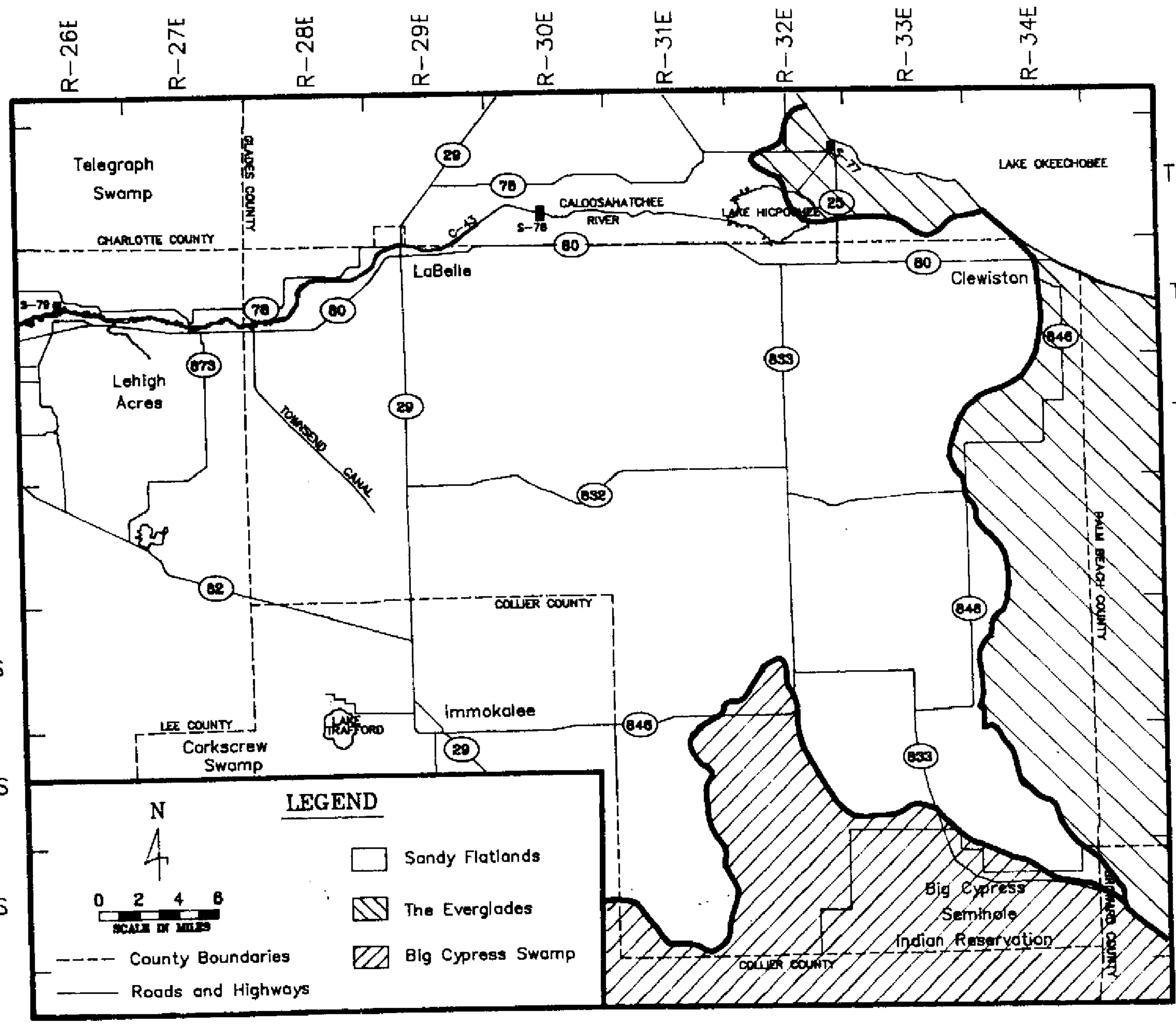


Figure 2 PHYSIOGRAPHIC REGIONS WITHIN THE STUDY AREA (MODIFIED FROM KLEIN, 1964)

GEOLOGY

Rock units ranging in age from Oligocene to Recent are penetrated by production and monitor wells within the study area. Formations and groups discussed in this report include the Suwannee Limestone, Hawthorn Group, Tamiami Formation, and undifferentiated terrace deposits including the Caloosahatchee Marl and Fort Thompson Formation. Figure 3 is a generalized geologic and hydrostratigraphic column of the study area.

Oligocene Series

Rocks of Oligocene age in the study area belong to the Suwannee Limestone. In Lee County the Suwannee Limestone is typically a yellow to pale orange, moderately indurated, very porous calcarenite interbedded with sandy phosphatic limestones and dolomites (Wedderburn et al., 1982). The formation varies in thickness from 50 feet to more than 150 feet. The Suwannee Limestone is used as a source of irrigation water in Glades County.

Miocene Series

Rocks of Miocene age in the study area belong to the Hawthorn Group. The Hawthorn Group is divided into lower carbonate and upper clastic sequences (Scott and Knapp, in press). The carbonate sequence is composed of poorly to moderately indurated phosphatic micrites and dolomites. The upper clastic sequence is composed primarily of greenish-gray phosphatic silts interbedded with coarse sand and sandstones. The base of the Hawthorn Group occurs at the contact between the Suwannee Limestone and the Lower Hawthorn/Tampa Limestone. The top of the Hawthorn Group in Lee County is identified by the first occurrence of a continuous greenish-gray dolosilt. In eastern Collier and much of Hendry County the top of the Hawthorn Group occurs at a poorly consolidated sand or sandy silt beneath the biogenic limestones of the Tamiami Formation.

<table>
<tr><th>AGE</th><th colspan="2">FORMATION OR GROUP</th><th>RANGE OF THICKNESS (feet)</th><th>AQUIFER SYSTEM</th><th>HYDROGEOLOGIC UNIT</th></tr>
<tr><td rowspan="2">RECENT</td><td rowspan="4">UNDIFFERENTIATED</td><td>PAMLICO SAND</td><td rowspan="2">0-8</td><td rowspan="5">SURFICIAL AQUIFER SYSTEM</td><td rowspan="3">WATER TABLE AQUIFER</td></tr>
<tr><td>LAKE FLIRT MARL</td></tr>
<tr><td rowspan="2">PLEISTOCENE</td><td>FT. THOMPSON FORMATION</td><td>0-15</td></tr>
<tr><td>CALOOSAHATCHEE MARL</td><td>0-15</td><td>TAMIAMI CONFINING BEDS</td></tr>
<tr><td>PLIOCENE</td><td colspan="2">TAMIAMI FORMATION</td><td>30-110</td><td>LOWER TAMIAMI AQUIFER</td></tr>
<tr><td rowspan="7">MIOCENE</td><td colspan="2" rowspan="6">HAWTHORN GROUP</td><td rowspan="6">300-500</td><td rowspan="5">INTERMEDIATE AQUIFER SYSTEM</td><td>UPPER HAWTHORN CONFINING ZONE</td></tr>
<tr><td>SANDSTONE AQUIFER</td></tr>
<tr><td>MID-HAWTHORN CONFINING ZONE</td></tr>
<tr><td>MID-HAWTHORN AQUIFER</td></tr>
<tr><td>LOWER HAWTHORN CONFINING ZONE</td></tr>
<tr><td rowspan="3">FLORIDAN AQUIFER SYSTEM</td><td rowspan="2">LOWER HAWTHORN/ TAMPA PRODUCING ZONE</td></tr>
<tr><td colspan="2">TAMPA LIMESTONE</td><td>150-200</td></tr>
<tr><td>OLIGOCENE</td><td colspan="2">SUWANNEE LIMESTONE</td><td>50-150</td><td>SUWANNEE LIMESTONE</td></tr>
</table>

FIGURE 3. GENERALIZED STRATIGRAPHIC AND HYDROGEOLOGIC COLUMN FOR HENDRY AND SOUTHERN GLADES COUNTIES

Pliocene Series

The Tamiami Formation, as first described by Mansfield (1939), is a fossiliferous sandy limestone. In northern Hendry and southern Glades Counties the formation is thin and difficult to distinguish from the younger biogenic limestones of the Fort Thompson Limestone and Caloosahatchee Marl. The Tamiami Formation is thickest in southern Hendry County. It thins to the north and west, pinching out in Glades County.

Pleistocene-Recent Series

The rocks above the Tamiami Formation vary throughout the study area, but two locally identifiable formations are of particular interest: the Caloosahatchee Marl, identified by Heilprin (1887) along the banks of the upper reaches of the Caloosahatchee River, and the Fort Thompson Formation, identified by Sellards (1919) and Cook and Mossom (1929) along the banks of the Caloosahatchee River at Fort Thompson, 2 miles east of LaBelle.

The Caloosahatchee Marl was first identified as Pliocene in age, but DuBar (1958) assigned it to the Pleistocene on the basis of vertebrate fossils and mollusks. According to Klein et al. (1964), this formation is a discontinuous deposit of unconsolidated sand and sandy marl with abundant marine mollusks, which occurred as Tamiami Formation erosional remnants. These reworked sediments seem to fill in the depressions in the eroded surface of the Tamiami.

The Fort Thompson Formation unconformably overlies the Caloosahatchee Marl. This formation is of Pleistocene Age and consists of alternating beds of marine shells and fresh water limestones.

The Caloosahatchee Marl and Fort Thompson Formation will be classified as undifferentiated as a matter of convenience due to the difficulty in distinguishing the two lithologies (Wedderburn, 1982). Also classified as undifferentiated are the Lake Flirt Marl (Sellards, 1919) and organic soils of recent age. Both of these formations overlie the Fort Thompson and consist of organic peat, muck, and sandy marl.

HYDROGEOLOGY

Seven well cutting descriptions were chosen to describe the hydrogeology of the study area. These wells were selected because of the depth penetrated, the quality of the cuttings, and the reliability of the descriptions. Lithologic descriptions and hydrostratigraphic columns are in Appendix 1.

Hydrostratigraphic nomenclature used in this report follows that proposed by the Florida Bureau of Geology (FBG, 1986). Three aquifer systems underlie the study area: the Surficial Aquifer System, the Intermediate Aquifer System, and the Floridan Aquifer System (Figure 3). This report will discuss only the Surficial and Intermediate Aquifer Systems. Generally, water withdrawn from the Floridan Aquifer System in the majority of the study area is not suitable for domestic or agricultural purposes.

Surficial Aquifer System

The Surficial Aquifer System occurs within the sediments of the undifferentiated deposits and the Tamiami Formation. The Surficial Aquifer System contains the water table and hydraulically connected aquifers lying above the top of a laterally extensive and vertically persistent bed of much lower permeability (FBG, 1986), which is the upper Hawthorn confining zone. In most of the study area the sands, shell beds, and limestones exhibit sufficient hydraulic continuity to be considered a single producing zone. However, in the southern portion of the study area where the aquifer is relatively thick, lower permeable micrites and silt occur which significantly retard vertical flow creating a semi-confined or semi-unconfined producing zone. In these areas, the aquifers that are included within the Surficial Aquifer System are the water table aquifer and the lower Tamiami aquifer.

The water table aquifer is the only laterally persistent fresh water aquifer within the Surficial Aquifer System throughout Hendry County. The lithologic makeup of the water table aquifer is extremely variable. Potential well yields from this source are dependent on aquifer thickness and lithology. Well yields are extremely low in areas where the aquifer consists mostly of fine sand and silt. However, in areas where thick sequences of permeable limestone and shell beds are persistent, yields of over 1500 gallons per minute (GPM) can be maintained (Klein, 1964).

The lower Tamiami aquifer occurs below the water table aquifer as a biogenic limestone and sand unit that produces significant amounts of water in southern Hendry County. Separating this unit from the water table aquifer are beds of low permeability, consisting of poorly indurated micritic limestones, dolosilts, and calcareous sandy clays. Working with limited regional data, Klein (1964) chose to include these deposits in the shallow aquifer. In neighboring Collier and Lee Counties, however, this unit has been identified as the lower Tamiami aquifer (Knapp, et al., 1986). The areal extent of this unit in Hendry County cannot be clearly identified from existing data. However, a test drilling program will be part of the upcoming reconnaissance study which is designed to define the extent and hydraulic properties of the lower Tamiami aquifer in Hendry County.

Intermediate Aquifer System

The Intermediate Aquifer System is composed primarily of low permeable clays with occasional interbedded permeable limestones and dolomites. As a whole, this unit confines the underlying Floridan Aquifer System. However, two aquifers occur in this system in portions of the study area. They are the sandstone aquifer and the mid-Hawthorn aquifer.

The sandstone aquifer underlies the phosphatic, clayey, and sandy beds of the upper Hawthorn confining zone at depths between 150 and 250 ft. below sea level. Since in most areas this confining bed is relatively thin, the sandstone aquifer acts as a semi-confined aquifer receiving much of its recharge from the Surficial Aquifer System.

Lithologically, this aquifer is composed of sandstones, sandy limestones, and sandy dolomites interbedded with clayey dolosilts and indurated limestones. In some areas the sandstone aquifer is divided into an upper clastic and lower carbonate portion as seen in well HE-008 (Appendix 1). The occurrence of this aquifer is generally limited to the area west of SR 29.

As with the Surficial Aquifer System, the silt and clay content of the sandstone layers, and the degree of solutioning of the limestone layers control the amount of water that can be withdrawn. Well yields are moderate, with transmissivities less than 50,000 gallons per day per foot. East of SR 29 the carbonate facies of the aquifer appears to pinch out. Further investigations on the lateral extent of this aquifer will be conducted during later phases of this program.

The mid-Hawthorn aquifer (Wedderburn et al., 1982) is composed of moderately porous limestones and dolomites which occur below a regional disconformity in the upper portion of the Hawthorn Group. The limestones frequently contain large quantities of phosphatic sand and the dolomites have intergranular, moldic, fracture, and solution porosity. However, the mid-Hawthorn aquifer is one of the lowest yielding aquifers in southwest Florida.

The mid-Hawthorn aquifer is confined by a relatively thick layer made up of clayey dolosilt interbedded with poorly indurated limestones, dolomites, and phosphatic sand. A rubble bed of very coarse phosphate and quartz sand at the base of this confining zone can be traced through characteristic geophysical signatures throughout most of the lower west coast (Knapp, et al; 1986).

In Lee County the mid-Hawthorn aquifer produces limited quantities of potable water for several communities. In Collier County it is not extensively used. The productivity of this aquifer in Hendry and Glades Counties is very low due to a high content of clay and silt and is not a significant source of ground water.

WATER USE

In the eastern section of the study area, most of the water for irrigation, domestic, or industrial purposes comes from Lake Okeechobee. Clewiston and South Bay withdraw water for municipal use from the lake, and the lake recharges the Moore Haven wellfield. The Everglades originally provided drainage as sheet flow from the lake towards the south and southeast; however, the sheet flow no longer occurs but is channelized and regulated.

The Caloosahatchee River flows from Lake Okeechobee westward to the Gulf of Mexico. Structures such as the Franklin Lock (S-79), the Ortona Lock, (S-78) and the Moore Haven Lock (S-77) control the flow in the river. Most of the water east of S-79 is fresh and is used as a primary or supplemental supply of water by many residents and some municipalities. The Townsend Canal, parallel to the Hendry-Lee County line, flows north into the Caloosahatchee River during the wet season. It provides irrigation water to several agricultural properties in western Hendry County during the dry season (Fan, 1983). Other minor tributaries also supply water to residential properties and farm lands adjacent to the Caloosahatchee River.

Ground water is the major source of water throughout the remainder of the study area. Water quality in the Surficial Aquifer System is generally good throughout this area.

Presently, there are eight public supply wellfields within the study area:

1. LaBelle (Surficial Aquifer System)
2. Lee County (Surficial Aquifer System and sandstone aquifer)
3. Moore Haven (Surficial Aquifer System)
4. Port LaBelle (sandstone aquifer)
5. Lehigh Acres (sandstone aquifer)
6. Florida Cities-Green Meadows (sandstone aquifer)
7. Immokalee Utilities (sandstone aquifer)
8. U.S. Sugar Corporation (Surficial Aquifer System)

The locations of the wellfields are shown in Figure 4. The U. S. Sugar Corporation wellfield operates only as an emergency reserve system. At this time, there are no plans for additional municipal wellfields.

The Surficial Aquifer System is a major source of water throughout the study area. Figure 5 shows water use from the Surficial Aquifer System per nine square mile area as permitted by the SFWMD. Values represent water use from both public water supplies and agricultural properties in million gallons per year (mgy). Since permitted allocations for agricultural irrigation are based on a maximum amount needed during a drought, actual water use is much less than the permitted amount. Only limited data on actual water use exists.

Permitted allocations from the Surficial Aquifer System in Hendry County in 1986 totalled 23.6 billion gallons per year. Water from the Surficial Aquifer System is used extensively throughout the southern half of the study area, particularly near the border of Lee, Hendry, and Collier Counties, where water use exceeds 1.8 billion gallons per year per square mile. Ground water use in this area may be a combination of withdrawal from both the water table and the lower Tamiami aquifers (Knapp et al., 1985). Most of the water withdrawn in this area is used for agricultural purposes. Other areas of concentrated ground water use occur near municipal wellfields (Figure 4). All the water withdrawn from the Surficial Aquifer System in southeastern Hendry County is for agriculture. Withdrawals are expected to increase as a result of the increase in citrus development and the lack of other water sources in the area.

Permitted allocations from the sandstone aquifer in Hendry County in 1986 totalled 7.6 billion gallons per year. Figure 6 portrays the permitted water use from the sandstone aquifer per nine square mile area. The sandstone aquifer is a major source of water for the western portion of the study area. The truncated lateral extent of this aquifer towards the north and east limits its use throughout most of

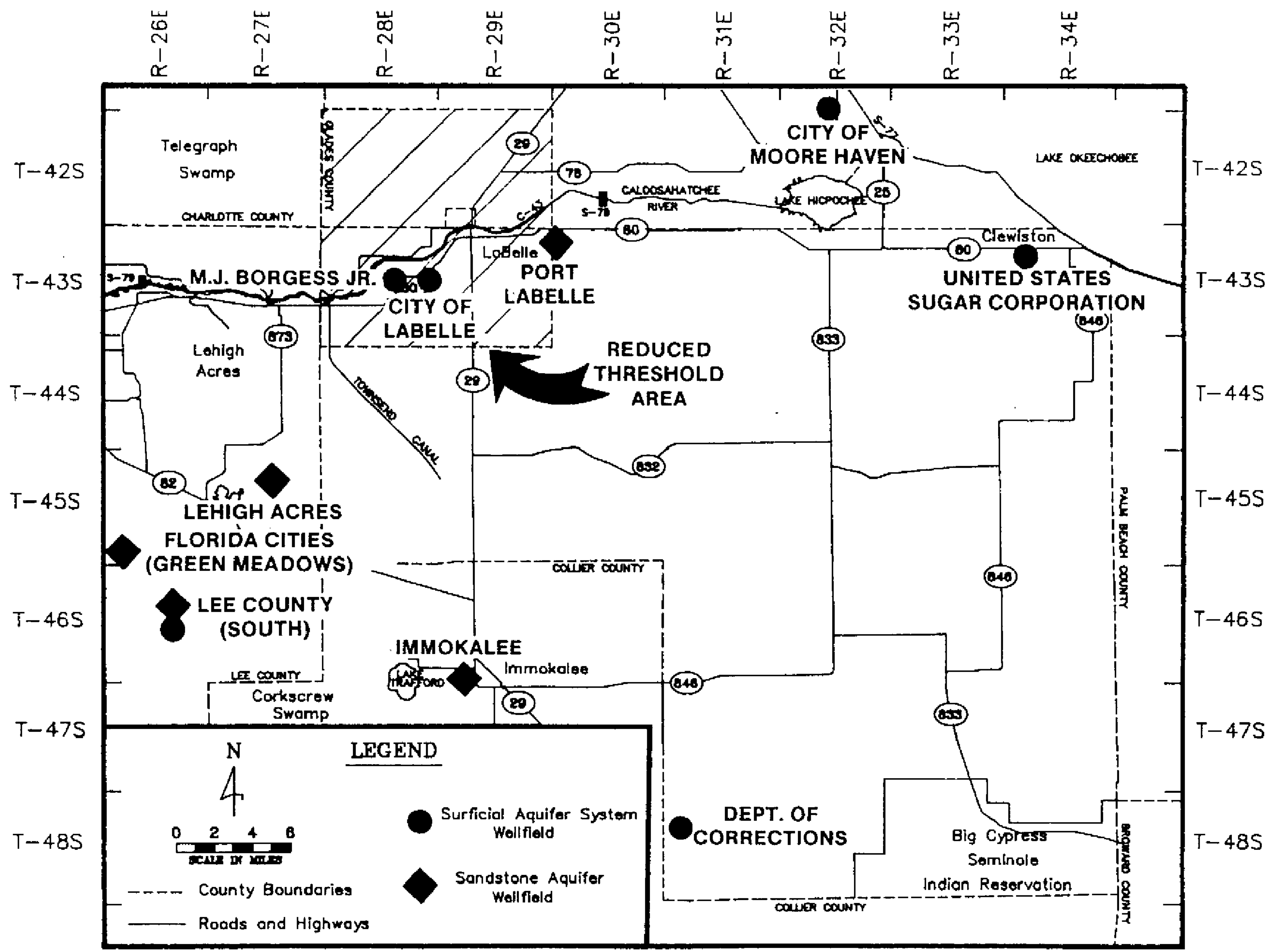


Figure 4 LOCATIONS OF WELLFIELDS WITHIN STUDY AREA

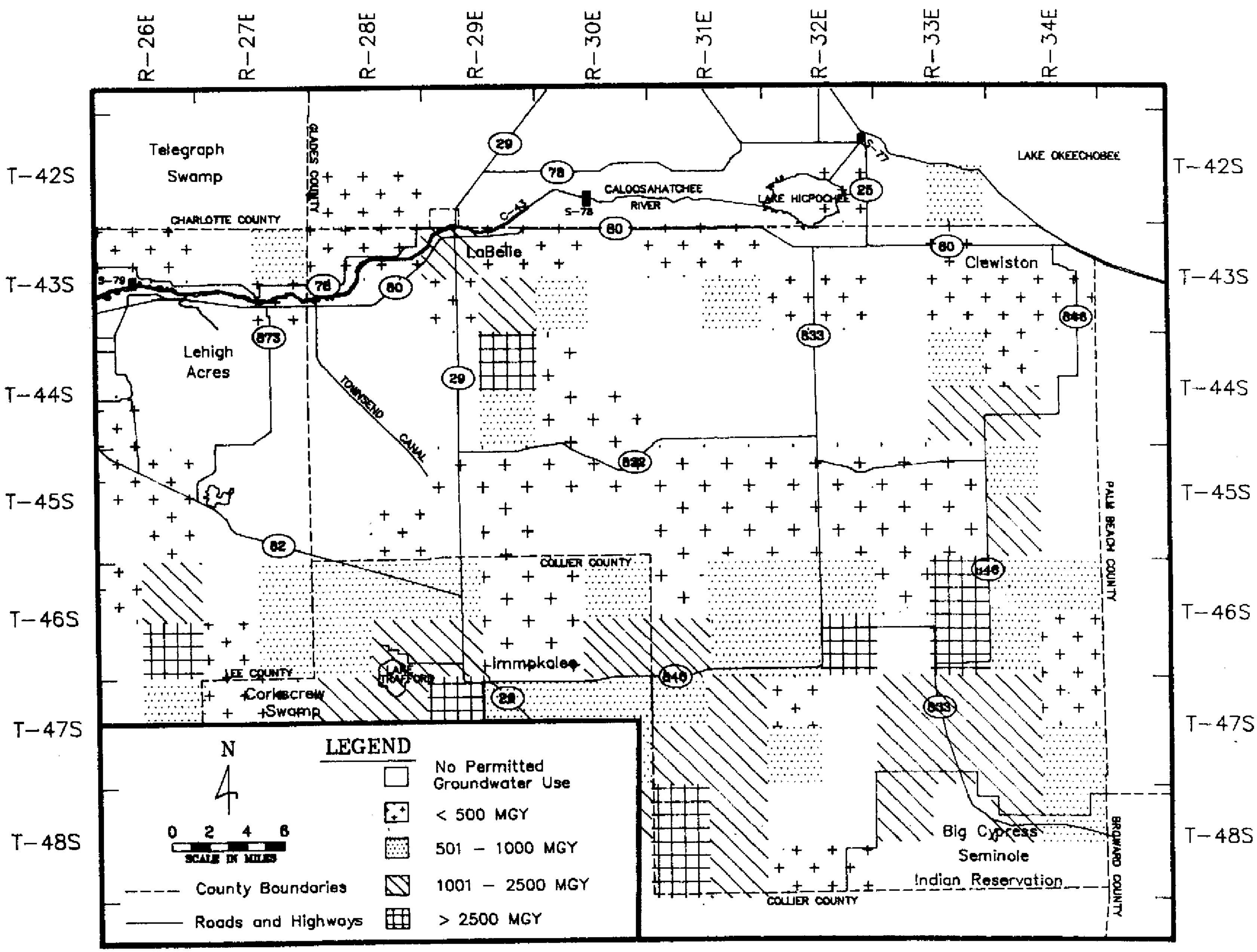


Figure 5 WATER USE ALLOCATIONS FROM THE SURFICIAL AQUIFER SYSTEM IN MILLION GALLONS PER YEAR PER 9 SQUARE MILES

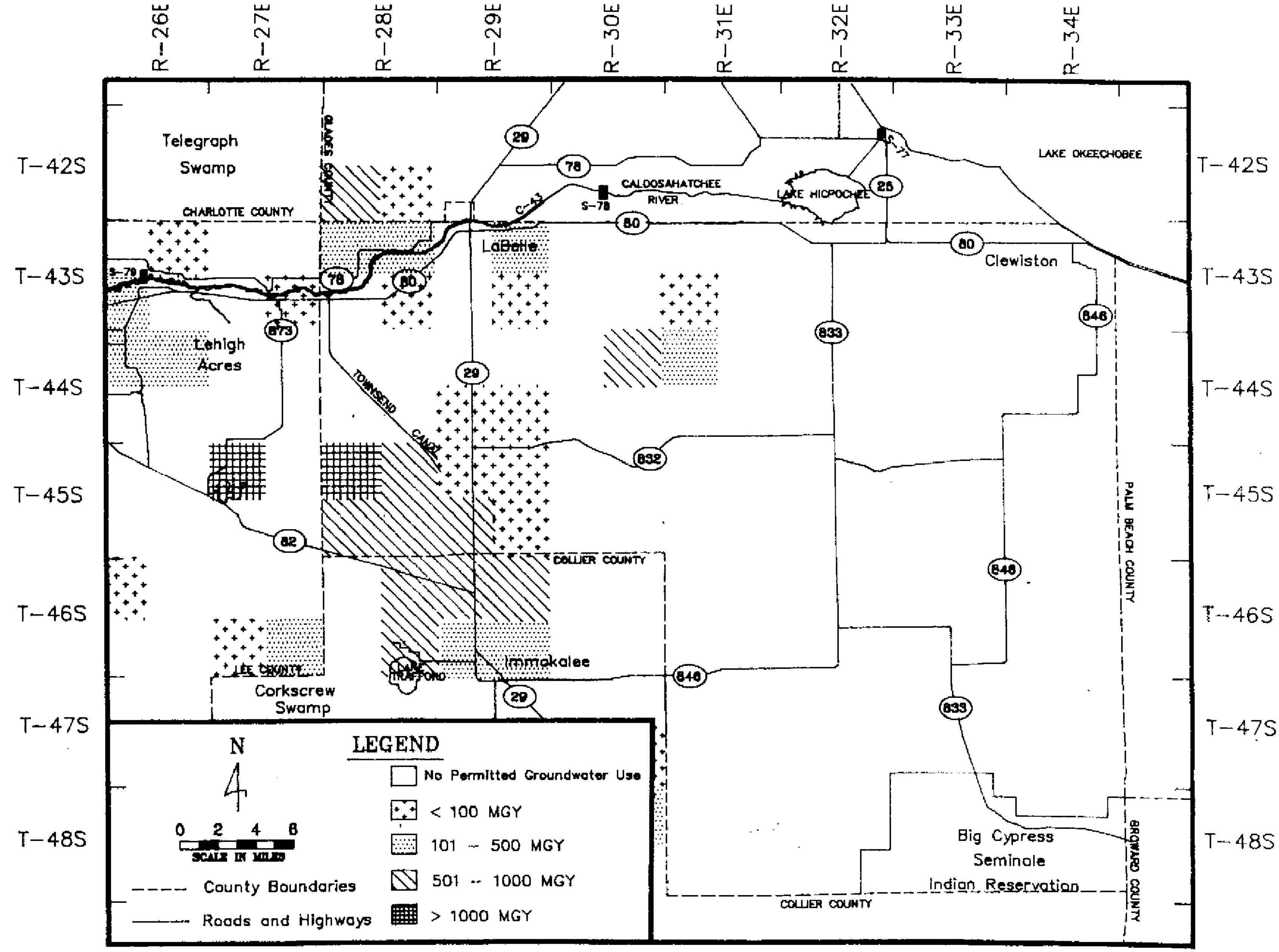


Figure 6 WATER USE ALLOCATION FROM THE SANDSTONE AQUIFER IN MILLION GALLONS PER YEAR PER 9 SQUARE MILES

Hendry and Glades Counties. However, much of the ground water use west of SR 29 originates from the this aquifer.

Most of the withdrawals from the sandstone aquifer occurs in isolated sections. A large percentage of the withdrawals are near Immokalee, Lehigh Acres, and the Lee County wellfields (Figure 4). Other areas withdrawing water from the Sandstone aquifer include scattered agricultural properties and Port LaBelle.

The South Florida Water Management District calculates water requirements for irrigation purposes based on a modified Blaney-Criddle equation (SFWMD, 1985). The equation computes the amount of water necessary to supplement rainfall during the driest month of a drought occurring statistically once every five years. The calculated irrigation requirement is based on humidity, sunlight, crop type, mean temperature, rainfall, soil types, and efficiency of the irrigation system. This quantity of water represents the amount needed for optimum crop growth and often becomes the permittee's legal use, subject to restrictions in the event of declared water shortages and/or local and regional impacts of the requested water use. Some water use requirements for several crops within the study area are in Appendix 2.

Reduced Threshold Area

The South Florida Water Management District issues two types of water use permits: general permits for uses not exceeding 100,000 gallons per day, and individual permits for uses greater than 100,000 gallons per day. However, in certain areas a different permitting criteria is used. These areas are called Reduced Threshold Areas (RTA) and are located in areas of low aquifer yield, high water use, or high potential for saline water intrusion. In an RTA the cutoff between the issuance of a general or an individual permit is 10,000 gallons per day. Boundaries of the various RTA's are defined in the SFWMD Permit Information Manual, Volume III, 1985.

An RTA is located in Townships 42 and 43 south and Ranges 29 and 30 east, within the study area (Figure 4). This area has been defined according to low aquifer yields which are attributed to low transmissivities and low storage capacities.

LAND USE

Land use in Hendry County was investigated to determine present and future trends in water use. Agriculture is the dominant land use in the county. Since most of the agricultural land is not located near surface water sources, growth in agriculture is expected to have a substantial effect on the ground water resources of the county. General assumptions regarding potential for agricultural development were applied to 1984 areal survey data to approximate future land use changes. This exercise was undertaken to provide an estimate of future water use needs with respect to areal distribution. This information will be quantitatively evaluated in a later study to determine if growth of this magnitude would adversely impact the water esources of the county. The proposed land use changes are conceptual and do not represent any plans or commitments of the county or private landowners.

Land use classifications for this study were determined by examination of aerial photographs taken in 1984 at a scale of 1:24000. Each aerial photograph was divided into parcels, each corresponding to a section of land (approximately one square mile each). Each section was assigned one of the following land use types according to the dominant land use in the section: agriculture, wetlands, forest and range, and urban.

The examination of aerial photographs show that in 1984 50.8% of the land in the study area was used for agriculture. Approximately 47% of this agricultural land is in citrus production or currently being converted to citrus. Undeveloped wetlands make up 30.2% of the study area, while isolated areas of forest and range account for 14.1% of the study area. Urban lands comprise only 4.9% of the study area. The majority of the urban areas are concentrated near Lake Okeechobee and along the Caloosahatchee River.

The large amounts of forest and rangeland combined with the temperate climate make Hendry County very attractive for citrus development. It is estimated that since 1977 approximately 25% of the pasture, range, and forested uplands in the study area have been or are in the process of being converted into citrus groves (Ray Burgress, personal communication).

Figure 7 shows the potential for conversion of existing land uses to citrus production. This map was constructed using the same aerial photographs that were used to determine the land use in the study area. Every section of land in the study area was examined and assigned a conversion potential of high, low, or existing based on the dominant land use in that section. Sections that consist mostly of rangeland, forested uplands, or pasture were assigned a high potential for conversion to citrus production. The sections designated as having a low potential for conversion to citrus consist mostly of wetlands, urban land, and developed agriculture such as sugar cane and vegetables. The areas designated as existing are citrus groves that appear on the aerial photographs, and those areas with a water use permit or permit application for citrus irrigation as of July 1986. Figure 7 shows that approximately 24% of the study area (47% of the developed agricultural land) is already in citrus production or planned for conversion in the near future. Thirty-seven percent of the study area has been assigned a high potential for conversion to citrus production, and 39% has been assigned a low potential for conversion. This does not mean that an area with a high potential for conversion will become citrus groves. If future economic, environmental and political conditions are such that Hendry County becomes (more) attractive to citrus production, the areas of high potential are more likely to be converted to citrus production than the areas of low potential.

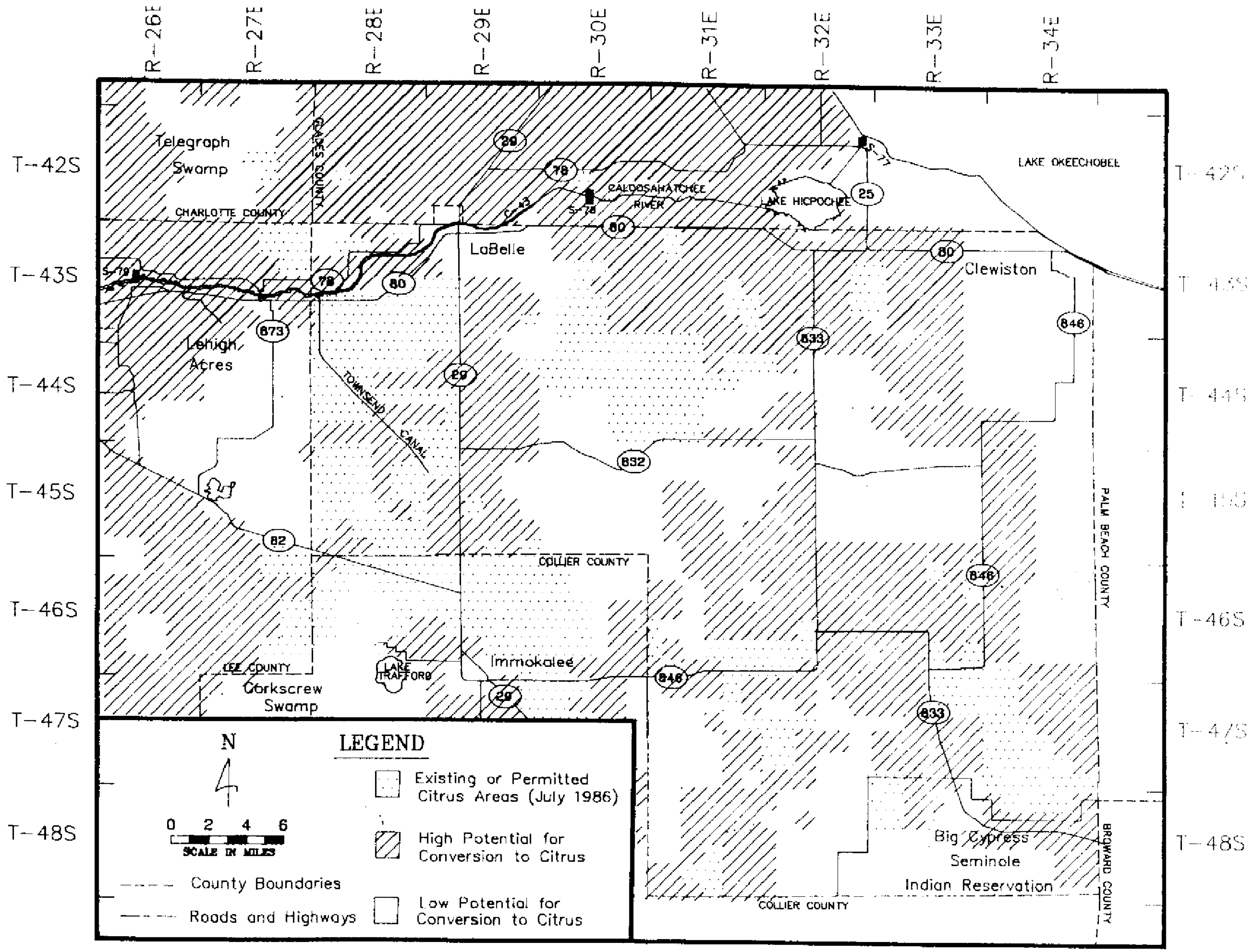


Figure 7 POTENTIAL FOR CONVERSION TO CITRUS PRODUCTION

Most of the land that would be converted to citrus production is currently rangeland, forested uplands, and pasture. Since none of this land is irrigated, conversion to citrus production would cause a substantial increase in water use. If the growth of the citrus industry in Hendry County continues to increase at the current rate, by 1990 twenty-five to thirty percent (approximately 71,000 acres) of the pasture, range, and forested uplands may be converted to citrus production. Using the modified Blaney-Criddle formula to calculate the supplemental irrigation requirement for citrus, an increase of 46.8 billion gallons in the county's annual water use would result. This represents a 42.1% increase over the 1986 permitted water use. Since much of the land that has a high potential for citrus development is not located near surface water, the calculated increase in water use may put the ground water system under stress in localized areas.

EVALUATION OF THE WATER LEVEL MONITOR NETWORK

Introduction

The Surficial Aquifer System and sandstone aquifer monitor networks (Figures 8, 9, 10) were statistically analyzed to; a) determine the stations which represent ambient conditions from those which are influenced by external factors, b) to determine an areal distribution scheme for the placement of additional monitor wells based on variance reduction, and c) to assess the interactive relationship between ground water levels and rainfall. Rainfall stations used in the analysis are shown in Figure 11. The differentiation between ambient and stressed wells was determined by analyzing the variance of individual stations with respect to the entire network. Areas which exhibit high seasonal variance were considered to be influenced by pumpage or canal stage manipulation and may require increased monitoring (additional stations, increased sampling frequency, or both). Next, universal kriging (Skrivan and Karlinger, 1980) was used to evaluate potential monitor network distribution schemes in terms of minimizing spacial variance.

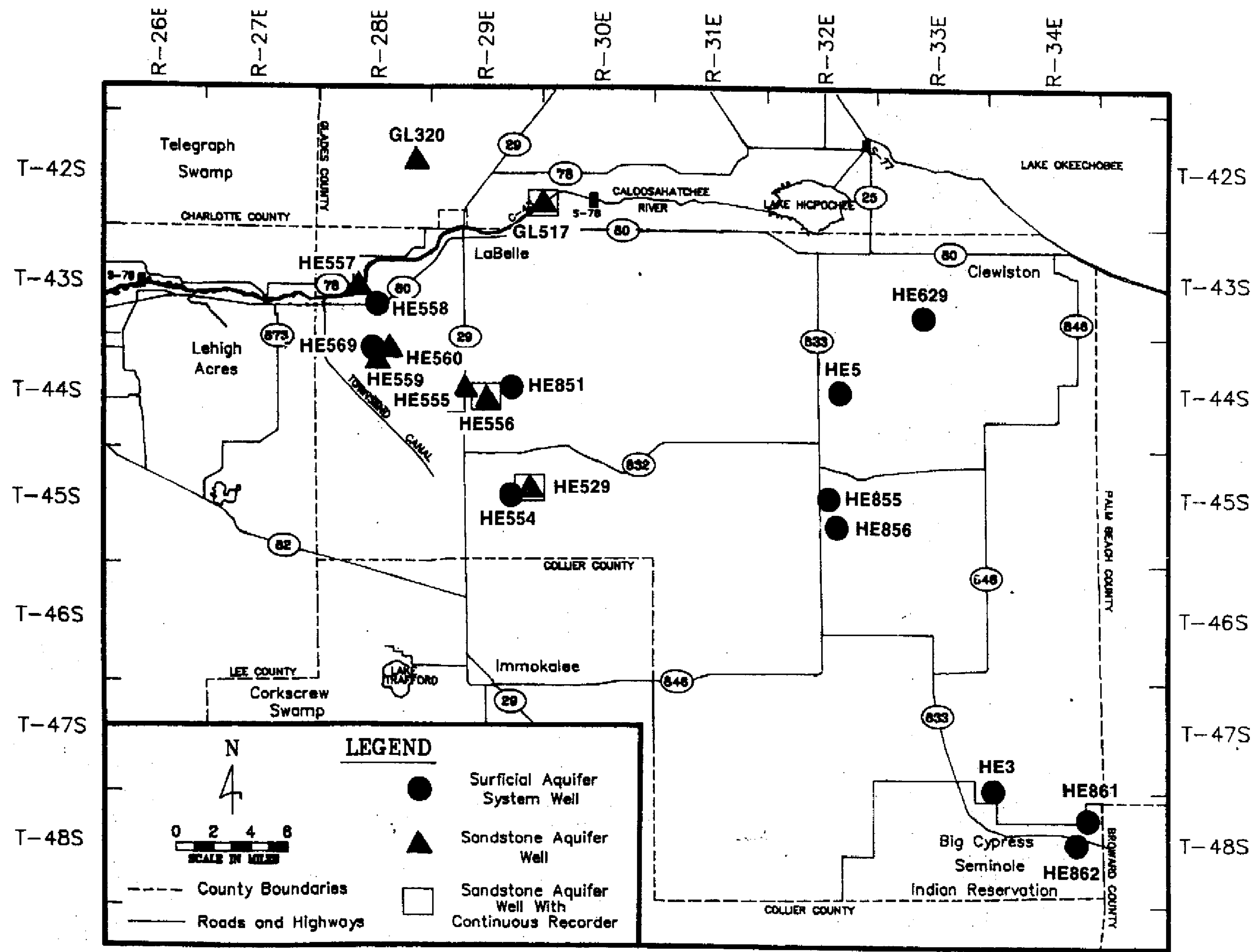


Figure 8 LOCATIONS OF ACTIVE HENDRY & GLADES COUNTIES USGS MONITOR WELLS (1986)

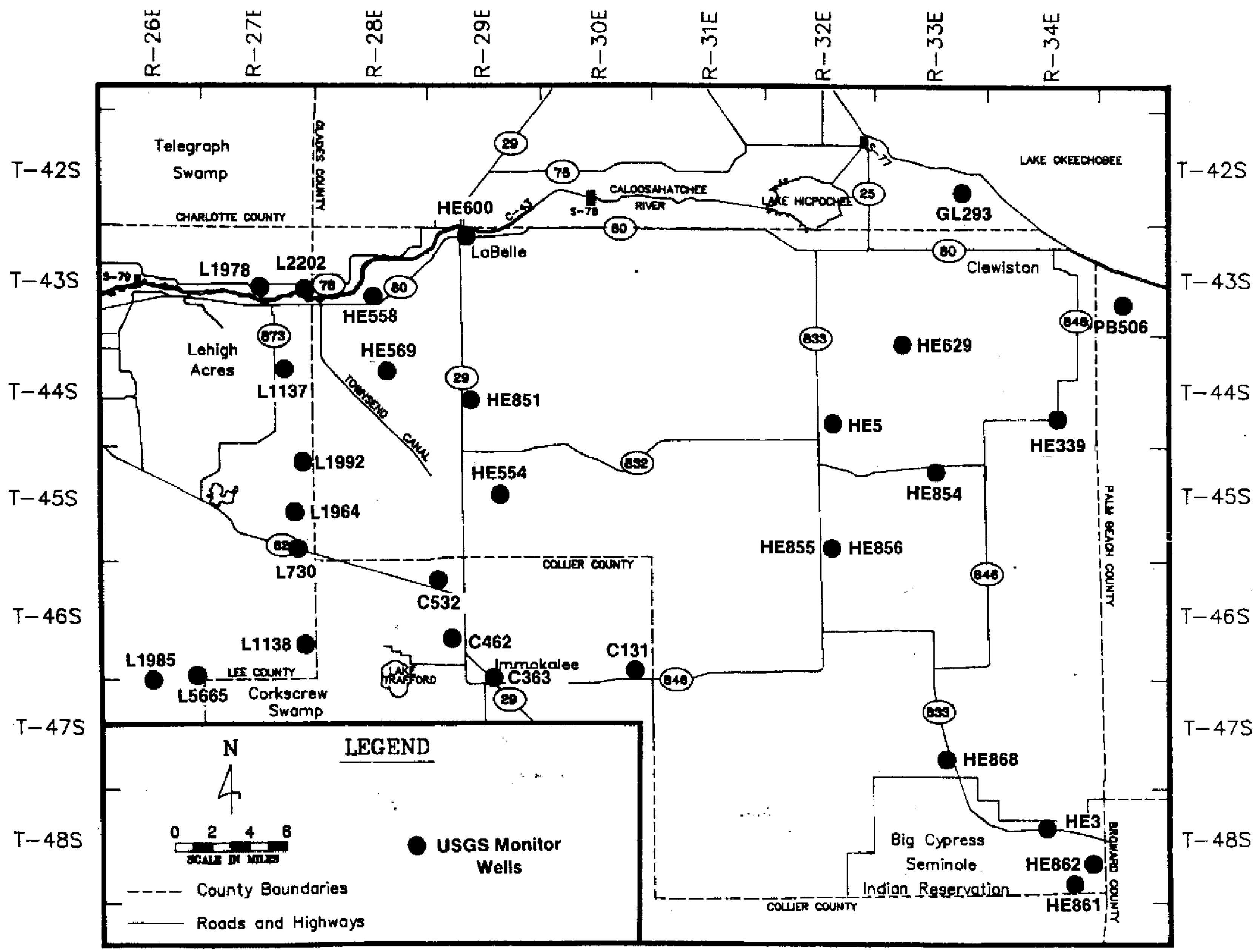


Figure 9 LOCATIONS OF USGS SURFICIAL AQUIFER SYSTEM MONITOR WELLS USED IN WATER ANALYSIS

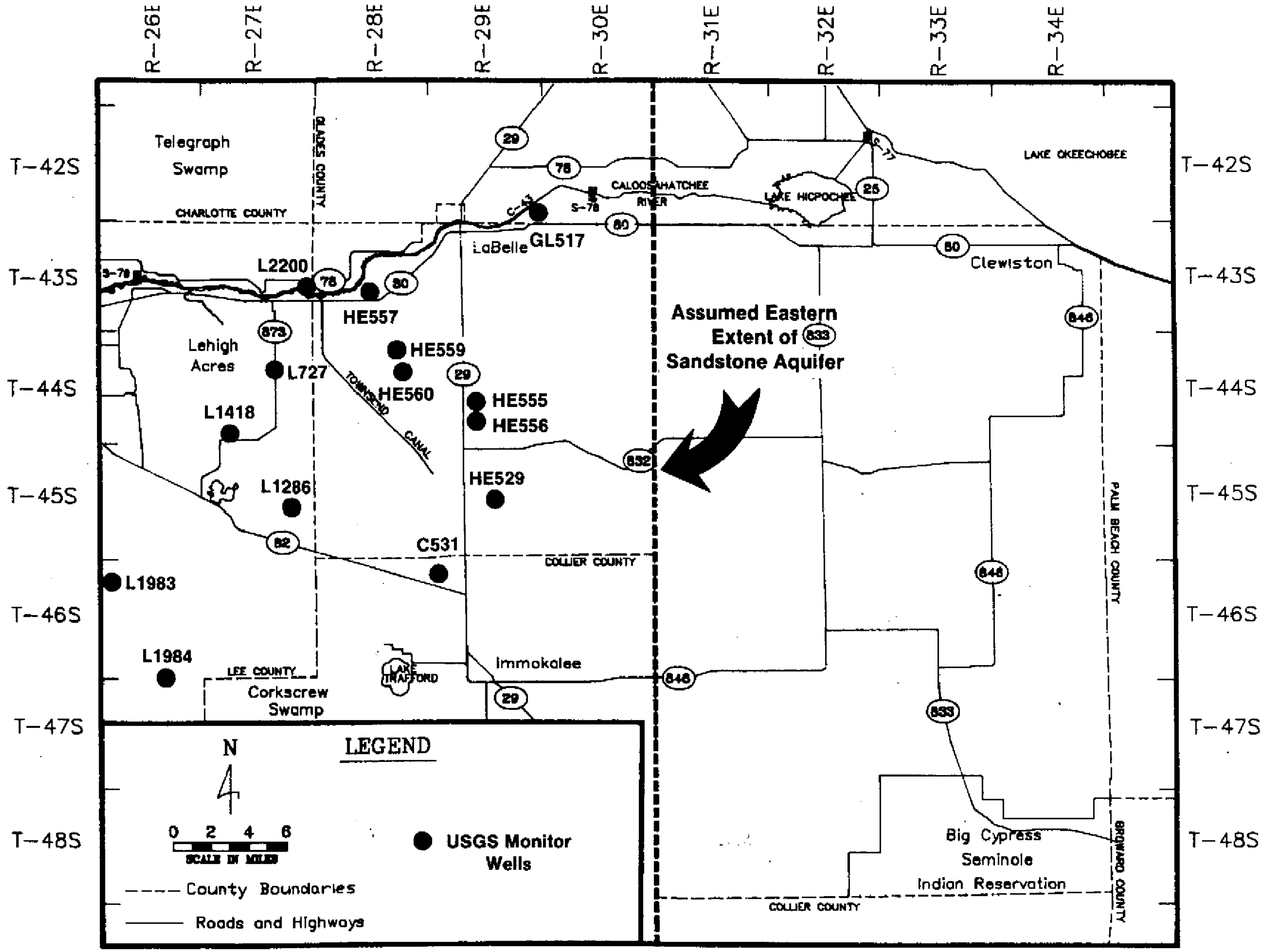


Figure 10 LOCATIONS OF USGS SANDSTONE AQUIFER MONITOR WELLS USED IN WATER LEVEL ANALYSIS

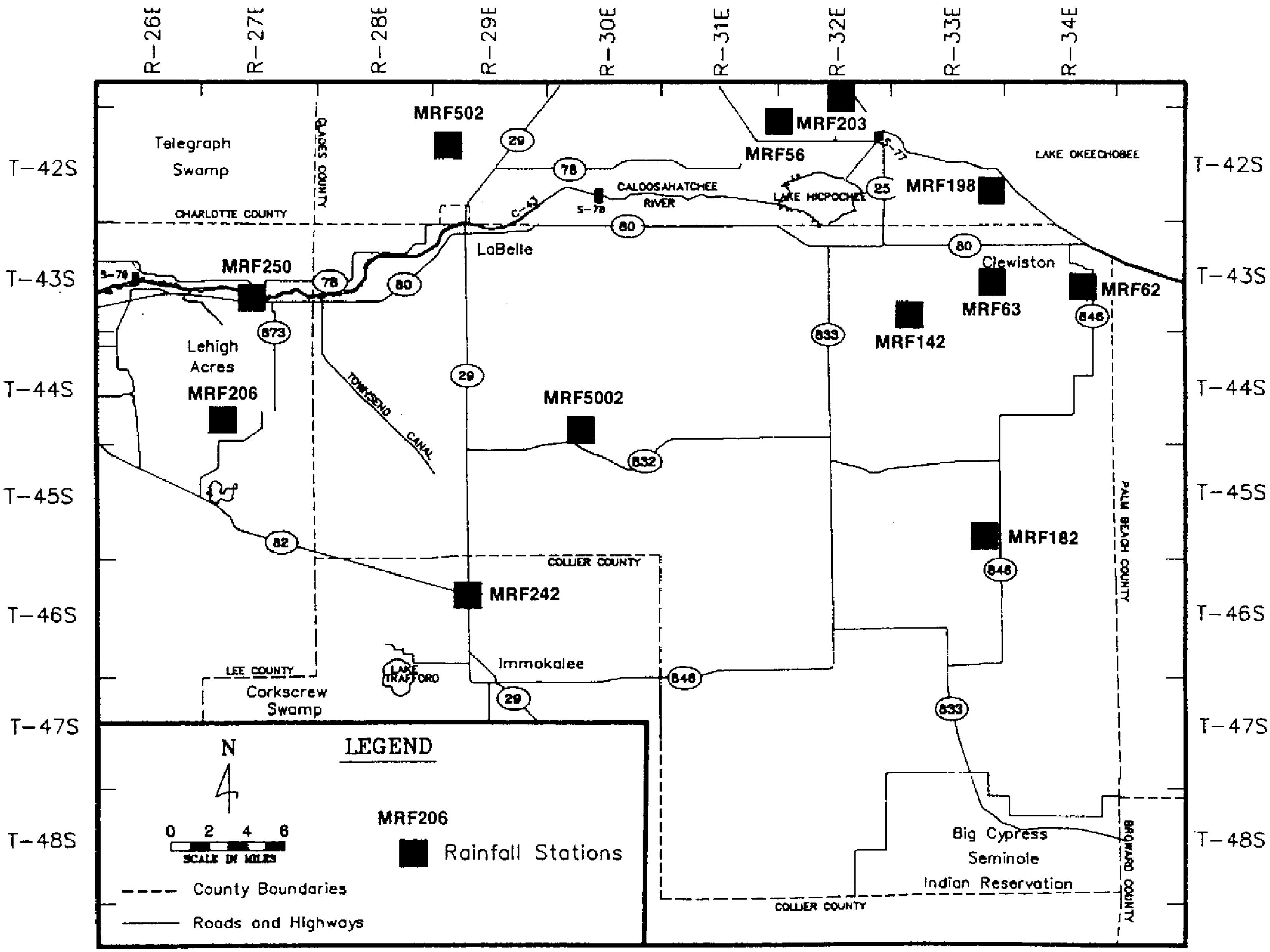


Figure 11 LOCATIONS OF RAINFALL COLLECTION AND MEASURING STATIONS

Finally, the relationship between recharge and ground water levels was assessed through cross correlation of individual rainfall events with ground water fluctuations.

The condition of the existing monitor networks (the number of wells per quifer and the length/sampling frequency for each stations) limited the scope of the statistical evaluation. A total of 29 observation wells comprise the surficial monitor network while 22 wells occur in the sandstone aquifer. Water level data (summarized in Appendix 3) for the period of 1977 to 1986 were used in the analyses. As the networks are expanded over time, more detailed evaluations can be undertaken.

Final decisions regarding monitor network design should consider other variables such as land use, environmental impacts, future growth and costs.

Methodology

Station Variance

For this preliminary analysis, the magnitude of monthly water level fluctuations is determined from the amount of variance exhibited by individual stations (univariate analysis). Variance (σ^2) is expressed in terms of standard deviation (σ) where:

$$\sigma^2 = \sum_{i=1}^{n} \frac{(x_i - \mu)^2}{n}$$

n = number of samples

x = value of the ith measurement

μ = the population mean

However, because the standard deviation is scale dependent with respect to the magnitude of the mean, it is difficult to compare relative variance between stations.

For this reason, the coefficient of variance (CV) was calculated for each station for comparative purposes. The coefficient of variance expresses the standard deviation as a percentage of the mean where:

$$CV = \frac{\sigma}{\mu} X 100$$

The magnitude of the CV was used to determine those stations which most likely reflected ambient conditions versus the stations which were influenced by external factors such as pumpage or canal stage manipulation. For this preliminary analysis, the stations with CV values over 10% were considered to be significantly influenced by external factors and may be require increased monitoring.

Kriging

Spatial analysis was accomplished through the use of the kriging algorithm. Kriging provides unbiased estimates of variable in regions where the available data exhibit autocorrelation. These estimates are obtained in such a way that they have minimum variance. The magnitude of these variances are available as a by-product of the kriging algorithm. The results include maps of the estimated values distributed over the study area and a map of the accuracy of the estimates in terms of their variances (Skrivan and Karlinger, 1980).

The first element of the kriging analysis is the estimation of the trend or drift of the mean values over the region. In this study the drift is assumed to be constant. While not rigorously proven here, this assumption is supported by an in depth statistical analysis for the ground water monitor network in neighboring Lee County (Shih, 1986).

The second element is the estimation of the semi-variogram function. A semi-variogram relates the growth of estimation variance as a function of distance from any measured point. The estimation variance applies to the residuals between the trend surface and the calculated variable with distance from a measurement point. Therefore, the semi-variogram is a function which describes the rate of decay of the residuals with distance from a measured point with minimal variance. In this study, assuming isotropic, nondrift conditions, the semi-variogram is described as a Gausian function with respect to the distance between sites. However, to calculate the drift, it is necessary to first establish the semi-variogram. Therefore, the solution to a kriging problem requires an iterative process. After the semi-variogram/drift estimation process has iterated to a desired closure criteria, interpolated values can be defined at any specified interval throughout the study area.

Due to the small number of stations in the existing network, the kriging algorithm was used primarily to assess the total variance reducing capacity of various regularly spaced monitor well arrays. When the exact locations of existing wells were added to the theoretical arrays, an improved estimate of spatial variance on a site specific basis could be attained.

Correlation

Autocorrelation is used to determine the linear dependence among successive values within a continuous series of data points. Linear dependence among different series is called lag cross correlation and can be either proportional (positive correlation) or inverse (negative correlation). A correlogram is a graphical means of describing two sets of time variant data, in this case, rainfall and water levels. Time, in days, is plotted against the absolute value of the correlation coefficient to determine the number of days which elapse before the highest value for the correlation coefficient is reached. The correlation coefficients are calculated as follows:

$$r = \frac{\text{covariance}\,(x,y)}{\sqrt{[\text{variance}\,(x) \cdot \text{variance}\,(y)]}}$$

In addition to the correlation between rainfall and water levels, the relationship between water level fluctuations between adjacent aquifers was examined. The results of the cross correlations are strongly tied to the local geologic conditions and may vary substantially throughout the study area.

RESULTS

Calculated statistics for Surficial Aquifer System monitor wells are shown in Appendix 4 and the areal distribution of coefficients of variation are shown in Figure 12. Statistics for selected wells are shown on Table 1. The average annual CV's ranged between 1.84% (L-1138) and 15.89% (L-1985) for wells monitoring the Surficial Aquifer System within the study area. Wells exhibiting CV's over 10% are located in proximity to public supply wellfields, the Caloosahatchee River or major drainage canals where water levels are subject to frequent change. Water level fluctuations in Hendry County alone were consistently small (annual CV's average 5.50%). This suggests that the surficial monitor wells in Hendry County (except HE-861, annual CV = 10.55) reflect ambient water level conditions at this time.

Analysis of monthly variance shows water levels fluctuate most during the later part of the dry season (March, April, May and June). Lowest variance generally occurs during the months of September and August. Comparison of daily variance against end of month data also undertaken on selected stations with continuous water level data. Despite the larger number of variables in the data set (30 daily values per month versus 10 monthly values), the calculated CV's from daily water level measurements were consistently smaller than those calculated from the end of month data sets. This indicates that water level measurements are more consistent on a daily basis. However, under a stressed environment, where ground water levels respond dramatically to pumpage, this assumption may not be true.

The coefficients of variation for the sandstone aquifer ranged from 3.21% to 48.92%, as shown in Appendix 4 and Figure 13. Statistics on selected wells are

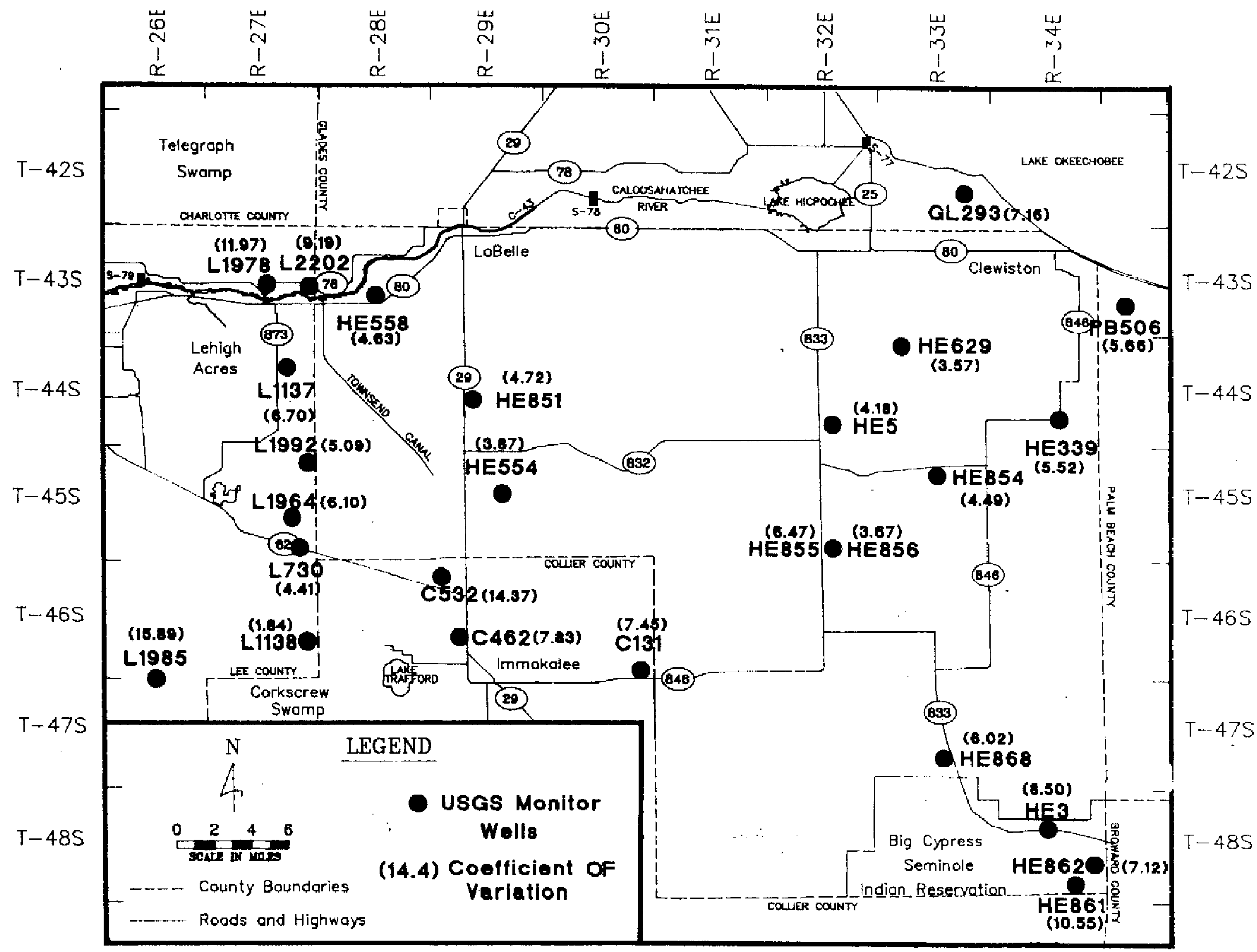


Figure 12 DISTRIBUTION OF CALCULATED VARIATION COEFFICIENTS FOR THE SURFICIAL AQUIFER SYSTEM

TABLE 1
CALCULATED MEANS AND VARIANCES FOR SELECTED WELLS MONITORING THE SURFICIAL AQUIFER SYSTEM
(Monthly Mean [ft]/Monthly Variance [ft^2])

WELL	C-131	GL-293	HE-3	HE-5
JAN	23.10/3.35	11.94/0.67	17.13/6.13	24.06/0.67
FEB	22.89/3.16	11.95/0.62	17.04/5.63	24.04/0.72
MAR	22.44/1.69	12.30/0.53	16.76/1.65	23.84/0.63
APR	22.97/3.31	12.19/0.92	16.16/1.36	23.37/0.82
MAY	22.57/0.93	11.87/1.03	15.49/2.27	23.24/0.62
JUN	23.67/3.53	12.27/0.85	17.52/4.01	24.56/1.68
JUL	23.93/2.14	12.50/0.49	17.49/1.67	24.50/1.64
AUG	24.93/1.71	11.95/0.81	18.24/0.18	24.94/0.54
SEP	24.95/0.60	12.07/0.26	18.36/0.70	25.24/0.54
OCT	23.97/2.43	12.12/0.31	18.20/1.63	24.34/0.65
NOV	23.70/1.19	11.74/0.80	17.78/0.88	23.98/0.20
DEC	23.26/1.88	11.84/1.08	17.49/1.39	23.76/0.18
YEARLY MEAN (ft)	23.45	12.06	17.36	24.17
YEARLY VARIANCE (ft^2)	3.05	0.75	2.18	1.02
VARIATION COEFFICIENT (%)	7.45	7.16	8.50	4.18

WELL	HE-339	HE-554	HE-558	PB-506
JAN	12.52/0.25	29.98/1.15	14.69/0.34	10.17/0.09
FEB	12.61/0.89	30.10/0.75	14.55/0.28	10.27/0.16
MAR	12.57/0.27	29.58/0.77	14.37/0.37	9.81/0.28
APR	12.27/0.49	29.12/0.73	14.14/0.12	9.59/0.34
MAY	12.69/0.59	28.90/1.89	14.24/0.40	9.69/0.08
JUN	12.66/0.73	29.82/1.51	14.90/0.71	9.70/0.48
JUL	12.32/0.28	30.09/0.46	15.04/0.25	9.96/0.42
AUG	12.35/0.47	31.09/0.54	14.92/0.25	10.13/0.27
SEP	12.25/0.19	30.93/0.30	14.93/0.47	9.78/0.26
OCT	11.93/0.41	30.16/1.16	14.19/0.27	10.01/0.24
NOV	12.00/0.20	29.80/0.50	14.13/0.29	10.25/0.37
DEC	11.94/0.41	29.50/0.72	14.34/0.35	10.17/0.19
YEARLY MEAN (ft)	12.34	29.93	14.54	9.96
YEARLY VARIANCE (ft^2)	0.46	1.34	0.45	0.32
VARIATION COEFFICIENT (%)	5.52	3.87	4.63	5.66

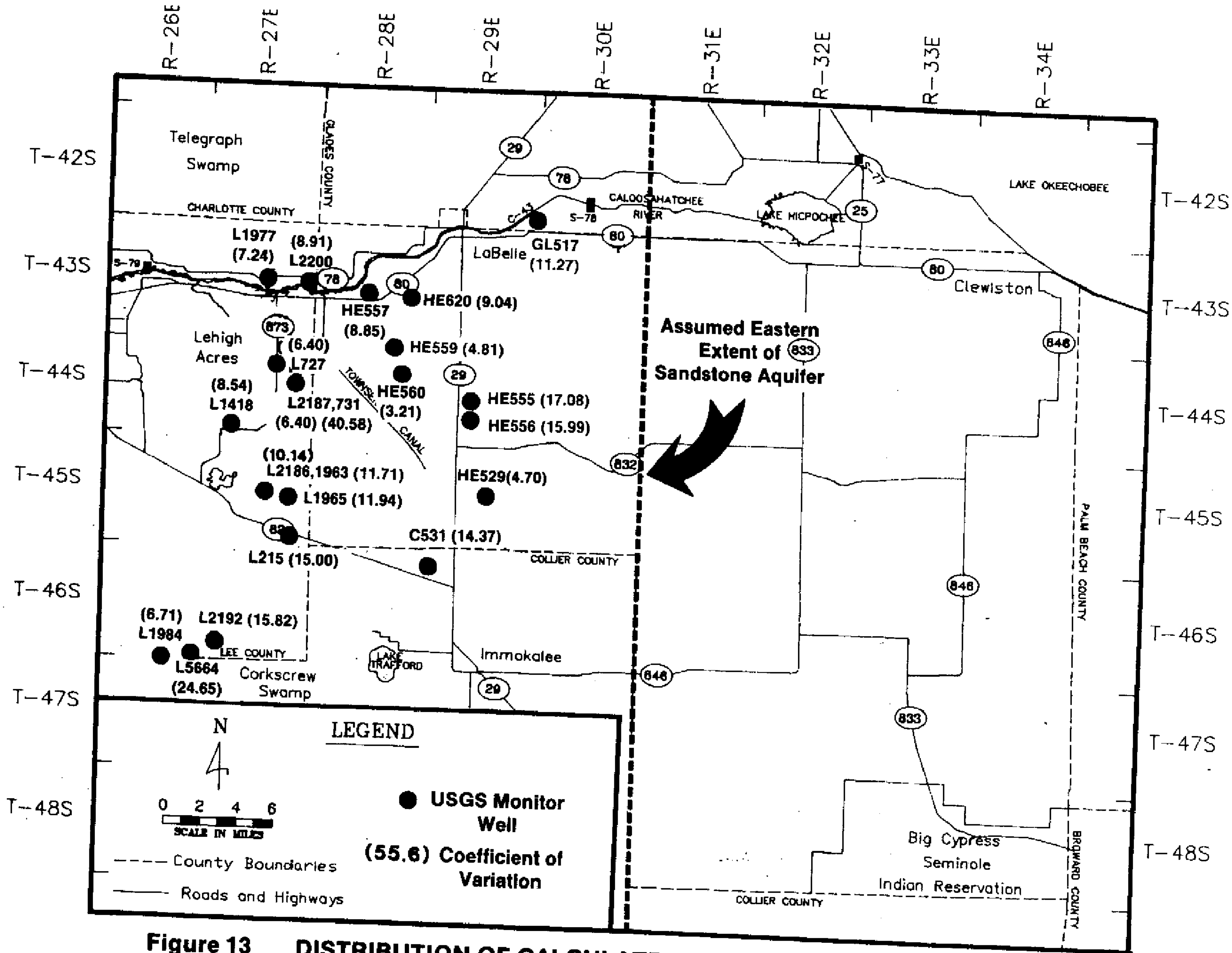


Figure 13 DISTRIBUTION OF CALCULATED VARIATION COEFFICIENTS FOR THE SANDSTONE AQUIFER

shown on Table 2. Highest average annual CV value calculated for the sandstone aquifer in Hendry County (17.08%) occurred in well HE-555. This well is located adjacent to a large citrus grove and is apparently influenced by pumpage. The highest variance in the study area occurred in well L-1984 which is located in the Lee County South wellfield. This reflects the influence of seasonal demands combined with long term increases in withdrawals rates.

The average annual CV for the sandstone aquifer in Hendry County wells is 9.10%. This value is higher than the value calculated for the Surficial Aquifer System because the sandstone aquifer is being developed to a much greater extent than the shallow aquifers at this time. Also, because the aquifer is confined, has low storage, and is characterized by low transmissivity, water levels can be expected to fluctuate more dynamically to pumping.

Of the seven wells analyzed in Hendry County, two had average annual CV's consistently above 10%. Of the remaining five, only three, HE-529, HE-559, and HE-560 had all the monthly CV's below 10%. These three stations are considered to most accurately reflect ambient water levels for the sandstone aquifer based on the specified criteria.

The kriging algorithm was applied to regularly distributed monitor networks to determine the total system variance. The analysis considered variance associated with the water level measurements over time, combined with the spacial variance associated with distance from any particular measuring point. Once again, the results were expressed in terms of the coefficient of variance for comparison.

A hypothetical network consisting of 20 evenly spaced wells distributed over an area the size of Hendry County was used to evaluate the Surficial Aquifer System network. Assuming the network is sampled monthly, the calculated CV would be 22%. This value would drop to 16% if the network is sampled daily. If the CV is to be reduced from 16% to 6%, an additional 121 wells would be required with a daily sampling frequency. Additional reduction of variance is not cost effective at this

TABLE 2
CALCULATED MEANS AND VARIANCES
FOR SELECTED WELLS MONITORING THE SANDSTONE AQUIFER
(Monthly Mean [ft]/Monthly Variance [ft2])

WELL	C-531	GL-517	HE-529
JAN	26.43/19.39	10.76/1.05	29.11/1.75
FEB	26.49/7.95	10.60/1.24	29.10/1.32
MAR	29.30/10.11	10.71/1.31	28.57/1.32
APR	22.56/11.40	9.89/0.67	28.03/2.07
MAY	24.03/15.44	9.79/0.81	27.88/2.59
JUN	27.63/5.53	11.16/1.94	29.26/1.84
JUL	29.66/3.29	11.59/1.16	29.53/1.49
AUG	30.58/1.70	12.04/0.57	30.46/0.83
SEP	30.69/2.64	12.30/0.54	30.58/0.31
OCT	25.52/8.58	11.09/0.65	29.54/0.42
NOV	25.53/9.78	10.52/0.24	29.33/0.51
DEC	25.23/9.44	10.23/0.99	29.05/0.87
YEARLY MEAN (ft)	26.62	10.89	29.21
YEARLY VARIANCE (ft^2)	14.63	1.51	1.89
VARIATION COEFFICIENT (%)	14.37	11.27	4.70

WELL	HE-555	L-1977
JAN	20.90/14.05	12.14/0.49
FEB	21.31/9.70	12.29/0.69
MAR	21.16/13.16	12.07/0.80
APR	19.42/10.88	11.30/1.02
MAY	18.28/19.63	11.45/0.81
JUN	21.01/10.30	12.37/0.31
JUL	23.34/7.88	12.80.0.32
AUG	24.72/4.06	12.94/0.47
SEP	25.11/3.82	13.14/0.14
OCT	23.88/8.78	12.61/0.32
NOV	23.37/8.93	12.12/0.36
DEC	21.83/10.75	11.97/0.38
YEARLY MEAN (ft)	22.04	12.26
YEARLY VARIANCE (ft^2)	14.18	0.79
VARIATION COEFFICIENT (%)	17.08	7.24

time because the historic monitor and water use data suggests the Surficial Aquifer System is not stressed by large scale pumping. However, the exsting network is not evenly distributed across the county. For this reason, additional wells may be needed in the north central and south central portions of the county to achieve the desired coverage.

The same analysis was completed for the sandstone aquifer. Six hypothetical wells were evenly distributed in western Hendry County corresponding to the known extent of the sandstone aquifer. The resulting CV's are 20% if the wells are sampled monthly, and 17% if they are sampled daily. The CV could be reduced to 10% using 24 evenly distributed wells which are measured daily. The present distribution is sufficient based on current use. However, additional monitor wells may be needed in the future to monitor impacts of increased agricultural activities in the southwestern corner of the county.

An example of the cross-correlation between water levels in the Surficial Aquifer System and rainfall is shown in Figure 14. The graph shows a significant correlation between the two data sets. The largest degree of correlation is 21.55% which occurs two days after a precipitation event. This implies 21.55% of the water level changes are a result of precipitation and 78.45% are caused by other factors such as ground water withdrawals, evapotranspiration rates, tidal influence, etc.

The result of the cross-correlation between sandstone aquifer well L-1984 and rainfall station MRF 206 is shown in Figure 15. Only two days show a positive correlation, and in both cases, the correlation is less than 1%. This suggests a good degree of confinement exists above the sandstone aquifer, at this site.

The result of the cross-correlation between the Surficial Aquifer System and sandstone aquifer is shown in Figure 16. A maximum of 42.3% of water level changes in the sandstone aquifer can be attributed to changes in the overlying Surficial Aquifer System. The largest percentage of correlation occurs at a lag time

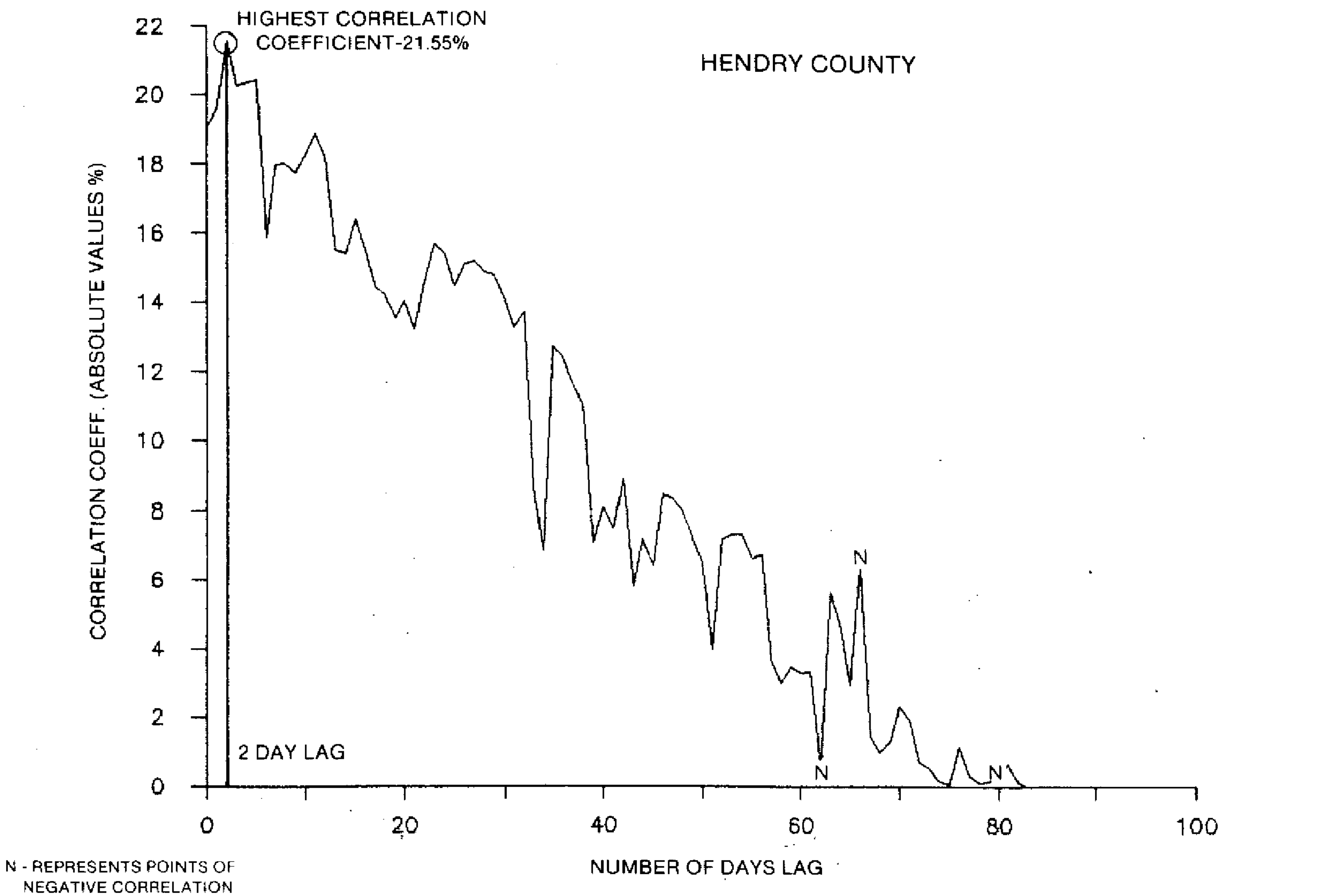


Figure 14 CROSS CORRELATION BETWEEN WELL HE-558 AND RAINFALL STATION MRF5021

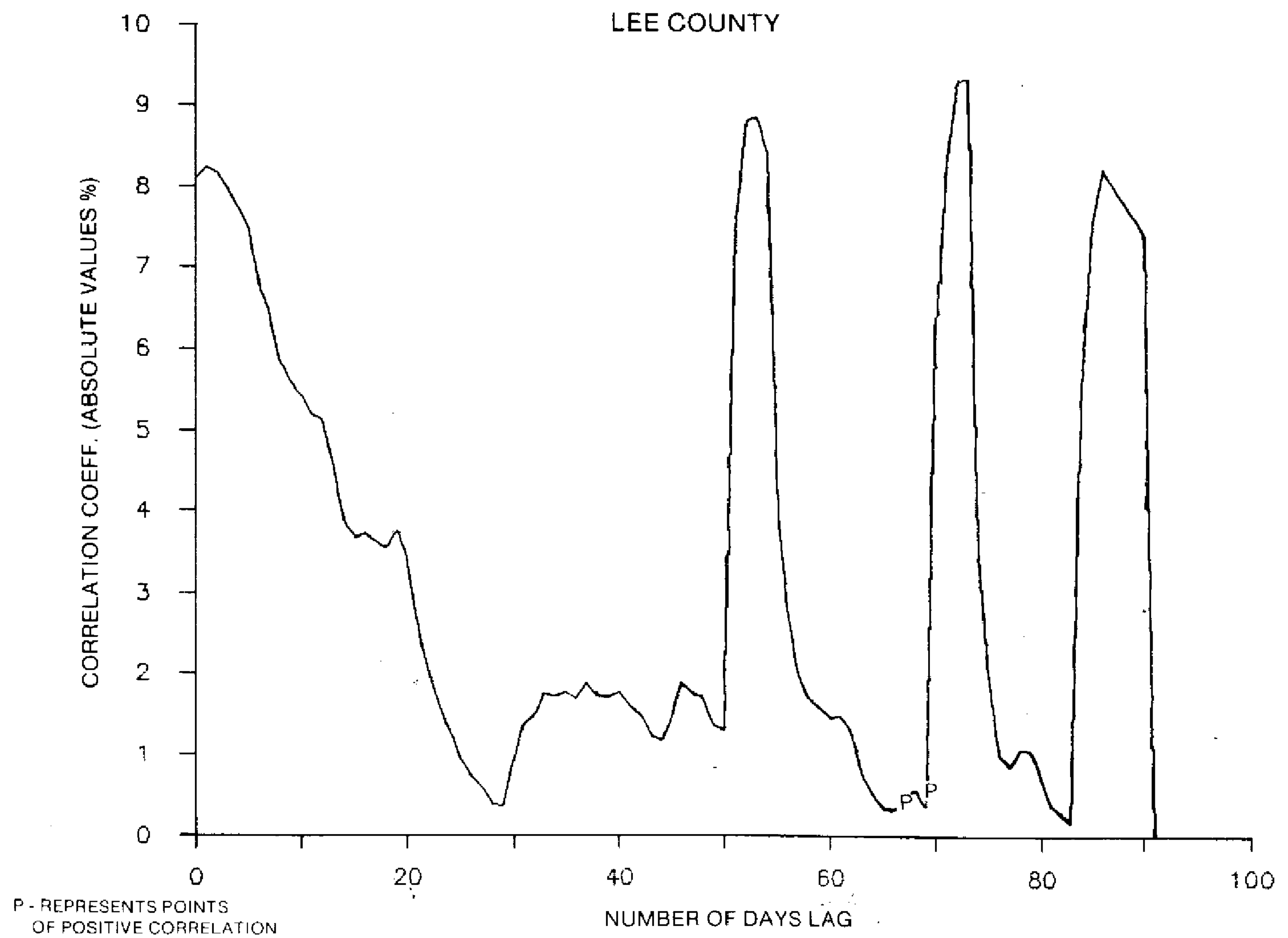


Figure 15 CROSS CORRELATION BETWEEN WELL L-1984 AND RAINFALL STATION MRF206

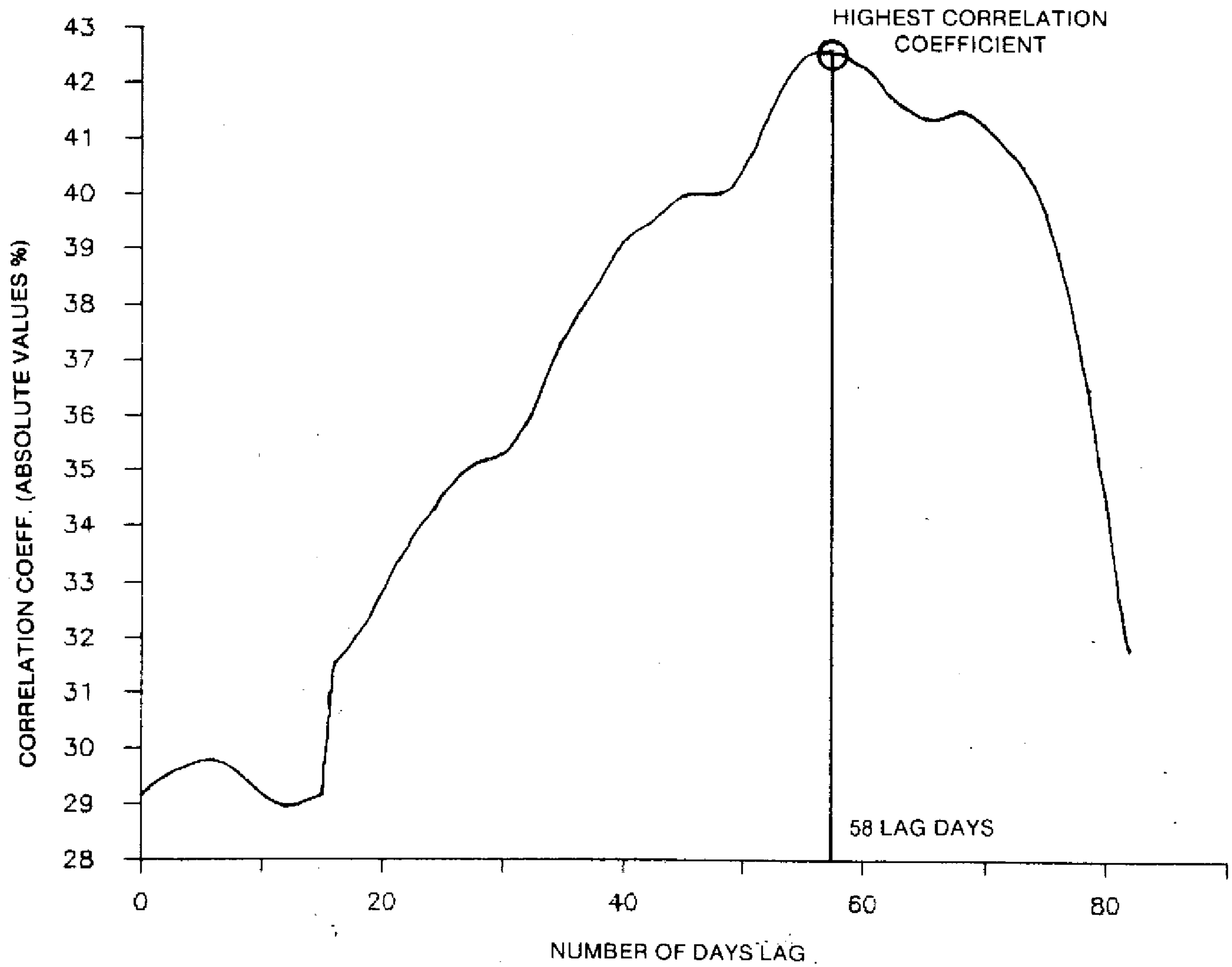


Figure 16 CROSS CORRELATION BETWEEN THE WATER LEVELS IN THE SURFICIAL AQUIFER SYSTEM AND THE SANDSTONE AQUIFER (L-1983 AND HE-558)

of 58 days, which also indicates that there may be significant confinement between the two aquifers.

A cross-correlation was also done to determine if water level changes in the Surficial Aquifer System can be attributed to changes in water levels in the sandstone aquifer. The result of this analysis shows no obvious correlation (Figure 17). This supports the premise that the sandstone aquifer receives recharge from the Surficial Aquifer System.

CONCLUSIONS

1. Land use in Hendry County is undergoing a rapid change from predominantly pasture and rangeland to developed agriculture, primarily citrus and row crops. Thirty-seven percent of the county has a high potential for conversion to citrus production, while 24% of the county is already in citrus production or in the process of being converted to citrus.
2. The change in land use will result in an increase in water use. Because of the limited nature of the surface water resources in Hendry County, the majority of the increased water withdrawals will be from ground water.
3. All of the USGS wells monitoring the Surficial Aquifer System in Hendry County, with the exception of well HE-861, are representative of the ambient water levels in this aquifer system.
4. Of the seven USGS wells monitoring the sandstone aquifer in Hendry County, three represent the ambient water levels. The remaining wells are influenced by ground water withdrawals. Water levels in the sandstone aquifer are more variable than water levels in the Surficial Aquifer System. This is a result of lower transmissivity and storage values, the confined nature of the aquifer, and the fact that the sandstone aquifer is being heavily developed.
5. The Surficial Aquifer System is recharged primarily by rainfall. The statistical analysis showed a high degree of correlation between water levels in the

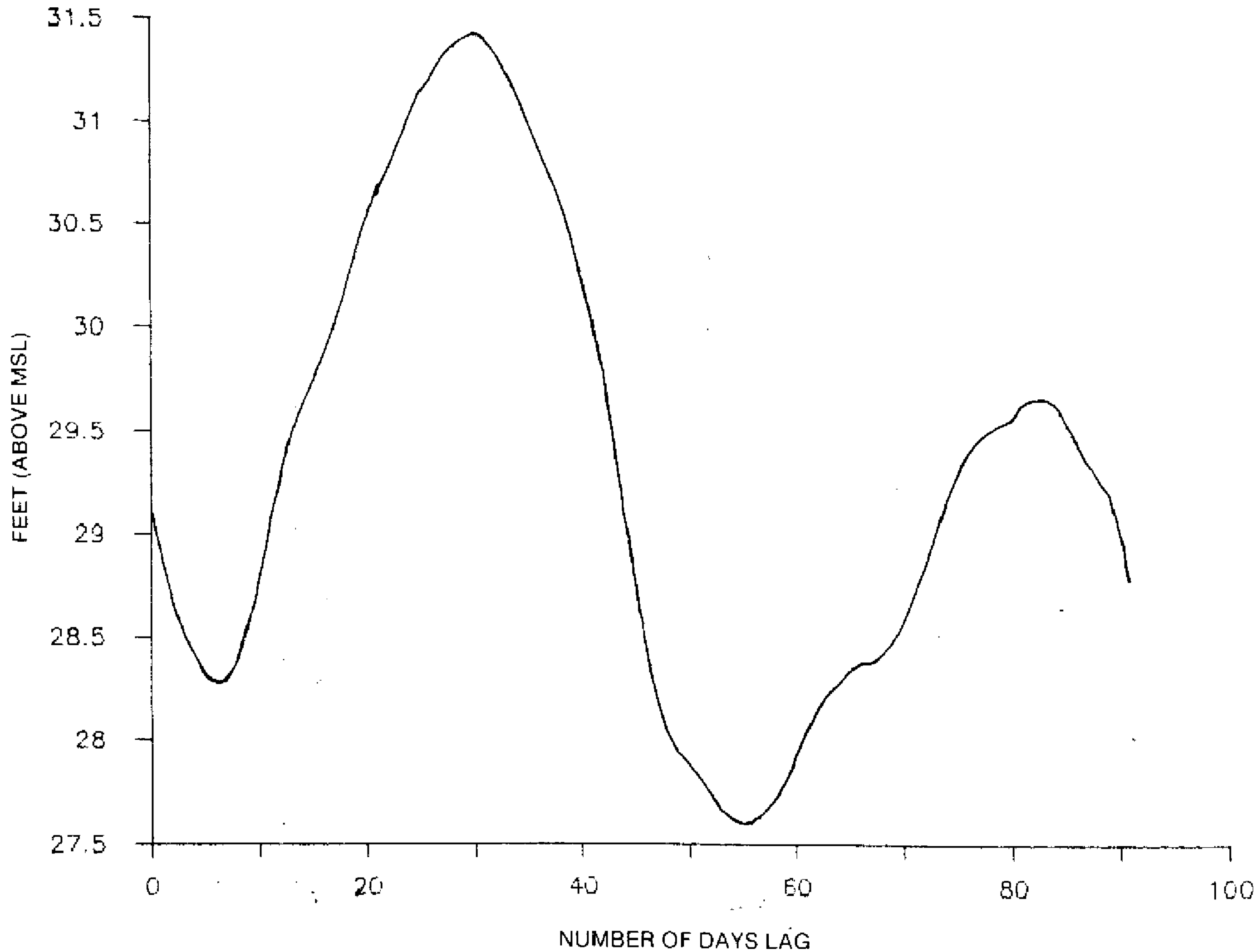


Figure 17 CROSS CORRELATION BETWEEN THE WATER LEVELS IN THE SANDSTONE AQUIFER AND THE SURFICIAL AQUIFER SYSTEM (HE-558 AND L-1983)

Surficial Aquifer System and precipitation two days after rainfall events. The sandstone aquifer has significant confinement above, as shown by the very low degree of correlation between water levels in the sandstone aquifer and rainfall. However, the sandstone aquifer receives most of its recharge from the Surficial Aquifer System. Because the highest degree of correlation occurs with a lag time of 58 days, a significant amount of confinement exists between the two aquifers.

6. The USGS ground water monitor networks are generally adequate based on current ground water use. However, additional wells will be needed because of the increasing withdrawals and the fact that the current network is not evenly distributed across the county.

RECOMMENDATIONS

1. Based on the existing and projected land use data presented, it is recommended that the nine sites be investigated in the next phase of the Hendry County ground water study. These sites are shown on Figure 18. Data generated at each site should include well cuttings, geophysical data, and aquifer characteristic data. Observation wells should be maintained at each site for collection of long term water level and quality data.
2. Land use data for Hendry County should be updated prior to developing a regional ground water flow model. Updated land use and associated water demands are a necessary prerequisite to model development or the formation of a water use plan.
3. Funding for the ground water monitor network should be continued in order to maintain continuous time series data. Most of the existing stations have over ten years of uninterrupted data. This type of data is rare and extremely valuable for developing time series forecast models. Such information will also be necessary to support management decisions as growth progresses.

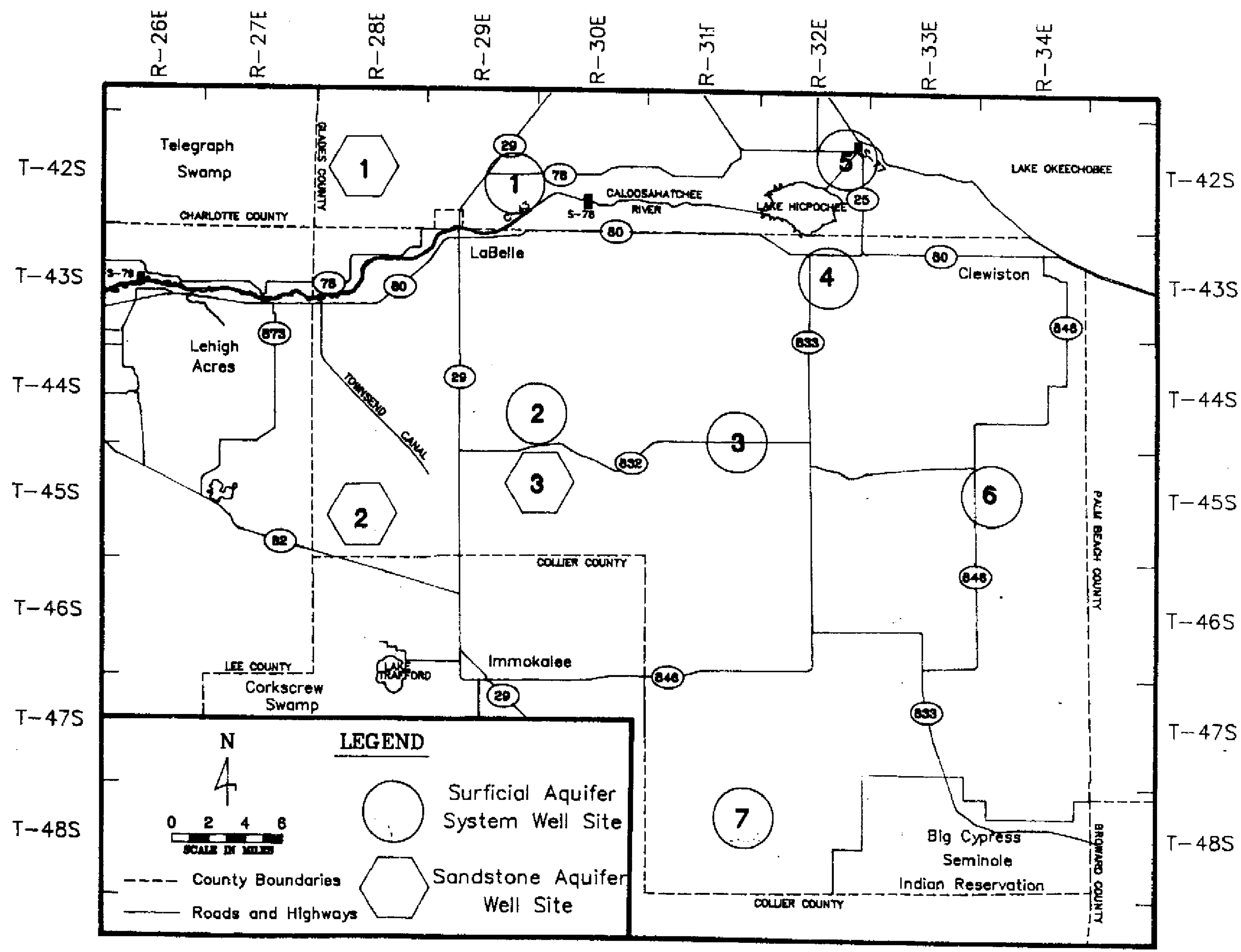


Figure 18 RECOMMENDED LOCATIONS FOR FUTURE MONITORING WELLS IN THE SURFICIAL AQUIFER SYSTEM AND THE SANDSTONE AQUIFER

REFERENCES

Applin, P. L. and E. R. Applin, 1944. Regional Subsurface Stratigraphy and Structure of Florida and Southern Georgia: Bull. of American Association of Petroleum Geologists, Vol. 28, No. 12, Washington, D.C.

Cooke, C. W. and S. Mossom, 1929. Geology of Florida: Florida Geological Survey, 20th Annual Report.

Dubar, Jules R., 1958. Neogene Stratigraphy of Southwestern Florida: Gulf Coast Association Geol. Soc. Trans., Vol. VIII, p. 129-155, 14 figs.

Fan, Andrew and Raymond Burgess, 1983. Surface Water Availability of the Caloosahatchee Basin: SFWMD Technical Memorandum.

Florida Bureau of Geology, 1986. Hydrogeological Units of Florida: Florida Geological Survey Special Publication No. 28.

Heilprin, Angelo, 1887. Explorations on the West Coast of Florida and in the Okeechobee Wilderness: Wagner Free Inst. Sci. Trans., V. 1.

Klein, H., M. C. Schroeder, and W. F. Lichtler, 1964. Geology and Ground- Water Resources of Glades and Hendry Counties, Florida: Florida Geological Survey, Report of Investigations No. 37.

Knapp, Michael S., William S. Burns, and Timothy S. Sharp, 1986 Preliminary Assessment of the Groundwater Resources of Western Collier County, Florida: South Florida Water Management District Technical Publication #86-1.

Mansfield, W. C., 1939. Notes on the Upper Tertiary and Pleistocene Mollusks of Peninsular Florida: Florida Geological Survey, Bull. 18.

Matheron, G. and C. Huijbregts, 1971. Universal Kriging (an optimal method for estimating and contouring in trend surface analysis), decision making in the mineral industry, C.I.M. Special Volume No. 12, p. 159-169.

Missimer, T. M., 1978. The Tamiami Formation-Hawthorn Formation Contact in Southwest Florida: Florida Scientist, Vol. 41, No. 1, 33-39 p.

Parker, G. F. and C. W. Cooke, 1944. Late Cenozoic Geology of Southern Florida with a Discussion of the Groundwater: Florida Geological Survey Bulletin 27, 119 p.

Puri, H. S. and R. O. Vernon, 1964. Summary of the Geology of Florida and a Guidebook to the Classic Exposures: Florida Geological Survey, Special Publication #5 (revised).

Scott, T. M., and M. S. Knapp, in press. The Hawthorn Group of Peninsular Florida: Miami Geological Society Memoir No. 3.

Sellards, E. H., 1919. Geologic Section Across the Everglades, Florida: Florida Geological Survey 12th Annual Report, p. 67-76.

Shih, George, 1986. Monitoring Network Expansion. Southeastern Ground Water Symposium Proceedings, pp. 57-70.

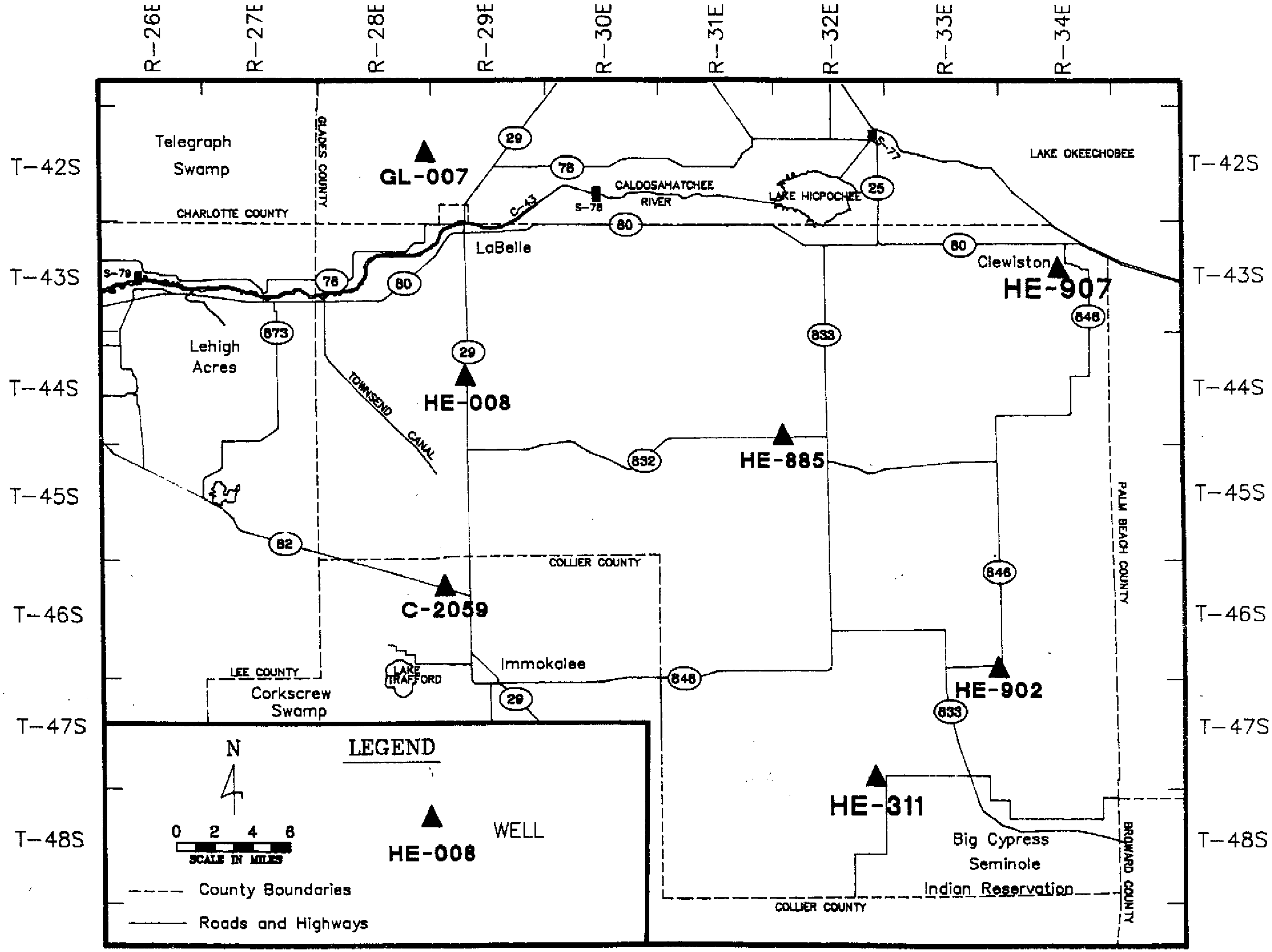
Skrivan, James A. and Michael R. Karlinger, 1980. Semi-Variogram Estimation and Universal Kriging Program: Computer Program Documentation User's Manual, USGS, Water Resources Division.

South Florida Water Management District, 1985. Management of Water Use: Permit Information Manual, Volume III, Resource Control Department.

Wedderburn, L. A., M. S. Knapp, D. P. Waltz, and W. S. Burns, 1982. Hydrogeologic Reconnaissance of Lee County, Florida: South Florida Water Management District, Technical Publication 82-1, 192 p.

APPENDIX A

INDIVIDUAL HYDROGEOLOGIC DESCRIPTIONS



LOCATIONS OF WELLS WITH HYDROGEOLOGIC SECTIONS

LITHO LOG PRINTOUT

WELL NUMBER: W- 401

COUNTY - HENDRY

TOTAL DEPTH - 460 FT.
49 SAMPLES FROM 0 - 460 FT.

LOCATION: T.42S R.29E S.18 AC
LAT = N 26D 49M 06S
LON = W 81D 27M 57S

COMPLETION DATE - 84/01/02

ELEVATION - 40 FT.

OTHER TYPES OF LOGS AVAILABLE: GEOLOGIST, CALIPER, ELECTRIC, GAMMA, LATERLOG

OWNER/DRILLER: RTA7(WGL007)DRILLED BY WOOSTER(SFWMD),SR 720 1.5 MI WEST OF LYKES TOWER

WORKED BY: DESCRIBED BY SCOTT BURNS (7-5-84), SAMPLE QUALITY (POOR)
HYDROGEOLOGIC UNITS

0.0 90.0 SURFICIAL AQUIFER SYSTEM
0.0 20.0 WATER TABLE AQUIFER
20.0 60.0 CONFINING ZONE
60.0 90.0 INTERMEDIATE AQUIFER
90.0 410.0 UPPER HAWTHORN CONFINING ZONE
410.0 460.0 MID-HAWTHORN AQUIFER

0.0- 10.0 090UDSC UNDIFFERENTIATED SAND AND CLAY
10.0- 20.0 112CLSCR CALOOSAHATCHEE FM.
20.0- 90.0 122TMIM TAMIAMI FM.
90.0- 460.0 122HTRN HAWTHORN FM.

0.0- 10.0 SAND; MODERATE YELLOWISH BROWN TO DARK YELLOWISH ORANGE; 20% POROSITY, INTERGRANULAR; GRAIN SIZE: FINE, RANGE: VERY FINE TO FINE; ROUNDNESS:SUB-ANGULAR TO ANGULAR; HIGH SPHERICITY; UNCONSOLIDATED; HEMATITE-02%, IRON STAIN- %; NO FOSSIL;

10.0- 30.0 LIMESTONE; WHITE; 15% POROSITY, MOLDIC, INTERGRANULAR; GRAIN TYPE: CALCILUTITE, SKELTAL CAST; 15% ALLOCHEMICAL CONSTITUENTS; GRAIN SIZE: MICROCRYSTALLINE; RANGE: CRYPTOCRYSTALLINE TO FINE; GOOD INDURATION; QUARTZ SAND-20%, IRON STAIN- %; FOSSIL MOLDS, ECHINOID;

30.0- 40.0 SILT; YELLOWISH GRAY; 08% POROSITY, INTERGRANULAR, LOW PERMEABILITY; POOR INDURATION; QUARTZ SAND-40%, CLAY-20%, CALCILUTITE-25%; PLASTIC; BENTHIC FORAMINIFERA;
SAND MODE IS FINE AND SUBANGULAR

40.0- 40.0 AS ABOVE, DECREASE IN SAND 20%, INCREASE PERCENTAGE OF MICRITE (30%)

40.0- 50.0 LIMESTONE; LIGHT OLIVE GRAY TO WHITE; 08% POROSITY, INTERGRANULAR, LOW PERMEABILITY; GRAIN TYPE: CALCILUTITE; 05% ALLOCHEMICAL CONSTITUENTS; GRAIN SIZE: MICROCRYSTALLINE; RANGE: CRYPTOCRYSTALLINE TO FINE; POOR INDURATION; SILT-40%, QUARTZ SAND-20%; MOLLUSKS;
OLIVE GRAY SANDY SILT INTERBEDDED WITH POORLY LITHOFIED BIOGENIC MICRITE (OSTREA & PELECYPODS)

50.0- 60.0 SAND; YELLOWISH GRAY; 08% POROSITY, INTERGRANULAR, LOW PERMEABILITY; GRAIN SIZE: VERY FINE, RANGE: MICROCRYSTALLINE TO FINE; ROUNDNESS:ANGULAR TO SUB-ANGULAR; HIGH SPHERICITY; POOR INDURATION; CLAY MATRIX, DOLOMITE CEMENT; DOLOMITE-10%, CLAY-15%, CALCILUTITE-10%; BENTHIC FORAMINIFERA;
CALCAREOUS DOLOSILT MATRIX

60.0- 70.0 LIMESTONE; WHITE TO YELLOWISH GRAY; 15% POROSITY, INTERGRANULAR, PIN POINT VUGS; GRAIN TYPE: CALCILUTITE, BIOGENIC; 45% ALLOCHEMICAL CONSTITUENTS; GRAIN SIZE: MEDIUM; RANGE: CRYPTOCRYSTALLINE TO COARSE; MODERATE INDURATIO' QUARTZ SAND-20%; CHALKY; MOLLUSKS;
CHLAMYS NODOSUS

70.0- 90.0 LIMESTONE; WHITE; 15% POROSITY, INTERGRANULAR, PIN POINT VUGS, MOLDIC; GRAIN TYPE: CALCILUTITE, BIOGENIC; 45% ALLOCHEMICAL CONSTITUENTS; GRAIN SIZE: MEDIUM; RANGE: CRYPTOCRYSTALLINE TO VERY COARSE; GOOD INDURATION; DOLOMITE-15%, QUARTZ SAND-05%; CHALKY; MOLLUSKS;
PECTIN MOLDS

90.0- 90.0 AS ABOVE WITH LOWER POROSITY; LESS BIOGENIC

90.0- 100.0 CALCILUTITE; YELLOWISH GRAY; 08% POROSITY, INTERGRANULAR, LOW PERMEABILITY; GRAIN TYPE: CALCILUTITE, INTRACLASTS; 5% ALLOCHEMICAL CONSTITUENTS; GRAIN SIZE: CRYPTOCRYSTALLINE; RANGE: CRYPTOCRYSTALLINE TO MICROCRYSTALLINE; POOR INDURATION; QUARTZ SAND-30%, SILT-20%, PHOSPHATIC SAND-02%; CHALKY; NO FOSSIL;

100.0- 110.0 AS ABOVE

110.0- 120.0 CALCILUTITE; YELLOWISH GRAY; 08% POROSITY, INTERGRANULAR, LOW PERMEABILITY; GRAIN TYPE: CALCILUTITE; 5% ALLOCHEMICAL CONSTITUENTS; GRAIN SIZE: CRYPTOCRYSTALLINE; RANGE: CRYPTOCRYSTALLINE TO MICROCRYSTALLINE; POOR INDURATION; QUARTZ SAND-30%, SILT-20%, PHOSPHATIC SAND-03%; CHALKY; NO FOSSIL;

120.0- 130.0 AS ABOVE

130.0- 140.0 SILT; GRAYISH GREEN; NOT OBSERVED; POOR INDURATION; QUARTZ SAND-10%, PHOSPHATIC SAND-02%, CLAY-10%; PLASTIC, CALCAREOUS; BENTHIC FORAMINIFERA;

140.0- 150.0 AS ABOVE

150.0- 160.0 SILT; GRAYISH GREEN; 08% POROSITY, INTERGRANULAR, LOW PERMEABILITY; POOR INDURATION; QUARTZ SAND-30%, PHOSPHATIC SAND-02%, CLAY-10%; PLASTIC, CALCAREOUS; NO FOSSIL;

160.0- 170.0 AS ABOVE

170.0- 180.0 CLAY; GRAYISH OLIVE; 08% POROSITY, INTERGRANULAR, LOW PERMEABILITY; POOR INDURATION; CALCILUTITE-30%, CLAY-15%, PHOSPHATIC SAND-06%, QUARTZ SAND-15%; PLASTIC, CALCAREOUS; BENTHIC FORAMINIFERA;

180.0- 190.0 CLAY; GRAYISH GREEN; 08% POROSITY, INTERGRANULAR, LOW PERMEABILITY; POOR INDURATION; QUARTZ SAND-30%, CLAY-15%, PHOSPHATIC SAND-04%; PLASTIC, CALCAREOUS; BENTHIC FORAMINIFERA;

190.0- 200.0 AS ABOVE

200.0- 210.0 CALCILUTITE; VERY LIGHT GRAY; 08% POROSITY, INTERGRANULAR, LOW PERMEABILITY; GRAIN TYPE: CALCILUTITE; 05% ALLOCHEMICAL CONSTITUENTS; GRAIN SIZE: MICROCRYSTALLINE; RANGE: CRYPTOCRYSTALLINE TO MICROCRYSTALLINE; POOR INDURATION; QUARTZ SAND-40%, PHOSPHATIC SAND-08%; NO FOSSIL;

210.0- 220.0 AS ABOVE

220.0- 230.0 CLAY; LIGHT OLIVE BROWN; 08% POROSITY, INTERGRANULAR, LOW PERMEABILITY; POOR INDURATION; QUARTZ SAND-30%, CLAY-20%, PHOSPHATIC SAND-08%; PLASTIC, CALCAREOUS;

230.0- 240.0 CALCILUTITE; VERY LIGHT GRAY; 08% POROSITY, INTERGRANULAR, LOW PERMEABILITY; GRAIN TYPE: CALCILUTITE; 05% ALLOCHEMICAL CONSTITUENTS; GRAIN SIZE: MICROCRYSTALLINE; RANGE: CRYPTOCRYSTALLINE TO MICROCRYSTALLINE; POOR INDURATION; QUARTZ SAND-20%, PHOSPHATIC SAND-10%, DOLOMITE-10%; CHALKY;

240.0- 250.0 AS ABOVE

250.0- 260.0 CALCILUTITE; WHITE; 08% POROSITY, INTERGRANULAR, LOW PERMEABILITY; GRAIN TYPE: CALCILUTITE; 10% ALLOCHEMICAL CONSTITUENTS; GRAIN SIZE: CRYPTOCRYSTALLINE; RANGE: CRYPTOCRYSTALLINE TO MICROCRYSTALLINE; POOR INDURATION; QUARTZ SAND-15%, PHOSPHATIC SAND-07%, DOLOMITE-10%; CHALKY; NO FOSSIL;

260.0- 270.0 AS ABOVE

270.0- 280.0 SILT; GRAYISH OLIVE; NOT OBSERVED; POOR INDURATION; CLAY-20%, QUARTZ SAND-10%, PHOSPHATIC SAND-03%; PLASTIC, CALCAREOUS; BENTHIC FORAMINIFERA;

280.0- 300.0 CALCILUTITE; WHITE; 08% POROSITY, INTERGRANULAR, LOW PERMEABILITY; GRAIN TYPE: CALCILUTITE; GRAIN SIZE: CRYPTOCRYSTALLINE; RANGE: CRYPTOCRYSTALLINE TO MICROCRYSTALLINE; POOR INDURATION; DOLOMITE-20%, QUARTZ SAND-05%, PHOSPHATIC SAND-03%; CHALKY; NO FOSSIL;

300.0- 310.0 SILT; GRAYISH GREEN; NOT OBSERVED; POOR INDURATION; CLAY-20%, QUARTZ SAND-10%, PHOSPHATIC SAND-03%; PLASTIC, CALCAREOUS;

310.0- 320.0 CALCILUTITE; WHITE; 08% POROSITY, INTERGRANULAR, LOW PERMEABILITY; GRAIN TYPE: CALCILUTITE; 05% ALLOCHEMICAL CONSTITUENTS; GRAIN SIZE: CRYPTOCRYSTALLINE; RANGE: CRYPTOCRYSTALLINE TO MICROCRYSTALLINE; POOR INDURATION; DOLOMITE-20%, QUARTZ SAND-05%, PHOSPHATIC SAND-03%; CHALKY; NO FOSSIL;

320.0- 340.0 AS ABOVE

340.0- 370.0 CALCILUTITE; WHITE; 08% POROSITY, INTERGRANULAR, LOW PERMEABILITY; GRAIN TYPE: CALCILUTITE; 05% ALLOCHEMICAL CONSTITUENTS; GRAIN SIZE: CRYPTOCRYSTALLINE; RANGE: CRYPTOCRYSTALLINE TO MICROCRYSTALLINE; MODERATE INDURATION; DOLOMITE-20%, QUARTZ SAND-15%, PHOSPHATIC SAND-03%; CHALKY; NO FOSSIL;

370.0- 370.0 AS ABOVE WITH 3% QTZ & PHOSPHATIC GRAVEL

370.0- 380.0 CLAY; LIGHT GRAYISH GREEN; 08% POROSITY, INTERGRANULAR, LOW PERMEABILITY; POOR INDURATION; CALCILUTITE-30%, PHOSPHATIC SAND-04%; CALCAREOUS;

380.0- 400.0 CALCILUTITE; YELLOWISH GRAY; 08% POROSITY, INTERGRANULAR, LOW PERMEABILITY;
GRAIN TYPE: CALCILUTITE; 05% ALLOCHEMICAL CONSTITUENTS; GRAIN SIZE: CRYPTOCRYSTALLINE;
RANGE: CRYPTOCRYSTALLINE TO MICROCRYSTALLINE; POOR INDURATION; DOLOMITE-15%,
QUARTZ SAND-05%, PHOSPHATIC GRAVEL-02%, PHOSPHATIC SAND-03%;

400.0- 410.0 AS ABOVE

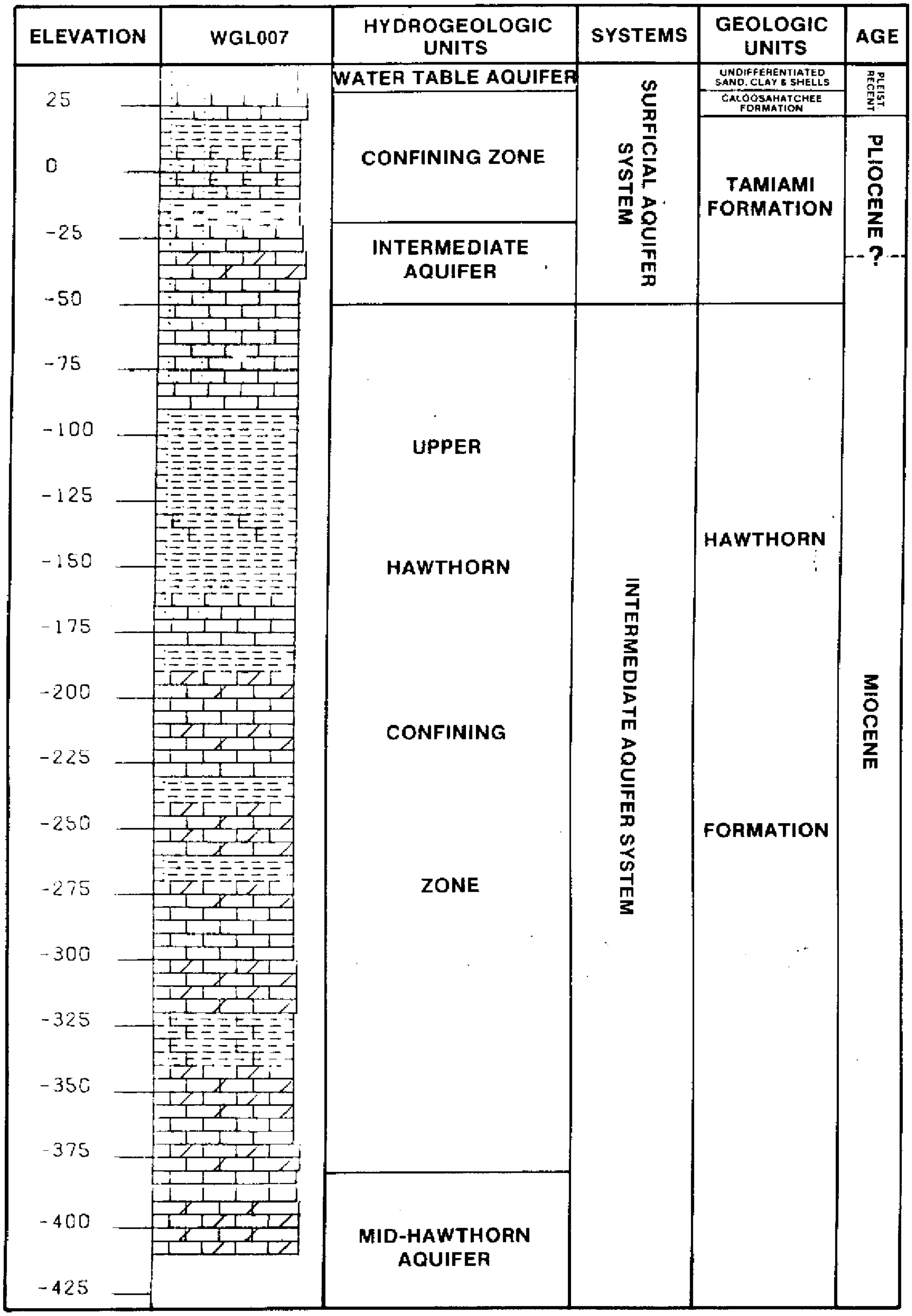
410.0- 420.0 LIMESTONE; WHITE; 13% POROSITY, INTERGRANULAR, PIN POINT VUGS; GRAIN TYPE: CALCILUTITE;
05% ALLOCHEMICAL CONSTITUENTS; GRAIN SIZE: MICROCRYSTALLINE;
RANGE: CRYPTOCRYSTALLINE TO FINE; GOOD INDURATION; QUARTZ SAND-10%, PHOSPHATIC SAND-08%,
DOLOMITE-10%;

420.0- 430.0 LIMESTONE; WHITE; 11% POROSITY, INTERGRANULAR, PIN POINT VUGS; GRAIN TYPE: CALCILUTITE;
05% ALLOCHEMICAL CONSTITUENTS; GRAIN SIZE: MICROCRYSTALLINE;
RANGE: CRYPTOCRYSTALLINE TO FINE; MODERATE INDURATION; QUARTZ SAND-05%,
PHOSPHATIC SAND-02%;

430.0- 460.0 LIMESTONE; VERY LIGHT GRAY; 13% POROSITY, INTERGRANULAR, PIN POINT VUGS;
GRAIN TYPE: CALCILUTITE, CRYSTALS; 12% ALLOCHEMICAL CONSTITUENTS; GOOD INDURATION;
DOLOMITE-15%;

460.0- 460.0 AS SAMPLE 420 TO 430

460.0 TOTAL DEPTH



HYDROGEOLOGIC CROSS SECTION
GL-007

LITHO LOG PRINTOUT

WELL NUMBER: W- 2059

TOTAL DEPTH - 410 FT.
40 SAMPLES FROM 0 - 410 FT.

COMPLETION DATE - 22/10/75

COUNTY - COLLIER

LOCATION: T.46S R.29E S.07 AD
LAT = N 26D 28M 59S
LON = W 81D 27M 30S
ELEVATION - 42 FT.

OWNER/DRILLER: USGS 531,NORTH OF IMMOKALEE,DRILLER (COASTAL CAISSENS)

WORKED BY: DESCRIBED BY MIKE KNAPP (06-26-84),QUALITY (GOOD)

HYDROGEOLOGIC UNITS

0.0 96.0 SURFICIAL AQUIFER SYSTEM
0.0 15.0 WATER TABLE AQUIFER
15.0 35.0 UPPER TAMIAMI CONFINING BEDS
35.0 96.0 LOWER TAMIAMI AQUIFER
96.0 190.0 UPPER HAWTHORN CONFINING ZONE
190.0 250.0 SANDSTONE AQUIFER
250.0 390.0 MID-HAWTHORN CONFINING ZONE
390.0 410.0 MID-HAWTHORN AQUIFER

0.0- 15.0 090UDSS UNDIFFERENTIATED SAND, CLAY, AND SHELLS
15.0- 35.0 122TMIM TAMIAMI FM.
35.0- 410.0 122HTRN HAWTHORN FM.

0.0- 5.0 SAND; LIGHT GREENISH BLUE; 35% POROSITY, INTERGRANULAR; GRAIN SIZE: MEDIUM, RANGE: VERY FINE TO MEDIUM; ROUNDNESS:SUB-ANGULAR TO ANGULAR; MEDIUM SPHERICITY; UNCONSOLIDATED;

5.0- 10.0 SAND; DARK YELLOWISH ORANGE; 20% POROSITY, INTERGRANULAR; GRAIN SIZE: MEDIUM, RANGE: VERY FINE TO MEDIUM; ROUNDNESS:SUB-ANGULAR; MEDIUM SPHERICITY; UNCONSOLIDATED; CALCILUTITE MATRIX;

10.0- 15.0 AS ABOVE

15.0- 20.0 SAND; DARK GRAYISH YELLOW; 12% POROSITY, INTERGRANULAR, LOW PERMEABILITY; GRAIN SIZE: MEDIUM, RANGE: VERY FINE TO COARSE; ROUNDNESS:SUB-ANGULAR; MEDIUM SPHERICITY; POOR INDURATION; DOLOMITE CEMENT, CALCILUTITE MATRIX; DOLOMITE-35%, CALCILUTITE-15%; DOLOSILT INTERMIXED

20.0- 25.0 LIMESTONE; VERY LIGHT ORANGE; 12% POROSITY, INTERGRANULAR, LOW PERMEABILITY; GRAIN TYPE: BIOGENIC, CALCILUTITE; 10% ALLOCHEMICAL CONSTITUENTS; GRAIN SIZE: MICROCRYSTALLINE; RANGE: MICROCRYSTALLINE TO MEDIUM; MODERATE INDURATION; CALCILUTITE MATRIX, DOLOMITE CEMENT; DOLOMITE-15%, QUARTZ SAND-10%; MOLLUSKS;

25.0- 30.0 AS ABOVE

30.0- 35.0 AS ABOVE

35.0- 50.0 SAND; WHITE TO LIGHT GRAY; 30% POROSITY, INTERGRANULAR; GRAIN SIZE: COARSE, RANGE: FINE TO VERY COARSE; ROUNDNESS:ROUNDED TO SUB-ANGULAR; MEDIUM SPHERICITY; UNCONSOLIDATED; CALCILUTITE MATRIX; CALCILUTITE-05%; MOLLUSKS;

50.0- 60.0 AS ABOVE

60.0- 65.0 SAND; VERY LIGHT GRAY; 30% POROSITY, INTERGRANULAR, POSSIBLY HIGH PERMEABILITY; GRAIN SIZE: COARSE, RANGE: FINE TO GRANULE; ROUNDNESS:ROUNDED TO SUB-ANGULAR; MEDIUM SPHERICITY; UNCONSOLIDATED; CALCILUTITE MATRIX; CALCILUTITE-05%, PHOSPHATIC SAND-02%;

65.0- 70.0 SAND; VERY LIGHT GRAY; 30% POROSITY, INTERGRANULAR, POSSIBLY HIGH PERMEABILITY; GRAIN SIZE: COARSE, RANGE: FINE TO VERY COARSE; ROUNDNESS:ROUNDED TO SUB-ANGULAR; MEDIUM SPHERICITY; UNCONSOLIDATED; CALCILUTITE MATRIX; CALCILUTITE-05%;

70.0- 80.0 SAND; VERY LIGHT GRAY; 35% POROSITY, INTERGRANULAR, POSSIBLY HIGH PERMEABILITY; GRAIN SIZE: VERY COARSE, RANGE: COARSE TO GRANULE; ROUNDNESS:ROUNDED; MEDIUM SPHERICITY; UNCONSOLIDATED;

80.0- 96.0 SAND; VERY LIGHT GRAY; 30% POROSITY, INTERGRANULAR, POSSIBLY HIGH PERMEABILITY; GRAIN SIZE: COARSE, RANGE: FINE TO VERY COARSE; ROUNDNESS:ROUNDED TO SUB-ANGULAR; MEDIUM SPHERICITY; UNCONSOLIDATED; CALCILUTITE MATRIX; CALCILUTITE-05%, PHOSPHATIC SAND-02%;

96.0- 110.0 SAND; YELLOWISH GRAY; 10% POROSITY, INTERGRANULAR, LOW PERMEABILITY; GRAIN SIZE: COARSE, RANGE: FINE TO VERY COARSE; ROUNDNESS:ROUNDED TO SUB-ANGULAR; MEDIUM SPHERICITY; POOR INDURATION; DOLOMITE CEMENT, CLAY MATRIX; DOLOMITE-25%, CLAY-05%, PHOSPHATIC SAND-02%; MOLLUSKS;

110.0- 120.0 AS ABOVE

120.0- 130.0 SAND; VERY LIGHT GRAY; 15% POROSITY, INTERGRANULAR, LOW PERMEABILITY; GRAIN SIZE: COARSE, RANGE: VERY FINE TO VERY COARSE; ROUNDNESS:ROUNDED TO SUB-ANGULAR; MEDIUM SPHERICITY; POOR INDURATION; DOLOMITE CEMENT, CALCILUTITE MATRIX, CLAY MATRIX; DOLOMITE-10%, CALCILUTITE-10%, CLAY-05%, PHOSPHATIC SAND-03%; MOLLUSKS;

130.0- 140.0 AS ABOVE

140.0- 150.0 CLAY; YELLOWISH GRAY; 10% POROSITY, INTERGRANULAR, LOW PERMEABILITY; POOR INDURATION; DOLOMITE CEMENT, CALCILUTITE MATRIX, CLAY MATRIX; CALCILUTITE-10%, CLAY-05%, QUARTZ SAND-30%; MOLLUSKS;

150.0- 160.0 AS ABOVE

160.0- 170.0 SILT; YELLOWISH GRAY; 10% POROSITY, INTERGRANULAR, LOW PERMEABILITY; POOR INDURATION; DOLOMITE CEMENT, CALCILUTITE MATRIX, CLAY MATRIX; DOLOMITE-30%, CALCILUTITE-10%, CLAY-05%; MOLLUSKS;

170.0- 180.0 AS ABOVE

180.0- 190.0 SAND; LIGHT OLIVE GRAY; 10% POROSITY, INTERGRANULAR, LOW PERMEABILITY; GRAIN SIZE: MEDIUM, RANGE: VERY FINE TO MEDIUM; ROUNDNESS:SUB-ANGULAR; MEDIUM SPHERICITY; POOR INDURATION; DOLOMITE CEMENT, CALCILUTITE MATRIX, CLAY MATRIX; DOLOMITE-30%, CALCILUTITE-10%, CLAY-10%;

190.0- 200.0 DOLOMITE; YELLOWISH GRAY; 15% POROSITY, INTERGRANULAR, MOLDIC; 50-90% ALTERED; EUHEDRAL; GRAIN SIZE: VERY FINE; RANGE: VERY FINE TO MICROCRYSTALLINE; GOOD INDURATION; DOLOMITE CEMENT, CALCILUTITE MATRIX, SPARRY CALCITE CEMENT; QUARTZ SAND-15%, PHOSPHATIC SAND-02%; MOLLUSKS, FOSSIL MOLDS;

200.0- 210.0 LIMESTONE; VERY LIGHT ORANGE; 15% POROSITY, INTERGRANULAR, MOLDIC; GRAIN TYPE: BIOGENIC, CALCILUTITE; 15% ALLOCHEMICAL CONSTITUENTS; GRAIN SIZE: MICROCRYSTALLINE; RANGE: MICROCRYSTALLINE TO COARSE; MODERATE INDURATION; CALCILUTITE MATRIX, DOLOMITE CEMENT; DOLOMITE-20%; MOLLUSKS, FOSSIL MOLDS, CORAL, WORM TRACES;

210.0- 220.0 AS ABOVE

220.0- 250.0 LIMESTONE; VERY LIGHT ORANGE; 15% POROSITY, INTERGRANULAR, MOLDIC; GRAIN TYPE: BIOGENIC, CALCILUTITE; 10% ALLOCHEMICAL CONSTITUENTS; GRAIN SIZE: MICROCRYSTALLINE; RANGE: MICROCRYSTALLINE TO MEDIUM; MODERATE INDURATION; CALCILUTITE MATRIX, DOLOMITE CEMENT; DOLOMITE-25%, QUARTZ SAND-02%; MOLLUSKS, FOSSIL MOLDS;

250.0- 260.0 CLAY; YELLOWISH GRAY; 10% POROSITY, INTERGRANULAR, LOW PERMEABILITY; POOR INDURATION; DOLOMITE CEMENT, CALCILUTITE MATRIX; CALCILUTITE-10%, QUARTZ SAND-15%, PHOSPHATIC SAND-03%; MOLLUSKS;

260.0- 270.0 AS ABOVE

270.0- 280.0 AS ABOVE

280.0- 300.0 CLAY; YELLOWISH GRAY; 10% POROSITY, INTERGRANULAR, LOW PERMEABILITY; POOR INDURATION; DOLOMITE CEMENT, CALCILUTITE MATRIX, CLAY MATRIX; CALCILUTITE-10%, CLAY-10%, QUARTZ SAND-10%, PHOSPHATIC SAND-05%; MOLLUSKS;

300.0- 300.0 AS ABOVE - COARSE SAND (CAVINGS?)

300.0- 320.0 CLAY; YELLOWISH GRAY; 10% POROSITY, INTERGRANULAR, LOW PERMEABILITY; POOR INDURATION; DOLOMITE CEMENT, CALCILUTITE MATRIX, CLAY MATRIX; CALCILUTITE-05%, CLAY-10%, QUARTZ SAND-10%, PHOSPHATIC SAND-05%; MOLLUSKS;

320.0- 340.0 AS ABOVE

340.0- 350.0 CLAY; YELLOWISH GRAY; 10% POROSITY, INTERGRANULAR, LOW PERMEABILITY; POOR INDURATION; DOLOMITE CEMENT, CALCILUTITE MATRIX, CLAY MATRIX; CALCILUTITE-15%, CLAY-10%, QUARTZ SAND-25%, PHOSPHATIC SAND-05%; MOLLUSKS;

350.0- 360.0 SAND; YELLOWISH GRAY; 15% POROSITY, INTERGRANULAR, LOW PERMEABILITY; GRAIN SIZE: COARSE, RANGE: VERY FINE TO COARSE; ROUNDNESS:SUB-ANGULAR; MEDIUM SPHERICITY; POOR INDURATION; DOLOMITE CEMENT, CALCILUTITE MATRIX, CLAY MATRIX; DOLOMITE-25%, CLAY-05%, CALCILUTITE-05%, PHOSPHATIC SAND-05%; MOLLUSKS;

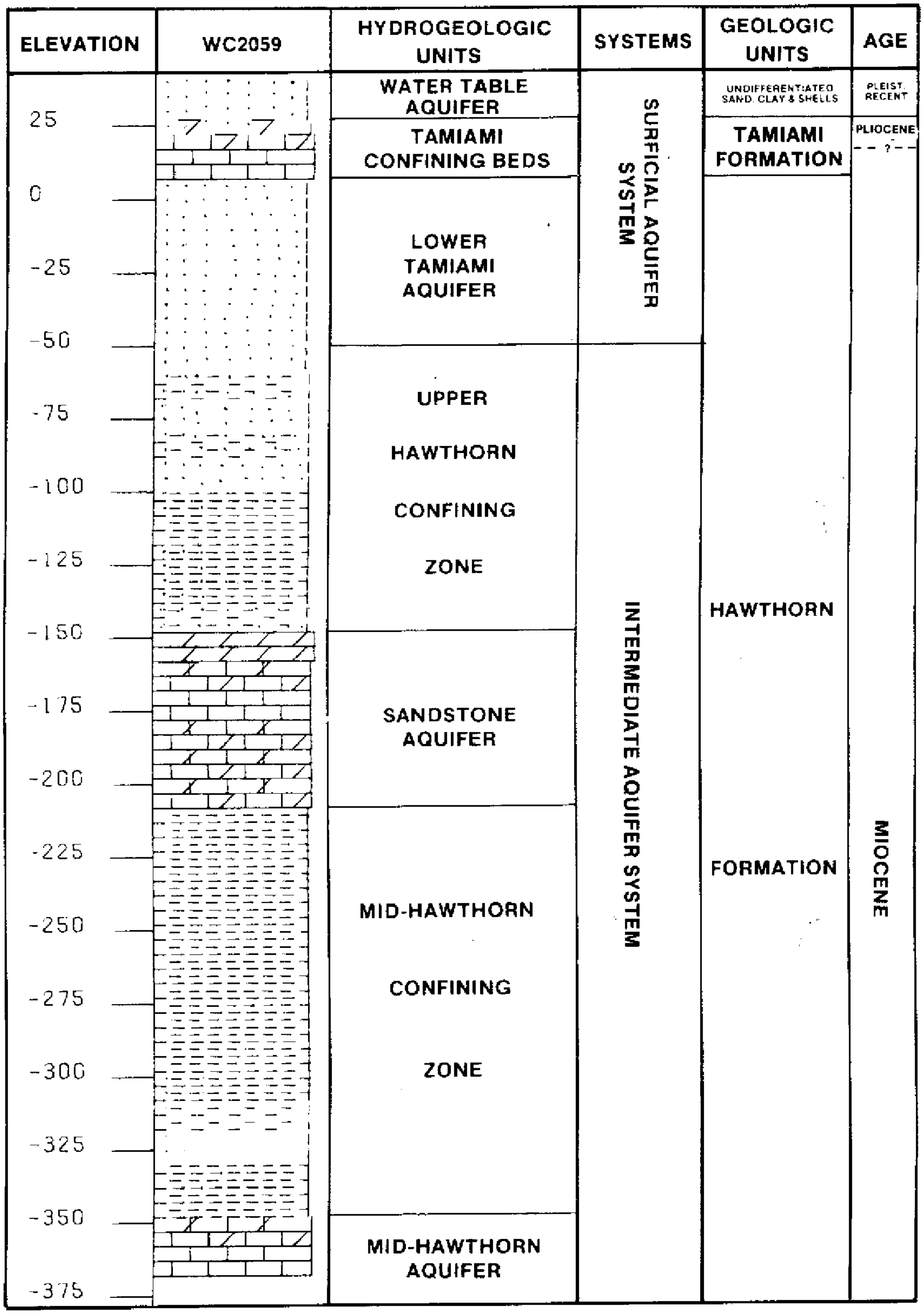
360.0- 370.0 AS ABOVE

370.0- 380.0 CLAY: YELLOWISH GRAY; 10% POROSITY, INTERGRANULAR, LOW PERMEABILITY; POOR INDURATION; DOLOMITE CEMENT, CALCILUTITE MATRIX, CLAY MATRIX; CALCILUTITE-10%, CLAY-05%, PHOSPHATIC SAND-10%, QUARTZ SAND-15%; MOLLUSKS;

380.0- 390.0 CLAY; YELLOWISH GRAY; 10% POROSITY, INTERGRANULAR, LOW PERMEABILITY; POOR INDURATION; DOLOMITE CEMENT, CALCILUTITE MATRIX, CLAY MATRIX; CALCILUTITE-10%, CLAY-05%, PHOSPHATIC SAND-15%, QUARTZ SAND-05%; MOLLUSKS;

390.0- 400.0 LIMESTONE; VERY LIGHT ORANGE; 15% POROSITY, INTERGRANULAR, MOLDIC; GRAIN TYPE: BIOGENIC, CALCILUTITE, CRYSTALS; 15% ALLOCHEMICAL CONSTITUENTS; GRAIN SIZE: MICROCRYSTALLINE; RANGE: MICROCRYSTALLINE TO COARSE; MODERATE INDURATION; CALCILUTITE MATRIX, DOLOMITE CEMENT, SPARRY CALCITE CEMENT; DOLOMITE-25%, PHOSPHATIC SAND-10%, QUARTZ SAND-05%; MOLLUSKS, CORAL, FOSSIL MOLDS;

400.0- 410.0 AS ABOVE



HYDROGEOLOGIC CROSS SECTION
C-2059

LITHO LOG PRINTOUT

WELL NUMBER: W- 119

COUNTY - HENDRY

TOTAL DEPTH - 380 FT.
36 SAMPLES FROM 0 - 380 FT.

LOCATION: T.44S R.29E S.16 BC
LAT = N 26D 38M 45S
LON = W 81D 26M 12S

COMPLETION DATE - 25/01/84

ELEVATION - 28 FT.

OTHER TYPES OF LOGS AVAILABLE: GEOLOGIST, CALIPER, ELECTRIC, GAMMA, LATERLOG

OWNER/DRILLER: RTA6(HE-008)DRILLED BY WOOSTER(SFWMD), SEARS ROAD & SR 29

WORKED BY: DESCRIBED BY SCOTT BURNS (6-15-84), SAMPLE QUALITY (GOOD)
HYDROGEOLOGIC UNITS

0.0 40.0 WATER TABLE AQUIFER
40.0 140.0 UPPER HAWTHORN CONFINING ZONE
140.0 180.0 SANDSTONE AQUIFER
180.0 370.0 MID HAWTHORN CONFINING ZONE
370.0 380.0 MID HAWTHORN AQUIFER

0.0- 20.0 090UDSS UNDIFFERENTIATED SAND, CLAY, AND SHELLS
200.0- 40.0 122TMIM TAMIAMI FM.
400.0- 380.0 122HTRN HAWTHORN FM.

0.0- 10.0 SANDSTONE; LIGHT REDDISH ORANGE; 25% POROSITY, INTERGRANULAR; GRAIN SIZE: FINE, RANGE: VERY FINE TO MEDIUM; ROUNDNESS:SUB-ANGULAR; LOW SPHERICITY; POOR INDURATION; CALCILUTITE MATRIX, CLAY MATRIX; CALCILUTITE-20%, CLAY-15%, IRON STAIN- %; NO FOSSIL;

10.0- 10.0 SANDSTONE; GRAYISH BROWN; 25% POROSITY, INTERGRANULAR; GRAIN SIZE: FINE, RANGE: VERY FINE TO MEDIUM; ROUNDNESS:SUB-ANGULAR; LOW SPHERICITY; POOR INDURATION; CALCILUTITE MATRIX, CLAY MATRIX; CALCILUTITE-20%, CLAY-15%, IRON STAIN- %; NO FOSSIL;

10.0- 20.0 SANDSTONE; VERY LIGHT GRAY TO YELLOWISH GRAY; 25% POROSITY, INTERGRANULAR; GRAIN SIZE: FINE, RANGE: VERY FINE TO MEDIUM; ROUNDNESS:SUB-ANGULAR; LOW SPHERICITY; MODERATE INDURATION; CALCILUTITE MATRIX, SPARRY CALCITE CEMENT; CALCILUTITE-40%, SPAR-10%; NO FOSSIL;

20.0- 30.0 CALCILUTITE; YELLOWISH GRAY; 10% POROSITY, INTERGRANULAR, MOLDIC; GRAIN TYPE: CALCILUTITE, INTRACLASTS; 25% ALLOCHEMICAL CONSTITUENTS; RANGE: CRYPTOCRYSTALLINE TO CRYPTOCRYSTALLINE; POOR INDURATION; QUARTZ SAND-40%, PHOSPHATIC SAND-04%; NO FOSSIL;

30.0- 40.0 SANDSTONE; YELLOWISH GRAY; 15% POROSITY, INTERGRANULAR, MOLDIC; GRAIN SIZE: FINE, RANGE: MICROCRYSTALLINE TO FINE; LOW SPHERICITY; POOR INDURATION; CALCILUTITE MATRIX, CLAY MATRIX; CALCILUTITE-15%, CLAY-10%, PHOSPHATIC SAND-03%, IRON STAIN- %; MOLLUSKS; OSTREA FRAGMENTS

40.0- 50.0 CLAY; YELLOWISH GRAY; 10% POROSITY, LOW PERMEABILITY; POOR INDURATION; QUARTZ SAND-05%, PHOSPHATIC SAND-02%, IRON STAIN- %; PLASTIC; NO FOSSIL;

50.0- 60.0 AS ABOVE

60.0- 70.0 SILT; LIGHT OLIVE GRAY; 10% POROSITY, LOW PERMEABILITY; BENTHIC FORAMINIFERA;

70.0- 80.0 CLAY; OLIVE GRAY; 10% POROSITY, LOW PERMEABILITY; POOR INDURATION; PLASTIC; BENTHIC FORAMINIFERA, DIATOMS;

80.0- 90.0 AS ABOVE

90.0- 100.0 CLAY; LIGHT OLIVE; 10% POROSITY, LOW PERMEABILITY; POOR INDURATION; QUARTZ SAND-10%, PHOSPHATIC SAND-04%; FOSSIL FRAGMENTS;

100.0- 110.0 AS ABOVE

110.0- 120.0 SAND; MODERATE GRAYISH GREEN; 15% POROSITY, INTERGRANULAR; GRAIN SIZE: COARSE, RANGE: MEDIUM TO GRANULE; ROUNDNESS:ROUNDED; MEDIUM SPHERICITY; POOR INDURATION; CLAY MATRIX; SILT-40%, PHOSPHATIC GRAVEL-02%; FOSSIL FRAGMENTS;

120.0- 130.0 SILT; GRAYISH OLIVE TO WHITE; 12% POROSITY, LOW PERMEABILITY; POOR INDURATION; QUARTZ SAND-35%, DOLOMITE-20%;
05% QUARTZ GRAVEL

130.0- 140.0 AS ABOVE

140.0- 160.0 LIMESTONE; YELLOWISH GRAY TO VERY LIGHT GRAY; 15% POROSITY, INTERGRANULAR, VUGULAR; GRAIN TYPE: CALCILUTITE, INTRACLASTS; 40% ALLOCHEMICAL CONSTITUENTS; GRAIN SIZE: VERY FINE; RANGE: MICROCRYSTALLINE TO GRANULE; MODERATE INDURATION; CALCILUTITE MATRIX, DOLOMITE CEMENT; QUARTZ SAND-20%, CLAY-20%, DOLOMITE-10%;

160.0- 160.0 AS ABOVE WITH LESS SILT

160.0- 170.0 LIMESTONE; WHITE; 17% POROSITY, VUGULAR, INTERGRANULAR; GRAIN TYPE: CALCILUTITE; 15% ALLOCHEMICAL CONSTITUENTS; GRAIN SIZE: VERY FINE; RANGE: MICROCRYSTALLINE TO COARSE; MODERATE INDURATION; QUARTZ SAND-05%, DOLOMITE-10%;

170.0- 180.0 LIMESTONE; WHITE; 12% POROSITY, VUGULAR, INTERGRANULAR; GRAIN TYPE: CALCILUTITE; 15% ALLOCHEMICAL CONSTITUENTS; GRAIN SIZE: VERY FINE; RANGE: MICROCRYSTALLINE TO GRANULE; POOR INDURATION; QUARTZ SAND-15%, DOLOMITE-20%; CHALKY;

180.0- 190.0 CALCILUTITE; YELLOWISH GRAY TO WHITE; 10% POROSITY, PIN POINT VUGS; GRAIN TYPE: CALCILUTITE; 20% ALLOCHEMICAL CONSTITUENTS; GRAIN SIZE: VERY FINE; RANGE: MICROCRYSTALLINE TO MEDIUM; POOR INDURATION; DOLOMITE-30%, QUARTZ SAND-30%; CHALKY; NO FOSSIL;
MED. GRAINED SUBANGULAR SAND

190.0- 200.0 AS ABOVE

200.0- 220.0 NO SAMPLES

220.0- 230.0 CALCILUTITE; YELLOWISH GRAY; 10% POROSITY, INTERGRANULAR, LOW PERMEABILITY; GRAIN TYPE: CALCILUTITE; 30% ALLOCHEMICAL CONSTITUENTS; GRAIN SIZE: VERY FINE; RANGE: CRYPTOCRYSTALLINE TO MEDIUM; MODERATE INDURATION; QUARTZ SAND-20%, PHOSPHATIC SAND-02%, DOLOMITE-15%; CHALKY; NO FOSSIL;
2% QTZ GRANULES

230.0- 240.0 AS ABOVE

240.0- 250.0 CALCILUTITE; YELLOWISH GRAY; 10% POROSITY, INTERGRANULAR; GRAIN TYPE: CALCILUTITE; 40% ALLOCHEMICAL CONSTITUENTS; GRAIN SIZE: FINE; RANGE: CRYPTOCRYSTALLINE TO GRANULE; POOR INDURATION; QUARTZ SAND-40%, DOLOMITE-15%; NO FOSSIL;
5% QTZ GRAVEL

250.0- 270.0 CALCILUTITE; YELLOWISH GRAY; 10% POROSITY, INTERGRANULAR; POOR INDURATION; QUARTZ SAND-40%, DOLOMITE-20%;

270.0- 290.0 SILT; YELLOWISH GRAY; 08% POROSITY, LOW PERMEABILITY; POOR INDURATION; QUARTZ SAND-25%, CALCILUTITE-35%, CLAY-35%, PHOSPHATIC SAND-01%; PLASTIC; NO FOSSIL;

290.0- 300.0 SILT; YELLOWISH GRAY; 08% POROSITY, LOW PERMEABILITY; POOR INDURATION; QUARTZ SAND-15%, PHOSPHATIC SAND-04%, CLAY-35%, CALCILUTITE-45%;

300.0- 310.0 SANDSTONE; YELLOWISH GRAY; 12% POROSITY, INTERGRANULAR, PIN POINT VUGS; GRAIN SIZE: FINE, RANGE: VERY FINE TO MEDIUM; ROUNDNESS:SUB-ANGULAR; MEDIUM SPHERICITY; MODERATE INDURATION; DOLOMITE CEMENT, CALCILUTITE MATRIX; DOLOMITE-20%, PHOSPHATIC SAND-10%;

310.0- 330.0 CLAY; LIGHT OLIVE GRAY; 08% POROSITY, LOW PERMEABILITY; POOR INDURATION; PHOSPHATIC SAND-02%; POOR SAMPLE, PLASTIC;

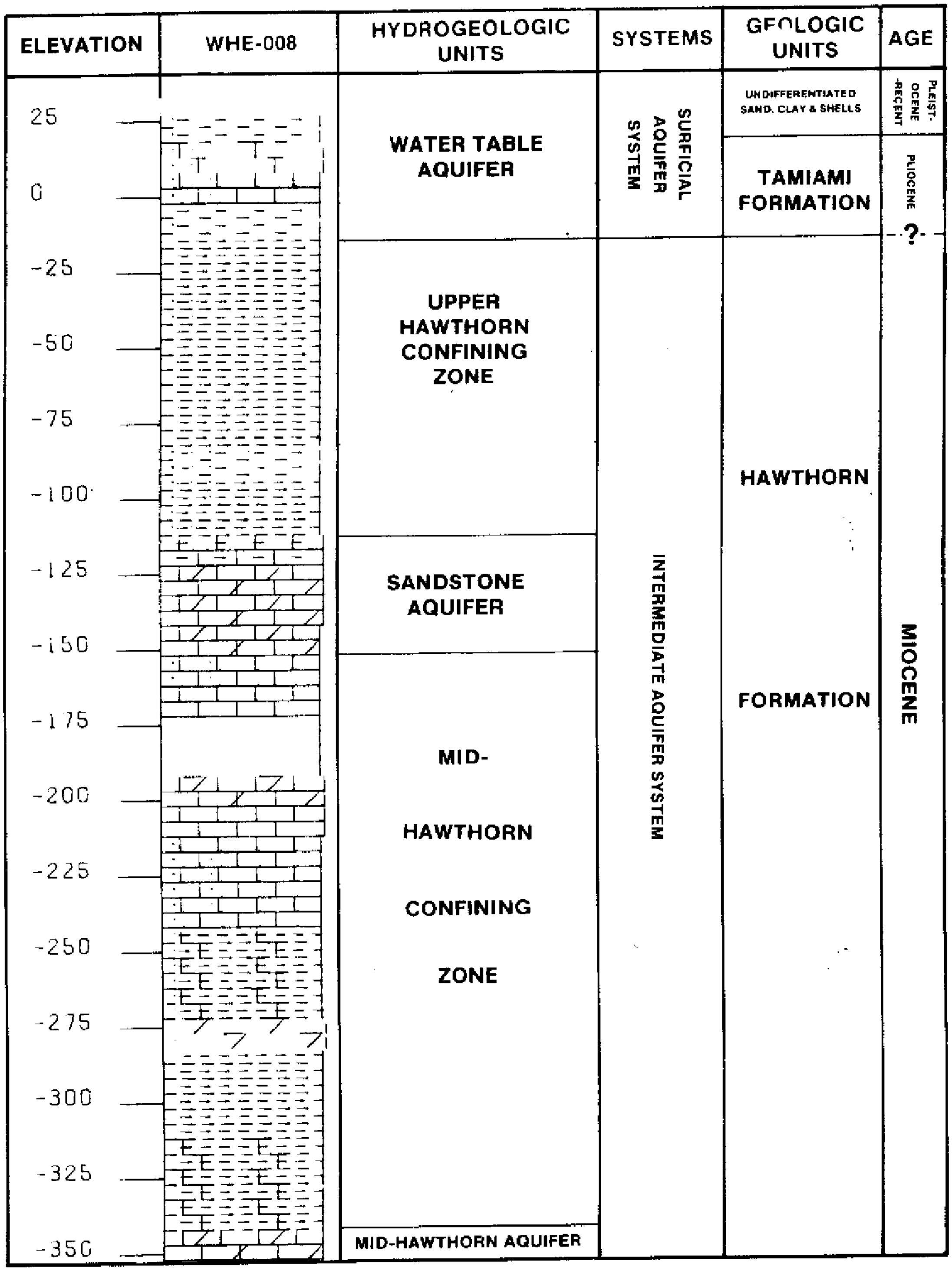
330.0- 340.0 CLAY; GREENISH GRAY; LOW PERMEABILITY; POOR INDURATION; PHOSPHATIC SAND-03%; PLASTIC;

340.0- 360.0 CLAY; GREENISH GRAY; LOW PERMEABILITY; POOR INDURATION; LIMESTONE-25%, PHOSPHATIC SAND-03%; PLASTIC; FOSSIL FRAGMENTS;

360.0- 370.0 CLAY; GREENISH GRAY; POOR INDURATION; CALCILUTITE-30%, PHOSPHATIC SAND-04%;

370.0- 380.0 CALCILUTITE; WHITE; 10% POROSITY, INTERGRANULAR; GRAIN TYPE: CALCILUTITE, CRYSTALS; 15% ALLOCHEMICAL CONSTITUENTS; GRAIN SIZE: VERY FINE; RANGE: MICROCRYSTALLINE TO GRANULE; POOR INDURATION; DOLOMITE-25%, PHOSPHATIC SAND-05%; FOSSIL FRAGMENTS;

380.0 TOTAL DEPTH



HYDROGEOLOGIC CROSS SECTION
HE-008

LITHO LOG PRINTOUT

WELL NUMBER: W- 306

COUNTY - HENDRY

TOTAL DEPTH - 00280 FT.
53 SAMPLES FROM 0 - 289 FT.

LOCATION: T.46S R.33E S.36 DD
LAT = N 26D 26M 12S
LON = W 80D 58M 19S

COMPLETION DATE - N/A

ELEVATION - 022 FT.

OWNER/DRILLER: USGS WELL HE-902

WORKED BY: SMITH AND NELMS, SAMPLE QUALITY FAIR
HYDROGEOLOGIC UNITS

0	195	SURFICIAL AQUIFER SYSTEM
0	30	WATER TABLE AQUIFER
30	90	CONFINING ZONE
90	190	LOWER TAMIAMI AQUIFER
190	280	UPPER HAWTHORN CONFINING ZONE

0.0-	90.0	090UDSC	UNDIFFERENTIATED SAND AND CLAY
90.0-	190.0	122TMIM	TAMIAMI FM.
190.0-	280.0	122HTRN	HAWTHORN FM.

0.0- 5.0 SAND; BLACK TO VERY LIGHT ORANGE; 20% POROSITY, INTERGRANULAR; GRAIN SIZE: MEDIUM, RANGE: FINE TO COARSE; ROUNDNESS:SUB-ANGULAR TO ROUNDED; MEDIUM SPHERICITY; UNCONSOLIDATED; CALCILUTITE-07%, PLANT REMAINS-%;

5.0- 10.0 SAND; YELLOWISH GRAY; 15% POROSITY, INTERGRANULAR; GRAIN SIZE: VERY COARSE, RANGE: MEDIUM TO GRANULE; ROUNDNESS:SUB-ANGULAR TO ROUNDED; MEDIUM SPHERICITY; UNCONSOLIDATED; PLANT REMAINS- %; FROSTED;

10.0- 20.0 SAND; LIGHT OLIVE GRAY; 20% POROSITY, INTERGRANULAR; GRAIN SIZE: COARSE, RANGE: MEDIUM TO VERY COARSE; ROUNDNESS:ROUNDED; MEDIUM SPHERICITY; UNCONSOLIDATED; FROSTED;

20.0- 30.0 AS ABOVE

30.0- 35.0 SAND; LIGHT OLIVE GRAY; 15% POROSITY, INTERGRANULAR, LOW PERMEABILITY; GRAIN SIZE: FINE, RANGE: CRYPTOCRYSTALLINE TO COARSE; ROUNDNESS:SUB-ANGULAR TO ROUNDED; MEDIUM SPHERICITY; UNCONSOLIDATED; CLAY-15%;

35.0- 40.0 AS ABOVE

40.0- 45.0 SAND; LIGHT OLIVE GRAY; 15% POROSITY, INTERGRANULAR; GRAIN SIZE: MEDIUM, RANGE: MICROCRYSTALLINE TO COARSE; ROUNDNESS:SUB-ANGULAR TO ROUNDED; MEDIUM SPHERICITY; UNCONSOLIDATED; SILT-15%, PHOSPHATIC SAND-03%;
LARGER GRAINS FROSTED, 2% PHOSPHATIC GRAVEL

45.0- 50.0 AS ABOVE

50.0- 55.0 CLAY; OLIVE GRAY; 15% POROSITY, INTERGRANULAR, LOW PERMEABILITY; UNCONSOLIDATED;
QUARTZ SAND-45%, PHOSPHATIC SAND-01%, CALCILUTITE-02%;
SAND GRAINS FROSTED

55.0- 60.0 SAND; LIGHT OLIVE GRAY; 20% POROSITY, INTERGRANULAR, LOW PERMEABILITY; GRAIN SIZE: MEDIUM,
RANGE: CRYPTOCRYSTALLINE TO COARSE; ROUNDNESS:ROUNDED; MEDIUM SPHERICITY; UNCONSOLIDATED;
CLAY-10%, SILT-05%, PHOSPHATIC SAND-02%; FROSTED; FOSSIL FRAGMENTS;

60.0- 62.0 AS ABOVE
WITH MORE SHELL FRAGMENTS & LESS CLAY

62.0- 65.0 CALCILUTITE; LIGHT OLIVE GRAY; 10% POROSITY, INTERGRANULAR, PIN POINT VUGS,
LOW PERMEABILITY; GRAIN TYPE: CALCILUTITE, INTRACLASTS, BIOGENIC;
60% ALLOCHEMICAL CONSTITUENTS; GRAIN SIZE: FINE; RANGE: VERY FINE TO COARSE;
POOR INDURATION; CALCILUTITE MATRIX; QUARTZ SAND-20%, SILT-10%, PHOSPHATIC SAND-01%;
FOSSIL FRAGMENTS, BENTHIC FORAMINIFERA;

65.0- 70.0 SILT; LIGHT OLIVE GRAY; 20% POROSITY, INTERGRANULAR, LOW PERMEABILITY; POOR INDURATION;
CLAY MATRIX; QUARTZ SAND-40%, CLAY-02%, CALCILUTITE-02%, PHOSPHATIC SAND-03%; FROSTED;
FOSSIL FRAGMENTS;

70.0- 75.0 AS ABOVE

75.0- 80.0 CALCILUTITE; LIGHT OLIVE GRAY; 10% POROSITY, INTERGRANULAR, LOW PERMEABILITY;
GRAIN TYPE: BIOGENIC, INTRACLASTS, CALCILUTITE; 10% ALLOCHEMICAL CONSTITUENTS;
GRAIN SIZE: MICROCRYSTALLINE; RANGE: MICROCRYSTALLINE TO FINE; UNCONSOLIDATED;
QUARTZ SAND-30%, PHOSPHATIC SAND-02%; FOSSIL FRAGMENTS, SPICULES;

80.0- 85.0 AS ABOVE
BETTER INDURATED

85.0- 90.0 SAND; YELLOWISH GRAY; 25% POROSITY, INTERGRANULAR, MOLDIC, POSSIBLY HIGH PERMEABILITY;
GRAIN SIZE: FINE, RANGE: MICROCRYSTALLINE TO FINE; ROUNDNESS:SUB-ANGULAR;
MEDIUM SPHERICITY; GOOD INDURATION; SPARRY CALCITE CEMENT, CALCILUTITE MATRIX;
CALCILUTITE-25%, CLAY-20%, PHOSPHATIC SAND-02%, PYRITE-01%; FOSSIL MOLDS;

90.0- 95.0 LIMESTONE; YELLOWISH GRAY; 15% POROSITY, INTERGRANULAR, MOLDIC; GRAIN TYPE: INTRACLASTS,
BIOGENIC; 70% ALLOCHEMICAL CONSTITUENTS; GRAIN SIZE: FINE;
RANGE: MICROCRYSTALLINE TO FINE; GOOD INDURATION; CALCILUTITE MATRIX,
SPARRY CALCITE CEMENT; QUARTZ SAND-40%, PHOSPHATIC SAND-03%; BRYOZOA, FOSSIL FRAGMENTS;

95.0- 100.0 AS ABOVE

100.0- 105.0 AS ABOVE

105.0- 110.0 LIMESTONE; YELLOWISH GRAY TO MODERATE GRAY; 15% POROSITY, INTERGRANULAR, MOLDIC;
GRAIN TYPE: CALCILUTITE, INTRACLASTS, CRYSTALS; 60% ALLOCHEMICAL CONSTITUENTS;
GRAIN SIZE: MICROCRYSTALLINE; RANGE: CRYPTOCRYSTALLINE TO FINE; GOOD INDURATION;
SPARRY CALCITE CEMENT, CALCILUTITE MATRIX; QUARTZ SAND-45%, PHOSPHATIC SAND-01%;
FOSSIL FRAGMENTS;

110.0- 115.0 AS ABOVE

115.0- 120.0 AS ABOVE

120.0- 125.0 AS ABOVE

125.0- 130.0 AS ABOVE

130.0- 135.0 AS ABOVE

135.0- 140.0 AS ABOVE

140.0- 145.0 AS ABOVE

145.0- 150.0 AS ABOVE

150.0- 155.0 AS ABOVE

155.0- 160.0 AS ABOVE

160.0- 165.0 AS ABOVE

165.0- 170.0 AS ABOVE

170.0- 175.0 AS ABOVE

175.0- 180.0 AS ABOVE

180.0- 185.0 AS ABOVE

185.0- 190.0 AS ABOVE

190.0- 195.0 SAND; GRAYISH OLIVE GREEN; 15% POROSITY, INTERGRANULAR, LOW PERMEABILITY; GRAIN SIZE: FINE, RANGE: VERY FINE TO FINE; ROUNDNESS:SUB-ANGULAR; HIGH SPHERICITY; UNCONSOLIDATED; CLAY-10%, PHOSPHATIC SAND-04%;

195.0- 200.0 AS ABOVE

200.0- 205.0 AS ABOVE

205.0- 210.0 AS ABOVE

210.0- 215.0 CLAY; OLIVE GRAY TO GRAYISH OLIVE GREEN; 10% POROSITY, INTERGRANULAR, LOW PERMEABILITY; UNCONSOLIDATED; QUARTZ SAND-10%, PHOSPHATIC SAND-01%; POOR SAMPLE; FOSSIL FRAGMENTS;

215.0- 220.0 AS ABOVE

220.0- 225.0 CLAY; OLIVE GRAY TO GRAYISH OLIVE GREEN; 15% POROSITY, INTERGRANULAR, LOW PERMEABILITY; MODERATE INDURATION; SILT-40%, CALCILUTITE-02%; POOR SAMPLE;

225.0- 230.0 AS ABOVE

230.0- 235.0 AS ABOVE

235.0- 240.0 SAND; OLIVE GRAY; 15% POROSITY, INTERGRANULAR, LOW PERMEABILITY; GRAIN SIZE: VERY FINE, RANGE: MICROCRYSTALLINE TO FINE; ROUNDNESS:SUB-ANGULAR; HIGH SPHERICITY; UNCONSOLIDATED; SILT-10%, CLAY-10%, PHOSPHATIC SAND-02%; POOR SAMPLE;

240.0- 245.0 AS ABOVE

245.0- 250.0 AS ABOVE

250.0- 255.0 AS ABOVE
WITH TRACES OF SHELL FRAGMENTS

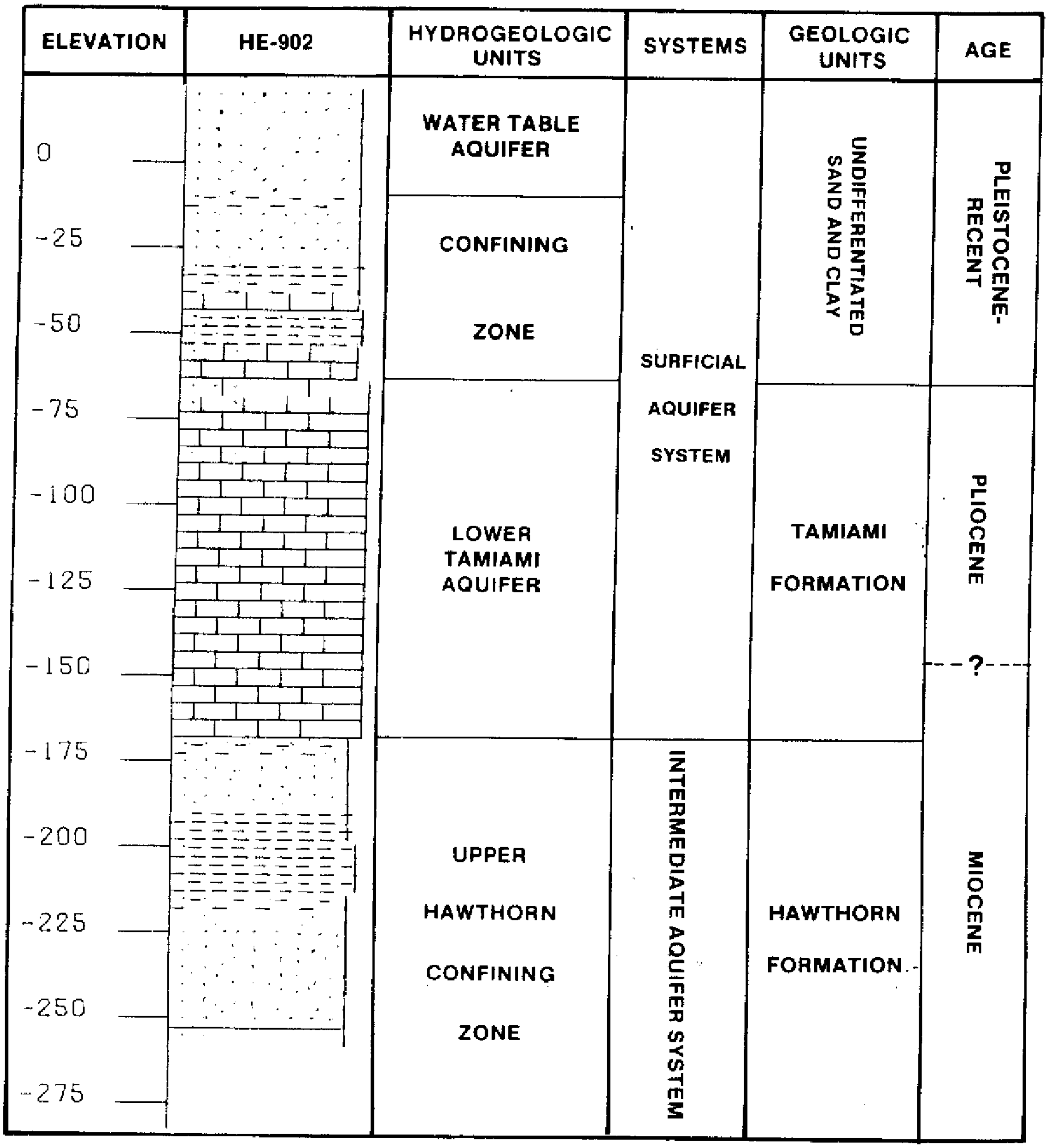
255.0- 260.0 AS ABOVE

260.0- 265.0 AS ABOVE

265.0- 270.0 AS ABOVE

270.0- 280.0 AS ABOVE

280.0 TOTAL DEPTH



HYDROGEOLOGIC CROSS SECTION
HE-902

WELL NUMBER: W- 203

COUNTY - HENDRY

TOTAL DEPTH - 00300 FT.
59 SAMPLES FROM 0 - 300 FT.

LOCATION: T.45S R.32E S.06
LAT = N 26D 36M 20S
LON = W 81D 09M 44S

COMPLETION DATE - N/A

ELEVATION - 028 FT.

OWNER/DRILLER: USGS WELL HE-885

WORKED BY: SMITH AND NELMS, SAMPLE QUALITY POOR
HYDROGEOLOGIC UNITS
0 50 SURFICIAL AQUIFER SYSTEM
0 50 WATER TABLE AQUIFER
50 300 UPPER HAWTHORN CONFINING ZONE

0.0- 6.0 090UDSS UNDIFFERENTIATED SAND, CLAY, AND SHELLS
6.0- 50.0 122TMIM TAMIAMI FM.
50.0- 300.0 122HTRN HAWTHORN FM.

0.0- 6.0 SAND; DARK REDDISH ORANGE; 25% POROSITY, INTERGRANULAR; GRAIN SIZE: MEDIUM, RANGE: FINE TO MEDIUM; ROUNDNESS:SUB-ANGULAR; MEDIUM SPHERICITY; UNCONSOLIDATED; CALCILUTITE-02%, IRON STAIN- %, PLANT REMAINS-%;

6.0- 10.0 LIMESTONE; YELLOWISH GRAY; 10% POROSITY, INTERGRANULAR, PIN POINT VUGS; GRAIN TYPE: INTRACLASTS, CALCILUTITE; 30% ALLOCHEMICAL CONSTITUENTS; GRAIN SIZE: MICROCRYSTALLINE; RANGE: MICROCRYSTALLINE TO FINE; MODERATE INDURATION; CALCILUTITE MATRIX; QUARTZ SAND-30%, PHOSPHATIC SAND-01%, PLANT REMAINS- %; FOSSIL FRAGMENTS;

10.0- 12.0 AS ABOVE

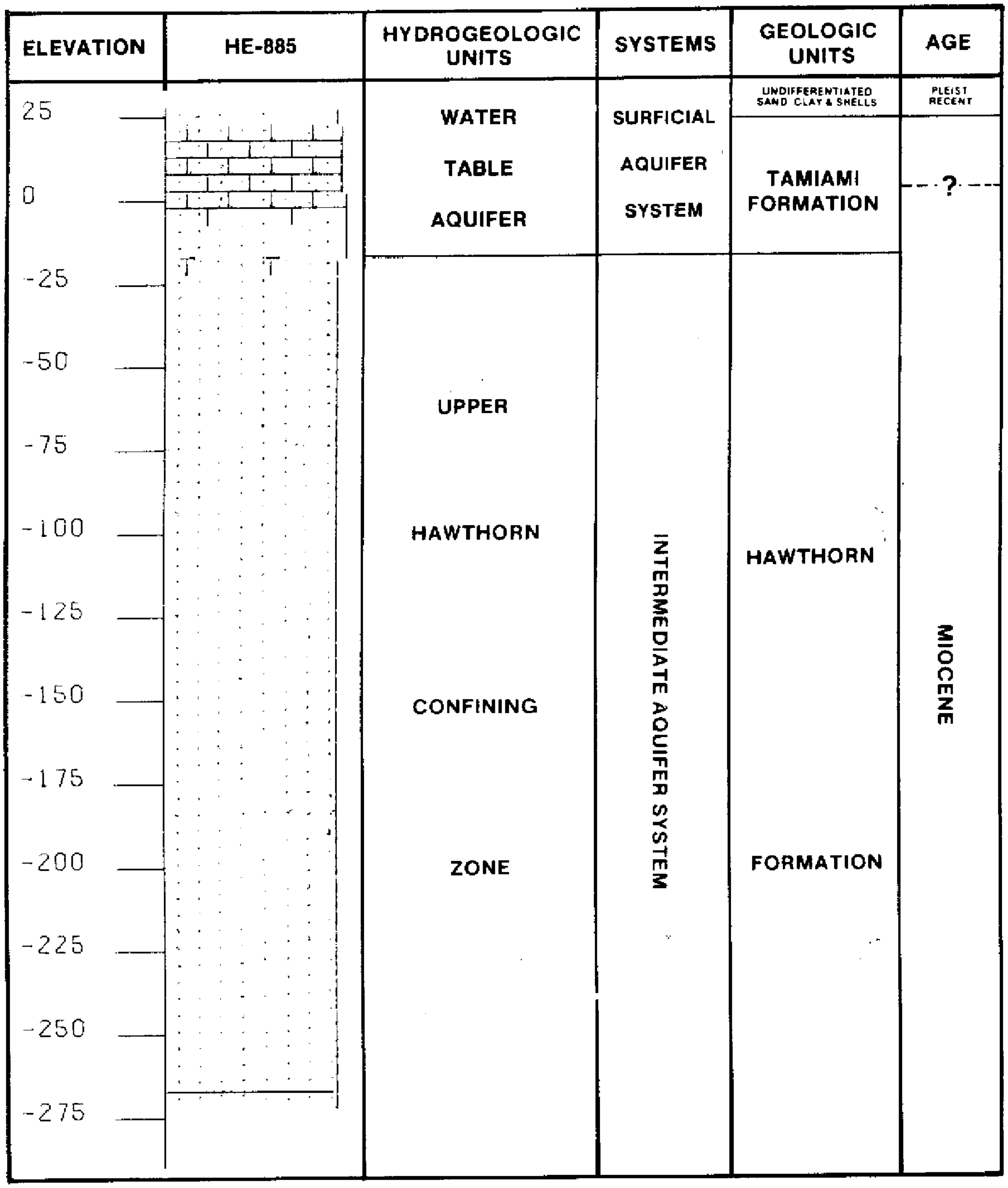
12.0- 25.0 LIMESTONE; YELLOWISH GRAY; 12% POROSITY, INTERGRANULAR, PIN POINT VUGS; GRAIN TYPE: INTRACLASTS, CALCILUTITE; 40% ALLOCHEMICAL CONSTITUENTS; GRAIN SIZE: MICROCRYSTALLINE; RANGE: MICROCRYSTALLINE TO VERY FINE; POOR INDURATION; CALCILUTITE MATRIX; QUARTZ SAND-40%;

25.0- 30.0 LIMESTONE; YELLOWISH GRAY; 08% POROSITY, INTERGRANULAR, PIN POINT VUGS; GRAIN TYPE: INTRACLASTS, CALCILUTITE; 30% ALLOCHEMICAL CONSTITUENTS; GRAIN SIZE: MICROCRYSTALLINE; RANGE: CRYPTOCRYSTALLINE TO VERY FINE; MODERATE INDURATION; CALCILUTITE MATRIX, SPARRY CALCITE CEMENT; QUARTZ SAND-30%, CALCITE-10%; FOSSIL FRAGMENTS;

30.0- 35.0 SANDSTONE; YELLOWISH GRAY; 10% POROSITY, INTERGRANULAR; GRAIN SIZE: FINE, RANGE: MICROCRYSTALLINE TO FINE; ROUNDNESS:SUB-ANGULAR; HIGH SPHERICITY; MODERATE INDURATION; CALCILUTITE MATRIX, SPARRY CALCITE CEMENT; CALCILUTITE-30%, CALCITE-20%; FOSSIL FRAGMENTS;

35.0- 40.0 AS ABOVE

40.0- 45.0	AS ABOVE
45.0- 50.0	SAND; YELLOWISH GRAY; 20% POROSITY, INTERGRANULAR; GRAIN SIZE: FINE, RANGE: MICROCRYSTALLINE TO MEDIUM; ROUNDNESS:SUB-ANGULAR TO ROUNDED; HIGH SPHERICITY; UNCONSOLIDATED; CALCILUTITE-15%, LIMESTONE-05%;
50.0- 55.0	SAND; OLIVE GRAY; 15% POROSITY, INTERGRANULAR; GRAIN SIZE: FINE, RANGE: VERY FINE TO MEDIUM; ROUNDNESS:SUB-ANGULAR; HIGH SPHERICITY; UNCONSOLIDATED; CALCILUTITE-10%, CALCITE-02%, PHOSPHATIC SAND-01%; FOSSIL FRAGMENTS;
55.0- 60.0	SAND; OLIVE GRAY; 10% POROSITY, INTERGRANULAR, LOW PERMEABILITY; GRAIN SIZE: FINE, RANGE: MICROCRYSTALLINE TO MEDIUM; ROUNDNESS:SUB-ANGULAR; HIGH SPHERICITY; UNCONSOLIDATED; SILT-15%, CALCILUTITE-15%, PHOSPHATIC SAND-01%;
60.0- 65.0	AS ABOVE WITH SPARSE SHELL FRAGMENTS
65.0- 70.0	AS ABOVE
70.0- 75.0	AS ABOVE
75.0- 80.0	AS ABOVE WITH MORE SHELL FRAGMENTS
80.0- 85.0	AS ABOVE
85.0- 90.0	AS ABOVE
90.0- 95.0	AS ABOVE
95.0- 100.0	AS ABOVE
100.0- 105.0	AS ABOVE
105.0- 110.0	AS ABOVE
110.0- 115.0	AS ABOVE WITH DECREASING SHELL CONTENT
115.0- 120.0	AS ABOVE
120.0- 125.0	AS ABOVE
125.0- 130.0	AS ABOVE
130.0- 135.0	AS ABOVE
135.0- 140.0	AS ABOVE WITH INCREASED SHELL AND PHOSPHATIC SAND
140.0- 300.0	AS ABOVE SAMPLES FROM 60 TO 300 APPEAR TO BE MIXED
300.0	TOTAL DEPTH



HYDROGEOLOGIC CROSS SECTION HE-885

LITHO LOG PRINTOUT

WELL NUMBER: W- 311

COUNTY - HENDRY

TOTAL DEPTH - 00460 FT.
80 SAMPLES FROM 0 - 460 FT.

LOCATION: T.48S R.32E S.23 AA
LAT = N 26D 17M 46S
LON = W 81D 06M 18S

COMPLETION DATE - 27/08/86

ELEVATION - 020 FT.

OWNER/DRILLER: BIG CYPRESS SEMINOLE INDIAN RESERVATION (SITE 1 - ROAD),
OWNER/DRILLER: DRILLED BY SFWMD (TONY LUBRANO)

WORKED BY: SMITH AND WELMS, SAMPLE QUALITY GOOD
HYDROGEOLOGIC UNITS

0	124	SURFICIAL AQUIFER SYSTEM
0	12	WATER TABLE AQUIFER
12	78	TAMAIMI CONFINING ZONE
78	124	LOWER TAMIAMI AQUIFER
124	362	UPPER HAWTHORN CONFINING ZONE
362	450	MID HAWTHORN AQUIFER (LOW YIELD)
450	460	LOWER HAWTHORN CONFINING ZONE

0.0-	1.0	090UDSS	UNDIFFERENTIATED SAND, CLAY, AND SHELLS
1.0-	124.0	122TMIM	TAMIAMI FM.
124.0-	460.0	122HTRN	HAWTHORN FM.

0.0- 1.0 SAND; MODERATE BROWN TO LIGHT BROWN; 20% POROSITY, INTERGRANULAR; GRAIN SIZE: MEDIUM, RANGE: FINE TO COARSE; ROUNDNESS:SUB-ANGULAR; MEDIUM SPHERICITY; UNCONSOLIDATED; IRON STAIN- %, HEAVY MINERALS-01%, LIMESTONE-01%; FROSTED;

1.0- 2.0 LIMESTONE; VERY LIGHT ORANGE TO GRAYISH ORANGE; 20% POROSITY, VUGULAR; GRAIN TYPE: CRYSTALS, INTRACLASTS; 60% ALLOCHEMICAL CONSTITUENTS; GRAIN SIZE: MEDIUM; RANGE: CRYPTOCRYSTALLINE TO COARSE; MODERATE INDURATION; SPARRY CALCITE CEMENT; QUARTZ SAND-40%, CALCILUTITE-05%; FOSSIL FRAGMENTS;

2.0- 3.0 SAND; LIGHT YELLOWISH ORANGE TO DARK YELLOWISH ORANGE; 20% POROSITY, INTERGRANULAR; GRAIN SIZE: MEDIUM, RANGE: FINE TO COARSE; ROUNDNESS:ROUNDED; HIGH SPHERICITY; UNCONSOLIDATED; CALCILUTITE-10%, IRON STAIN- %; FROSTED;

3.0- 7.0 LIMESTONE; YELLOWISH GRAY; 15% POROSITY, INTERGRANULAR; GRAIN TYPE: CRYSTALS, INTRACLASTS, BIOGENIC; 50% ALLOCHEMICAL CONSTITUENTS; GRAIN SIZE: MEDIUM; RANGE: MICROCRYSTALLINE TO COARSE; MODERATE INDURATION; CALCILUTITE MATRIX, SPARRY CALCITE CEMENT; QUARTZ SAND-30%, CALCILUTITE-15%; FOSSIL FRAGMENTS, WORM TRACES, MOLLUSKS;

7.0- 10.0 SAND; YELLOWISH GRAY; 20% POROSITY, INTERGRANULAR; GRAIN SIZE: FINE, RANGE: VERY FINE TO MEDIUM; ROUNDNESS:SUB-ANGULAR TO ROUNDED; HIGH SPHERICITY; UNCONSOLIDATED; CALCILUTITE-20%; CALCAREOUS;

10.0- 12.0 AS ABOVE
WITH 50% MICRITE (CALCILUTITE)

12.0- 15.0 CALCILUTITE; WHITE TO VERY LIGHT GRAY; 10% POROSITY, INTERGRANULAR, LOW PERMEABILITY; GRAIN TYPE: CALCILUTITE, INTRACLASTS; 50% ALLOCHEMICAL CONSTITUENTS; GRAIN SIZE: FINE; RANGE: VERY FINE TO MEDIUM; UNCONSOLIDATED; QUARTZ SAND-50%, PHOSPHATIC SAND-01%;

15.0- 17.0 AS ABOVE

17.0- 19.0 AS ABOVE

19.0- 25.0 AS ABOVE
SAND CONTENT DECREASES TO 30 %

25.0- 27.0 AS ABOVE

27.0- 30.0 LIMESTONE; YELLOWISH GRAY; 15% POROSITY, INTERGRANULAR; GRAIN TYPE: CALCILUTITE, CRYSTALS, INTRACLASTS; 30% ALLOCHEMICAL CONSTITUENTS; GRAIN SIZE: VERY FINE; RANGE: MICROCRYSTALLINE TO COARSE; MODERATE INDURATION; CALCILUTITE MATRIX, SPARRY CALCITE CEMENT; CALCILUTITE-20%, QUARTZ SAND-15%, PHOSPHATIC SAND-01%; FOSSIL FRAGMENTS;

30.0- 32.0 AS ABOVE
SAND CONTENT INCREASES TO 25%

32.0- 35.0 SAND; YELLOWISH GRAY; 25% POROSITY, INTERGRANULAR; GRAIN SIZE: MEDIUM, RANGE: VERY FINE TO COARSE; ROUNDNESS:SUB-ANGULAR; MEDIUM SPHERICITY; UNCONSOLIDATED; CALCILUTITE-25%, LIMESTONE-15%, PHOSPHATIC SAND-01%; CALCAREOUS; FOSSIL FRAGMENTS;

35.0- 40.0 LIMESTONE; DARK YELLOWISH ORANGE TO LIGHT GRAY; 10% POROSITY, INTERGRANULAR, VUGULAR, POSSIBLY HIGH PERMEABILITY; GRAIN TYPE: CRYSTALS, INTRACLASTS; 10% ALLOCHEMICAL CONSTITUENTS; GRAIN SIZE: CRYPTOCRYSTALLINE; RANGE: CRYPTOCRYSTALLINE TO VERY FINE; GOOD INDURATION; SPARRY CALCITE CEMENT; QUARTZ SAND-05%, CALCILUTITE-05%, PHOSPHATIC SAND-01%; FOSSIL FRAGMENTS, MOLLUSKS;

40.0- 45.0 SAND; LIGHT OLIVE GRAY; 15% POROSITY, INTERGRANULAR, LOW PERMEABILITY; GRAIN SIZE: MEDIUM, RANGE: VERY FINE TO MEDIUM; ROUNDNESS:ANGULAR TO SUB-ANGULAR; HIGH SPHERICITY; UNCONSOLIDATED; CALCILUTITE-25%, PHOSPHATIC SAND-01%; FOSSIL FRAGMENTS;

45.0- 50.0 AS ABOVE

50.0- 55.0 AS ABOVE
WITH 5% CLAY

55.0- 60.0 AS ABOVE

60.0- 62.0 AS ABOVE

62.0- 70.0 AS ABOVE
SAME AS 40 - 45

70.0- 78.0 AS ABOVE

78.0- 80.0 LIMESTONE; LIGHT GRAY TO MODERATE DARK GRAY; 25% POROSITY, INTERGRANULAR, MOLDIC, POSSIBLY HIGH PERMEABILITY; GRAIN TYPE: CALCILUTITE, INTRACLASTS, CRYSTALS; 80% ALLOCHEMICAL CONSTITUENTS; GRAIN SIZE: FINE; RANGE: CRYPTOCRYSTALLINE TO MEDIUM; GOOD INDURATION; SPARRY CALCITE CEMENT, CALCILUTITE MATRIX; QUARTZ SAND-30%, PHOSPHATIC SAND-01%; MOLLUSKS, FOSSIL FRAGMENTS;

80.0- 82.0 AS ABOVE

82.0- 85.0 AS ABOVE
SAND CONTENT INCREASED

85.0- 90.0 AS ABOVE

90.0- 95.0 AS ABOVE
CALCITE CONTENT DECREASING

95.0- 100.0 AS ABOVE

100.0- 105.0 AS ABOVE

105.0- 110.0 AS ABOVE

110.0- 115.0 AS ABOVE
WITH 3% PHOSPHATIC SAND

115.0- 120.0 AS ABOVE

120.0- 124.0 AS ABOVE

124.0- 127.0 SAND; YELLOWISH GRAY; 20% POROSITY, INTERGRANULAR; GRAIN SIZE: FINE, RANGE: VERY FINE TO FINE; ROUNDNESS:ANGULAR TO SUB-ANGULAR; MEDIUM SPHERICITY; UNCONSOLIDATED; PHOSPHATIC SAND-07%;
SAMPLE CONSISTS OF 50% SHELL FRAGMENTS

127.0- 135.0 AS ABOVE
WITH LESS SHELL (30%) AND 25% SILT

135.0- 140.0 AS ABOVE

140.0- 145.0 SAND; OLIVE GRAY; 15% POROSITY, INTERGRANULAR, LOW PERMEABILITY; GRAIN SIZE: FINE, RANGE: VERY FINE TO MEDIUM; ROUNDNESS:SUB-ANGULAR; HIGH SPHERICITY; UNCONSOLIDATED; CLAY-15%, PHOSPHATIC SAND-05%, CALCITE-02%;

145.0- 150.0 AS ABOVE
WITH 20% CLAY AND 2% MICRITE(CALCILUTITE)

150.0- 155.0 CLAY; OLIVE GRAY; 10% POROSITY, INTERGRANULAR, LOW PERMEABILITY; UNCONSOLIDATED; QUARTZ SAND-30%, PHOSPHATIC SAND-03%; FOSSIL FRAGMENTS;

155.0- 160.0 AS ABOVE
WITH 10% SAND

160.0- 170.0 AS ABOVE
WITH 5% SAND

170.0- 180.0 SAND; OLIVE GRAY; 10% POROSITY, INTERGRANULAR, LOW PERMEABILITY; GRAIN SIZE: FINE, RANGE: MICROCRYSTALLINE TO FINE; ROUNDNESS:ANGULAR TO SUB-ANGULAR; MEDIUM SPHERICITY; POOR INDURATION; CLAY MATRIX; CLAY-35%;

180.0- 190.0 AS ABOVE

190.0- 194.0 AS ABOVE

194.0- 196.0 AS ABOVE

196.0- 200.0 AS ABOVE
WITH 2% MICRITE(CALCILUTITE)

200.0- 210.0 AS ABOVE

210.0- 220.0 AS ABOVE

220.0- 225.0 CLAY; OLIVE GRAY; 10% POROSITY, INTERGRANULAR, LOW PERMEABILITY; UNCONSOLIDATED; QUARTZ SAND-30%;

225.0- 245.0 AS ABOVE
WITH LESS SAND (5%)

245.0- 250.0 SAND; OLIVE GRAY; 10% POROSITY, INTERGRANULAR, LOW PERMEABILITY; GRAIN SIZE: FINE, RANGE: MICROCRYSTALLINE TO FINE; ROUNDNESS:ANGULAR TO SUB-ANGULAR; MEDIUM SPHERICITY; POOR INDURATION; CLAY MATRIX; CLAY-35%;

250.0- 260.0 CLAY; OLIVE GRAY; 10% POROSITY, INTERGRANULAR, LOW PERMEABILITY; UNCONSOLIDATED; QUARTZ SAND-30%;

260.0- 262.0 AS ABOVE

262.0- 265.0 AS ABOVE

265.0- 270.0 AS ABOVE

270.0- 280.0 AS ABOVE
WITH 50% SAND

280.0- 290.0 AS ABOVE

290.0- 295.0 AS ABOVE

295.0- 300.0 AS ABOVE
WITH 40% SAND

300.0- 310.0 AS ABOVE
WITH 10% SAND

310.0- 320.0 AS ABOVE
WITH 5% PHOSPHATIC SAND AND 2% PHOSPHATIC GRAVEL

320.0- 330.0 AS ABOVE

330.0- 340.0 AS ABOVE
WITH 1% PHOSPHATIC SAND

340.0- 350.0 AS ABOVE
WITH 20% SAND

350.0- 358.0 AS ABOVE

358.0- 362.0 LIMESTONE; YELLOWISH GRAY; 10% POROSITY, INTERGRANULAR; GRAIN TYPE: BIOGENIC, INTRACLASTS; 40% ALLOCHEMICAL CONSTITUENTS; GRAIN SIZE: VERY FINE; RANGE: MICROCRYSTALLINE TO FINE; MODERATE INDURATION; CALCILUTITE MATRIX; QUARTZ SAND-10%, CLAY-10%, CALCITE-05%, PHOSPHATIC SAND-02%; FOSSIL FRAGMENTS;

362.0- 370.0 AS ABOVE

370.0- 382.0 AS ABOVE
WITH 20% CALCITE REPLACED SHELLS

382.0- 390.0 AS ABOVE
WITH 5% CLAY

390.0- 400.0 AS ABOVE

400.0- 410.0 AS ABOVE
WITH 7% MICRITE AND NO CALCITE REPLACED SHELLS

410.0- 420.0 AS ABOVE

420.0- 430.0 AS ABOVE
WITH 15% MICRITE(CALCILUTITE)

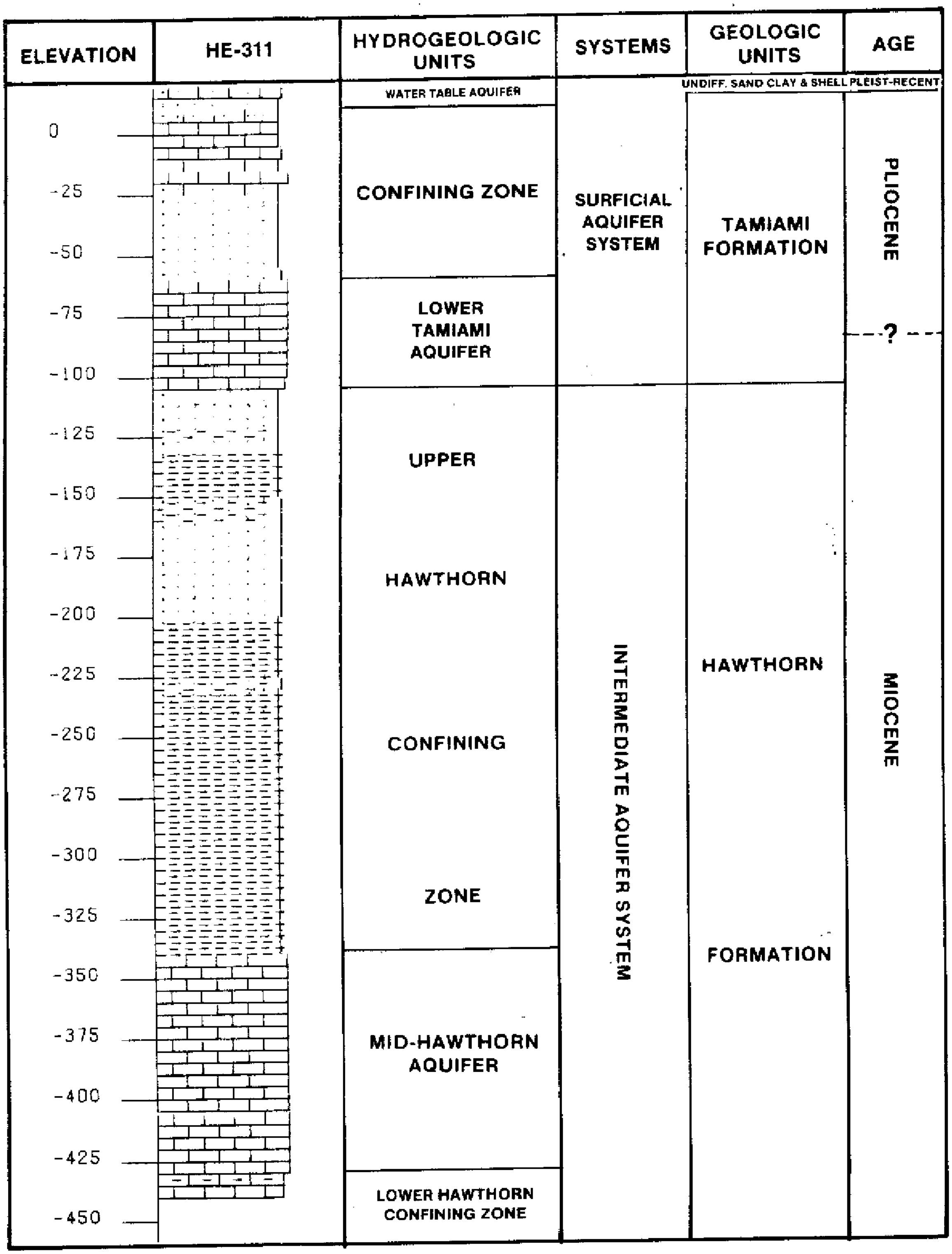
430.0- 440.0 AS ABOVE

440.0- 450.0 AS ABOVE

450.0- 455.0 CALCILUTITE; YELLOWISH GRAY; 10% POROSITY, INTERGRANULAR, LOW PERMEABILITY; GRAIN TYPE: CALCILUTITE, INTRACLASTS; 20% ALLOCHEMICAL CONSTITUENTS; GRAIN SIZE: MICROCRYSTALLINE; RANGE: MICROCRYSTALLINE TO FINE; UNCONSOLIDATED; QUARTZ SAND-05%, CLAY-03%, PHOSPHATIC SAND-02%; CHALKY;

455.0- 460.0 AS ABOVE

460.0 TOTAL DEPTH



HYDROGEOLOGIC CROSS SECTION HE-311

LITHO LOG PRINTOUT

WELL NUMBER: W- 202

COUNTY - HENDRY

TOTAL DEPTH - 00250 FT.
44 SAMPLES FROM 0 - 250 FT.

LOCATION: T.43S R.34E S.16 D
LAT = N 26D 44M 33S
LON = W 80D 56M 15S

COMPLETION DATE - N/A

ELEVATION - 019 FT.

OWNER/DRILLER: USGS WELL HE-907

WORKED BY: SMITH AND NELMS, SAMPLE QUALITY FAIR
HYDROGEOLOGIC UNITS
0 185 SURFICIAL AQUIFER SYSTEM
185 250 UPPER HAWTHORN CONFINING ZONE

0.0- 25.0 090UDSC UNDIFFERENTIATED SAND AND CLAY
25.0- 130.0 122TMIM TAMIAMI FM.
130.0- 185.0 122MOCNC MIOCENE COARSE CLASTICS
185.0- 250.0 122HTRN HAWTHORN FM.

0.0- 5.0 SAND; DARK YELLOWISH BROWN; 30% POROSITY, INTERGRANULAR; GRAIN SIZE: MEDIUM, RANGE: FINE TO MEDIUM; ROUNDNESS:SUB-ANGULAR; HIGH SPHERICITY; UNCONSOLIDATED; IRON STAIN- %, PEAT-%;

5.0- 10.0 SAND; VERY LIGHT ORANGE; 30% POROSITY, INTERGRANULAR; GRAIN SIZE: MEDIUM, RANGE: FINE TO COARSE; ROUNDNESS:ANGULAR TO SUB-ANGULAR; HIGH SPHERICITY; UNCONSOLIDATED; PHOSPHATIC GRAVEL-01%, IRON STAIN-%;

10.0- 15.0 SAND; YELLOWISH GRAY; 30% POROSITY, INTERGRANULAR; GRAIN SIZE: MEDIUM, RANGE: FINE TO MEDIUM; ROUNDNESS:ANGULAR TO ROUNDED; HIGH SPHERICITY; UNCONSOLIDATED; IRON STAIN- %, PEAT-%;

15.0- 20.0 AS ABOVE

20.0- 25.0 AS ABOVE

25.0- 30.0 SAND; VERY LIGHT ORANGE; 30% POROSITY, INTERGRANULAR; GRAIN SIZE: COARSE, RANGE: MEDIUM TO COARSE; ROUNDNESS:SUB-ANGULAR; HIGH SPHERICITY; UNCONSOLIDATED; CALCILUTITE-03%, PHOSPHATIC SAND-01%; FOSSIL FRAGMENTS;

30.0- 35.0 SAND; VERY LIGHT ORANGE TO VERY LIGHT GRAY; 25% POROSITY, INTERGRANULAR; GRAIN SIZE: MEDIUM, RANGE: FINE TO COARSE; ROUNDNESS:SUB-ANGULAR TO ROUNDED; HIGH SPHERICITY; UNCONSOLIDATED; CALCILUTITE-05%, PHOSPHATIC SAND-02%; FOSSIL FRAGMENTS;

35.0- 40.0 SAND; VERY LIGHT ORANGE TO LIGHT OLIVE GRAY; 20% POROSITY, INTERGRANULAR; GRAIN SIZE: MEDIUM, RANGE: FINE TO COARSE; ROUNDNESS:ANGULAR TO ROUNDED; MEDIUM SPHERICITY; UNCONSOLIDATED; CALCILUTITE-25%, PHOSPHATIC SAND-03%; FROSTED; FOSSIL FRAGMENTS;

40.0- 45.0 SAND; VERY LIGHT ORANGE TO LIGHT OLIVE; 25% POROSITY, INTERGRANULAR; GRAIN SIZE: MEDIUM, RANGE: FINE TO MEDIUM; ROUNDNESS:ANGULAR TO SUB-ANGULAR; HIGH SPHERICITY; UNCONSOLIDATED; CALCILUTITE-15%, CALCITE-05%, PHOSPHATIC SAND-02%; FOSSIL FRAGMENTS;

45.0- 50.0 SAND; YELLOWISH GRAY TO LIGHT OLIVE GRAY; 30% POROSITY, INTERGRANULAR; GRAIN SIZE: FINE, RANGE: FINE TO MEDIUM; ROUNDNESS:ANGULAR TO SUB-ANGULAR; HIGH SPHERICITY; UNCONSOLIDATED; CALCILUTITE-02%, PHOSPHATIC SAND-02%, CALCITE-01%;

50.0- 55.0 AS ABOVE

55.0- 60.0 AS ABOVE

60.0- 65.0 AS ABOVE

65.0- 70.0 AS ABOVE
WITH LOWER FOSSIL FRAGMENT CONTENT

70.0- 75.0 AS ABOVE

75.0- 80.0 SAND; LIGHT OLIVE GRAY; 25% POROSITY, INTERGRANULAR; GRAIN SIZE: FINE, RANGE: FINE TO COARSE; ROUNDNESS:ANGULAR TO ROUNDED; HIGH SPHERICITY; UNCONSOLIDATED; PHOSPHATIC SAND-02%, CALCILUTITE-02%, CALCITE-01%; FOSSIL FRAGMENTS;

80.0- 85.0 AS ABOVE

85.0- 90.0 SAND; LIGHT OLIVE GRAY; 20% POROSITY, INTERGRANULAR; GRAIN SIZE: MEDIUM, RANGE: FINE TO COARSE; ROUNDNESS:ANGULAR TO SUB-ANGULAR; HIGH SPHERICITY; UNCONSOLIDATED; CALCITE-02%, CALCILUTITE-02%, PHOSPHATIC SAND-01%; FOSSIL FRAGMENTS;

90.0- 95.0 SAND; LIGHT OLIVE GRAY; 30% POROSITY, INTERGRANULAR; GRAIN SIZE: MEDIUM, RANGE: FINE TO MEDIUM; ROUNDNESS:ANGULAR TO SUB-ANGULAR; MEDIUM SPHERICITY; UNCONSOLIDATED; CALCITE-10%, PHOSPHATIC SAND-02%;

95.0- 100.0 AS ABOVE

100.0- 105.0 AS ABOVE

105.0- 110.0 AS ABOVE

110.0- 115.0 AS ABOVE

115.0- 120.0 AS ABOVE

120.0- 125.0 AS ABOVE

125.0- 130.0 SAND; LIGHT OLIVE GRAY; 20% POROSITY, INTERGRANULAR; GRAIN SIZE: MEDIUM, RANGE: VERY FINE TO MEDIUM; ROUNDNESS:SUB-ANGULAR TO ROUNDED; MEDIUM SPHERICITY; UNCONSOLIDATED; SILT-05%, CALCILUTITE-05%, CALCITE-02%, PHOSPHATIC SAND-01%;

130.0- 135.0 SAND; VERY LIGHT ORANGE TO YELLOWISH GRAY; 15% POROSITY, INTERGRANULAR; GRAIN SIZE: COARSE, RANGE: MEDIUM TO COARSE; ROUNDNESS:SUB-ANGULAR; MEDIUM SPHERICITY; UNCONSOLIDATED; CALCILUTITE-45%, CLAY-10%, PHOSPHATIC SAND-01%; FOSSIL FRAGMENTS;

135.0- 140.0 AS ABOVE

140.0- 145.0 AS ABOVE

145.0- 150.0 SAND; VERY LIGHT ORANGE TO YELLOWISH GRAY; 20% POROSITY, INTERGRANULAR; GRAIN SIZE: MEDIUM, RANGE: FINE TO COARSE; ROUNDNESS:SUB-ANGULAR TO ROUNDED; MEDIUM SPHERICITY; UNCONSOLIDATED; CLAY-10%, CALCILUTITE-01%, PHOSPHATIC SAND-01%, IRON STAIN- %; FOSSIL FRAGMENTS;

150.0- 155.0 AS ABOVE

155.0- 160.0 AS ABOVE

160.0- 165.0 AS ABOVE

165.0- 170.0 AS ABOVE

170.0- 175.0 SAND; VERY LIGHT ORANGE TO LIGHT OLIVE GRAY; 30% POROSITY, INTERGRANULAR; GRAIN SIZE: MEDIUM, RANGE: FINE TO VERY COARSE; ROUNDNESS:ANGULAR TO ROUNDED; MEDIUM SPHERICITY; UNCONSOLIDATED; CLAY-15%, CALCILUTITE-15%, PHOSPHATIC GRAVEL-02%; FROSTED; FOSSIL FRAGMENTS, MOLLUSKS;

175.0- 180.0 AS ABOVE

180.0- 185.0 AS ABOVE

185.0- 190.0 SAND; OLIVE GRAY; 15% POROSITY, INTERGRANULAR, LOW PERMEABILITY; GRAIN SIZE: FINE, RANGE: MICROCRYSTALLINE TO FINE; ROUNDNESS:SUB-ANGULAR; MEDIUM SPHERICITY; UNCONSOLIDATED; SILT-10%, PHOSPHATIC SAND-05%, CALCILUTITE-01%, CLAY-01%; FOSSIL FRAGMENTS;

190.0- 195.0 AS ABOVE

195.0- 200.0 AS ABOVE

200.0- 210.0 CLAY; DARK GREENISH GRAY; 05% POROSITY, INTERGRANULAR, LOW PERMEABILITY; MODERATE INDURATION; SILT-10%, QUARTZ SAND-05%, CALCILUTITE-01%; FOSSIL FRAGMENTS;

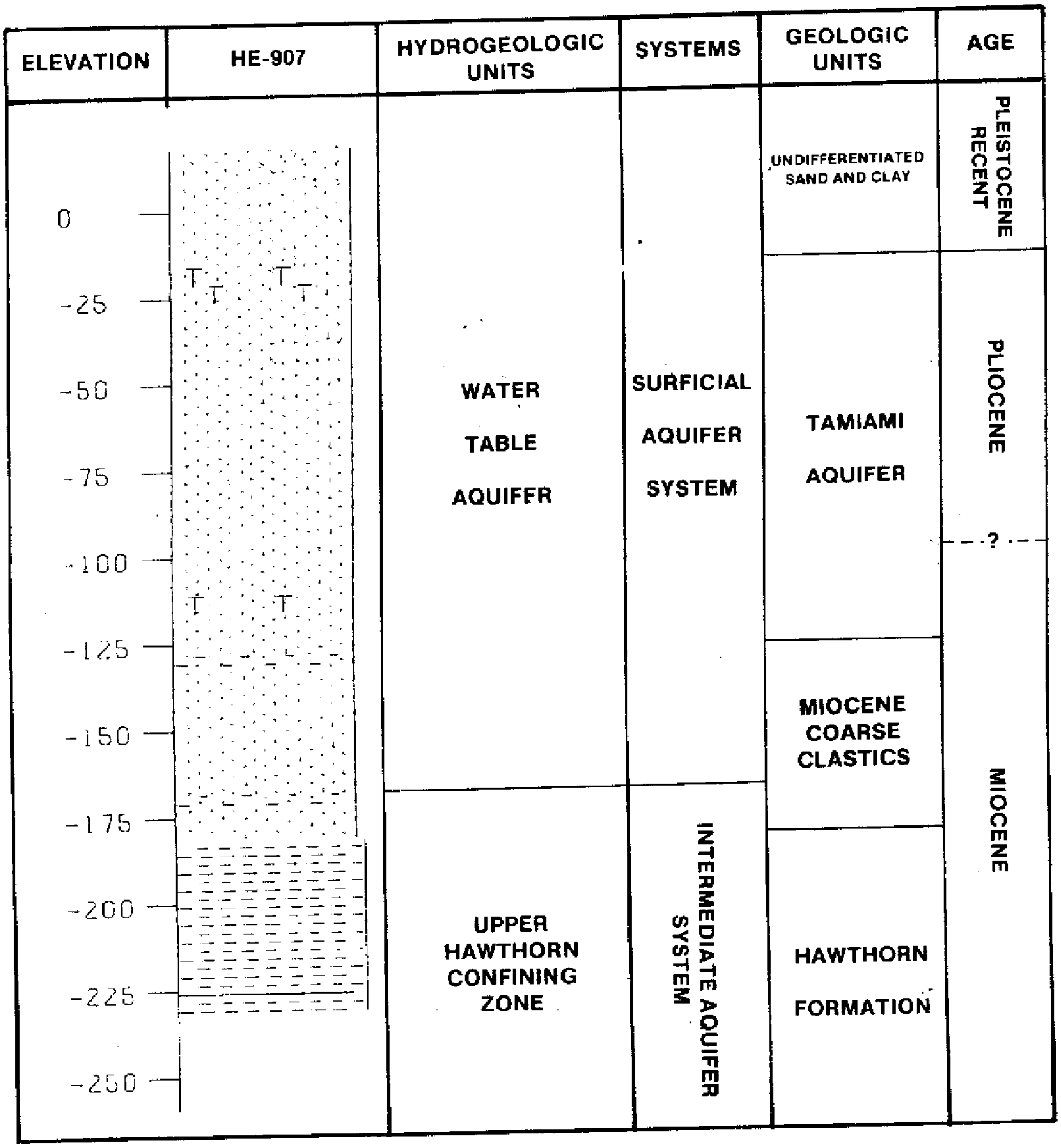
210.0- 220.0 AS ABOVE

220.0- 230.0 AS ABOVE

230.0- 240.0 AS ABOVE

240.0- 250.0 AS ABOVE

250.0 TOTAL DEPTH



HYDROGEOLOGIC CROSS SECTION HE-907

APPENDIX B

CALCULATIONS OF IRRIGATION REQUIREMENTS FOR CROPS TYPICAL OF THE STUDY AREA

CALCULATIONS OF IRRIGATION REQUIREMENTS FOR PASTURE IN CLEWISTON

	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	TOTAL
MEAN RAINFALL	1.31	1.89	1.94	2.84	4.59	6.73	6.51	6.74	7.97	3.72	1.02	1.61	46.87
EVAPOTRANSPIRATION	1.82	2.18	3.76	5.18	6.67	7.40	7.87	7.54	6.41	4.88	3.06	2.08	58.85
AVE. EFFECTIVE RAIN	.62	.89	1.00	1.52	2.52	3.64	3.63	3.67	3.98	1.90	.52	.77	24.66
8-IN-10 EFF. RAIN	.52	.75	.84	1.28	2.11	3.06	3.05	3.09	3.34	1.59	.44	.64	20.72
AVERAGE IRRIGATION	1.19	1.28	2.77	3.66	4.15	3.76	4.24	3.87	2.44	2.98	2.54	1.32	34.19
2-IN-10 IRRIGATION	1.29	1.43	2.93	3.90	4.55	4.34	4.82	4.46	3.07	3.28	2.62	1.44	38.14

SUPPLEMENTAL CROP REQUIREMENT = 34.19 INCHES MAXIMUM MONTH REQUIREMENT = 4.82 INCHES (OCCURS IN JULY)

NOTES: 1. EVAPOTRANSPIRATION WAS CALCULATED USING A MODIFIED BLANEY-CRIDDLE METHOD.
2. MEAN RAINFALL WAS AVERAGED FROM 22 YEARS OF RECORD AT CLEWISTON.
3. AVERAGE EFFECTIVE RAINFALL IS THE AMOUNT OF RAINFALL THAT WOULD BE EXPECTED TO BE USEFUL TO CROPS DURING AN AVERAGE YEAR.
8-IN-10 EFFECTIVE RAINFALL IS WHAT WOULD BE EXPECTED TO BE USEFUL FOR CROPS WITH A PROBABILITY OF 8 YEARS IN 10
5. AVERAGE IRRIGATION IS THE NET AMMOUNT THAT SHOULD BE APPLIED FOR MAXIMUM YIELDS DURING AN AVERAGE YEAR.
6. 2-IN-10 IRRIGATION IS THE NET AMOUNT THAT SHOULD BE APPLIED FOR MAXIMUM YIELDS WITH A PROBABILITY OF REQUIREMENT OF THE AMOUNT SHOWN BEING 2 YEARS IN 10.
7. BASED ON .8 SOIL TYPE O

CALCULATIONS OF IRRIGATION REQUIREMENTS FOR PASTURE IN LA BELLE

	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	TOTAL
MEAN RAINFALL	1.62	2.26	2.74	2.94	4.11	9.06	8.18	7.54	7.69	3.86	1.31	1.35	52.66
EVAPOTRANSPIRATION	1.84	2.14	3.66	5.06	6.63	7.38	7.81	7.48	6.32	4.77	2.97	2.07	58.12
AVE. EFFECTIVE RAIN	.76	1.05	1.35	1.56	2.28	4.68	4.40	4.03	3.84	1.95	.66	.65	27.20
8-IN-10 EFF. RAIN	.65	.90	1.16	1.34	1.96	4.02	3.78	3.46	3.30	1.67	.57	.56	23.40
AVERAGE IRRIGATION	1.08	1.09	2.30	3.50	4.35	2.70	3.42	3.46	2.48	2.82	2.31	1.42	30.91
2-IN-10 IRRIGATION	1.18	1.24	2.49	3.72	4.67	3.35	4.03	4.02	3.02	3.09	2.40	1.51	34.72

SUPPLEMENTAL CROP REQUIREMENT = 30.91 INCHES MAXIMUM MONTH REQUIREMENT = 4.67 INCHES (OCCURS IN MAY)

NOTES: 1. EVAPOTRANSPIRATION WAS CALCULATED USING A MODIFIED BLANEY-CRIDDLE METHOD.
2. MEAN RAINFALL WAS AVERAGED FROM 40 YEARS OF RECORD AT LA BELLE.
3. AVERAGE EFFECTIVE RAINFALL IS THE AMOUNT OF RAINFALL THAT WOULD BE EXPECTED TO BE USEFUL TO CROPS DURING AN AVERAGE YEAR.
8-IN-10 EFFECTIVE RAINFALL IS WHAT WOULD BE EXPECTED TO BE USEFUL FOR CROPS WITH A PROBABILITY OF 8 YEARS IN 10
5. AVERAGE IRRIGATION IS THE NET AMMOUNT THAT SHOULD BE APPLIED FOR MAXIMUM YIELDS DURING AN AVERAGE YEAR.
6. 2-IN-10 IRRIGATION IS THE NET AMOUNT THAT SHOULD BE APPLIED FOR MAXIMUM YIELDS WITH A PROBABILITY OF REQUIREMENT OF THE AMOUNT SHOWN BEING 2 YEARS IN 10.
7. BASED ON .8 SOIL TYPE O

CALCULATIONS OF IRRIGATION REQUIREMENTS FOR CITRUS IN CLEWISTON

	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	TOTAL
MEAN RAINFALL	1.31	1.89	1.94	2.84	4.59	6.73	6.51	6.74	7.97	3.72	1.02	1.61	46.87
EVAPOTRANSPIRATION	2.33	2.52	3.51	4.27	5.26	5.71	6.07	5.89	5.16	4.20	3.06	2.42	50.40
AVE. EFFECTIVE RAIN	.64	.91	.98	1.45	2.33	3.31	3.29	3.35	3.71	1.83	.52	.78	23.09
8-IN-10 EFF. RAIN	.54	.76	.83	1.21	1.95	2.78	2.76	2.81	3.12	1.53	.44	.66	19.40
AVERAGE IRRIGATION	1.69	1.61	2.52	2.82	2.93	2.40	2.79	2.54	1.45	2.37	2.54	1.64	27.31
2-IN-10 IRRIGATION	1.80	1.76	2.68	3.05	3.31	2.93	3.31	3.07	2.04	2.66	2.62	1.77	31.00

SUPPLEMENTAL CROP REQUIREMENT = 27.31 INCHES MAXIMUM MONTH REQUIREMENT = 3.31 INCHES (OCCURS IN JULY)

NOTES: 1. EVAPOTRANSPIRATION WAS CALCULATED USING A MODIFIED BLANEY-CRIDDLE METHOD.
2. MEAN RAINFALL WAS AVERAGED FROM 22 YEARS OF RECORD AT CLEWISTON.
3. AVERAGE EFFECTIVE RAINFALL IS THE AMOUNT OF RAINFALL THAT WOULD BE EXPECTED TO BE USEFUL TO CROPS DURING AN AVERAGE YEAR.
8-IN-10 EFFECTIVE RAINFALL IS WHAT WOULD BE EXPECTED TO BE USEFUL FOR CROPS WITH A PROBABILITY OF 8 YEARS IN 10
5. AVERAGE IRRIGATION IS THE NET AMMOUNT THAT SHOULD BE APPLIED FOR MAXIMUM YIELDS DURING AN AVERAGE YEAR.
6. 2-IN-10 IRRIGATION IS THE NET AMOUNT THAT SHOULD BE APPLIED FOR MAXIMUM YIELDS WITH A PROBABILITY OF REQUIREMENT OF THE AMOUNT SHOWN BEING 2 YEARS IN 10.
7. BASED ON .8 SOIL TYPE 0

CALCULATIONS OF IRRIGATION REQUIREMENTS FOR CITRUS IN LA BELLE

	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	TOTAL
MEAN RAINFALL	1.62	2.26	2.74	2.94	4.11	9.06	8.18	7.54	7.69	3.86	1.31	1.35	52.66
EVAPOTRANSPIRATION	2.36	2.48	3.41	4.16	5.23	5.69	6.03	5.84	5.08	4.10	2.97	2.41	49.77
AVE. EFFECTIVE RAIN	.78	1.07	1.34	1.48	2.11	4.26	3.98	3.67	3.58	1.88	.66	.66	25.48
8-IN-10 EFF. RAIN	.67	.92	1.15	1.27	1.81	3.66	3.42	3.16	3.08	1.61	.57	.57	21.91
AVERAGE IRRIGATION	1.58	1.41	2.07	2.68	3.12	1.43	2.05	2.16	1.50	2.23	2.31	1.75	24.29
2-IN-10 IRRIGATION	1.69	1.56	2.26	2.89	3.41	2.03	2.61	2.68	2.00	2.49	2.40	1.84	27.86

SUPPLEMENTAL CROP REQUIREMENT = 24.29 INCHES MAXIMUM MONTH REQUIREMENT = 3.41 INCHES (OCCURS IN MAY)

NOTES: 1. EVAPOTRANSPIRATION WAS CALCULATED USING A MODIFIED BLANEY-CRIDDLE METHOD.
2. MEAN RAINFALL WAS AVERAGED FROM 40 YEARS OF RECORD AT LA BELLE.
3. AVERAGE EFFECTIVE RAINFALL IS THE AMOUNT OF RAINFALL THAT WOULD BE EXPECTED TO BE USEFUL TO CROPS DURING AN AVERAGE YEAR.
8-IN-10 EFFECTIVE RAINFALL IS WHAT WOULD BE EXPECTED TO BE USEFUL FOR CROPS WITH A PROBABILITY OF 8 YEARS IN 10
5. AVERAGE IRRIGATION IS THE NET AMMOUNT THAT SHOULD BE APPLIED FOR MAXIMUM YIELDS DURING AN AVERAGE YEAR.
6. 2-IN-10 IRRIGATION IS THE NET AMOUNT THAT SHOULD BE APPLIED FOR MAXIMUM YIELDS WITH A PROBABILITY OF REQUIREMENT OF THE AMOUNT SHOWN BEING 2 YEARS IN 10.
7. BASED ON .8 SOIL TYPE 0

CALCULATIONS OF IRRIGATION REQUIREMENTS FOR MELONS IN CLEWISTON

PLANTING DATE = DECEMBER 1

	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	TOTAL
MEAN RAINFALL	1.31	1.89	1.94	2.84	4.59	6.73	6.51	6.74	7.97	3.72	1.02	1.61	46.87
EVAPOTRANSPIRATION	2.77	3.01	3.66	.00	.00	.00	.00	.00	.00	.00	.00	1.98	11.43
AVE. EFFECTIVE RAIN	.66	.94	.99	.00	.00	.00	.00	.00	.00	.00	.00	.76	3.35
8-IN-10 EFF. RAIN	.55	.79	.83	.00	.00	.00	.00	.00	.00	.00	.00	.64	2.81
AVERAGE IRRIGATION	2.11	2.07	2.67	.00	.00	.00	.00	.00	.00	.00	.00	1.22	8.08
2-IN-10 IRRIGATION	2.22	2.22	2.83	.00	.00	.00	.00	.00	.00	.00	.00	1.34	8.61

SUPPLEMENTAL CROP REQUIREMENT = 8.08 INCHES   MAXIMUM MONTH REQUIREMENT = 2.83 INCHES (OCCURS IN MARCH)

NOTES:
1. EVAPOTRANSPIRATION WAS CALCULATED USING A MODIFIED BLANEY-CRIDDLE METHOD.
2. MEAN RAINFALL WAS AVERAGED FROM 22 YEARS OF RECORD AT CLEWISTON.
3. AVERAGE EFFECTIVE RAINFALL IS THE AMOUNT OF RAINFALL THAT WOULD BE EXPECTED TO BE USEFUL TO CROPS DURING AN AVERAGE YEAR.

8-IN-10 EFFECTIVE RAINFALL IS WHAT WOULD BE EXPECTED TO BE USEFUL FOR CROPS WITH A PROBABILITY OF 8 YEARS IN 10

5. AVERAGE IRRIGATION IS THE NET AMMOUNT THAT SHOULD BE APPLIED FOR MAXIMUM YIELDS DURING AN AVERAGE YEAR.
6. 2-IN-10 IRRIGATION IS THE NET AMOUNT THAT SHOULD BE APPLIED FOR MAXIMUM YIELDS WITH A PROBABILITY OF REQUIREMENT OF THE AMOUNT SHOWN BEING 2 YEARS IN 10.
7. BASED ON .8 SOIL TYPE 0

CALCULATIONS OF IRRIGATION REQUIREMENTS FOR MELONS IN LA BELLE

PLANTING DATE = DECEMBER 1

	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	TOTAL
MEAN RAINFALL	1.62	2.26	2.74	2.94	4.11	9.06	8.18	7.54	7.69	3.86	1.31	1.35	52.66
EVAPOTRANSPIRATION	2.81	2.96	3.56	.00	.00	.00	.00	.00	.00	.00	.00	1.97	11.29
AVE. EFFECTIVE RAIN	.80	1.10	1.35	.00	.00	.00	.00	.00	.00	.00	.00	.65	3.89
8-IN-10 EFF. RAIN	.69	.94	1.16	.00	.00	.00	.00	.00	.00	.00	.00	.56	3.35
AVERAGE IRRIGATION	2.00	1.86	2.21	.00	.00	.00	.00	.00	.00	.00	.00	1.33	7.40
2-IN-10 IRRIGATION	2.12	2.01	2.40	.00	.00	.00	.00	.00	.00	.00	.00	1.42	7.95

SUPPLEMENTAL CROP REQUIREMENT = 7.40 INCHES   MAXIMUM MONTH REQUIREMENT = 2.40 INCHES (OCCURS IN MARCH)

NOTES:
1. EVAPOTRANSPIRATION WAS CALCULATED USING A MODIFIED BLANEY-CRIDDLE METHOD.
2. MEAN RAINFALL WAS AVERAGED FROM 40 YEARS OF RECORD AT LA BELLE.
3. AVERAGE EFFECTIVE RAINFALL IS THE AMOUNT OF RAINFALL THAT WOULD BE EXPECTED TO BE USEFUL TO CROPS DURING AN AVERAGE YEAR.

8-IN-10 EFFECTIVE RAINFALL IS WHAT WOULD BE EXPECTED TO BE USEFUL FOR CROPS WITH A PROBABILITY OF 8 YEARS IN 10

5. AVERAGE IRRIGATION IS THE NET AMMOUNT THAT SHOULD BE APPLIED FOR MAXIMUM YIELDS DURING AN AVERAGE YEAR.
6. 2-IN-10 IRRIGATION IS THE NET AMOUNT THAT SHOULD BE APPLIED FOR MAXIMUM YIELDS WITH A PROBABILITY OF REQUIREMENT OF THE AMOUNT SHOWN BEING 2 YEARS IN 10.
7. BASED ON .8 SOIL TYPE 0

CALCULATIONS OF IRRIGATION REQUIREMENTS FOR SMALL VEG. IN CLEWISTON

PLANTING DATE = DECEMBER 1

	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	TOTAL
MEAN RAINFALL	1.31	1.89	1.94	2.84	4.59	6.73	6.51	6.74	7.97	3.72	1.02	1.61	46.87
EVAPOTRANSPIRATION	2.84	3.09	2.92	.00	.00	.00	.00	.00	.00	.00	.00	1.81	10.65
AVE. EFFECTIVE RAIN	.66	.94	.95	.00	.00	.00	.00	.00	.00	.00	.00	.75	3.31
8-IN-10 EFF. RAIN	.55	.79	.80	.00	.00	.00	.00	.00	.00	.00	.00	.63	2.78
AVERAGE IRRIGATION	2.18	2.15	1.97	.00	.00	.00	.00	.00	.00	.00	.00	1.06	7.35
2-IN-10 IRRIGATION	2.28	2.30	2.12	.00	.00	.00	.00	.00	.00	.00	.00	1.18	7.88

SUPPLEMENTAL CROP REQUIREMENT = 7.35 INCHES   MAXIMUM MONTH REQUIREMENT = 2.30 INCHES (OCCURS IN FEBRUARY)

NOTES: 1. EVAPOTRANSPIRATION WAS CALCULATED USING A MODIFIED BLANEY-CRIDDLE METHOD.
2. MEAN RAINFALL WAS AVERAGED FROM 22 YEARS OF RECORD AT CLEWISTON.
3. AVERAGE EFFECTIVE RAINFALL IS THE AMOUNT OF RAINFALL THAT WOULD BE EXPECTED TO BE USEFUL TO CROPS DURING AN AVERAGE YEAR.
8-IN-10 EFFECTIVE RAINFALL IS WHAT WOULD BE EXPECTED TO BE USEFUL FOR CROPS WITH A PROBABILITY OF 8 YEARS IN 10
5. AVERAGE IRRIGATION IS THE NET AMMOUNT THAT SHOULD BE APPLIED FOR MAXIMUM YIELDS DURING AN AVERAGE YEAR.
6. 2-IN-10 IRRIGATION IS THE NET AMOUNT THAT SHOULD BE APPLIED FOR MAXIMUM YIELDS WITH A PROBABILITY OF REQUIREMENT OF THE AMOUNT SHOWN BEING 2 YEARS IN 10.
7. BASED ON .8 SOIL TYPE 0

CALCULATIONS OF IRRIGATION REQUIREMENTS FOR SMALL VEG. IN LA BELLE

PLANTING DATE = DECEMBER 1

	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	TOTAL
MEAN RAINFALL	1.62	2.26	2.74	2.94	4.11	9.06	8.18	7.54	7.69	3.86	1.31	1.35	52.66
EVAPOTRANSPIRATION	2.87	3.03	2.84	.00	.00	.00	.00	.00	.00	.00	.00	1.80	10.54
AVE. EFFECTIVE RAIN	.81	1.10	1.29	.00	.00	.00	.00	.00	.00	.00	.00	.64	3.84
8-IN-10 EFF. RAIN	.69	.95	1.11	.00	.00	.00	.00	.00	.00	.00	.00	.55	3.30
AVERAGE IRRIGATION	2.07	1.93	1.54	.00	.00	.00	.00	.00	.00	.00	.00	1.16	6.70
2-IN-10 IRRIGATION	2.18	2.08	1.72	.00	.00	.00	.00	.00	.00	.00	.00	1.25	7.24

SUPPLEMENTAL CROP REQUIREMENT = 6.70 INCHES   MAXIMUM MONTH REQUIREMENT = 2.18 INCHES (OCCURS IN JANUARY)

NOTES: 1. EVAPOTRANSPIRATION WAS CALCULATED USING A MODIFIED BLANEY-CRIDDLE METHOD.
2. MEAN RAINFALL WAS AVERAGED FROM 40 YEARS OF RECORD AT LA BELLE.
3. AVERAGE EFFECTIVE RAINFALL IS THE AMOUNT OF RAINFALL THAT WOULD BE EXPECTED TO BE USEFUL TO CROPS DURING AN AVERAGE YEAR.
8-IN-10 EFFECTIVE RAINFALL IS WHAT WOULD BE EXPECTED TO BE USEFUL FOR CROPS WITH A PROBABILITY OF 8 YEARS IN 10
5. AVERAGE IRRIGATION IS THE NET AMMOUNT THAT SHOULD BE APPLIED FOR MAXIMUM YIELDS DURING AN AVERAGE YEAR.
6. 2-IN-10 IRRIGATION IS THE NET AMOUNT THAT SHOULD BE APPLIED FOR MAXIMUM YIELDS WITH A PROBABILITY OF REQUIREMENT OF THE AMOUNT SHOWN BEING 2 YEARS IN 10.
7. BASED ON .8 SOIL TYPE 0

CALCULATIONS OF IRRIGATION REQUIREMENTS FOR TOMATO IN CLEWISTON

PLANTING DATE = DECEMBER 1

	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	TOTAL
MEAN RAINFALL	1.31	1.89	1.94	2.84	4.59	6.73	6.51	6.74	7.97	3.72	1.02	1.61	46.87
EVAPOTRANSPIRATION	2.81	3.81	4.13	.00	.00	.00	.00	.00	.00	.00	.00	1.79	12.54
AVE. EFFECTIVE RAIN	.66	.98	1.02	.00	.00	.00	.00	.00	.00	.00	.00	.75	3.41
8-IN-10 EFF. RAIN	.55	.82	.86	.00	.00	.00	.00	.00	.00	.00	.00	.63	2.86
AVERAGE IRRIGATION	2.15	2.83	3.11	.00	.00	.00	.00	.00	.00	.00	.00	1.04	9.13
2-IN-10 IRRIGATION	2.26	2.99	3.27	.00	.00	.00	.00	.00	.00	.00	.00	1.16	9.68

SUPPLEMENTAL CROP REQUIREMENT = 9.13 INCHES MAXIMUM MONTH REQUIREMENT = 3.27 INCHES (OCCURS IN MARCH)

NOTES:
1. EVAPOTRANSPIRATION WAS CALCULATED USING A MODIFIED BLANEY-CRIDDLE METHOD.
2. MEAN RAINFALL WAS AVERAGED FROM 22 YEARS OF RECORD AT CLEWISTON.
3. AVERAGE EFFECTIVE RAINFALL IS THE AMOUNT OF RAINFALL THAT WOULD BE EXPECTED TO BE USEFUL TO CROPS DURING AN AVERAGE YEAR.

8-IN-10 EFFECTIVE RAINFALL IS WHAT WOULD BE EXPECTED TO BE USEFUL FOR CROPS WITH A PROBABILITY OF 8 YEARS IN 10

5. AVERAGE IRRIGATION IS THE NET AMMOUNT THAT SHOULD BE APPLIED FOR MAXIMUM YIELDS DURING AN AVERAGE YEAR.
6. 2-IN-10 IRRIGATION IS THE NET AMOUNT THAT SHOULD BE APPLIED FOR MAXIMUM YIELDS WITH A PROBABILITY OF REQUIREMENT OF THE AMOUNT SHOWN BEING 2 YEARS IN 10.
7. BASED ON .8 SOIL TYPE 0

CALCULATIONS OF IRRIGATION REQUIREMENTS FOR TOMATO IN LA BELLE

PLANTING DATE = DECEMBER 1

	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	TOTAL
MEAN RAINFALL	1.62	2.26	2.74	2.94	4.11	9.06	8.18	7.54	7.69	3.86	1.31	1.35	52.66
EVAPOTRANSPIRATION	2.84	3.74	4.01	.00	.00	.00	.00	.00	.00	.00	.00	1.78	12.38
AVE. EFFECTIVE RAIN	.80	1.15	1.38	.00	.00	.00	.00	.00	.00	.00	.00	.64	3.97
8-IN-10 EFF. RAIN	.69	.99	1.19	.00	.00	.00	.00	.00	.00	.00	.00	.55	3.41
AVERAGE IRRIGATION	2.04	2.60	2.63	.00	.00	.00	.00	.00	.00	.00	.00	1.14	8.41
2-IN-10 IRRIGATION	2.15	2.76	2.82	.00	.00	.00	.00	.00	.00	.00	.00	1.23	8.97

SUPPLEMENTAL CROP REQUIREMENT = 8.41 INCHES MAXIMUM MONTH REQUIREMENT = 2.82 INCHES (OCCURS IN MARCH)

NOTES:
1. EVAPOTRANSPIRATION WAS CALCULATED USING A MODIFIED BLANEY-CRIDDLE METHOD.
2. MEAN RAINFALL WAS AVERAGED FROM 40 YEARS OF RECORD AT LA BELLE.
3. AVERAGE EFFECTIVE RAINFALL IS THE AMOUNT OF RAINFALL THAT WOULD BE EXPECTED TO BE USEFUL TO CROPS DURING AN AVERAGE YEAR.

8-IN-10 EFFECTIVE RAINFALL IS WHAT WOULD BE EXPECTED TO BE USEFUL FOR CROPS WITH A PROBABILITY OF 8 YEARS IN 10

5. AVERAGE IRRIGATION IS THE NET AMMOUNT THAT SHOULD BE APPLIED FOR MAXIMUM YIELDS DURING AN AVERAGE YEAR.
6. 2-IN-10 IRRIGATION IS THE NET AMOUNT THAT SHOULD BE APPLIED FOR MAXIMUM YIELDS WITH A PROBABILITY OF REQUIREMENT OF THE AMOUNT SHOWN BEING 2 YEARS IN 10.
7. BASED ON .8 SOIL TYPE 0

APPENDIX C

INFORMATION REGARDING MONITOR WELLS USED IN WATER LEVEL ANALYSIS

USGS WELLS USED IN WATER LEVEL ANALYSIS

WELL #	S/T/R	LAT.	LONG.	CASING DIA. (in.)	CASING DEP. (ft.)	TOTAL DEPTH (ft.)	AQUIFER	TYPE OF RECORD	PERIOD OF RECORD
C-131	1/47/30	26 25 21	81 16 19	6	22	54	Surficial	contin.	6/52-12/86
C-363	34/46/29	26 25 55	81 24 25	2	84	119	Surficial	contin.	11/68-12/86
C-462	20/46/29	26 27 24	81 26 12	8	50	110	Surficial	contin.	11/68-12/86
C-531	7/46/29	26 29 28	81 27 29	4	210	253	Sandstone	contin.	10/75-12/86
C-532	7/46/29	26 29 28	81 27 29	4	3	13	Surficial	monthly	10/75-12/86
GL-293	15/42/33	26 48 59	81 00 51	4	5	9	Surficial	contin.	1/64-12/86
GL-517	36/42/29	26 46 12	81 22 29	8	128	138	Sandstone	contin.	2/77-12/86
HE-3	12/48/33	26 18 59	80 58 54	6	8	10	Surficial	monthly	7/50-12/86
HE-5	27/44/32	26 37 50	81 07 40	6	8	13	Surficial	monthly	1/41-12/86
HE-339	27/44/34	26 37 27	80 55 10	2	5	10	Surficial	daily	2/64-12/86
HE-529	21/45/29	26 33 10	81 25 09	4	135	155	Sandstone	contin.	10/75-12/86
HE-554	21/45/29	26 33 10	81 25 09	4	5	15	Surficial	monthly	10/75-12/86
HE-555	21/44/29	26 38 45	81 26 07	4	250	270	Sandstone	monthly	10/75-12/86
HE-556	21/44/29	26 38 45	81 26 07	4	135	155	Sandstone	contin.	10/75-12/86
HE-557	28/43/28	26 42 35	81 31 06	4	80	102	Sandstone	monthly	10/75-12/86
HE-558	28/43/28	26 42 35	81 31 06	4	3	14	Surficial	monthly	10/75-12/86
HE-559	10/44/28	26 39 30	81 30 01	4	155	165	Sandstone	monthly	10/75-12/86

USGS WELLS USED IN WATER LEVEL ANALYSIS

WELL #	S/T/R	LAT.	LONG.	CASING DIA. (in.)	CASING DEP. (ft.)	TOTAL DEPTH (ft.)	AQUIFER	TYPE OF RECORD	PERIOD OF RECORD
HE-560	10/44/28	26 39 30	81 30 15	4	70	87	Sandstone	monthly	10/75-12/86
HE-569	10/44/28	26 39 30	81 30 15	4	11	17	Surficial	monthly	10/75-12/86
HE-620	19/43/29	26 43 53	81 28 11	2	171	351	Sandstone	monthly	9/77-12/86
HE-629	6/44/33	26 41 37	81 04 07	2	33	144	Surficial	monthly	9/77-12/86
HE-851	21/44/29	26 38 45	81 26 07	4	5	13	Surficial	monthly	1/80-12/86
HE-854	10/45/33	26 35 15	81 01 20	4	3	14	Surficial	monthly	8/77-12/86
HE-855	34/45/32	26 31 35	81 07 35	4	70	90	Surficial	monthly	8/77-12/86
HE-856	34/45/32	26 31 35	81 07 35	4	9	11	Surficial	monthly	8/77-12/86
HE-861	24/48/34	26 17 35	80 53 40	4	37	70	Surficial	contin.*	9/77-12/86
HE-862	24/48/34	26 17 35	80 53 40	4	7	11	Surficial	monthly	9/77-12/86
HE-868	27/47/33	26 21 18	81 00 29	4	-	97	Surficial	monthly	9/77-12/86
L-727	11/44/27	26 39 50	81 35 54	4	67	68	Sandstone	contin.	7/68-12/86
L-730	35/45/27	26 31 37	81 35 15	4	18	19	Surficial	contin.	8/68-12/86
L-731	25/46/27	26 27 03	81 34 02	4	165	243	Sandstone	contin.	8/68-12/86
L-1137	11/44/27	26 39 50	81 35 54	4	15	20	Sandstone	contin.	6/70-11/85
L-1138	25/46/27	26 27 03	81 34 02	4	15	20	Surficial	monthly	6/70-12/86
L-1418	32/44/27	26 36 30	81 37 53	8	55	62	Sandstone	contin.	1/71-12/86
L-1963	15/45/27	26 33 44	81 36 17	4	68	74	Sandstone	monthly	12/74-12/86

*monthly after 6/85

USGS WELLS USED IN WATER LEVEL ANALYSIS

WELL #	S/T/R	LAT.	LONG.	CASING DIA. (in.)	CASING DEP. (ft.)	TOTAL DEPTH (ft.)	AQUIFER	TYPE OF RECORD	PERIOD OF RECORD
L-1964	15/45/27	26 33 44	81 36 17	4	14	24	Surficial	monthly	12/74/12/86
L-1965	13/45/27	26 33 53	81 33 58	4	50	183	Sandstone	monthly	12/65-12/86
L-1977	21/43/27	26 43 20	81 36 57	4	65	185	Sandstone	monthly	12/74-12/86
L-1978	21/43/27	26 43 20	81 36 57	4	7	17	Surficial	monthly	12/74-12/86
L-1984	22/46/26	26 27 13	81 41 46	4	206	288	Sandstone	contin.	11/74-12/86
L-1985	22/46/26	26 27 03	81 34 02	4	43	50	Surficial	contin.	12/74-12/86
L-1992	13/45/27	26 33 53	81 33 58	4	19	25	Surficial	monthly	12/74-12/86
L-2186	15/45/27	26 33 44	81 36 18	4	133	160	Sandstone	contin.	8/75-12/86
L-2187	11/44/27	26 39 50	81 35 54	4	136	154	Sandstone	monthly	8/75-12/86
L-2192	29/46/27	26 26 59	81 38 25	4	155	184	Sandstone	monthly	8/75-12/86
L-2200	24/43/27	26 43 29	81 34 04	4	122	163	Sandstone	monthly	8/75-12/86
L-2202	24/43/27	26 43 29	81 34 04	4	7	19	Surficial	monthly	8/75-12/86
L-2215	35/45/27	26 31 27	81 35 16	4	99	145	Sandstone	monthly	10/75-12/86
L-5664	36/46/26	26 25 14	81 39 34	4	180	300	Sandstone	monthly	11/82-12/86
L-5665	36/46/26	26 25 14	81 39 34	4	32	37	Surficial	monthly	11/82/12/86
PB-506	36/43/35	26 41 53	80 47 52	4	11	15	Surficial	contin.	1/64-11/85

APPENDIX D

CALCULATED WATER LEVEL MEANS AND STANDARD DEVIATIONS FOR SELECTED MONITOR WELLS

INTRODUCTION

This appendix contains the results of a statistical analysis of the 51 wells monitored by the U. S. Geological Survey in the study area. The analysis was done using data from 1977 through 1986. Column 1 contains the well numbers. Column 2 indicates the month. Column 3 is the number of monthly records for the period 1977 through 1986. Columns 4, 5, and 6 are the maximum monthly water level, the minimum monthly water level, and the mean monthly water level for the same period. Column 7 is the standard deviation of the monthly water levels. Column 8 is the variance of the monthly water levels. Column 9 is the coefficient of variation, expressed as a percentage. All the terms are defined and discussed in the text.

		Rec	Max	Min	Mean	SD	VAR	CV
HE-3	JAN	6	18.66	15.86	17.13	1.02	1.05	5.98
HE-3	FEB	6	18.60	15.89	17.04	0.98	0.96	5.75
HE-3	MAR	6	18.62	15.32	16.76	1.28	1.65	7.67
HE-3	APR	7	17.94	14.35	16.16	1.36	1.85	8.42
HE-3	MAY	6	17.48	13.40	15.49	1.51	2.27	9.72
HE-3	JUN	7	19.67	13.51	17.52	2.00	4.01	11.43
HE-3	JUL	7	18.62	15.07	17.49	1.29	1.67	7.38
HE-3	AUG	7	18.99	17.58	18.24	0.42	0.18	2.29
HE-3	SEP	7	19.72	17.18	18.36	0.84	0.70	4.57
HE-3	OCT	8	21.14	16.66	18.20	1.28	1.63	7.02
HE-3	NOV	8	20.08	16.91	17.78	0.94	0.88	5.29
HE-3	DEC	7	20.10	16.11	17.49	1.18	1.39	6.75
	YEAR		21.14	13.40	17.36	1.48	2.18	8.50
		Rec	Max	Min	Mean	SD	VAR	CV
HE-5	JAN	9	25.29	22.92	24.06	0.82	0.67	3.40
HE-5	FEB	10	25.30	22.85	24.04	0.71	0.51	2.97
HE-5	MAR	9	25.35	22.76	23.84	0.79	0.63	3.32
HE-5	APR	10	24.70	22.29	23.37	0.82	0.68	3.53
HE-5	MAY	10	24.55	22.34	23.24	0.62	0.39	2.67
HE-5	JUN	10	26.40	22.38	24.56	1.30	1.68	5.28
HE-5	JUL	10	26.24	22.54	24.50	1.28	1.64	5.23
HE-5	AUG	10	25.76	23.74	24.94	0.54	0.30	2.18
HE-5	SEP	10	25.87	24.19	25.24	0.54	0.29	2.14
HE-5	OCT	10	26.20	23.22	24.34	0.81	0.65	3.31
HE-5	NOV	10	24.77	23.08	23.98	0.45	0.20	1.88
HE-5	DEC	9	24.39	23.11	23.76	0.42	0.18	1.77
	YEAR		26.40	22.29	24.17	1.01	1.02	4.18
		Rec	Max	Min	Mean	SD	VAR	CV
HE-339	JAN	7	13.11	11.50	12.52	0.50	0.25	3.96
HE-339	FEB	8	14.73	11.42	12.61	0.94	0.89	7.48
HE-339	MAR	7	13.55	11.79	12.57	0.52	0.27	4.13
HE-339	APR	7	12.92	11.01	12.27	0.70	0.49	5.70
HE-339	MAY	8	13.09	12.35	12.69	0.24	0.06	1.91
HE-339	JUN	8	14.84	12.06	12.66	0.85	0.73	6.73
HE-339	JUL	7	13.34	11.68	12.32	0.53	0.28	4.29
HE-339	AUG	7	13.17	10.80	12.35	0.69	0.47	5.55
HE-339	SEP	8	12.95	11.42	12.25	0.44	0.19	3.56
HE-339	OCT	8	13.14	10.95	11.93	0.64	0.41	5.39
HE-339	NOV	7	12.75	11.38	12.00	0.45	0.20	3.74
HE-339	DEC	8	12.99	10.84	11.94	0.64	0.41	5.37
	YEAR		14.84	10.80	12.34	0.68	0.46	5.52

		Rec	Max	Min	Mean	SD	VAR	CV
HE-529	JAN	9	30.95	27.14	29.11	1.32	1.75	4.54
HE-529	FEB	10	30.76	27.24	29.10	1.15	1.32	3.94
HE-529	MAR	9	30.80	27.09	28.57	1.15	1.32	4.02
HE-529	APR	10	29.88	25.29	28.03	1.44	2.07	5.13
HE-529	MAY	10	30.64	25.59	27.88	1.61	2.59	5.77
HE-529	JUN	10	31.32	27.08	29.26	1.36	1.84	4.64
HE-529	JUL	10	32.24	28.07	29.53	1.22	1.49	4.13
HE-529	AUG	10	32.47	29.04	30.46	0.91	0.83	2.99
HE-529	SEP	10	31.52	29.69	30.58	0.56	0.31	1.83
HE-529	OCT	10	30.40	28.42	29.54	0.65	0.42	2.19
HE-529	NOV	10	30.30	28.36	29.33	0.71	0.51	2.43
HE-529	DEC	10	30.44	27.62	29.05	0.93	0.87	3.21
	YEAR		32.47	25.29	29.21	1.37	1.89	4.70

		Rec	Max	Min	Mean	SD	VAR	CV
HE-554	JAN	9	31.58	28.23	29.98	1.07	1.15	3.58
HE-554	FEB	10	31.56	28.88	30.10	0.87	0.75	2.88
HE-554	MAR	9	31.56	28.55	29.58	0.88	0.77	2.97
HE-554	APR	10	30.43	27.77	29.12	0.86	0.73	2.94
HE-554	MAY	10	31.35	26.96	28.90	1.38	1.90	4.77
HE-554	JUN	10	31.96	27.83	29.82	1.51	2.29	5.07
HE-554	JUL	10	31.44	29.17	30.09	0.68	0.46	2.25
HE-554	AUG	10	31.89	29.54	31.09	0.74	0.54	2.37
HE-554	SEP	10	31.71	30.34	30.93	0.55	0.30	1.77
HE-554	OCT	10	33.22	28.81	30.16	1.16	1.35	3.85
HE-554	NOV	10	30.94	28.83	29.80	0.71	0.50	2.38
HE-554	DEC	9	30.96	28.35	29.50	0.85	0.72	2.87
	YEAR		33.22	26.96	29.93	1.16	1.34	3.87

		Rec	Max	Min	Mean	SD	VAR	CV
HE-555	JAN	9	26.70	15.50	20.90	3.75	14.05	17.93
HE-555	FEB	10	26.92	16.91	21.31	3.12	9.74	14.65
HE-555	MAR	9	26.32	14.57	21.16	3.63	13.16	17.15
HE-555	APR	10	23.24	11.37	19.42	3.30	10.88	16.99
HE-555	MAY	10	25.16	8.55	18.28	4.43	19.63	24.24
HE-555	JUN	10	25.96	15.42	21.01	3.21	10.30	15.27
HE-555	JUL	10	28.04	17.74	23.34	2.81	7.88	12.03
HE-555	AUG	10	28.35	21.92	24.72	2.02	4.06	8.15
HE-555	SEP	10	28.49	21.94	25.11	1.95	3.82	7.78
HE-555	OCT	10	28.42	18.90	23.88	2.96	8.78	12.40
HE-555	NOV	10	28.26	17.96	23.37	2.99	8.93	12.79
HE-555	DEC	10	27.81	15.58	21.83	3.28	10.75	15.03
	YEAR		28.49	8.55	22.04	3.77	14.18	17.08

		Rec	Max	Min	Mean	SD	VAR	CV
HE-556	JAN	9	25.47	14.75	20.16	3.70	13.68	18.34
HE-556	FEB	10	25.83	15.82	20.42	3.33	11.08	16.31
HE-556	MAR	9	25.40	14.30	20.39	3.60	12.95	17.65
HE-556	APR	10	22.83	12.74	18.97	2.79	7.76	14.69
HE-556	MAY	10	23.63	11.74	18.91	3.32	11.03	17.56
HE-556	JUN	10	27.62	16.84	21.38	3.22	10.36	15.05
HE-556	JUL	10	27.22	18.07	22.55	2.53	6.38	11.20
HE-556	AUG	10	27.80	20.89	23.73	2.16	4.68	9.11
HE-556	SEP	10	28.01	22.12	24.31	2.03	4.12	8.35
HE-556	OCT	10	27.57	18.78	23.17	2.86	8.17	12.34
HE-556	NOV	10	27.37	18.76	22.81	2.65	7.00	11.60
HE-556	DEC	10	26.52	15.37	21.20	3.09	9.58	14.60
	YEAR		28.01	11.74	21.52	3.44	11.84	15.99

		Rec	Max	Min	Mean	SD	VAR	CV
HE-557	JAN	9	15.81	12.59	14.27	1.01	1.02	7.09
HE-557	FEB	10	15.65	12.91	14.10	0.91	0.84	6.48
HE-557	MAR	9	15.88	10.99	13.72	1.33	1.78	9.71
HE-557	APR	10	15.14	10.44	13.09	1.54	2.39	11.80
HE-557	MAY	10	14.98	10.75	13.28	1.42	2.02	10.71
HE-557	JUN	10	16.23	13.42	14.79	0.72	0.52	4.86
HE-557	JUL	10	16.13	14.34	15.34	0.52	0.27	3.40
HE-557	AUG	10	16.19	15.06	15.59	0.34	0.11	2.15
HE-557	SEP	10	16.08	14.92	15.75	0.34	0.11	2.13
HE-557	OCT	10	15.89	13.54	14.90	0.72	0.52	4.83
HE-557	NOV	10	15.43	11.66	14.13	1.18	1.39	8.33
HE-557	DEC	9	15.50	13.33	14.38	0.66	0.44	4.62
	YEAR		16.23	10.44	14.45	1.28	1.63	8.85

		Rec	Max	Min	Mean	SD	VAR	CV
HE-558	JAN	9	15.80	13.63	14.69	0.59	0.34	4.00
HE-558	FEB	10	15.36	13.55	14.55	0.53	0.28	3.65
HE-558	MAR	9	15.45	13.25	14.37	0.60	0.37	4.21
HE-558	APR	10	14.51	13.42	14.14	0.35	0.12	2.47
HE-558	MAY	10	15.53	13.22	14.24	0.63	0.40	4.43
HE-558	JUN	10	16.04	13.25	14.90	0.84	0.71	5.67
HE-558	JUL	10	15.81	14.06	15.04	0.50	0.25	3.30
HE-558	AUG	10	15.57	13.99	14.92	0.50	0.25	3.37
HE-558	SEP	10	16.38	13.52	14.93	0.69	0.47	4.62
HE-558	OCT	10	15.16	13.48	14.19	0.52	0.27	3.66
HE-558	NOV	10	14.93	13.23	14.13	0.54	0.29	3.80
HE-558	DEC	10	15.23	13.57	14.34	0.59	0.35	4.14
	YEAR		16.38	13.22	14.54	0.67	0.45	4.63

		Rec	Max	Min	Mean	SD	VAR	CV
HE-559	JAN	8	22.58	19.54	20.41	0.94	0.89	4.61
HE-559	FEB	8	22.04	19.61	20.41	0.80	0.64	3.90
HE-559	MAR	7	21.47	19.34	20.19	0.71	0.51	3.54
HE-559	APR	8	20.83	18.50	19.57	0.78	0.60	3.97
HE-559	MAY	9	20.45	18.18	19.52	0.71	0.50	3.64
HE-559	JUN	9	21.94	20.05	20.75	0.59	0.34	2.82
HE-559	JUL	9	21.96	20.36	21.22	0.47	0.22	2.22
HE-559	AUG	9	22.26	20.61	21.55	0.45	0.21	2.11
HE-559	SEP	8	22.13	21.55	21.84	0.17	0.03	0.76
HE-559	OCT	8	21.89	20.56	21.20	0.46	0.22	2.19
HE-559	NOV	9	24.54	20.18	21.09	1.28	1.65	6.09
HE-559	DEC	8	20.82	19.96	20.34	0.30	0.09	1.47
	YEAR		24.54	18.18	20.69	1.00	0.99	4.81

		Rec	Max	Min	Mean	SD	VAR	CV
HE-560	JAN	8	22.69	20.48	21.34	0.78	0.60	3.64
HE-560	FEB	8	22.15	20.70	21.50	0.49	0.24	2.29
HE-560	MAR	7	22.20	20.85	21.42	0.47	0.22	2.19
HE-560	APR	8	21.89	20.18	21.13	0.61	0.37	2.87
HE-560	MAY	9	21.59	19.69	20.91	0.61	0.37	2.90
HE-560	JUN	9	22.38	21.10	21.67	0.44	0.20	2.05
HE-560	JUL	8	22.34	21.05	21.86	0.41	0.17	1.86
HE-560	AUG	9	22.99	21.82	22.43	0.40	0.16	1.78
HE-560	SEP	8	23.71	22.21	22.63	0.45	0.21	2.00
HE-560	OCT	7	22.67	21.61	22.12	0.39	0.15	1.74
HE-560	NOV	9	22.35	21.45	21.76	0.32	0.10	1.48
HE-560	DEC	8	22.43	21.21	21.65	0.41	0.17	1.90
	YEAR		23.71	19.69	21.70	0.70	0.48	3.21

		Rec	Max	Min	Mean	SD	VAR	CV
HE-569	JAN	8	24.40	20.22	23.06	1.30	1.69	5.63
HE-569	FEB	8	23.74	22.22	22.87	0.55	0.30	2.41
HE-569	MAR	7	24.23	20.07	22.65	1.30	1.68	5.73
HE-569	APR	8	24.65	22.36	23.14	0.77	0.59	3.33
HE-569	MAY	9	24.62	21.78	23.17	0.79	0.62	3.40
HE-569	JUN	9	23.59	20.84	22.29	0.71	0.50	3.18
HE-569	JUL	9	23.34	21.63	22.38	0.58	0.34	2.61
HE-569	AUG	8	23.44	22.10	22.83	0.57	0.33	2.51
HE-569	SEP	8	23.99	21.60	22.80	0.82	0.68	3.61
HE-569	OCT	8	23.74	22.42	22.84	0.41	0.17	1.81
HE-569	NOV	9	24.06	21.63	22.75	0.77	0.59	3.39
HE-569	DEC	8	23.79	22.42	23.13	0.47	0.22	2.05
	YEAR		24.65	20.07	22.82	0.84	0.71	3.68

		Rec	Max	Min	Mean	SD	VAR	CV
HE-620	JAN	8	16.59	13.67	14.82	1.02	1.04	6.89
HE-620	FEB	8	16.35	13.23	14.93	1.12	1.25	7.50
HE-620	MAR	8	15.33	10.73	13.90	1.38	1.90	9.91
HE-620	APR	8	16.69	11.88	13.92	1.65	2.72	11.85
HE-620	MAY	8	15.70	11.21	13.66	1.61	2.59	11.79
HE-620	JUN	9	17.16	13.50	15.35	0.99	0.97	6.43
HE-620	JUL	9	16.93	14.76	15.88	0.68	0.47	4.31
HE-620	AUG	9	16.95	15.58	16.33	0.40	0.16	2.44
HE-620	SEP	9	17.13	16.13	16.66	0.31	0.10	1.86
HE-620	OCT	8	16.63	14.89	15.74	0.67	0.45	4.25
HE-620	NOV	9	16.35	14.14	15.27	0.74	0.55	4.84
HE-620	DEC	9	16.23	13.78	14.82	0.77	0.59	5.18
	YEAR		17.16	10.73	15.14	1.37	1.88	9.04

		Rec	Max	Min	Mean	SD	VAR	CV
HE-629	JAN	4	18.70	16.80	17.69	0.72	0.52	4.09
HE-629	FEB	3	17.90	16.92	17.42	0.40	0.16	2.30
HE-629	MAR	4	18.00	16.30	17.40	0.66	0.43	3.79
HE-629	APR	5	17.72	16.44	17.14	0.49	0.24	2.83
HE-629	MAY	5	17.78	16.15	17.34	0.61	0.37	3.50
HE-629	JUN	5	18.59	17.01	17.90	0.53	0.28	2.97
HE-629	JUL	4	18.67	18.45	18.57	0.09	0.01	0.49
HE-629	AUG	4	18.30	16.34	17.68	0.78	0.61	4.43
HE-629	SEP	6	18.81	17.88	18.34	0.37	0.14	2.04
HE-629	OCT	5	17.79	17.34	17.57	0.17	0.03	0.99
HE-629	NOV	5	17.70	17.04	17.48	0.26	0.07	1.47
HE-629	DEC	5	18.02	17.16	17.55	0.29	0.08	1.63
	YEAR		18.81	16.15	17.68	0.63	0.40	3.57

		Rec	Max	Min	Mean	SD	VAR	CV
HE-851	JAN	6	26.55	24.01	24.91	0.84	0.71	3.39
HE-851	FEB	7	26.83	24.10	25.04	0.88	0.77	3.50
HE-851	MAR	6	26.62	24.00	24.74	0.91	0.84	3.70
HE-851	APR	7	25.66	23.19	24.48	0.81	0.66	3.33
HE-851	MAY	7	26.48	22.60	24.01	1.21	1.47	5.04
HE-851	JUN	7	27.52	23.49	25.62	1.62	2.61	6.31
HE-851	JUL	7	27.41	24.38	25.72	0.98	0.96	3.81
HE-851	AUG	7	27.00	25.61	26.48	0.47	0.22	1.76
HE-851	SEP	7	27.10	26.07	26.64	0.38	0.15	1.44
HE-851	OCT	7	27.25	24.92	25.69	0.80	0.64	3.13
HE-851	NOV	7	26.11	24.38	25.32	0.65	0.43	2.58
HE-851	DEC	7	26.75	23.92	24.91	0.94	0.89	3.79
	YEAR		27.52	22.60	25.31	1.19	1.43	4.72

		Rec	Max	Min	Mean	SD	VAR	CV
HE-854	JAN	3	20.69	19.73	20.05	0.45	0.20	2.26
HE-854	FEB	3	19.59	19.36	19.45	0.10	0.01	0.52
HE-854	MAR	4	19.23	18.68	19.08	0.23	0.05	1.22
HE-854	APR	4	19.64	17.70	18.89	0.72	0.52	3.81
HE-854	MAY	4	18.76	18.26	18.63	0.21	0.04	1.13
HE-854	JUN	4	19.31	17.35	18.47	0.86	0.74	4.67
HE-854	JUL	4	20.46	18.13	19.88	1.01	1.02	5.07
HE-854	AUG	4	20.85	19.07	20.10	0.64	0.41	3.20
HE-854	SEP	4	20.88	19.93	20.54	0.37	0.14	1.81
HE-854	OCT	3	20.91	19.54	20.25	0.56	0.31	2.77
HE-854	NOV	3	20.29	19.71	19.93	0.26	0.07	1.30
HE-854	DEC	3	20.23	19.86	20.05	0.15	0.02	0.75
	YEAR		20.91	17.35	19.57	0.88	0.77	4.49

		Rec	Max	Min	Mean	SD	VAR	CV
HE-855	JAN	8	27.27	22.58	25.55	1.45	2.10	5.67
HE-855	FEB	9	27.14	23.61	25.64	1.06	1.11	4.12
HE-855	MAR	8	26.96	22.67	24.85	1.44	2.08	5.80
HE-855	APR	9	26.22	19.17	23.85	2.10	4.40	8.80
HE-855	MAY	9	26.25	20.70	24.22	1.58	2.49	6.52
HE-855	JUN	9	27.97	21.72	25.23	1.92	3.69	7.61
HE-855	JUL	9	27.59	23.63	25.86	1.42	2.01	5.48
HE-855	AUG	10	27.50	25.26	26.54	0.73	0.53	2.74
HE-855	SEP	10	27.66	25.92	26.88	0.63	0.40	2.35
HE-855	OCT	10	27.36	21.31	25.32	1.74	3.02	6.86
HE-855	NOV	10	26.48	23.07	25.51	1.16	1.35	4.56
HE-855	DEC	9	26.55	22.42	25.21	1.22	1.49	4.84
	YEAR		27.97	19.17	25.42	1.65	2.71	6.47

		Rec	Max	Min	Mean	SD	VAR	CV
HE-856	JAN	8	27.40	24.73	26.34	0.90	0.81	3.41
HE-856	FEB	9	27.30	25.17	26.15	0.71	0.50	2.70
HE-856	MAR	8	27.90	24.28	26.10	1.20	1.44	4.61
HE-856	APR	9	26.97	24.69	25.83	0.76	0.58	2.94
HE-856	MAY	9	26.46	23.60	25.49	0.90	0.81	3.52
HE-856	JUN	9	28.05	24.84	26.44	1.04	1.09	3.94
HE-856	JUL	9	27.60	23.51	26.37	1.28	1.65	4.87
HE-856	AUG	10	27.57	26.23	27.05	0.44	0.20	1.64
HE-856	SEP	10	28.03	26.54	27.25	0.40	0.16	1.46
HE-856	OCT	10	28.44	25.14	26.76	0.86	0.75	3.23
HE-856	NOV	10	27.04	24.89	26.51	0.59	0.35	2.22
HE-856	DEC	10	27.34	24.79	26.37	0.73	0.54	2.78
	YEAR		28.44	23.51	26.41	0.97	0.94	3.67

		Rec	Max	Min	Mean	SD	VAR	CV
HE-861	JAN	8	13.43	11.06	12.27	0.84	0.71	6.86
HE-861	FEB	9	13.72	10.26	12.16	0.96	0.92	7.90
HE-861	MAR	8	13.65	10.07	11.91	1.20	1.45	10.11
HE-861	APR	9	12.47	8.69	11.08	1.13	1.27	10.17
HE-861	MAY	9	12.24	7.46	10.70	1.57	2.46	14.65
HE-861	JUN	9	14.49	9.02	12.12	1.72	2.97	14.23
HE-861	JUL	9	13.87	9.95	12.74	1.21	1.47	9.51
HE-861	AUG	9	14.16	13.02	13.54	0.33	0.11	2.45
HE-861	SEP	10	14.02	13.14	13.65	0.25	0.06	1.87
HE-861	OCT	10	13.44	11.62	12.87	0.56	0.31	4.34
HE-861	NOV	10	12.95	11.74	12.46	0.42	0.18	3.37
HE-861	DEC	9	13.39	11.06	12.27	0.64	0.41	5.22
	YEAR		14.49	7.46	12.34	1.30	1.69	10.55

		Rec	Max	Min	Mean	SD	VAR	CV
HE-862	JAN	8	14.61	11.40	13.03	0.86	0.74	6.60
HE-862	FEB	9	13.63	11.10	12.79	0.74	0.54	5.77
HE-862	MAR	8	13.57	10.93	12.70	0.83	0.68	6.51
HE-862	APR	9	12.96	11.41	12.21	0.61	0.38	5.02
HE-862	MAY	9	13.20	11.30	12.04	0.61	0.38	5.11
HE-862	JUN	9	14.37	11.61	12.78	0.89	0.80	6.98
HE-862	JUL	9	14.44	11.22	13.14	0.96	0.92	7.30
HE-862	AUG	9	15.30	13.21	14.35	0.64	0.41	4.45
HE-862	SEP	10	14.65	13.31	13.85	0.54	0.29	3.87
HE-862	OCT	10	14.98	12.90	13.51	0.60	0.36	4.42
HE-862	NOV	10	13.37	12.67	13.03	0.23	0.05	1.78
HE-862	DEC	9	13.61	11.83	12.88	0.58	0.33	4.48
	YEAR		15.30	10.93	13.04	0.93	0.86	7.12

		Rec	Max	Min	Mean	SD	VAR	CV
HE-868	JAN	3	20.10	18.06	18.93	0.86	0.74	4.54
HE-868	FEB	3	19.94	17.77	18.54	0.99	0.98	5.35
HE-868	MAR	3	20.00	17.84	18.69	0.94	0.88	5.03
HE-868	APR	3	18.62	17.26	17.88	0.56	0.31	3.14
HE-868	MAY	3	19.01	17.21	18.40	0.84	0.71	4.57
HE-868	JUN	3	21.83	17.25	19.30	1.90	3.61	9.84
HE-868	JUL	3	20.36	17.15	18.91	1.33	1.77	7.03
HE-868	AUG	3	20.11	18.27	19.00	0.80	0.64	4.21
HE-868	SEP	4	19.56	18.25	19.00	0.50	0.25	2.62
HE-868	OCT	5	20.07	16.95	18.60	1.21	1.47	6.51
HE-868	NOV	4	19.86	17.22	18.79	1.00	1.00	5.32
HE-868	DEC	4	20.25	17.09	18.88	1.27	1.62	6.73
	YEAR		21.83	16.95	18.75	1.13	1.27	6.02

MONTHLY	MEANS	Rec	Max	Min	Mean	SD	VAR	CV
GL-293	JAN	9	14.33	9.76	11.94	0.82	0.67	6.87
GL-293	FEB	8	14.00	9.80	11.95	0.78	0.62	6.57
GL-293	MAR	8	14.00	9.73	12.30	0.73	0.53	5.92
GL-293	APR	8	13.97	9.70	12.19	0.96	0.92	7.85
GL-293	MAY	8	14.27	9.85	11.87	1.02	1.03	8.56
GL-293	JUN	7	13.85	10.10	12.27	0.92	0.85	7.53
GL-293	JUL	7	14.21	11.00	12.50	0.70	0.49	5.61
GL-293	AUG	7	13.83	9.69	11.95	0.90	0.81	7.55
GL-293	SEP	7	14.43	10.86	12.07	0.51	0.26	4.21
GL-293	OCT	7	14.39	11.00	12.12	0.56	0.31	4.61
GL-293	NOV	7	14.27	9.70	11.74	0.90	0.81	7.65
GL-293	DEC	7	14.33	9.46	11.80	1.04	1.08	8.79
	YEAR		13.98	9.66	12.06	0.86	0.75	7.16

		Rec	Max	Min	Mean	SD	VAR	CV
GL-517	JAN	8	12.76	9.51	10.76	1.03	1.05	9.54
GL-517	FEB	10	12.74	8.68	10.60	1.11	1.24	10.51
GL-517	MAR	9	13.20	9.38	10.71	1.15	1.31	10.69
GL-517	APR	10	11.56	8.84	9.89	0.82	0.67	8.25
GL-517	MAY	10	11.59	8.61	9.79	0.90	0.81	9.19
GL-517	JUN	10	14.32	9.36	11.16	1.39	1.94	12.47
GL-517	JUL	10	13.39	10.11	11.59	1.08	1.16	9.28
GL-517	AUG	10	13.57	11.16	12.04	0.76	0.57	6.28
GL-517	SEP	10	13.63	11.26	12.30	0.73	0.54	5.95
GL-517	OCT	10	12.29	9.53	11.09	0.81	0.65	7.29
GL-517	NOV	10	11.49	9.84	10.52	0.49	0.24	4.67
GL-517	DEC	10	11.45	7.86	10.23	0.99	0.98	9.67
	YEAR		14.32	7.86	10.89	1.23	1.51	11.27

MONTHLY	MEANS	Rec	Max	Min	Mean	SD	VAR	CV
PB-506	JAN	8	11.41	8.58	10.17	0.31	0.09	3.01
PB-506	FEB	8	12.00	7.85	10.27	0.40	0.16	3.92
PB-506	MAR	8	11.35	8.00	9.81	0.53	0.28	5.36
PB-506	APR	8	11.02	7.44	9.59	0.58	0.34	6.05
PB-506	MAY	8	11.83	8.00	9.69	0.30	0.09	3.05
PB-506	JUN	8	11.51	7.00	9.70	0.69	0.48	7.15
PB-506	JUL	9	11.71	8.00	9.96	0.65	0.42	6.49
PB-506	AUG	8	11.63	8.64	10.13	0.52	0.27	5.13
PB-506	SEP	9	11.65	8.04	9.78	0.51	0.26	5.18
PB-506	OCT	8	11.61	7.52	10.01	0.49	0.24	4.88
PB-506	NOV	8	11.95	8.15	10.25	0.61	0.37	5.96
PB-506	DEC	8	11.45	8.24	10.17	0.43	0.19	4.24
	YEAR		11.15	8.30	9.96	0.56	0.32	5.66

		Rec	Max	Min	Mean	SD	VAR	CV
C-131	JAN	10	26.03	20.01	23.10	1.83	3.35	7.93
C-131	FEB	10	25.55	19.43	22.88	1.78	3.16	7.77
C-131	MAR	10	25.55	19.73	22.44	1.69	2.84	7.51
C-131	APR	10	24.66	19.16	21.97	1.82	3.31	8.28
C-131	MAY	10	23.91	20.58	22.57	0.96	0.93	4.27
C-131	JUN	10	27.34	20.86	23.67	1.88	3.53	7.94
C-131	JUL	10	25.71	21.14	23.93	1.46	2.14	6.12
C-131	AUG	10	27.8	22.82	24.94	1.31	1.71	5.25
C-131	SEP	10	26.06	23.71	24.95	0.77	0.60	3.10
C-131	OCT	10	25.88	20.88	23.97	1.56	2.43	6.51
C-131	NOV	10	25.21	21.82	23.70	1.09	1.19	4.61
C-131	DEC	10	25.02	20.97	23.26	1.37	1.88	5.90
	YEAR		27.8	19.16	23.45	1.75	3.05	7.45

		Rec	Max	Min	Mean	SD	VAR	CV
C-363	JAN	5	31.08	27.9	29.72	1.14	1.30	3.84
C-363	FEB	4	32.22	28.32	29.63	1.53	2.34	5.16
C-363	MAR	5	32.16	26.51	29.68	2.06	4.26	6.96
C-363	APR	6	31.54	26.22	29.26	1.83	3.35	6.26
C-363	MAY	6	31.34	27.48	29.21	1.25	1.56	4.28
C-363	JUN	6	33.19	27.98	30.39	1.65	2.73	5.44
C-363	JUL	6	32.54	28.6	30.38	1.46	2.14	4.81
C-363	AUG	6	32.5	29.45	31.45	1.01	1.01	3.20
C-363	SEP	6	32.48	29.99	31.44	0.93	0.86	2.95
C-363	OCT	6	31.63	28.78	30.96	1.00	0.99	3.22
C-363	NOV	6	31.92	28.47	30.16	1.20	1.44	3.99
C-363	DEC	6	30.89	27.84	29.69	1.25	1.55	4.20
	YEAR		33.19	26.22	30.19	1.58	2.50	5.24

		Rec	Max	Min	Mean	SD	VAR	CV
C-462	JAN	10	34.34	27.46	31.51	2.78	7.73	8.82
C-462	FEB	10	34.34	28.22	31.34	2.46	6.07	7.86
C-462	MAR	10	34.41	27.33	30.85	2.49	6.21	8.07
C-462	APR	10	33.25	26.75	30.10	2.28	5.19	7.57
C-462	MAY	10	34.93	26.14	29.88	2.77	7.67	9.27
C-462	JUN	10	34.69	27.96	31.30	2.24	5.01	7.15
C-462	JUL	10	34.76	27.97	32.03	2.28	5.20	7.12
C-462	AUG	10	35.26	30.21	33.08	1.70	2.87	5.12
C-462	SEP	10	35.48	31.27	33.91	1.33	1.76	3.91
C-462	OCT	10	35.09	29.72	32.39	1.82	3.31	5.61
C-462	NOV	10	34.19	29.12	31.62	1.75	3.06	5.54
C-462	DEC	10	35.27	28.35	31.42	2.27	5.17	7.24
	YEAR		35.48	26.14	31.62	2.48	6.13	7.83

		Rec	Max	Min	Mean	SD	VAR	CV
C-531	JAN	8	31.03	19.69	26.43	4.40	19.38	16.66
C-531	FEB	9	31.45	21.27	26.49	2.82	7.95	10.64
C-531	MAR	9	31.55	22.09	25.30	3.18	10.11	12.57
C-531	APR	9	25.8	14.83	22.56	3.38	11.40	14.97
C-531	MAY	9	29.37	18.72	24.03	3.93	15.44	16.35
C-531	JUN	9	31.21	24.3	27.63	2.35	5.53	8.51
C-531	JUL	9	31.99	27.15	29.66	1.81	3.29	6.11
C-531	AUG	9	32.53	27.82	30.58	1.30	1.70	4.26
C-531	SEP	9	32.26	26.56	30.69	1.62	2.64	5.29
C-531	OCT	10	31.33	22.58	25.52	2.93	8.58	11.48
C-531	NOV	9	29.6	19.92	25.53	3.13	9.78	12.25
C-531	DEC	10	30.68	21.04	25.23	3.07	9.44	12.18
	YEAR		32.53	14.83	26.62	3.82	14.63	14.37

		Rec	Max	Min	Mean	SD	VAR	CV
C-532	JAN	10	41.14	39.24	40.12	0.59	0.34	1.46
C-532	FEB	10	41.26	29.37	38.76	3.25	10.57	8.39
C-532	MAR	10	40.95	39.1	39.56	0.51	0.26	1.30
C-532	APR	10	41.38	36.42	39.65	1.45	2.11	3.66
C-532	MAY	9	41.4	38.55	39.78	0.96	0.92	2.41
C-532	JUN	10	43.29	29.23	39.47	3.67	13.44	9.29
C-532	JUL	10	40.76	37.7	39.67	0.81	0.66	2.05
C-532	AUG	10	41.43	39.47	40.08	0.59	0.35	1.48
C-532	SEP	9	41.01	39.46	40.09	0.42	0.17	1.04
C-532	OCT	8	39.97	38.16	39.33	0.52	0.27	1.31
C-532	NOV	9	40.4	38.83	39.64	0.46	0.21	1.15
C-532	DEC	10	41.1	39.18	39.90	0.60	0.36	1.51
	YEAR		43.29	29.23	39.67	1.64	2.70	4.14

		Rec	Max	Min	Mean	SD	VAR	CV
L-727	JAN	10	17.26	14.6	15.67	0.77	0.59	4.92
L-727	FEB	10	17.09	13.34	15.44	1.02	1.05	6.62
L-727	MAR	10	17.46	14.35	15.55	0.87	0.75	5.57
L-727	APR	10	16.21	13.77	14.84	0.80	0.64	5.37
L-727	MAY	10	16.12	13.7	14.84	0.83	0.69	5.61
L-727	JUN	10	17.8	15	16.06	0.92	0.84	5.70
L-727	JUL	10	17.64	15.33	16.49	0.67	0.45	4.06
L-727	AUG	10	17.8	16.36	17.09	0.46	0.21	2.69
L-727	SEP	10	17.94	16.15	17.09	0.54	0.30	3.18
L-727	OCT	10	17.36	15.38	16.22	0.60	0.36	3.70
L-727	NOV	10	16.42	15.15	15.72	0.42	0.18	2.69
L-727	DEC	9	16.51	15.05	15.61	0.44	0.20	2.85
	YEAR		17.94	13.34	15.89	1.02	1.03	6.40

		Rec	Max	Min	Mean	SD	VAR	CV
L-730	JAN	10	28.96	24.67	26.50	1.14	1.30	4.31
L-730	FEB	10	29.1	25.1	26.52	1.15	1.32	4.33
L-730	MAR	10	28.56	25.15	26.43	1.04	1.08	3.94
L-730	APR	10	27.12	24.81	25.72	0.71	0.50	2.76
L-730	MAY	10	26.5	24.48	25.42	0.65	0.42	2.54
L-730	JUN	10	28.99	25.37	26.87	1.20	1.45	4.48
L-730	JUL	10	28.5	26.05	27.37	0.79	0.62	2.88
L-730	AUG	10	28.81	27.71	28.22	0.37	0.14	1.33
L-730	SEP	10	29.45	27.01	28.06	0.77	0.60	2.76
L-730	OCT	10	27.86	25.97	26.96	0.70	0.49	2.60
L-730	NOV	10	27.81	25.46	26.69	0.72	0.51	2.69
L-730	DEC	10	28.63	24.98	26.52	0.92	0.85	3.48
	YEAR		29.45	24.48	26.77	1.18	1.39	4.41

		Rec	Max	Min	Mean	SD	VAR	CV
L-731	JAN	10	21.87	7.47	15.06	5.84	34.11	38.79
L-731	FEB	10	22.27	6.75	15.08	5.77	33.28	38.27
L-731	MAR	10	19.94	4.26	12.90	4.61	21.27	35.74
L-731	APR	10	14.63	-1.19	9.47	4.80	23.08	50.73
L-731	MAY	10	18.87	-2.2	9.88	6.12	37.41	61.93
L-731	JUN	10	20.48	6.55	16.08	4.34	18.86	27.01
L-731	JUL	10	22.33	16.07	19.48	2.29	5.25	11.76
L-731	AUG	10	22.85	20.1	21.31	1.02	1.05	4.81
L-731	SEP	10	22.86	9.75	18.77	4.43	19.64	23.61
L-731	OCT	10	21.38	5.14	13.44	5.17	26.70	38.44
L-731	NOV	10	20.12	1.38	11.16	4.58	21.01	41.07
L-731	DEC	10	20.19	7.24	12.40	4.51	20.31	36.35
	YEAR		22.86	-2.2	14.59	5.92	35.03	40.58

		Rec	Max	Min	Mean	SD	VAR	CV
L-1137	JAN	10	20.03	16.6	17.91	1.07	1.15	5.99
L-1137	FEB	10	20.94	16.45	17.89	1.26	1.60	7.07
L-1137	MAR	10	18.86	15.73	17.45	1.00	1.00	5.72
L-1137	APR	9	18.61	16.16	17.35	0.96	0.92	5.53
L-1137	MAY	10	18.78	15.78	17.35	0.89	0.80	5.15
L-1137	JUN	10	21.05	16.61	18.60	1.44	2.08	7.76
L-1137	JUL	10	21.38	16.04	18.76	1.36	1.86	7.27
L-1137	AUG	10	20.34	18.65	19.63	0.57	0.32	2.88
L-1137	SEP	10	20.61	18.17	19.52	0.69	0.48	3.53
L-1137	OCT	10	19.66	17.4	18.65	0.68	0.46	3.64
L-1137	NOV	10	18.91	17.83	18.18	0.35	0.12	1.94
L-1137	DEC	10	19.21	17	17.97	0.76	0.58	4.25
	YEAR		21.38	15.73	18.28	1.22	1.50	6.70

		Rec	Max	Min	Mean	SD	VAR	CV
L-1138	JAN	10	22.88	21.78	22.11	0.33	0.11	1.48
L-1138	FEB	10	22.32	21.78	22.01	0.19	0.03	0.84
L-1138	MAR	10	22.6	21.87	22.13	0.22	0.05	0.98
L-1138	APR	10	22.56	21.54	21.92	0.31	0.10	1.41
L-1138	MAY	9	22.28	21.38	21.88	0.31	0.10	1.42
L-1138	JUN	10	23.54	21.66	22.17	0.60	0.37	2.73
L-1138	JUL	10	23.14	21.66	22.15	0.44	0.19	1.98
L-1138	AUG	10	23.19	21.63	22.44	0.49	0.24	2.20
L-1138	SEP	10	23.37	21.53	22.33	0.48	0.23	2.16
L-1138	OCT	10	22.21	21.56	21.96	0.24	0.06	1.08
L-1138	NOV	10	22.48	21.21	21.95	0.32	0.10	1.46
L-1138	DEC	10	22.8	21.75	22.20	0.30	0.09	1.36
	YEAR		23.54	21.21	22.11	0.41	0.16	1.84

		Rec	Max	Min	Mean	SD	VAR	CV
L-1418	JAN	8	17.98	15.04	16.34	0.81	0.66	4.98
L-1418	FEB	8	17.86	15.4	16.38	0.86	0.74	5.24
L-1418	MAR	8	18.76	15.14	16.43	1.03	1.06	6.26
L-1418	APR	9	17.44	14.4	15.62	0.87	0.75	5.56
L-1418	MAY	8	16.98	14	15.15	0.95	0.90	6.25
L-1418	JUN	8	19.73	15.26	16.87	1.44	2.08	8.56
L-1418	JUL	8	19.53	15.98	17.58	1.10	1.20	6.24
L-1418	AUG	9	20.02	17.04	18.37	0.86	0.74	4.68
L-1418	SEP	9	21.1	17.58	18.89	1.11	1.24	5.90
L-1418	OCT	9	19.24	16.14	17.14	0.95	0.91	5.56
L-1418	NOV	9	17.33	15.18	16.14	0.57	0.32	3.53
L-1418	DEC	9	17.23	14.98	15.98	0.68	0.47	4.28
	YEAR		21.1	14	16.76	1.43	2.05	8.54

		Rec	Max	Min	Mean	SD	VAR	CV
L-1963	JAN	10	23.75	16.16	19.90	2.38	5.64	11.94
L-1963	FEB	10	23.76	15.98	19.77	2.23	4.96	11.26
L-1963	MAR	10	22.71	16.09	19.33	1.74	3.03	9.00
L-1963	APR	10	21.28	14	18.20	2.11	4.47	11.62
L-1963	MAY	10	20.69	14.45	18.03	1.98	3.92	10.99
L-1963	JUN	10	24.12	17.59	21.09	1.83	3.36	8.69
L-1963	JUL	10	24.4	19.07	21.82	1.53	2.33	7.00
L-1963	AUG	10	25	22.21	23.69	0.91	0.83	3.84
L-1963	SEP	10	25.35	21.08	22.95	1.15	1.32	5.01
L-1963	OCT	10	22.92	19.53	20.83	1.21	1.48	5.83
L-1963	NOV	10	21.98	17.72	19.71	1.28	1.63	6.49
L-1963	DEC	10	22.37	17.47	19.66	1.53	2.33	7.77
	YEAR		25.35	14	20.41	2.39	5.71	11.71

		Rec	Max	Min	Mean	SD	VAR	CV
L-1964	JAN	10	26.1	23.4	24.62	0.85	0.72	3.46
L-1964	FEB	10	29.19	23.5	24.84	1.53	2.35	6.17
L-1964	MAR	10	28	23.25	25.02	1.44	2.08	5.76
L-1964	APR	10	25.84	23.03	24.15	0.90	0.80	3.71
L-1964	MAY	10	26.98	23.01	24.21	1.09	1.19	4.51
L-1964	JUN	10	29.52	23.09	26.09	1.99	3.97	7.64
L-1964	JUL	10	28.35	24.04	26.53	1.39	1.94	5.25
L-1964	AUG	10	28.92	25.3	27.30	1.12	1.26	4.11
L-1964	SEP	10	27.99	25.69	26.86	0.73	0.53	2.72
L-1964	OCT	10	26.8	24.32	25.60	0.81	0.65	3.15
L-1964	NOV	10	26.03	23.61	24.89	0.73	0.54	2.95
L-1964	DEC	10	25.95	23.82	24.71	0.66	0.43	2.66
	YEAR		29.52	23.01	25.40	1.55	2.40	6.10

		Rec	Max	Min	Mean	SD	VAR	CV
L-1965	JAN	10	25.02	17.2	21.47	2.34	5.48	10.91
L-1965	FEB	10	25.13	17.13	21.18	2.39	5.73	11.30
L-1965	MAR	10	25.46	18.16	20.47	2.05	4.19	10.00
L-1965	APR	10	22.7	14.21	18.68	2.41	5.81	12.90
L-1965	MAY	10	22.66	15.77	19.53	2.00	3.98	10.21
L-1965	JUN	10	25.68	19.45	22.78	1.67	2.78	7.32
L-1965	JUL	10	25.4	22.5	23.88	1.02	1.04	4.27
L-1965	AUG	10	26.26	22.79	24.84	0.97	0.95	3.92
L-1965	SEP	10	26.12	19.94	23.91	1.97	3.88	8.23
L-1965	OCT	10	24.62	17.49	21.78	1.91	3.64	8.76
L-1965	NOV	10	23.03	16.48	20.77	2.03	4.12	9.77
L-1965	DEC	10	23.09	19.62	21.34	1.33	1.77	6.24
	YEAR		26.26	14.21	21.72	2.59	6.73	11.94

		Rec	Max	Min	Mean	SD	VAR	CV
L-1977	JAN	10	13.29	11.15	12.14	0.70	0.49	5.74
L-1977	FEB	10	13.53	10.65	12.29	0.82	0.68	6.71
L-1977	MAR	10	13.62	10.59	12.07	0.90	0.80	7.42
L-1977	APR	10	13.09	9.96	11.30	1.01	1.02	8.92
L-1977	MAY	10	12.77	10.25	11.45	0.90	0.81	7.84
L-1977	JUN	10	13.2	11.48	12.37	0.56	0.31	4.53
L-1977	JUL	10	13.69	12.04	12.80	0.56	0.32	4.39
L-1977	AUG	10	13.71	11.12	12.94	0.69	0.47	5.32
L-1977	SEP	9	13.53	12.36	13.14	0.37	0.14	2.81
L-1977	OCT	10	13.48	11.79	12.61	0.57	0.32	4.49
L-1977	NOV	10	12.98	11.16	12.12	0.60	0.36	4.97
L-1977	DEC	10	12.96	10.61	11.97	0.62	0.38	5.15
	YEAR		13.71	9.96	12.26	0.89	0.79	7.24

		Rec	Max	Min	Mean	SD	VAR	CV
L-1978	JAN	10	15.01	10.74	13.16	1.27	1.61	9.65
L-1978	FEB	10	17.39	10.53	13.07	1.75	3.08	13.43
L-1978	MAR	10	17.14	10.09	12.98	1.90	3.60	14.61
L-1978	APR	10	15.07	9.83	12.19	1.50	2.26	12.33
L-1978	MAY	10	14.82	9.69	12.30	1.72	2.96	13.99
L-1978	JUN	10	16.87	11.31	13.87	1.62	2.63	11.69
L-1978	JUL	10	15.75	12.15	13.96	1.38	1.91	9.90
L-1978	AUG	10	16.61	12.23	14.74	1.32	1.73	8.92
L-1978	SEP	10	16.2	13.16	14.99	0.88	0.77	5.86
L-1978	OCT	10	15.54	12.4	14.02	0.94	0.88	6.69
L-1978	NOV	10	14.99	11.8	13.44	0.80	0.64	5.94
L-1978	DEC	10	15.21	11.21	13.30	1.05	1.11	7.90
	YEAR		17.39	9.69	13.50	1.62	2.61	11.97

		Rec	Max	Min	Mean	SD	VAR	CV
L-1984	JAN	10	13.92	2.11	9.30	3.96	15.65	42.55
L-1984	FEB	10	14.03	-5.82	7.34	6.91	47.74	94.17
L-1984	MAR	10	13.24	-12.58	7.84	7.24	52.41	92.37
L-1984	APR	10	12.32	-11.35	7.21	6.66	44.39	92.40
L-1984	MAY	10	14.39	3.89	9.67	3.26	10.62	33.70
L-1984	JUN	10	14.53	8.5	12.40	2.00	3.99	16.11
L-1984	JUL	9	15.8	3.9	12.57	3.38	11.44	26.90
L-1984	AUG	9	16.75	8.1	14.07	2.69	7.21	19.09
L-1984	SEP	10	16.8	13.3	15.11	1.08	1.17	7.15
L-1984	OCT	9	15.55	5.97	12.09	3.04	9.26	25.17
L-1984	NOV	8	13.59	5	10.55	3.19	10.19	30.25
L-1984	DEC	9	13.95	-0.5	8.79	4.49	20.20	51.16
	YEAR		16.8	-12.58	10.53	5.15	26.54	48.92

		Rec	Max	Min	Mean	SD	VAR	CV
L-1985	JAN	10	19.02	10.27	15.65	2.69	7.25	17.21
L-1985	FEB	10	19.46	9.38	16.09	3.13	9.81	19.47
L-1985	MAR	10	18.3	10.48	15.49	2.53	6.42	16.36
L-1985	APR	10	18.52	9.63	14.36	2.56	6.53	17.80
L-1985	MAY	10	18.5	9.9	14.97	3.06	9.38	20.46
L-1985	JUN	10	18.87	9.57	16.34	2.85	8.15	17.47
L-1985	JUL	10	18.71	15.36	17.81	1.05	1.10	5.88
L-1985	AUG	10	19.4	16.88	18.54	0.75	0.57	4.07
L-1985	SEP	10	19.24	16.73	18.30	0.71	0.51	3.89
L-1985	OCT	9	18	15.82	17.01	0.67	0.45	3.94
L-1985	NOV	9	18.06	12.64	15.78	1.86	3.46	11.79
L-1985	DEC	9	18.72	11.97	15.50	2.63	6.91	16.96
	YEAR		19.46	9.38	16.32	2.59	6.73	15.89

		Rec	Max	Min	Mean	SD	VAR	CV
L-1992	JAN	10	23.73	21.07	22.52	0.71	0.51	3.16
L-1992	FEB	10	25.09	20.26	22.51	1.20	1.44	5.34
L-1992	MAR	10	24.38	20.57	22.61	1.14	1.30	5.05
L-1992	APR	10	23.59	20.15	22.09	0.95	0.90	4.30
L-1992	MAY	10	24.56	21.16	22.28	0.94	0.89	4.24
L-1992	JUN	10	25.56	21.24	23.37	1.22	1.48	5.21
L-1992	JUL	10	26.97	22.57	24.03	1.14	1.30	4.75
L-1992	AUG	9	25.24	23.68	24.27	0.49	0.24	2.02
L-1992	SEP	10	24.53	22.05	23.68	0.73	0.53	3.09
L-1992	OCT	10	24.16	21.27	23.06	0.93	0.86	4.03
L-1992	NOV	10	23.56	21.59	22.86	0.69	0.48	3.02
L-1992	DEC	10	23.63	20.05	22.42	0.94	0.89	4.20
	YEAR		26.97	20.05	22.96	1.17	1.37	5.09

		Rec	Max	Min	Mean	SD	VAR	CV
L-2186	JAN	8	22.32	18.3	20.12	1.41	1.97	7.02
L-2186	FEB	8	23.11	17.34	20.08	1.93	3.73	9.62
L-2186	MAR	8	23.83	17.86	20.17	1.85	3.41	9.16
L-2186	APR	8	22.62	16.56	18.69	1.81	3.29	9.70
L-2186	MAY	8	20.56	14.36	17.85	1.74	3.02	9.74
L-2186	JUN	8	22.53	18.68	20.10	1.11	1.24	5.53
L-2186	JUL	8	23.71	20.11	21.93	1.15	1.33	5.26
L-2186	AUG	8	24.78	21.54	22.85	1.02	1.04	4.46
L-2186	SEP	8	24.17	21.98	23.43	0.72	0.51	3.06
L-2186	OCT	9	23.73	19.6	21.80	1.21	1.46	5.55
L-2186	NOV	10	22.1	18.56	20.27	1.12	1.25	5.52
L-2186	DEC	10	22.2	17.53	19.62	1.31	1.73	6.70
	YEAR		24.78	14.36	20.56	2.08	4.34	10.14

		Rec	Max	Min	Mean	SD	VAR	CV
L-2187	JAN	10	17.24	14.42	15.55	0.81	0.66	5.23
L-2187	FEB	9	17.39	14.21	15.52	0.87	0.76	5.62
L-2187	MAR	10	17.3	14.24	15.40	0.87	0.75	5.63
L-2187	APR	10	16.04	13.53	14.67	0.79	0.63	5.41
L-2187	MAY	10	15.96	13.51	14.71	0.83	0.69	5.63
L-2187	JUN	10	17.71	14.81	15.96	0.97	0.94	6.08
L-2187	JUL	10	17.49	15.28	16.40	0.69	0.48	4.23
L-2187	AUG	10	17.7	16.22	16.98	0.46	0.22	2.73
L-2187	SEP	10	17.88	16.02	16.94	0.58	0.33	3.40
L-2187	OCT	10	17.14	15.25	15.94	0.55	0.30	3.45
L-2187	NOV	10	16.24	14.96	15.56	0.41	0.17	2.64
L-2187	DEC	10	16.32	14.8	15.39	0.46	0.22	3.02
	YEAR		17.88	13.51	15.75	1.01	1.02	6.40

		Rec	Max	Min	Mean	SD	VAR	CV
L-2192	JAN	10	16.54	10.66	14.01	2.13	4.53	15.19
L-2192	FEB	10	17.06	10.68	14.35	2.20	4.84	15.33
L-2192	MAR	10	16.72	10.41	13.70	2.10	4.42	15.35
L-2192	APR	10	16.51	9.81	12.68	2.05	4.21	16.18
L-2192	MAY	9	15.8	11.03	13.43	1.78	3.17	13.26
L-2192	JUN	10	17.21	12.73	15.42	1.25	1.57	8.13
L-2192	JUL	10	18.08	12.79	16.85	1.49	2.22	8.85
L-2192	AUG	10	18.84	17.33	18.02	0.57	0.32	3.15
L-2192	SEP	10	18.81	16.96	17.88	0.62	0.39	3.49
L-2192	OCT	10	17.73	13.41	15.87	1.27	1.61	8.00
L-2192	NOV	10	16.48	11.21	14.36	1.48	2.19	10.30
L-2192	DEC	10	16.79	10.49	13.83	2.02	4.10	14.64
	YEAR		18.84	9.81	15.05	2.38	5.67	15.82

		Rec	Max	Min	Mean	SD	VAR	CV
L-2200	JAN	10	13.86	10.92	12.64	0.91	0.83	7.21
L-2200	FEB	10	13.75	11.1	12.63	0.82	0.68	6.52
L-2200	MAR	10	14.02	11.14	12.40	0.89	0.79	7.16
L-2200	APR	10	13.3	9.74	11.74	1.01	1.02	8.58
L-2200	MAY	10	12.66	9.64	11.55	0.97	0.94	8.39
L-2200	JUN	10	13.84	11.98	12.77	0.60	0.36	4.69
L-2200	JUL	10	15.48	12.79	13.61	0.84	0.70	6.15
L-2200	AUG	10	14.31	13.13	13.63	0.37	0.14	2.70
L-2200	SEP	10	19.07	12.8	14.16	1.66	2.77	11.75
L-2200	OCT	10	13.86	12.11	13.05	0.55	0.30	4.23
L-2200	NOV	10	13.39	11.31	12.61	0.63	0.40	4.99
L-2200	DEC	10	13.7	11.4	12.65	0.67	0.44	5.27
	YEAR		19.07	9.64	12.79	1.14	1.30	8.91

		Rec	Max	Min	Mean	SD	VAR	CV
L-2202	JAN	10	15.64	12.53	13.66	1.02	1.05	7.50
L-2202	FEB	10	16.94	11.78	13.56	1.42	2.00	10.44
L-2202	MAR	10	16.48	11.79	13.46	1.30	1.69	9.67
L-2202	APR	10	14.39	11.45	12.62	0.89	0.79	7.03
L-2202	MAY	10	14.4	10.59	12.58	1.17	1.36	9.27
L-2202	JUN	10	16.34	12.32	14.17	1.34	1.81	9.49
L-2202	JUL	10	16.01	13.05	14.55	0.99	0.97	6.78
L-2202	AUG	10	16.32	13.38	14.88	1.01	1.03	6.82
L-2202	SEP	10	16.38	12.9	14.90	0.96	0.92	6.45
L-2202	OCT	10	15.01	12.26	13.96	0.82	0.67	5.86
L-2202	NOV	10	14.18	12.7	13.48	0.40	0.16	3.00
L-2202	DEC	10	14.24	12.45	13.45	0.61	0.38	4.56
	YEAR		16.94	10.59	13.77	1.27	1.60	9.19

		Rec	Max	Min	Mean	SD	VAR	CV
L-2215	JAN	10	24.36	15.3	20.35	2.99	8.96	14.71
L-2215	FEB	10	24.37	15.07	20.54	2.95	8.73	14.38
L-2215	MAR	10	24.86	15.17	19.77	2.58	6.64	13.04
L-2215	APR	9	23.34	12.76	17.58	3.13	9.77	17.78
L-2215	MAY	10	21.24	13.1	17.40	2.68	7.17	15.39
L-2215	JUN	10	23.8	17.04	20.73	1.95	3.80	9.40
L-2215	JUL	10	24.54	20.57	22.81	1.51	2.28	6.62
L-2215	AUG	10	25.97	22.97	24.23	0.97	0.94	3.99
L-2215	SEP	10	25.82	22.2	23.97	1.15	1.33	4.81
L-2215	OCT	10	24.39	19.08	21.56	2.08	4.32	9.65
L-2215	NOV	10	23.35	17.34	19.80	1.83	3.35	9.25
L-2215	DEC	10	23.97	16	18.94	2.28	5.18	12.02
	YEAR		25.97	12.76	20.67	3.10	9.61	15.00

		Rec	Max	Min	Mean	SD	VAR	CV
L-5664	JAN	4	9.99	5.98	7.99	1.87	3.52	23.47
L-5664	FEB	4	12.55	6.7	9.19	2.24	5.02	24.39
L-5664	MAR	4	12.82	6.9	9.35	2.34	5.50	25.08
L-5664	APR	4	12.05	6.16	8.20	2.28	5.21	27.86
L-5664	MAY	4	10.54	7.69	8.83	1.15	1.33	13.05
L-5664	JUN	4	12.65	9.12	11.32	1.33	1.77	11.75
L-5664	JUL	4	14.73	12.38	13.38	0.87	0.76	6.53
L-5664	AUG	4	14.16	12.57	13.56	0.60	0.36	4.42
L-5664	SEP	4	13.82	12.54	13.30	0.53	0.29	4.02
L-5664	OCT	4	12.64	9.06	10.78	1.27	1.61	11.77
L-5664	NOV	5	11.53	7.91	9.82	1.44	2.06	14.62
L-5664	DEC	5	9.97	6.77	8.13	1.09	1.20	13.46
	YEAR		14.73	5.98	10.27	2.53	6.40	24.65

		Rec	Max	Min	Mean	SD	VAR	CV
L-5665	JAN	4	16.89	14.76	15.79	0.81	0.65	5.10
L-5665	FEB	4	17.99	14.52	16.32	1.28	1.64	7.85
L-5665	MAR	4	17.64	14.4	16.26	1.24	1.53	7.60
L-5665	APR	4	16.32	13.97	15.18	0.91	0.83	6.02
L-5665	MAY	4	16.57	14.11	15.02	0.93	0.87	6.23
L-5665	JUN	4	17.66	14.53	16.31	1.13	1.27	6.91
L-5665	JUL	4	17.73	17.37	17.50	0.14	0.02	0.78
L-5665	AUG	4	18.23	17.33	17.66	0.34	0.12	1.92
L-5665	SEP	4	18.2	16.59	17.28	0.60	0.36	3.48
L-5665	OCT	4	17.2	15.6	16.27	0.68	0.46	4.18
L-5665	NOV	5	16.52	15.57	15.97	0.35	0.12	2.17
L-5665	DEC	5	17.15	15.33	15.96	0.66	0.44	4.15
	YEAR		18.23	13.97	16.28	1.14	1.29	6.98