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GROUND WATER RESOURCE ASSESSMENT OF EASTERN PALM BEACH COUNTY, FLORIDA

PART I
TEXT

by

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EXECUTIVE SUMMARY

There are two aquifer systems underlying eastern Palm Beach County, the shallow Surficial Aquifer System and the deeper Floridan Aquifer System. This assessment focused on the Surficial Aquifer System which is widely used for irrigation and public water supply in the study area. The Floridan Aquifer System, which has generally poorer water quality and lower yields than the Surficial Aquifer System, is infrequently used at present.

Surficial Aquifer System

The Surficial Aquifer System is the sole source of fresh ground water in eastern Palm Beach County. The system's most productive zone, commonly called the Turnpike aquifer, is the northern extension of the Biscayne aquifer. It is composed primarily of highly solutioned, extremely productive limestone. Throughout most of the Surficial Aquifer System, the Biscayne aquifer is surrounded by a moderately productive interval of sandy shell, moderately solutioned limestone, or moderately to well solutioned sandstone which is one-fifth to one-tenth as productive as the Biscayne aquifer. Most ground water in the study area is withdrawn from either the Biscayne aquifer or from the moderately productive interval; therefore, these are referred to collectively herein as the production zone. Productivity in the remainder of the Surficial Aquifer System, which is composed primarily of sands, is low.

The extent of the Biscayne aquifer in Palm Beach County is irregular. It extends from the Palm Beach - Broward County line north to approximately Hood Road where it pinches out. It also generally pinches out before reaching the coast to the east and Water Conservation Area 1 to the west. The Biscayne aquifer is thickest along its central portion between the Florida Turnpike and Military Trail (SR 809) where it is typically 40 to 100 ft. thick south of the M canal. The Biscayne aquifer thins to generally less than 40 ft. thick north of the M canal.

The production zone is most important in the study area north of C-51 where the Biscayne aquifer is less dominant than in the southern area. The production zone underlies most of the northern study area and is known to be absent only in a small area east of Military Trail between 45th St. and North Lake Blvd. Its extent in the western part of the area, from the L-8 canal east approximately 4 to 6 miles, is uncertain due to a lack of data. The production zone in the northern half of the study area is thickest, greater than 120 ft., near the Florida Turnpike and Okeechobee Boulevard (SR 704) just north of the C-51 canal where the Biscayne aquifer is thickest. It is also greater than 100 ft. thick along a north/south strip extending 3 to 6 miles west from the Florida Turnpike and in the areas between Donald Ross Road and PGA Boulevard.

The Ground Water Flow Models

Two three-dimensional ground water flow models of the Surficial Aquifer System in eastern Palm Beach County were developed; one for the study area between C-51 and the Palm Beach-Martin County line (north model) and one for the area between C-51 and the Hillsboro canal (south model). These models were used to quantify factors such as recharge, evapotranspiration, canal leakage, and ground water drawdowns under different meteorologic, hydrologic and management scenarios. The values presented in the conclusions represent the best presently available estimates of these quantities. It is possible that certain values will change when additional information becomes available and the models are further refined, however, this should not change the relative importance of the factors discussed below.

Recharge to the Surficial Aquifer System

Rainfall provides approximately 85 percent of the total annual aquifer recharge in the study area under present conditions. An additional 13 percent of the total annual recharge is provided by leakage from maintained surface water systems. Over half of this comes from the Lake Worth Drainage District (LWDD) canal system which covers close to half the study area. The remaining annual aquifer recharge comes primarily from ground water underflow into the study area from Water Conservation Area 1 (WCA-1).

Discharge/Water Use from the Surficial Aquifer System

The largest ground water losses from the Surficial Aquifer System in the study area result from evapotranspiration which accounts for approximately 60 percent of the average annual losses under present conditions. Leakage to canals in the study area, the next most important discharge from the aquifer, accounts for an additional 20 percent of the losses. Close to half of the ground water discharge to canals occurs in the LWDD system. Allocated withdrawals by ground water users make up another 15 percent of the estimated annual ground water losses. Remaining losses come primarily from leakage into the C-51 and Hillsboro canals along the study area boundaries. Ground water underflow out of the study area along the Intracoastal boundary is small, less than 1 percent of the total ground water losses.

Impacts of Allocated Water Use on the Surficial Aquifer System

Ground water level drawdowns in the study area resulting from presently allocated ground water withdrawals are greatest in areas where the aquifer transmissivity is lowest and there is little recharge from surface water systems. The largest simulated drawdowns in the study area, greater than 10 ft., occur at the Lake Worth wellfield. Substantial drawdowns also occur at the Boynton Beach, Delray Beach, Jupiter, and Seacoast wellfields which had drawdowns greater than 8, 4, 4 and 4 ft., respectively.

Ground water withdrawals are significantly increasing the potential for salt water intrusion along the coast in portions of the study area. Withdrawals by the Boca Raton Hotel and Yacht Club, the Royal Palm Yacht and Country Club, Boca Raton, Highland Beach, the Boca Teeca Corporation, Delray Beach, Boynton Beach, and the Gulfstream Golf Club are all increasing the coastal intrusion potential south of C-51. North of C-51, presently allocated withdrawals have a significant effect on salt water intrusion potential only in the areas east of the Seacoast North Palm Beach, Seacoast Burma, and Riviera Beach eastern wellfields.

Potential environmental impacts resulting from presently allocated withdrawals are limited primarily to the Loxahatchee Slough in the northern study area where the combined cumulative impacts of allocated withdrawals at the Jupiter and Seacoast Hood Road wellfields cause simulated water table drawdowns of 2 to 3 ft. at the eastern edge of the slough.

Impacts of Droughts on the Surficial Aquifer System

Simulated ground water level declines after droughts of 90 and 180 days duration have similar areal distributions although drawdowns are greater and more extensive after the 180 day drought. Drawdowns after a 180 day drought were largest (greater than 4 ft.) in the undrained northwest portion of the study area and in the northeast area just south of the Loxahatchee River. Drawdowns during drought conditions were also significant in the vicinity of wellfields. Drawdowns of over 2 ft. in the Riviera Beach, Royal Palm Beach, Lake Worth, Boynton Beach and Seacoast wellfields and over 3 ft. in the Jupiter and Seacoast (Hood Road) wellfields occurred after a 90 day drought. Drops of over 3 and 4 ft. occurred in the same wellfields after a 180 day drought.

Simulated ground water flow and heads along the Intracoastal show high potential for salt water intrusion occurring in the southeastern corner of the study area east of the Boca Raton Hotel and Yacht Club and the Royal Palm Yacht and Country Club during a 90 day drought with allocated water use. The intrusion potential increases during a 180 day drought and extends one mile further north to include the area east of the Boca Raton East Wellfield. The simulations also show high potential for intrusion occurring east of the Gulfstream Golf Course during a 180 day drought.

The simulations show moderate potential for salt water intrusion during a 90 day drought with allocated water use in the areas east of the Boynton Beach East, the Gulfstream Golf Course, the Boca Raton East, the Delray Beach South, and the Seacoast North Palm Beach wellfields. The 180 day drought simulations with allocated water use show increased intrusion potential in these areas and an additional area of moderate potential east of the Boca Teeca Corporation, Highland Beach, Seacoast Burma and Riviera Beach wellfields.

Influence of Maintained Surface Water Systems on the Surficial Aquifer System

Surface water systems with maintained water levels recharge the aquifer system wherever ground water levels are lower than the surface water levels. Recharge from these systems keeps ground water levels several feet higher than they would be otherwise in portions of the study area. These systems become particularly significant during droughts when downward leakage of surface water is the most important source of recharge to the aquifer if surface water levels can be maintained. The surface water recharge has the greatest influence in the vicinity of large ground water withdrawals. With surface water recharge, ground water levels near the Boca Raton, Boynton Beach, and Acme Improvement District wellfields are 3 to 4 ft. higher on average and 4 to 6 ft. higher during droughts. Surface water recharge effects are also notable in the vicinity of the West Palm Beach Water Catchment System. When surface water levels are maintained in this system, ground water levels are 1 to 3 ft. higher on average and 2 to 6 ft. higher during droughts.

Maintained surface water systems are generally considered quite important in preventing salt water intrusion. The model simulations verify that this is true for certain portions of the study area under drought conditions, however, it is not uniformly true for the entire study area under present conditions. In the northern study area, maintained systems have no significant effect on the salt water intrusion potential.

In the southern study area, the LWDD canal network does little to reduce salt water intrusion potential along the coast north of C-16. However, the network reduces the potential for salt water intrusion during the dry season and droughts along the coast south of C-16 where recharge from the canals raises ground water levels an average of about 0.9 ft. under dry season conditions and about 1.5 ft. under 90 day drought conditions. These increases significantly reduce the potential for intrusion along most of this stretch although there are areas where intrusion potential exists even with the canal recharge.

Impacts of Buildout Water Use

Ground water level drawdowns from increased pumpage at buildout are restricted to the vicinity of the increased withdrawals. Assuming all additional withdrawals are from the Surficial Aquifer System, projected drawdowns in the study area are largest in the north, where the pumpage increases are greatest and transmissivities are low. The largest simulated drawdowns, 8 ft., are at the Jupiter and Seacoast Hood Road wellfields. Fairly large drawdowns, about 6 ft., are also projected at the Seacoast North Palm Beach, and Burma wellfields. Smaller drawdowns, 1 to 4 ft., are projected for the Royal Palm Beach, Lake Worth, Acme, and the Palm Beach County System wellfields (1, 2, 3, and 9).

Environmental impacts and saltwater intrusion potential were not increased by the additional buildout pumpages except near the Jupiter and Seacoast wellfields. Additional cumulative withdrawals at the Jupiter and Seacoast Hood Road wellfields caused approximately 3 ft. of additional drawdown at the northeast corner of the Loxahatchee Slough and 4 ft. of additional drawdown at the southeast corner. These drawdowns would be expected to have adverse impacts on the slough. Increased potential for salt water intrusion occurs east of the Seacoast North Palm Beach wellfield where simulated heads drop 1 to 2 ft. along the coast as a result of the pumpage increases. These drawdowns increase the salt water intrusion potential in the area from moderate to probable.

Fortunately, Jupiter already plans to shift its additional buildout withdrawals to the Floridan aquifer which should allow them to meet their demand without causing adverse impacts. It appears that Seacoast will need to seek alternatives as well if they are to meet their buildout demands without environmental or salt water intrusion problems.

Potential for Additional Ground Water Development

Four categories of ground water development potential - good, moderate, fair, and poor - were defined based on aquifer productivity, ambient water quality, potential for water quality degradation, and potential for adverse environmental impacts. Adverse impacts on existing ground water users were not considered in defining the categories. The Surficial Aquifer System was divided into areas of similar development potential based on these categories. The entire upper Floridan aquifer was classified in the fair potential development category.

The good potential ground water development area in eastern Palm Beach County occurs entirely within the Biscayne aquifer which is the most productive zone of the Surficial Aquifer System. The good area is limited to where the Biscayne is greater than 40 ft. thick and where ground water withdrawals are unlikely to induce saltwater intrusion or cause adverse environmental impacts. This area extends north from the Palm Beach - Broward county line to approximately Okeechobee Blvd.

with an irregular east - west extent that generally includes the area between the Turnpike and Military Trail.

Most of the rest of the Surficial Aquifer System has fair or poor development potential. Areas with moderate development potential are limited and occur primarily on the fringes of the good development areas.

The areas with fair development potential generally had low productivity. Further, ground water from the fair potential development areas of the Surficial Aquifer System west of S.R. 7 and the West Palm Beach Water Catchment area often requires treatment with reverse osmosis to meet potable water quality standards. Low productivity and ambient ground water quality requiring reverse osmosis also occur throughout the upper Floridan aquifer, all of which is classified as having fair development potential. Plans for development of these low potential areas will have to include suitable ground water treatment.

Areas not meeting the criteria for good, moderate or fair were defined as having poor ground water development potential. Areas of the Surficial Aquifer System under the Loxahatchee Slough, the West Palm Beach Water Catchment Area, and the wetlands adjacent to Water Conservation Area 1 were classified in the poor potential group because of environmental concerns. The Surficial Aquifer System along the coastal margin is included in the poor category because of saltwater intrusion concerns. The lower Floridan aquifer is in the poor category because it has very poor quality ambient ground water.

Recommendations

Additional Surficial Aquifer System withdrawals should be denied if they are likely to decrease ground water levels or seaward ground water flow along those portions of the coast where the potential for saltwater intrusion is already significant. Withdrawals which will cause additional drawdowns under the Loxahatchee Slough should also be denied if the slough is to be protected. Existing permits for ground water use in these areas should continue to be re-evaluated and adjusted accordingly through the SFWMD water use permitting process.

Water levels in the LWDD coastal basins should continue to be maintained. When surface water deliveries to the LWDD system are limited, priority should be given to maintaining canal levels in the coastal basins because of their importance in preventing saltwater intrusion.

Additional ground water development of the Surficial Aquifer System should be done preferentially according to potential with areas of good, moderate and fair potential developed in that order. The ground water development potential of the Floridan Aquifer System in the study area should be explored further to determine if it is a viable alternative to the Surficial Aquifer System.

The models developed in this study should continue to be used in the water use permitting and planning process. They should be refined and updated as additional data become available with emphasis on improving confidence in the simulation results.

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ABSTRACT

The Surficial Aquifer System is the primary public water supply source in Eastern Palm Beach County (the study area). The extent and composition of the Surficial Aquifer System and two zones within it, the highly productive Biscayne aquifer and a moderately productive interval surrounding it, were defined using previously available and newly collected data. Two three-dimensional ground water flow models of the Surficial Aquifer System, one of the northern study area and one of the southern study area, were developed. The models were used to simulate a variety of meteorologic and management scenarios. Results showed the effects of allocated ground water use, surface water recharge, droughts and projected buildout ground water use on the system. Allocated water use lowers ground water levels and increases the potential for saltwater intrusion along the coast south of the C-16 canal. Surface water infiltration is the primary source of recharge to the aquifer during droughts and reduces the potential for coastal saltwater intrusion south of C-16 by maintaining ground water levels. However, saltwater intrusion is likely to occur along portions of the Palm Beach County coast during extended droughts. Ground water from the Surficial Aquifer System should be available to meet projected buildout demands except in the northeastern study area where additional Surficial Aquifer System withdrawals by the Town of Jupiter and Seacoast Utilities would be expected to adversely impact the Loxahatchee Slough. These users will need to seek alternative sources. Presently allocated withdrawals along the coastal margin where there is significant potential for saltwater intrusion should be reviewed and moved inland where possible. Additional development of the Surficial Aquifer System should not be permitted in these areas. The best potential for further ground water development exists in the south central portion of eastern Palm Beach County where the Biscayne aquifer is thick and adverse environmental and water quality impacts are not expected.

INTRODUCTION

PURPOSE AND SCOPE

This report presents the results of a ground water resources assessment of eastern Palm Beach County. The location and extent of the study area are shown in Figures 1 and 2. There are two aquifer systems underlying the study area, the shallow Surficial Aquifer System and the deeper Floridan Aquifer System. Most of this report focuses on the Surficial Aquifer System which is widely used for irrigation and public water supply in the study area. The Floridan Aquifer System, which generally has poorer water quality and lower yields than the Surficial Aquifer System, is covered in less detail since it is infrequently used at present.

Major tasks within the scope of the assessment were to:

1) Compile and evaluate existing hydrogeologic data.

2) Conduct field investigations to collect additional hydrogeologic data on the Surficial Aquifer System.

3) Define the hydrogeologic framework of the Surficial Aquifer System.

4) Develop and calibrate two, three-dimensional ground water flow models of the Surficial Aquifer System, one south and one north of the C-51 Canal.

5) Conduct model sensitivity analyses to determine the relative influence of different components of the hydrologic and hydrogeologic regimes.

6) Make predictive simulations with the models to assess the potential impacts of different climatic and hydrologic conditions on the aquifer system.

DATA COLLECTION AND ANALYSIS

The extent and characteristics of the Surficial Aquifer System were determined based on extensive review and evaluation of all available hydrogeologic information. This information was obtained from the United States Geological Survey (USGS), South Florida Water Management District (SFWMD), and private consultant publications and files. These data were supplemented by field investigations conducted as part of this study at five sites in the study area. These investigations included aquifer sample collection, geophysical logging, and 48 to 72 hour pump tests with multi-level observations wells.

Data from more than 150 wells including various combinations of well cuttings, sample descriptions, drilling and geophysical logs were reviewed. These data were ranked according to quality based on thoroughness of sample descriptions, availability of geophysical logs, and the sensitivity of geophysical logs to known lithologic variations within the aquifer. Low quality data were eliminated and data from 119 of the 150 wells were used to establish the extent and composition of the aquifer.

The hydraulic characteristics of the aquifer were determined from the results of 32 pump tests. The pump test data were reviewed and reanalyzed as necessary to

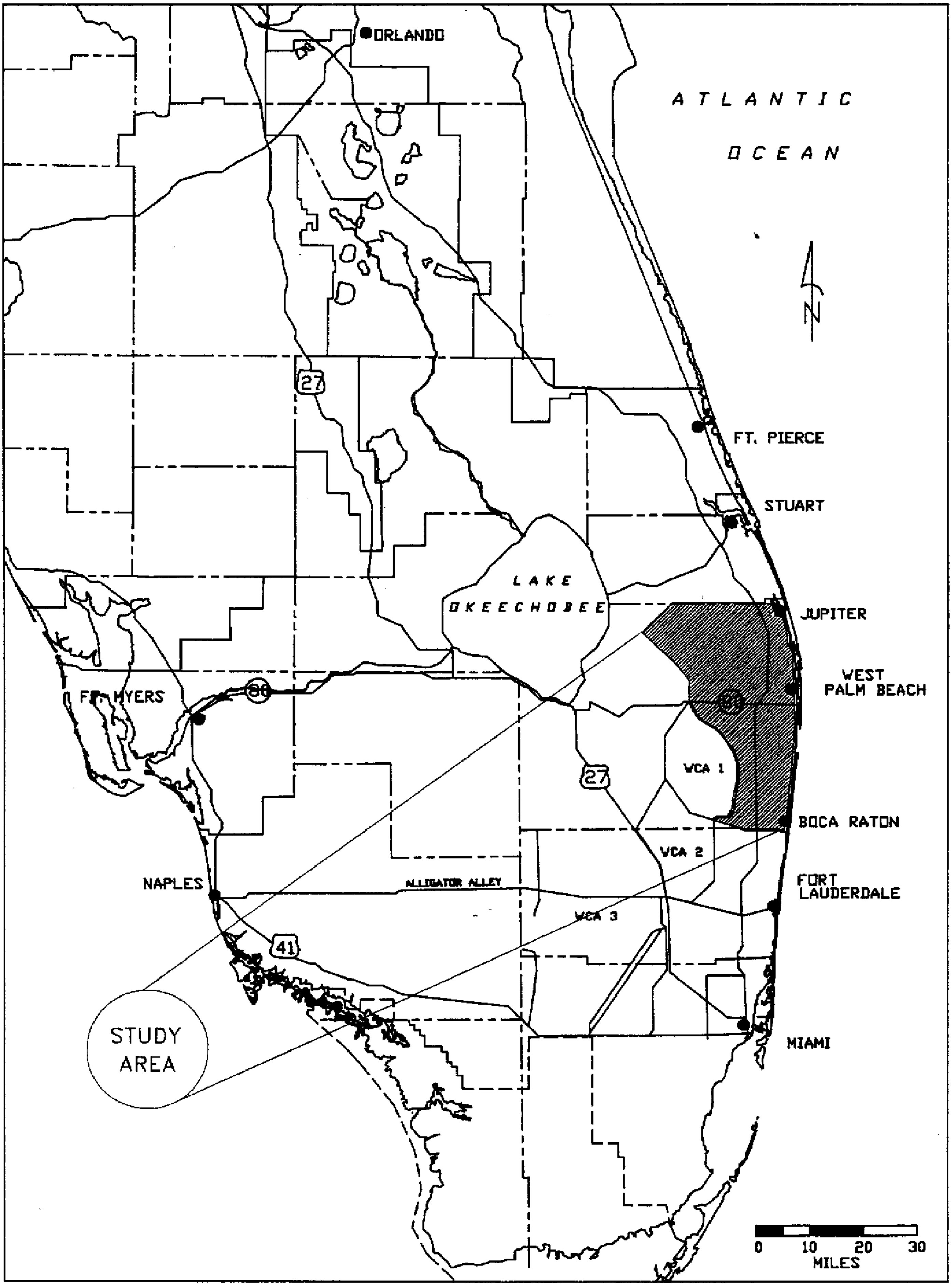

Figure 1 LOCATION OF STUDY AREA

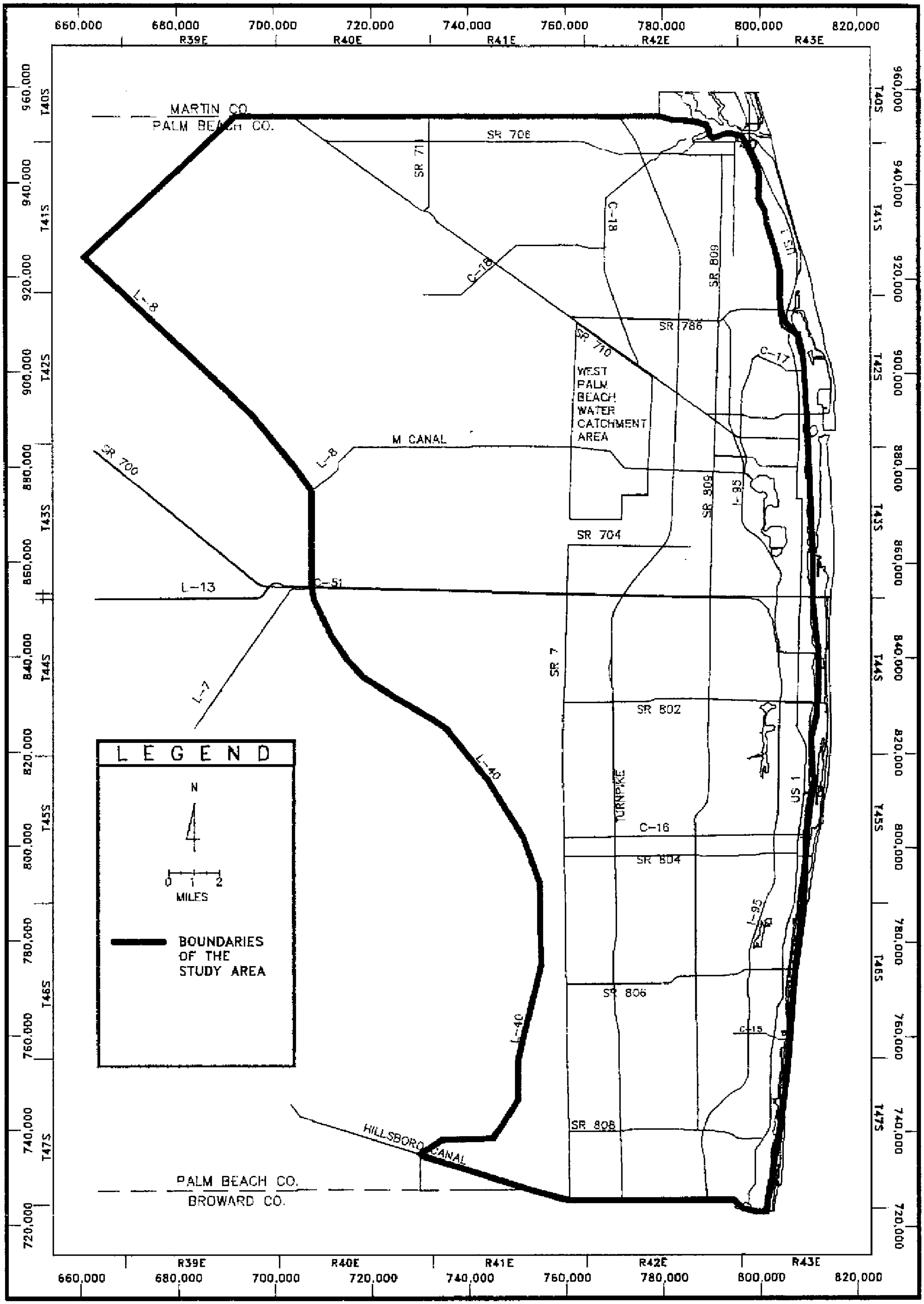

Figure 2 BOUNDARIES OF THE EASTERN PALM BEACH COUNTY STUDY AREA

estimate the hydraulic conductivities of zones within the aquifer. Reanalyses were done with both analytical and numerical techniques. Additional pump tests in the study area were also reviewed but were not used because of poor data quality or lack of documentation.

The Surficial Aquifer System was divided into two hydrogeologic zones based on the well and pump test data; a highly to moderately transmissive production zone exploited by almost all ground water users in the study area, and a less transmissive, non-production zone. The production zone was further divided into a highly transmissive interval, which is the northern extent of the Biscayne aquifer, and the remaining moderately transmissive interval referred to herein as the non-Biscayne production zone. The extent of each zone in the study area was mapped by correlating specific geologic features observed in well data to general hydraulic characteristics.

GROUND WATER FLOW MODELS (SURFICIAL AQUIFER SYSTEM)

After the extent, composition and hydraulic characteristics of the aquifer were defined, two ground water flow models of the Surficial Aquifer System in eastern Palm Beach County were developed for the study area using the USGS Modular Three-Dimensional Finite-Difference Ground Water Flow Model (MODFLOW) code. The south model is bounded by C-51 to the north, the Hillsboro canal to the south, the Intracoastal Waterway to the east and Water Conservation Area 1 to the west. The north model is bounded by C-51 to the south, the Palm Beach - Martin County line to the north, the Intracoastal Waterway to the east and the L-8 canal to the west.

The models were set up with uniform one half mile areal grids which overlap at the C-51 boundary. Both models are fully three-dimensional with six layers. This provides good representation of the hydrogeologic zones within the aquifer and the partial penetration of canals and wells. The aquifer was divided into three hydraulic conductivity zones for modeling purposes; the very high permeability Biscayne aquifer, the moderate permeability non-Biscayne production zone, and the low permeability non-production zone. The thickness and vertical extent of the layers in each model were varied to follow the hydraulic conductivity zones.

Development of the ground water flow models required detailed information on ground water withdrawals, rainfall, land use and surface water systems. Individual water use permits were reviewed to determine permitted ground water withdrawals and well locations. Public water supply ground water use was compiled from reported pumpages. Irrigation water use was estimated with the modified Blaney Criddle method used in the SFWMD water use permitting process. Recharge to the aquifer from rainfall infiltration was estimated for the models based on observed rainfall and land use data. Rainfall data were obtained from SFWMD publications and the District's DBHYDRO database. Land use data were provided by the SFWMD Land and Water Use Planning Group. Surface water systems in the study area were represented in the models based on system maps, stage data, water level maintenance schedules and structure control elevations provided by system operators, SFWMD permit files and aerial photographs.

The models were calibrated using four sets of water level data collected by the USGS between October 1983 and May 1985 at 74 observation wells in the study area. A steady state calibration was made against the average measured water levels in this period using average recharge and discharge values for the period in the models. A transient verification of the calibration results was attempted against changes in measured water levels during the same period using monthly time steps in the models with recharge and discharge varied accordingly. Further calibration/verification of the models was not possible due to lack of additional regional water level data.

After the models were initially calibrated, sensitivity analyses of the models were made by varying, one at a time, the following model parameters:

a) aquifer hydraulic conductivities
b) storage coefficients
c) canal sediment hydraulic conductivities
d) horizontal to vertical hydraulic conductivity anisotropy ratios
e) maximum evapotranspiration rate
f) evapotranspiration extinction depth
g) percent of rainfall recharging the aquifer

Results of the sensitivity simulations were analyzed to determine the effects of the parameters on simulated water levels and aquifer inflow and outflow.

Predictive simulations were made with the models for a variety of meteorologic and water use scenarios including average annual weather conditions, dry season conditions, and 90 and 180 day drought conditions with allocated water use. Additional simulations were made to determine the impacts of allocated water use, buildout water use and surface water systems with maintained water levels on the underlying aquifer system. Results of the simulations were evaluated to determine the influence of the various factors on aquifer water levels, recharge and discharge and to identify potential saltwater intrusion and wetland impact problems.

AQUIFER SYSTEMS

INTRODUCTION

There are two aquifer systems underlying Eastern Palm Beach County; the shallow, Surficial Aquifer System and the deeper, Floridan Aquifer System (Plate 1). These aquifer systems are effectively separated by the low permeability rocks and sediments of the Intermediate Confining Unit. The hydraulic properties of both aquifers and the confining unit (aquiclude) are dependent on the lithologic and diagenetic characteristics of the rock units in which they occur.

SURFICIAL AQUIFER SYSTEM

Introduction

The Surficial Aquifer System is the principal source of potable water in eastern Palm Beach County. The system is effectively unconfined; water levels within the aquifer correspond to the elevation of the water table. Recharge occurs locally by water moving relatively unimpaired down through the ubiquitous surface sands to the water table.

Several studies have investigated the Surficial Aquifer System in Palm Beach County. The most comprehensive work to date has been performed by the USGS. Early work by Parker et al. (1955), established the hydrogeologic foundation of southeast Florida but limited data precluded a detailed description of the aquifer systems in Palm Beach County.

Since 1955, the USGS, Florida Bureau of Geology (FBOG), SFWMD and many private consultants have collected and published a significant amount of hydrogeologic data for Palm Beach County. All available data were reviewed for the development of the modeled hydrogeologic framework of the study area. A complete bibliography of the publications and data sources used to determine hydrogeology is given in Appendix A.

Well data provided the basic information necessary to determine the extent, composition and hydraulic characteristics of the Surficial Aquifer System in the study area. Well cuttings, sample descriptions, drilling logs, geophysical logs and pump test data were used in determining hydrogeology.

Data from over 150 wells were reviewed. Data from 119 of these wells were actually used to determine the aquifer extent and construct the hydrogeologic model. Locations of wells used in this study are shown on Plates 2 and 2a. Data from the remaining wells were not used due to redundancy in location, shallow completion depths, or unreliable documentation.

Data were ranked from a high of 5 to a low of 1 according to quality. Quality rankings were based primarily on thoroughness of sample descriptions, availability of geophysical logs, and sensitivity of geophysical logs to known lithologic variations within the aquifer. Well depths, locations and data quality rankings are presented in the hydrogeologic data in Appendix B, Tables B-1 through B-7.

Lithology and Stratigraphy

The Surficial Aquifer System in the study area is made up of several different stratigraphic units (Plate 1). Due to similarities in lithology and faunal assemblages most of these units have not been definitively correlated across the study area. The delineation and correlation of these units was beyond the scope of this study.

Previous authors (Land, Rodis and Schneider, 1972) have dated the rocks and sediments of the Surficial Aquifer System from Miocene to Pleistocene in age. However, data collected in this study support a more restricted extent for the Surficial Aquifer System as presented by Miller (1987). Miller's lithologic cross-sections throughout the county suggest that the Surficial Aquifer System is composed of units which range in age from Pliocene (Tamiami Formation) to Pleistocene (Pamlico Formation).

As shown on Plate 1, the Surficial Aquifer System in the study area is comprised of part or all of the following formations: Pamlico Formation (Pleistocene), Anastasia Formation (Pleistocene), Fort Thompson Formation (Pleistocene), Caloosahatchee Formation (Pliocene- Pleistocene) and the Tamiami Formation (Pliocene). Although Miller (1987) includes sediments of the Miami Oolite (Pleistocene) into the Surficial Aquifer System in Palm Beach County, the extension of this formation from Broward County into southeastern Palm Beach County is questionable. Investigations of the stratigraphy of northern Broward County (Causaras, 1985) and the Hillsboro Canal area of southeastern Palm Beach County (McCoy and Hardee, 1970) do not recognize Miami Oolite sediments in the study area. Therefore, the Miami Oolite is not included into the Surficial Aquifer System in this study.

Pamlico Formation

The Pamlico Formation in Florida was identified by Parker and Cooke (1944) based on Stephenson's (1912) description of the Pleistocene sands of the Pamlico type section in North Carolina. Parker and Cook applied the formation name to all Pleistocene marine deposits in Florida which are younger than the Anastasia. It is probable that these sands represent undifferentiated deposits from more than one depositional environment and more than one episode of sea level rise and retreat (Enos and Perkins, 1977).

The upper portion of the Surficial Aquifer System is comprised primarily of quartz sands of the Pamlico Formation. The Pamlico occurs at or near the surface throughout most of the study area. Shell is often found in the Pamlico and may occur in bedded layers or disseminated throughout the sand. Other less common constituents include silts, clays and organic debris. Recently deposited organic soils may cover Pamlico sands in wetlands or in areas where plant growth has been persistent.

Anastasia Formation

The name Anastasia Formation was proposed by Sellards (1912) for extensive deposits of coquina rock occurring on Anastasia Island, Florida and extending along the east coast. Cook and Mossom (1929) expanded this definition to include " all the marine deposits of Pleistocene age that underlie the lowest plain (Pamlico Terrace) bordering the east coast of Florida north of the southern part of Palm Beach County."

Within the study area, the Anastasia Formation varies in composition from pure coquina to mixtures of sand, sandy limestone, sandstone, and shell. Lateral changes in lithology are difficult to predict while vertical changes in lithology tend to follow a downward progression from unconsolidated sand and shell to calcareous sandstone to biogenic limestone and coquina. Solution cavities are common in the limestone and coquina-dominated intervals. These solutioned zones form some of the most productive intervals of the Surficial Aquifer System.

The upper part of the Anastasia Formation is contemporaneous with the Miami Oolite. The contact between these two formations is gradational and occurs near the Palm Beach/Broward county border. The lower part of the Anastasia is contemporaneous with the Fort Thompson Formation. This contact is also gradational and occurs in the south and western part of the study area.

Fort Thompson Formation

The Fort Thompson was the name proposed by Sellards (1919) for " ... deposits consisting of alternating fresh- and brackish-water and marine marls and limestones ..." located along the Caloosahatchee River at Fort Thompson. The Fort Thompson Formation is present in the south and western part of the study area. To the east, the Fort Thompson grades laterally into the Anastasia Formation. In the study area Fort Thompson sediments often grade vertically into the underlying sediments of the Tamiami or Caloosahatchee formations.

Caloosahatchee Formation

Dall (1887) considered the lower shell beds exposed along the upper portion of the Caloosahatchee River to be Pliocene in age; he called them the Caloosahatchee beds or marls. The formation was officially named the Caloosahatchee Marl by Matson and Clap (1909). DuBar (1958) redefined the age of the Caloosahatchee Formation as being Pleistocene based on the occurrence of certain vertebrate fossils. Careful reevaluation of invertebrate faunal assemblages has led more recent authors (Brooks, 1968; Enos and Perkins, 1977) to divide the Formation into both Pliocene and Pleistocene members or chronostratigraphic zones.

The Caloosahatchee Formation in the study area consists of sandy, shelly marls with occasional stringers of well consolidated sandy limestone. The Formation is restricted to the western part of the study area where it may directly underlie the Anastasia, Fort Thompson, or Pamlico formations.

Tamiami Formation

The name Tamiami Limestone was proposed by Mansfield (1939) for "a limestone penetrated in digging shallow ditches to form the road bed of the Tamiami Trail over a distance of about 34 miles in Collier and Monroe Counties, Florida....The matrix of the limestone consists of a dirty - white to grey, rather hard, porous, nonoolitic limestone with inclusions of clear quartz grains". Mansfield believed the formation was Miocene in age based on faunal assemblages.

Since Mansfield's time, many authors have redescribed, recorrelated and redated the Tamiami Formation (Parker, 1942; 1951; Parker and Cooke, 1944; Brooks, 1968; 1981; Hunter and Wise, 1980). Only Causaras (1985) has attempted to correlate the Tamiami Formation into the study area. In her comprehensive cross-sections through Broward County, Causaras shows both a shelly limestone and a shelly sand facies of the Tamiami Formation underlying the Anastasia Formation in the southeast corner of Palm Beach County, near the Broward County border.

The Tamiami in eastern Palm Beach County may be represented by Pliocene age patch reef deposits which are remnants of the northeastern extension of the Floridian pseudoatoll (Petuch, 1986). These paleo-reef tracts and their associated talus deposits were subject to extensive solutioning during sea level declines during the late Pliocene/early Pleistocene. The resulting permeability increases in these sediments make them some of the more productive in the Surficial Aquifer System.

Pliocene reef fossils collected from test wells drilled by Swayze and Kane (in press) and from wells drilled by SFWMD during the course of this study are identifiable as Buckingham fauna (Petuch, 1988, personal communication). In this study, the Buckingham is considered to be the lower limestone member of the Pliocene Tamiami Formation, however, some debate currently exists in the literature as to whether the Buckingham should have formation (Mansfield, 1939; Petuch, 1986) or member (Hunter and Wise, 1980) status.

Hydrogeology

Introduction

The Surficial Aquifer System is the source of most potable water used in eastern Palm Beach County. It is an unconfined aquifer recharged by rain and leakage from surface water bodies with water level elevations higher than the local water table.

The Surficial Aquifer System is comprised of the saturated rock and sediment from the water table down to the relatively impermeable silts and clays of the underlying Intermediate Confining Unit. Because the water table in Eastern Palm Beach County fluctuates seasonally and is often at or near land surface, the vadose zone and tension-saturated zone sediments are also included in the aquifer system in this study. The base of the aquifer system was chosen to correspond to the first continuous occurrence of sediments having estimated hydraulic conductivities less than 50 feet per day or clay and silt constituents in concentrations greater than 15%.

The Surficial Aquifer System underlies all of the study area. In general, the thickness of the system ranges from a minimum of 115 feet in the west to a maximum of over 400 feet in the east (Plate 3). The thickness may vary locally as the aquifer system bottom tends to reflect the Miocene erosional surface which marks the top of the Hawthorn Group (Plate 4).

The Surficial Aquifer System is heterogeneous. In this study the aquifer system was divided into two hydrogeologic zones; a highly to moderately transmissive production zone exploited by almost all of the ground water users in the study area, and a less transmissive, non-production zone. The production zone was further divided into a highly transmissive interval, which is the northern extension of the Biscayne aquifer, and a moderately transmissive interval, hereafter referred to as the non-Biscayne production zone (Figure 3).

Individual zones and the Biscayne aquifer were identified in wells by correlating specific diagenetic features to general hydraulic characteristics. Tops, bottoms, and thickness of both zones and the Biscayne aquifer are listed in Appendix B, Tables B-1 through B-5.

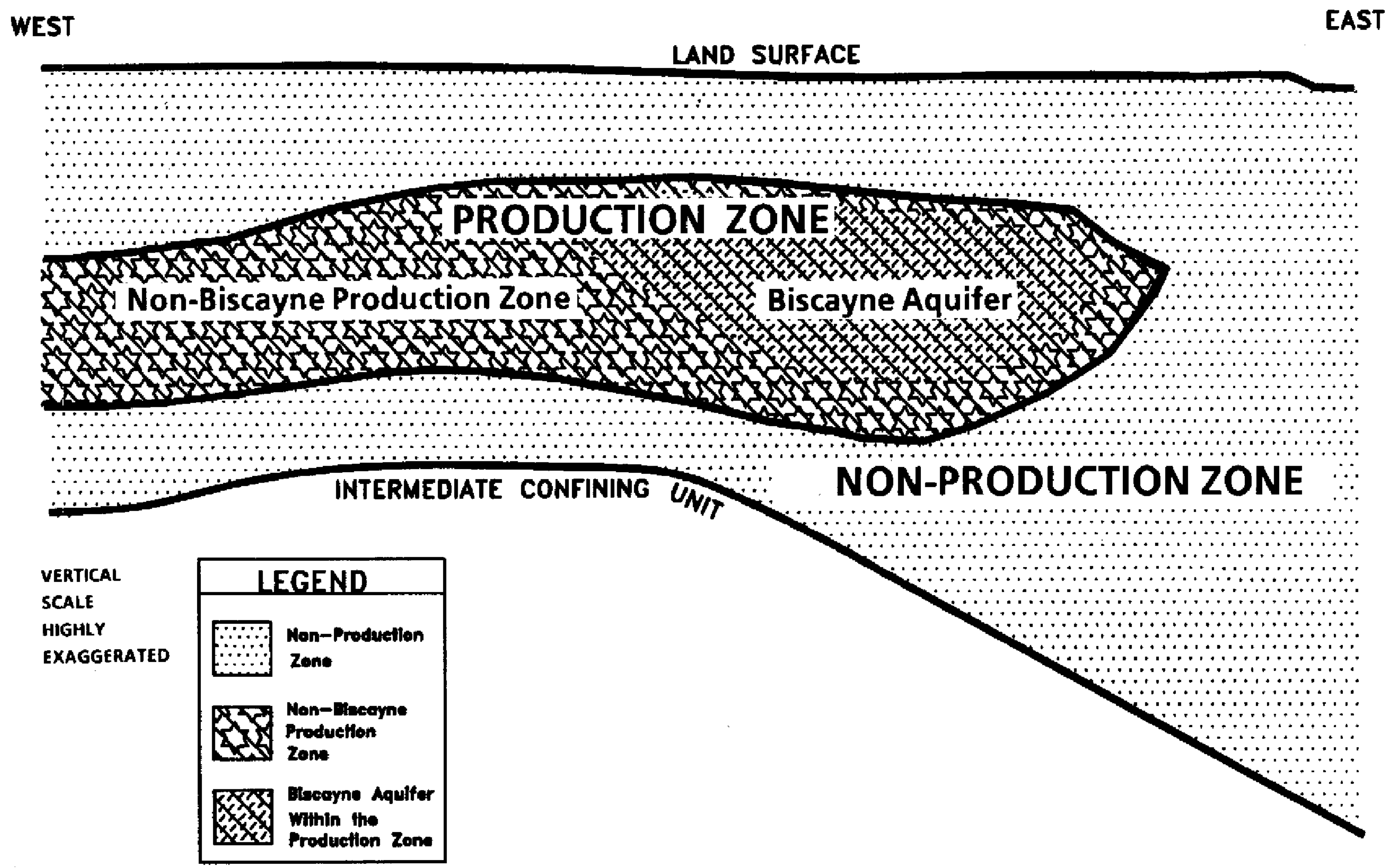

Figure 3 CONCEPTUAL CROSS SECTION OF HYDROGEOLOGIC ZONES WITHIN THE SURFICIAL AQUIFER SYSTEM, EASTERN PALM BEACH COUNTY, FLORIDA

Data Analysis

Hydraulic characteristics of the Surficial Aquifer System were determined from data acquired from 32 aquifer performance tests (APTs). The locations of these APTs are shown on Plate 5. Other APTs performed in the study area were analyzed but were not used due to the poor quality of data or lack of documentation.

Four of the APTs used were performed by the South Florida Water Management District. Fourteen others were performed by the USGS. Of these fourteen, four tests were repeated by the South Florida Water Management District after additional observation wells were added at the sites. The remainder of the APT data was provided by private consultants from tests performed in conjunction with wellfield expansion programs or adjacent user impact studies. Results of the reanalyses of data from these tests are shown in Tables 1, 2, and 3.

The methods used to analyze individual test data are noted in Table 1. Transmissivity estimates were commonly made using the Jacob method (Cooper and Jacob, 1946), since the Jacob method is less subjective than curve matching techniques when small fluctuations are present in the early time recorded data. In cases where the assumptions of the Jacob method were not met, curve matching techniques described by Boulton, (1963), Walton (1970), Hantush (1964), or Neuman (1975) were used.

Hydraulic conductivity values were estimated by dividing the calculated transmissivity by the thickness of the hydraulically dominant zone as determined from drilling logs and sample descriptions. Conductivity estimates were made for the Biscayne aquifer and the non-Biscayne production zone using APT data from sites where these zones controlled local aquifer characteristics. Using the method described above the average hydraulic conductivity value of the Biscayne aquifer, was estimated to be 1600 ft/day while the average hydraulic conductivity of the non-Biscayne production zone was estimated to be 150 ft/day.

Good published data for determining the hydraulic characteristics of the nonproduction zone surface sands were not available. Parker et al. (1955) found hydraulic conductivities of sands in eastern Palm Beach county to range from 1.3 to 107 ft/day. Constant head permeability tests performed with a K-605 permeameter on shallow sediments at the West Palm Beach Post Office exfiltration study site show hydraulic conductivities to be about 50 ft/day (José Alvarez, SFWMD, personal communication, 3/20/88). This 50 ft/day value is considered to be a reasonable estimation of the average hydraulic conductivity of the non-production zone sediments.

The specific yield of the shallow sands of the Surficial Aquifer System has not been reliably determined from APT data. APTs performed in areas where zones of high transmissivity are present must be run for extremely long periods of time before the actual dewatering of the surface sediments occurs. All of the APT data used in this report yielded storativity values indicative of early time fluid depressurization effects.

Parker et al. (1955) estimated the specific yield of surface sands in Miami, Florida by measuring the rise in water levels in a 9 foot deep monitor well (G-86) caused by local rainfall. The fine to medium quartz sands penetrated by this well are very similar to the shallow sediments in Palm Beach County. The authors calculated

TABLE 1. SUMMARY OF EASTERN PALM BEACH COUNTY APT DATA ANALYSES RESULTS (Transmissivity and Storativity)

SITE	TRANSMISSIVITY (T, ft^2/day)		STORATIVITY (S)	
	Jacob Method	Other	Jacob Method	Other
Palm Springs	N/A	*172,000	N/A	*$1.3X10^{-4}$
Acme	N/A	**15,000	N/A	**$9.0X10^{-4}$
Boca Raton	75,200	+96,000	$1.6X10^{-4}$	+$2.4X10^{-4}$
Boynton Beach	110,000			
Palm Beach Co. System 3	161,000		$7.0X10^{-4}$	
Highland Beach		**49,000		
Morikami Park	140,000			
Lantana Landfill		+ +66,000		
South Shore		**4,800		**$1.0X10^{-3}$
USGS 1 (PB 1581)	88,000		$6.0X10^{-3}$	
USGS 2 (PB 1574)	31,000		$2.7X10^{-3}$	
USGS 4 (PB 1598)	32,000		$2.0X10^{-2}$	
USGS 5 (PB 1603)	20,000		$1.1X10^{-3}$	
USGS 7 (PB 1578)	7,900		$2.7X10^{-5}$	
USGS 8 (PB 1571)	142,000			
USGS 9 (PB 1544)	207,000			
USGS 16 (PB 1576)	34,000			
I-95		•1,100		•$2.0X10^{-4}$
Hood Road	60,000		$4.0X10^{-4}$	
WPB WWTP		•40,100		
WPB LM		•24,600		
Jupiter PW 13		••8,000		••$6.0X10^{-4}$
Park of Commerce		**13,300		**$1.7X10^{-3}$
RB 851		•90,600		•$2.0X10^{-4}$
RB 852		•65,300		•$1.4X10^{-4}$
USGS 10 (PB 1567)		+ +7,500		
USGS 11 (PB 1564)	4,600		$4.9X10^{-4}$	
USGS 12 (PB 1558)	2,600		$3.0X10^{-5}$	
USGS 13 (PB 1555)	25,000		$7.4X10^{-4}$	
USGS 14 (PB 1550)	4,400		$5.4X10^{-5}$	
USGS 17 (PB 1607)	13,000			
LLP-TW	47,000			

* Modified Hantush Method + Hantush-Jacob Method • Walton Method
** Neuman Method + + Theis Recovery Method •• Boulton Method

TABLE 2. SUMMARY OF EASTERN PALM BEACH COUNTY APT DATA ANALYSES RESULTS (Zone Thickness)

SITE	THICKNESS (b, ft)			
	Test Well Completed Interval	Biscayne Aquifer	Non-Biscayne Production Zone	Total Aquifer
Palm Springs	47	45	Not defined	190
Acme	20	NP	Not defined	115
Boca Raton	60	45	Not defined	310
Boynton Beach	unknown	70	Not defined	230
Palm Beach Co. System 3	30	80 est	Not defined	220 est
Highland Beach	20	50 est	Not defined	320 est
Morikami Park	70	105	Not defined	240 est
Lantana Landfill	50 est	50 est	Not defined	180 est
South Shore	20	N/A	Not defined	122
USGS 1 (PB 1581)	120	95	Not defined	295
USGS 2 (PB 1574)	100	*64	Not defined	217
USGS 4 (PB 1598)	120	*84	Not defined	250
USGS 5 (PB 1603)	110	*64	Not defined	325
USGS 7 (PB 1578)	70	14	Not defined	254
USGS 8 (PB 1571)	100	45	Not defined	110
USGS 9 (PB 1544)	100	75	Not defined	243
USGS 16 (PB 1576)	100	27	Not defined	160
I-95	76	NP	NP	270
Hood Road	120	15	120	190
WPB WWTP	40	40	105	180
WPB LM	70	NP	73	200
Jupiter PW 13	64	NP	110	200
Park of Commerce	20	NP	62	167
RB 851	50	30 est	100	220
RB 852	50	30 est	100	220
USGS 10 (PB 1567)	80	NP	110	174
USGS 11 (PB 1564)	60	NP	73	170
USGS 12 (PB 1558)	60	NP	57	185
USGS 13 (PB 1555)	70	20	100	150
USGS 14 (PB 1550)	60	NP	100	153
USGS 17 (PB 1607)	100	16	110	180
LLP-TW	40	82 est	Not defined	265

NP = not present est = estimated
*Includes stringers of low conductivity strata

TABLE 3. SUMMARY OF EASTERN PALM BEACH COUNTY APT DATA ANALYSES RESULTS (Hydraulic Conductivity)

SITE	HYDRAULIC CONDUCTIVITY (T/b, ft/day)			
	Test Well Completed Interval	Biscayne Aquifer	Non-Biscayne Production Zone	Total Aquifer Average
Palm Springs	3,800	3,800	Not defined	900
Acme	N/A	NP	Not defined	130
Boca Raton	1,600	1,700	Not defined	240
Boynton Beach	unknown	1,600	Not defined	480
Palm Beach Co. System 3	5,400	2,000 est	Not defined	730 est
Highland Beach	2,450	980 est	Not defined	150 est
Morikami Park	2,000	1,300	Not defined	580 est
Lantana Landfill	1,300 est	1,300 est	Not defined	370 est
South Shore	240	N/A	Not defined	40
USGS 1 (PB 1581)	735	925	Not defined	300
USGS 2 (PB 1574)	310	*480	Not defined	60
USGS 4 (PB 1598)	265	*380	Not defined	130
USGS 5 (PB 1603)	180	*310	Not defined	60
USGS 7 (PB 1578)	110	560	Not defined	30
USGS 8 (PB 1571)	1,420	3,200	Not defined	1,290
USGS 9 (PB 1544)	2,070	2,800	Not defined	850
USGS 16 (PB 1576)	340	1,300	Not defined	212
I-95	14	NP	NP	4
Hood Road	500	4,000	500	320
WPB WWTP	1,000	1,000	380	220
WPB LM	350	NP	340	120
Jupiter PW 13	130	NP	70	40
Park of Commerce	660	NP	210	85
RB 851	1,810	3,020	906	410
RB 852	1,310	2,180	653	300
USGS 10 (PB 1567)	90	NP	70	40
USGS 11 (PB 1564)	80	NP	60	30
USGS 12 (PB 1558)	40	NP	50	14
USGS 13 (PB 1555)	360	1,250	250	170
USGS 14 (PB 1550)	70	NP	40	30
USGS 17 (PB 1607)	130	800	100	70
LLP-TW		600 est	180	

NP = not present est = estimated

*Values affected by stringers of low conductivity strata within the Biscayne Aquifer rainfall recharge to water level rise ratios of 0.23 for the sediments from 6.5 feet to 2.4 feet below land surface and 0.34 for the sediments from 2.5 feet to 0.85 feet below land surface. They speculated that these values were probably greater than the specific yield since some of this water would be retained by capillary forces during gravity drainage.

Johnson (1967) compiled specific yield values based on laboratory analyses for clastic sediments ranging from clay to coarse gravel. His findings showed specific yields for fine to coarse sand ranged from 0.10 to 0.35. The average specific yields for the fine, medium and coarse sands described in Johnson's report were 0.21, 0.26, and 0.32 respectively.

An average specific yield value of 0.25 was assumed for the near surface sediments in the study area based on their similarities to the sediments described by Parker et al. (1955) and Johnson (1967) and on the model calibration results. Further discussion of the effects of specific yield on water levels is presented in the Ground Water Modeling section of this report.

Within each zone of the Surficial Aquifer System the ratio of vertical to horizontal conductivity (anisotropy ratio) is low. Previous authors (Johnson and Morris, 1962; Davis, 1969; Piersol et al., 1940) have shown that in structurally undisturbed sedimentary formations this ratio is typically less than one. In the clastic intervals of the Surficial Aquifer System of eastern Palm Beach County anisotropy values less than one are expected due to the hydraulic influences of small scale stratifying features such as grain shape, orientation, sorting, bedding contacts and unconformities. The gross effect of this stratification is that the effective vertical conductivity of a section of the aquifer can be low even in zones where horizontal conductivities are high.

Carbonate dominated intervals of the Surficial Aquifer System also appear to be hydraulically stratified. Solution cavities observed in dual tube cuttings of Biscayne strata usually had a horizontal major axis of solutioning which suggests that in these zones horizontal hydraulic conductivities are much higher than vertical hydraulic conductivities.

Very low vertical to horizontal anisotropy ratios (much less than 0.1) in the Surficial Aquifer System in the study area are associated with the presence of clay or marl lenses. These lenses can impede the vertical movement of water to the extent that the system will act as a leaky, semi-confined aquifer. Well data showed these lenses to be localized features of limited areal extent.

The Biscayne Aquifer

The Biscayne aquifer is the most productive interval within the Surficial Aquifer System in Palm Beach County. The Biscayne aquifer is characterized by highly solutioned limestones with hydraulic conductivities as high as 4,000 ft/day (Table 3). Large diameter wells completed in these limestones may produce as much as 2,000 gallons per minute; consequently, the Biscayne aquifer has excellent potential for water supply development.

The name Biscayne aquifer was proposed by Parker (1951) for the hydrogeologic unit of water-bearing rocks that carries unconfined ground water in southeastern Florida. This definition has been refined by subsequent authors (Schroeder, Klein, and Hoy, 1958; Klein and Hull, 1978) to include general hydraulic properties. Fish (1988) has recently proposed a definition of the Biscayne aquifer in Broward County based on the stratigraphy and hydraulic conductivity of the Surficial Aquifer System there. While Fish's definition is the most detailed to date, it is not applicable in the study area because it is dependent on regional stratigraphic correlations which have not been done in Palm Beach County.

The Biscayne aquifer in eastern Palm Beach County was defined in this study as the interval within the Surficial Aquifer System which: 1) is comprised of at least 50 percent highly permeable (estimated hydraulic conductivity at least 500 ft./day) strata, 2) is at least 10 feet thick, and 3) extends from the top of the shallowest laterally-continuous highly permeable strata to the base of the deepest highly permeable strata which may be included without violating criteria 1). Other investigations in the study area have called it the "cavity riddled zone" (Land, 1977), the "cavity zone" (Fisher, 1980) and the "zone of secondary permeability" (Swayze and Miller, 1984). Data from these earlier investigations were used in conjunction with drilling and APT data collected during this study to correlate the Biscayne aquifer in eastern Palm Beach County. Maps of Biscayne aquifer thickness, top elevation and bottom elevation are shown on Plates 6, 7, and 8.

Biscayne aquifer strata is principally composed of highly solutioned carbonate deposits. Many of these deposits are biogenic in nature. Reefal fauna is common suggesting that in some areas the high degree of dissolutioning may be associated with the occurrence of primary porosity development in reef and talus deposits (Petuch 1986; Miller, 1988).

The highest hydraulic conductivities occur in intervals where the greatest amount of carbonate cement and/or allochems have been removed. Intervals where the original rock was partially grain supported by silicious sand does not display high hydraulic conductivities even though most or all of the original carbonate cement has dissolved. Only intervals characterized by empty or nearly empty solution cavities were recognized as Biscayne aquifer strata.

The following drilling characteristics and diagenetic features displayed in well cuttings were used to determine the presence of the Biscayne aquifer in areas where APT data were unavailable: 1) large circulation losses and/or sudden drops in the drill string during mud rotary drilling in carbonate intervals, 2) the presence of carbonate cemented cuttings with interconnected vugs or cavities, 3) concretion shaped cuttings in predominantly carbonate intervals, and 4) irregularly shaped carbonate cuttings with sucrosic texture. The occurrence of calcite crystals in well cuttings was not considered conclusive evidence of Biscayne strata as crystalline calcite was more commonly found in moderately permeable intervals as pseudomorphs of mollusks.

Production Zone

Throughout most of the Surficial Aquifer System the Biscayne aquifer is surrounded by a moderately transmissive zone of sandy shell, moderately solutioned limestone or moderately to well solutioned sandstone. In this study, the Biscayne aquifer and the moderately transmissive zone are referred to collectively as the "production zone". Its thickness and depth below land surface in the northern part of the study area are shown on Plates 9, 10, and 11. The production zone was not mapped in the southern part of the study area, because the Biscayne aquifer is the dominant ground water bearing interval in this region. In the central and northern part of the county the non-Biscayne production zone sediments have hydraulic conductivities averaging approximately 150 ft./day.

Non-Production Zone Sediments

The non-production zone sediments are composed of low to moderately permeable sands and marls with scattered lenses of very low permeability clay and limonite-cemented sandstones locally called "hardpan". Non-production zone sediments typically correspond to the sands of the Pamlico and Anastasia formations or the marls of the Caloosahatchee Formation. Hydraulic characteristics of non-production zone sediments were discussed previously in the Data Analysis section.

Thin discontinuous low permeability zones of clay or sandstone were identified in some wells. These low permeability zones were not incorporated into the hydrogeologic model since their discontinuous nature precludes their having a significant effect on regional hydraulics. Appendix B, Tables B-6 and B-7 describes the depth and occurrence of these intervals for individuals wishing to investigate specific sites in more detail.

Water Quality

Surficial Aquifer System ground water quality varies with location and depth in the study area. The water quality is influenced by numerous factors including the composition and permeability of the aquifer materials, local hydrologic conditions, saltwater intrusion and contamination from man's activities. In most of the study area, the ground water either meets or can be treated with conventional methods to meet potable water standards. Exceptions occur primarily where saltwater intrusion has occurred along the coast and where residual connate water occurs in the west.

Water quality trends in the Surficial Aquifer System follow the physiographic trends in the study area. The three physiographic regions of eastern Palm Beach County, the coastal ridge, the sandy flatlands, and the Everglades, (Parker and Cooke, 1944) are shown in Figure 4. Ground water quality is generally good in the coastal ridge, good to poor in the sandy flatlands, and poor in the Everglades.

Ground water quality in the study area is best in the coastal ridge and adjacent sandy flatlands where the Biscayne aquifer is present. The high permeabilities of the Biscayne strata in these areas have facilitated the flushing of residual seawater by better quality rainfall and canal infiltration recharge water. Water quality in the Biscayne aquifer is of the calcium bicarbonate type as a result of limestone dissolution. The ambient ground water is potable with respect to chlorides and total dissolved solids except where saltwater intrusion has occurred along the coastal margins.

In the western sandy flatlands and Everglades, where aquifer permeabilities are low, flushing of residual seawater is incomplete and the ground water quality is poor. Ground water quality in these areas deteriorates with depth as a result of even poorer flushing due to lower permeabilities toward the base of the aquifer. Chloride and total dissolved solids concentrations in these areas often exceed potable standards.

Chloride and specific conductance data collected in 1987 for the Surficial Aquifer System are given in Appendix D. These parameters are indicative of the degree of ground water mineralization and the ambient water quality of the aquifer

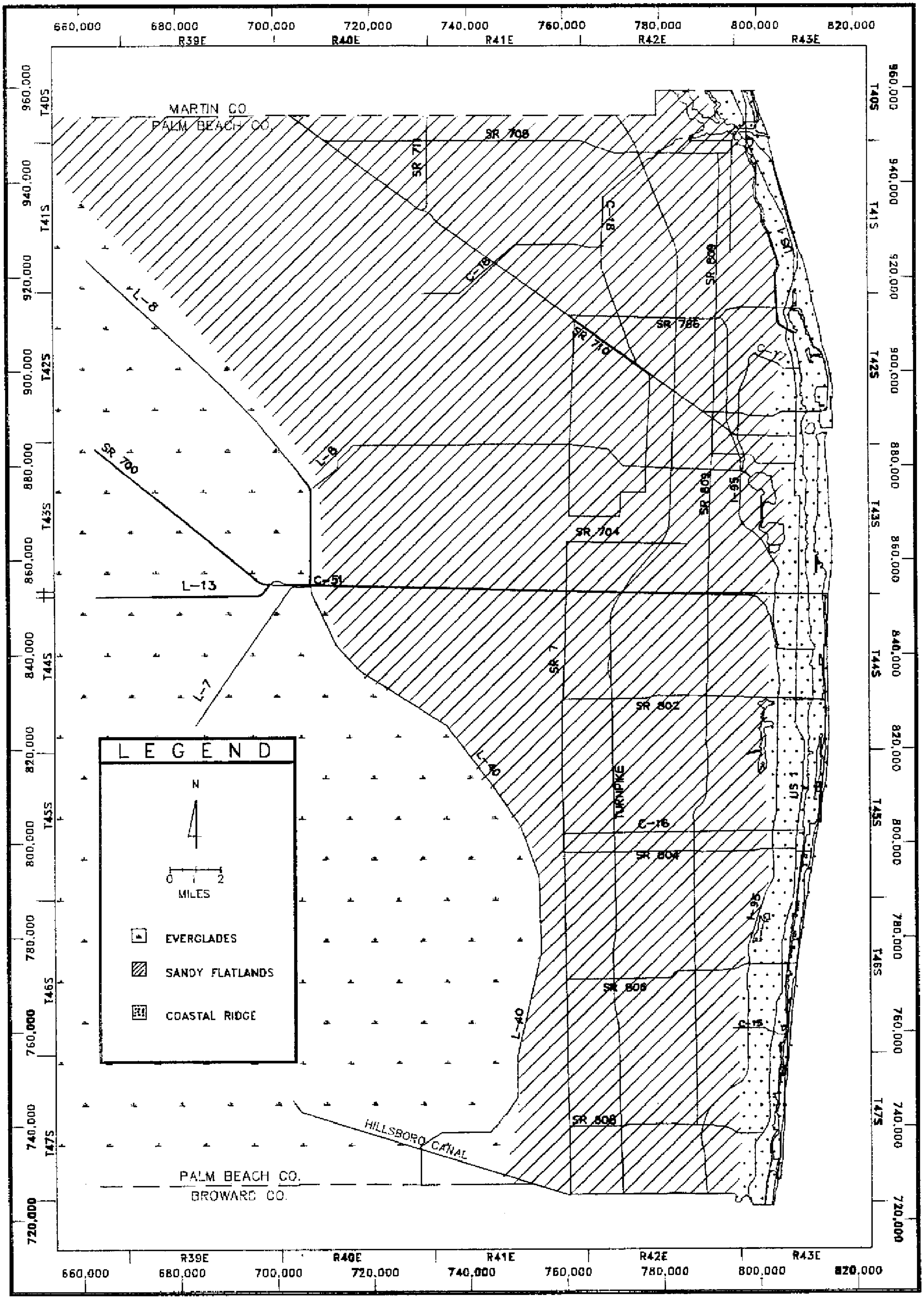

Figure 4 PHYSIOGRAPHIC PROVINCES — PALM BEACH COUNTY (AFTER PARKER AND COOKE, 1944)

system. Chloride values were obtained from the SFWMD ambient ground water network, from SFWMD Water Use Division files, and from USGS publications. Locations of water quality wells are plotted on Plate 12 and average measured chloride values in 1987 are plotted on Plate 13.

Saltwater intrusion has occurred along much of the coastal margin of the Surficial Aquifer System. The intrusion results from a combination of factors. Large scale withdrawals from the Surficial Aquifer System, extensive drainage systems and increased impervious area have reduced recharge, lowered water levels, and diminished the original seaward hydraulic gradient in some areas. In addition, numerous small canals without salinity control structures have been dredged into the Intracoastal Waterway creating inland fingers of brackish water.

Saltwater intrusion near or into coastal wellfields due to large ground water withdrawals has caused several major public water supply operators to change their wellfield operating procedures. Highland Beach, Boca Raton, Delray Beach and Boynton Beach water supply systems have all limited or eliminated pumping from their easternmost wells due to increasing chloride concentrations. Jupiter and Tequesta have both begun to rely on ground water withdrawals from Jupiter's newer, inland wells due to saltwater intrusion from the Atlantic Ocean, the Intracoastal Waterway and the brackish reaches of the Loxahatchee River.

The SFWMD oversees the SALT (Salt Water Tracking) network of public, USGS and private wells. District staff require the implementation of a SALT program in water use areas where historically high chloride concentrations exist. Data from SALT wells are used by the District in both planning and regulating water use with the objective of averting or minimizing saltwater intrusion into the Surficial Aquifer System.

INTERMEDIATE CONFINING UNIT

Introduction

The Intermediate Confining Unit in the study area is comprised of the relatively impermeable sequence of clays, silts and limestones of the Hawthorn Group. The Hawthorn Group described in this study includes an upper Miocene fine clastic facies which may be time equivalent to the Tamiami Formation as described by Mansfield (1939). Within the study area this confining unit varies in thickness from over 500 feet to over 700 feet and effectively restricts vertical movement of water between the confined Floridan Aquifer System and the Surficial Aquifer System. The top of this unit occurs at depths below -150 feet NGVD in the western part of the study area and dips toward the coast. In the southeastern part of the county, the top of the unit occurs at depths below -400 feet NGVD.

Lithology and Stratigraphy

Tamiami Formation

As discussed previously, no definitive correlation of the Tamiami Formation has been made through eastern Palm Beach County. Beds of calcareous sandstone and sandy limestone which occur beneath the Anastasia Formation in the southern part of the study area (Causaras, 1985) may be time equivalent to the Buckingham Member of the Tamiami Formation. Buckingham strata is included in the Surficial Aquifer System.

This study follows Scott's (1988) proposal that siliciclastic sediments previously assigned to the lower Tamiami Formation be reassigned to his newly proposed Peace River Formation of the Hawthorn Group. Causaras (1985), identified these sediments in south Palm Beach County as undifferentiated Tamiami and Hawthorn. These sediments are relatively impermeable in the study area, and their occurrence typically marks the top of the Intermediate Confining Unit.

Hawthorn Group

Phosphatic sediments quarried at the Simmons pits near the town of Hawthorn, Alachua County, Florida, were given the name "Hawthorn Beds" by Dall and Harris (1892). Matson and Clap (1909) gave the unit formation status based on descriptions by Dall and Harris (1892) and Johnson (1888). Puri and Vernon (1964) designated the Devil's Mill Hopper and Brooks Sink exposures as the type locations for the Hawthorn Formation. Scott (1988) formally elevated the formation to Group status and proposed that the Hawthorn #1 core W-11486, drilled in the vicinity of the now inaccessible Simmons pit, be designated as the neostratotype or replacement type section for the Hawthorn Group. A comprehensive treatise of the lithostratigraphy of the Hawthorn Group including a review of previous investigations is presented by Scott (1988).

Only the upper sediments of the Hawthorn Group were encountered in the test wells drilled in this study. Descriptions of the deeper Hawthorn sediments were compiled from consultant reports documenting the drilling and construction of the wells shown on Plate 14 which penetrate through the Hawthorn Group.

In the study area, sediments of the upper Hawthorn Group are sandy, clayey, calcareous, phosphatic, very fine to fine grained and poorly indurated. Scott (1988) places these sediments into his newly proposed Peace River Formation. The clay content of these sediments typically increase with depth until the unit becomes dominated by sandy, plastic, olive gray clay. Thin beds of silty sand and shell are also found in this clayey interval.

Samples from wells in eastern Palm Beach County show a rapid change from clay to marl and limestone dominated, Miocene strata underlying the Peace River Formation. Previous studies have identified this carbonate interval as the Tampa Formation (Geraghty & Miller, 1986, 1987a, 1987b; CH2M Hill, 1986). Based on King (1979) and King and Wright's (1979) redesignation of the Tampa type section, Scott (1988) mapped the top of the thickness of Tampa sediments and showed their occurrence is restricted to west-central Florida. Scott (1988) proposed that the Tampa Formation be downgraded to member status due to its limited occurrence. He further proposed that all the Miocene carbonate section underlying the Peace River Formation in south Florida be assigned to the newly named Arcadia Formation of the Hawthorn Group.

Hydrogeology

The relatively impermeable clays and fine clastic sediments of the Peace River Formation and the clays and limestones of the underlying Arcadia Formation prevent movement of water between the Surficial Aquifer System and the Floridan Aquifer System. A producing zone may be present in the basal limestones of the Arcadia Formation (identified as Tampa Formation by Geraghty and Miller, 1988).

Hydraulic characteristics of this zone and its degree of connection with the upper producing zones of the Floridan Aquifer System have not been determined.

FLORIDAN AQUIFER SYSTEM

Introduction

The Floridan Aquifer System is composed of a thick sequence of limestones and dolomites. The system is confined above by the Intermediate Confining Unit and below by the thick anhydrite sequences of the Sub-Floridan Confining Unit (Plate 1). Good producing zones occur in both the upper and lower portions of the Floridan Aquifer System. The producing zones of the upper part of the system are separated from those of the lower part of the system by a thick intra-aquifer confining unit of dense limestone and dolomite. The well-confined nature of Floridan strata in the study area precludes the possibility of water either entering or leaving the system except through wells or lateral ground water flow.

Geological and hydraulic data on the Floridan Aquifer System in Palm Beach County is limited and detailed maps of the system are not available. Information on the Floridan Aquifer System presented in this study comes from work performed by the USGS, FBOG, SFWMD, and from consultant reports documenting the construction of the injection and reverse osmosis wells shown on Plate 14. The correlation and mapping of the system was beyond the scope of this study.

Floridan Aquifer System water in the study area is non-potable without treatment. Water quality generally becomes poorer with depth. In the northern part of the study area water from the upper zones of the Floridan Aquifer System is of sufficient quality to make desalinization for water supply viable. In contrast, dissolved solids concentrations in water in the lower producing zones of the system are so high that it cannot presently be economically treated to meet potable water standards.

Lithology and Stratigraghy

Early work by Parker (1955) describes the "Floridan aquifer" as the hydrologic unit including "parts or all of the middle Eocene (Avon Park and Lake City limestones), upper Eocene (Ocala Limestone), Oligocene (Suwannee Limestone), and Miocene (Tampa Limestone), and permeable parts of the Hawthorn formation that are in hydrologic contact with the rest of the aquifer". In 1986, the Florida Geological Survey Committee on Florida Hydrostratigraphic Unit Definition elected to replace the term "Floridan aquifer" with "Floridan aquifer system" in recognition of the many producing zones within this hydrogeologic unit (Florida Bureau of Geology, 1986). In addition, the committee formalized the inclusion of the Oldsmar Formation (Eocene) and parts of the Cedar Keys Formation (Paleocene) into the total hydrogeologic framework of the Floridan Aquifer System.

Rock units which make up the system in the study area are the Suwannee Formation, the Ocala Group, the Avon Park Formation, the Lake City Formation, the Oldsmar Formation, and the upper part of the Cedar Keys Formation (Plate 1).

<u>Suwannee Limestone</u>

Applin and Applin (1944) show undifferentiated Oligocene beds extending throughout Palm Beach County. While attempts have been made to correlate the

Suwannee across the eastern part of the county (CH2M Hill, 1987), problems verifying the occurrence of this formation still exist due to the lack of good index fossil samples and the inconsistent lithology of the rocks and sediments directly overlying the Ocala.

The Suwannee Limestone is often a good producing zone in areas where it overlies the Ocala. In the study area, Oligocene age rocks and sediments, which some authors have called the Suwannee Formation, are high in their clastic composition. This clastic constituent of the formation has inhibited solutioning of the strata, resulting in only moderately good production from this part of the Floridan Aquifer System.

Ocala Group

Nomenclature of the upper Eocene limestones in Florida has evolved with the work of several authors (Cook, 1945; Applin and Applin, 1944; Vernon, 1951). Puri (1957) proposed that these limestones; the Crystal River, Williston and Inglis Formations; be recognized collectively as the Ocala Group. Because lateral gradations in lithology often make differentiation between these formations difficult they are commonly referred to collectively by their group name, the Ocala.

In eastern Palm Beach County the Ocala Group is composed of very pale orange to yellowish gray, highly fossiliferous, sparry limestone. The limestone is vuggy in some intervals indicating solutioning.

The top of the Ocala is an erosional surface and occurs between -900 and -1000 ft. NGVD where the Ocala is present. Samples from Acme and Palm Beach County System 9 injection wells show the Ocala has been completely eroded and is not present in these areas.

In most areas of the State, the Ocala Group is the principal producing unit of the Floridan Aquifer System. However, testing performed at the Jupiter RO-1 production well shows that Ocala strata contributes only one quarter of the naturally flowing water from the upper part of the system. Further evaluation of this unit in other parts of the study area will have to be performed before its regional production potential can be determined.

Avon Park Limestone

The name Avon Park Limestone was proposed by Applin and Applin (1944) for an Eocene limestone encountered in a well at the Avon Park Bombing Range in Polk County, Florida. Surface exposures of the Avon Park occur in Citrus and Levy Counties and in several localities along the defunct Cross State Florida Barge Canal.

The Avon Park is composed of yellowish gray to dark gray, fossiliferous, granular to chalky limestone with occasional dolomitic intervals. In the study area the top of the Avon Park occurs at depths ranging from -1000 NGVD to greater than -1400 NGVD. Thicknesses of the Avon Park vary from 500 to over 700 feet. Local trends in dip are difficult to determine because of problems in differentiating the limestones of the Avon Park from the limestones of overlying formations.

Sample logs of injection wells indicate the presence of several permeable zones within the Avon Park. There is insufficient data available to correlate and map these zones at present.

Lake City Limestone

The Lake City Limestone was described by Applin and Applin (1944) as an Eocene age, chalky fossiliferous limestone with beds of dark brown dolomite occurring between -492 and -1010 feet in a well at Lake City, Columbia County, Florida. In the study area the top of this formation occurs from about -1350 to greater than -1930 feet NGVD. The Lake City appears to dip and thicken to the east. Total thickness may exceed 1500 feet near the coast.

The lithology of the Lake City in the study area is similar to that described by Applin and Applin (1944). The limestones and dolomites of the Lake City are dense and relatively impermeable. These carbonates make up the major intra-aquifer confining zone within the Floridan Aquifer System. Samples and cores from deep Floridan wells indicate that within the study area Lake City strata effectively prevents the mixing of waters from the upper and lower producing zones of the Floridan Aquifer System.

Oldsmar Limestone

The Oldsmar Limestone was the name proposed by Applin and Applin (1944) for an early Eocene limestone in an oil test well near Oldsmar, Hillsborough County, Florida. In the study area the top of the Oldsmar ranges from less then -2300 feet NGVD in Southern States No.1 to greater than -2900 feet NGVD in the Palm Beach County System 9 injection well. The Oldsmar appears to have a local dip to the east-southeast.

The Oldsmar grades upward from a yellowish brown, crystalline, massive fractured and solutioned dolomite to a pinkish gray / very pale orange, sparry, biogenic, limestone.

The dolomites in the lower section are often highly cavernous due to dissolutioning. Drillers in south Florida have unofficially named these solutioned dolomites of the Oldsmar and Upper Cedar Keys formations the " Boulder Zone " (Plate 1) due to the way the drilling of this interval resembles drilling a layer of loose, boulder size rocks. In Palm Beach County, these solutioned zones often have extremely high hydraulic conductivities. This interval occurs locally between -2700 and -3200 feet NGVD and is currently exploited by all of the eight active Class I injection wells in the study area.

Cedar Keys Limestone

"The name Cedar Keys Formation was proposed by Cole (1944) for limestone of Paleocene age in a deep oil test at Cedar Keys, Florida.", (Stringfield, 1966). The top of the Formation probably occurs at about -3300 ft NGVD in the deep oil exploration well Southern States No. 1. The Formation dips to the southeast and probably occurs at depths greater than -3600 ft NGVD near the coast.

The lithology of the Cedar Keys Limestone ranges from a white creamy limestone to a fractured and cavernous gray to brown dolomite. Evaporites are common in the lower part of the Cedar Keys. Because the increasing presence of these continuous, unsolutioned evaporite layers indicates the absence of active water movement, the beginning of this evaporite sequence has been designated the top of the sub-Floridan Confining Unit (FBOG, 1986).

The upper section of the Cedar Keys Limestone is often fractured and cavernous. It usually has good hydraulic connection with the overlying Oldsmar Limestone. In other areas of the state this upper section is exploited as an injection zone for liquid waste disposal due to its poor quality water and very high hydraulic conductivity.

Hydrogeology

The Floridan Aquifer System is a confined artesian system. Potentiometric surfaces of the system in eastern Palm Beach County may exceed ground level by as much as 32 ft. (Geraghty and Miller, 1988). Wells completed in the Floridan Aquifer System will flow unaided at land surface.

Hydraulic properties of the Floridan Aquifer System vary both vertically and horizontally. Good producing zones exist in both the upper and lower portions of the system where post-depositional processes such as fracturing, solutioning and dolomitization have enhanced permeability. The intermediate section of the system is relatively impermeable and acts as an intra-aquifer confining unit.

Throughout the State the permeable zones in the upper part of the Floridan Aquifer System occur where solutioning has been greatest. Solutioning occurs where slightly acidic recharge water comes into contact with the carbonates of the system. Fractures in upper Floridan Aquifer System strata facilitate solutioning by exposing more carbonate surface area to acidic waters and providing passageways for water movement. Formation contacts in the upper part of the system are also typically sites of solutioning.

Several producing zones have been correlated in the upper part of the Floridan Aquifer System in counties adjacent to and north of the study area (Shaw and Trost, 1984) and (Brown and Reese, 1979). Although individual zones appear to have unique potentiometric surfaces (Brown and Reese, 1979) some of these zones may be hydraulically connected. The producing zones mapped by Brown and Reese have not been correlated through Palm Beach County, and the current paucity of data precludes their delineation in this study.

Shaw and Trost (1984) show that transmissivities in the upper producing zones of the Floridan Aquifer System decrease southward and eastward of Polk County. The upper producing zones of the Floridan in north Palm Beach County are only moderately solutioned and have transmissivities of less than 10,000 $ft.^2/day$ (Geraghty and Miller, 1988).

Water in the upper producing zones of the Floridan Aquifer System in the study area comes from two sources, water flowing in from recharge areas outside the study area and relict sea water. Inflowing water is the most significant source of recharge to these upper zones.

The process of inflow into the upper producing zones is ultimately driven by rainfall in Floridan recharge areas in northern Polk County where the Intermediate Confining Unit is thin or absent (Stringfield, 1936; Stewart, 1980). Rainfall in these areas percolates down into the upper part of the system, then flows laterally in all directions. As it moves, the fresh water reacts with the minerals in the strata and mixes with relict seawater not yet flushed from the marine limestone producing zones. By the time it reaches Palm Beach County, dissolved solid and chloride concentrations in the water exceed potable standards. From Palm Beach County, flow in the upper Floridan continues to move south and east until it is discharged through wells or natural spring in the ocean floor.

In the lower zones of the Floridan Aquifer System, post-depositional porosity development due to fracturing and solutioning is greatly enhanced by dolomitization. Dolomitization occurs when the calcium in limestone undergoes a mole-by-mole replacement with magnesium from either relict or recent sea water moving through the aquifer system. The resulting mineral, dolomite (Ca, Mg $(CO_3)_2$), has a crystal structure that is 13% smaller than calcite ($CaCO_3$). Initial losses in aquifer material due to dolomitization may result in aquifer compaction without significant increases in porosity. However, once dolomite has replaced approximately 70% of the calcite in the limestone, the dolomite crystals are numerous enough to support the aquifer strata (Weyl, 1960). Further dolomitization will result in rapid increases in porosity until the replacement is 80% to 90% complete (Murray, 1960).

The combination of fracturing, solutioning and dolomitization has resulted in the formation of highly transmissive cavity zones in the lower Floridan Aquifer System. In southeast Florida, these zones occur exclusively in dolomite dominated strata (Puri and Winston, 1974). These zones appear to be present throughout the study area (CH2M Hill, 1986, 1987; Geraghty and Miller, 1986, 1987a, 1987b) and are exploited for disposal of secondary treated effluent by all of the active Class I injection wells. Their highly transmissive and well confined nature combined with their poor quality ambient water make these zones suitable for disposal of secondarily treated waste water.

The origin of water in the high transmissivity, lower producing zones of the Floridan Aquifer System in the study area is not fully understood. Kohout et al. (1988) suggest that the original sea water present in these lower zones in south Florida has been mixed with recent sea water which has migrated landward under hydrothermally induced gradients. Their studies trace the degree of mixing of relect and recent sea water in these zones using carbon 14 isotope ratios as measured in water samples taken from deep injection wells located outside the study area.

Some of the water in the lower producing zones of the system comes from man. In 1985, injection wells operating along the southeast coast of Florida were injecting approximately 100 million gallons per day of industrial and municipal waste water into these high transmissivity zones (Meyer, 1985). The regional effects of this type of recharge on ground water flow patterns and hydrothermal gradients in the system has yet to be determined.

Water Quality

Water quality in the Floridan Aquifer System in the study area is poor due to the incomplete flushing of relict seawater by fresh recharge water. Flushing occurs primarily in the uppermost producing zones; consequently, water quality in the Floridan Aquifer System declines with increasing depth. Chloride concentrations in the upper producing zones present in Jupiter reverse osmosis well RO-1 ranged from 1850 mg/l at 1235 ft below land surface to 2900 mg/l at 1500 ft below land surface (Geraghty and Miller, 1988). In areas such as Jupiter, where there is insufficient Surficial Aquifer System water available to meet demands, water from the upper producing zones of the Floridan Aquifer System can be economically treated to potable standards using existing reverse osmosis technology.

In the deeper, highly-transmissive producing zones of the Floridan Aquifer System, where the effects of fresh water recharge are negligible, water quality is extremely poor; total dissolved solid (TDS) concentrations in these waters exceed 10,000 mg/l. Water in these zones is of such poor quality that the Environmental Protection Agency (EPA) has determined this water does not warrant protection from further degradation and injection of industrial and domestic wastes into these zones is allowed throughout the study area.

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HYDROLOGY

GROUND WATER / SURFACE WATER INTERACTIONS

Because the Surficial Aquifer System is unconfined, surface water systems in the study area affect ground water levels by recharging the aquifer system when surface water levels exceed ground water levels and, conversely, draining the aquifer system when surface water levels are lower than ground water levels. The flow rate between the systems is proportional to the head differences and the degree of hydraulic connection between the systems. The degree of hydraulic connection depends on the "wetted" surface area of the water body in contact with the aquifer, the thickness of bottom sediments in the surface water body, and the hydraulic conductivities of both the aquifer and the sediments.

There is little information on thickness and hydraulic conductivity of bottom sediments in the study area (refer to the modeling section for further discussion). However, relationships between observed surface and ground water levels in the county suggest a significant degree of connection exists between surface water systems and the underlying aquifer.

Surface water systems in or adjacent to the study area are so extensive that they control ground water levels to a large degree. These systems (shown on Plate 15) include the Intracoastal Waterway, Water Conservation Area I (WCA-1), the West Palm Beach Water Catchment Area, the Hillsboro canal, C-51, C-15, C-16, the L-40 canal, the L-8 canal, C-17, C-18, the M canal, Clear Lake, Lake Mangonia, and numerous surface water management systems operated by independent drainage and water control districts.

Surface water systems in the study area may be divided into three groups in terms of their influence on the Surficial Aquifer System:

- Maintained systems, characterized by water levels artificially maintained at predetermined levels, which recharge or drain the aquifer depending on the head gradients.
- Weir and structure controlled systems which drain the aquifer whenever ground water levels are above weir elevations and which have little influence otherwise.
- Water catchment and retention systems, that catch and hold excess surface water, which provide recharge to the aquifer as long as system water levels exceed ground water levels and which have little influence otherwise.

SURFACE WATER SYSTEMS

Surface Water System Data

Data on the surface water systems were collected from a variety of sources including system operators, SFWMD permit files, aerial photographs, real estate maps, and USGS topographic quad sheets. Canal locations and system boundaries were digitized by SFWMD staff and incorporated into the District's Geographic Science data base. The information herein is as accurate as possible given the number of sources used and the limited time for gathering data.

Maintained Surface Water Systems

Surface water systems in or adjacent to the study area with maintained water levels include the Lake Worth Drainage District (LWDD), the Acme Improvement District, the Loxahatchee Groves Water Control District, the SFWMD C-51 and Hillsboro canals, and WCA-1 (locations shown on Plate 15). These systems provide both drainage and water supply to the areas they serve. All maintained systems are subject to fluctuations depending on the discharge of excess water and the availability of outside water to supplement system water levels. Subsequent discussions of system operations are based on normal conditions when water level fluctuations are small. They do not address special operations during extreme flood or drought conditions.

The Lake Worth Drainage District operates and maintains the largest and oldest canal system in the county. The system serves approximately 325 square miles and as shown on Plate 15, covers most of the study area south of C-51. Water levels in the canals are maintained at specific elevations ranging from 15.5 ft. NGVD to tide level via a series of pumps and control structures. The system is permitted to withdraw 59.088 billion gallons of water per year from WCA-1, C-15, C-16 and the Hillsboro canal using pumps and gravity flow to maintain the specified water levels. Water is distributed through the system via four large equalizing canals running north and south, and over 50 smaller lateral canals running east and west. The large canals are generally 6 to 10 ft. deep and approximately 50 ft. wide while the smaller canals are about 3 ft. deep and 30 ft. wide. Locations of the canals, pumps, and control stations are shown on Plate 16. The system may be subdivided into water level basins according to canal water level maintenance elevations. The highest water levels are maintained at 15.5 ft. NGVD in the central basin with peripheral basins maintained at progressively lower elevations as shown on Plate 16.

The Acme Improvement District covers approximately 27 square miles west of the LWDD between WCA 1 and C-51 as shown on Plate 15. Locations of the Acme canals, lakes, and pumping facilities are shown on Plate 17. From December through June, water levels in the canals are maintained at 12.5 ft. NGVD north of canal C-23 and 13.5 ft. NGVD south of it. From July to November, levels are maintained one foot lower throughout the system. Acme is permitted to withdraw water from C-51 and WCA-1 to maintain these levels. Acme's canals are uniformly constructed with 6 foot bottom widths and side slopes of 2:1 from the bottom to 12 ft. NGVD and greater than 4:1 from 12 ft. NGVD to the surface. Canal bottom elevations range from 0 to 6 ft. NGVD.

The Loxahatchee Groves Water Control District serves approximately 8000 acres adjacent to and north of the C-51 canal as shown on Plate 15. Major canals in the district are shown on the same plate. Water levels in the system are maintained at 16.5 ft. NGVD during the wet season and 15.5 ft. NGVD during the dry season. The district withdraws water from C-51 to maintain these levels.

The SFWMD Hillsboro and C-51 canals are both maintained at control levels. In the study area, C-51 is held at 10.5 ft. NGVD west of the G-194 and at 8.5 ft. NGVD from G-194 to the S-155 salinity control structure under normal conditions. The Hillsboro canal is held at 7.5 ft. NGVD from S-39 to the Deerfield locks. It is tidal east of the Deerfield locks.

Weir and Structure Controlled Surface Water Systems

Surface water management systems in the study area whose water levels are not maintained by pumping include: 1) the Indian Trails Water Control District, 2) the Seminole Water Control District, 3) the South Indian River Water Control District, 4) the North Palm Beach County Water Control District (NPBWCD), 5) Pratt and Whitney, and 6) the North Palm Beach Heights Water Control District. The locations of these systems are shown on Plate 15. Canal water levels in these systems are controlled primarily by weirs and culverts. These systems function primarily as drains and affect the aquifer only when ground water levels are above the canal levels. Their drainage effects are limited by canal weir and culvert elevations. When canal levels fall below these elevations, the systems cease to function as drains. The weir control elevations for these systems are listed in Table 4.

There are also several SFWMD canals - C-18, C-17, and L-8 - in the study area where water levels are not maintained. These canals are shown on Plate 15. The C-18 canal is controlled by the C-18 weir just east of S.R. 710 which has a crest elevation of 17.6 ft. and by the S-46 gated spillway which is normally operated to maintain headwater stages near 14.5 ft. NGVD. C-18 is tidal east of S-46. Water levels in the C-17 canal are controlled by S-44, a gated spillway operated to maintain a headwater stage of 6.6 ft. NGVD during the wet season and 7.1 ft. NGVD during the dry season. C-17 is tidal east of S-44. This information was taken from Cooper and Lane (1988), which also contains more detailed information on the operation of most SFWMD canals in the study area.

The L-8 canal functions primarily as a water conduit whose elevation is dictated by water availability from, and the water needs of Lake Okeechobee, WCA-1, the L-8 basin and the S-5A basin. Under normal conditions, the SFWMD maintains the southeast portion of the L-8 canal at about 12.5 ft. NGVD by pumping water in from C-51 or by allowing water to flow in through culvert 10-A from Lake Okeechobee. Maintaining the canal at this elevation makes it possible for the City of West Palm Beach to withdraw water for recharge to their water catchment system via pumps located at the conjunction of the M-canal and the L-8 extension. Under drought conditions, the elevations of the L-8 canal are maintained only as long as excess water is available from the contributing basins.

Water Catchment and Retention Systems

The City of West Palm Beach operates the largest water catchment system in the study area. It consists of the M canal, the Water Catchment Area, the acreage surrounding the eastern leg of the M canal, and the acreage surrounding and including Lake Mangonia and Clear Lake as shown on Plate 15. Water from this system provides the public water supply for the City of West Palm Beach.

Depending on existing hydrologic conditions, the catchment system may receive water from rain, local surface water runoff, or from several regional basins via the L-8 and M canal networks. The regional basins which can supply water include Lake Okeechobee, WCA-1, the L-8 canal basin, and the S-5A basin. Water from these areas can be routed through the L-8 canal to the M canal intersection. The city is allowed to pump available water from L-8 into the M canal through which it gravity flows into the water catchment area and the two lakes.

TABLE 4. SUMMARY OF CONTROL TYPES AND ELEVATIONS OF WATER CONTROL DISTRICTS AND DEVELOPMENTS IN NORTH PALM BEACH COUNTY

DISTRICT/DEVELOPMENT	CONTROL TYPE	CONTROL ELEVATION (FT. NGVD)
North Palm Beach Water Control District		
Unit 2	Weir	4.35 to 11
Unit 3	Weir	9.5 to 12
Unit 4	Weir	10.5
Unit 6	Weir	13
Unit 7	Weir	7 to 11
Unit 9	Weir	6 to 11
Unit 10	Weir	16
Unit 11	Weir	15
Unit 14	Weir	15
Unit 15	Weir	10.5
Unit 16	Weir	16
Unit 19	Weir	8.5
Unit 23	Weir	6.0
Loxahatchee Groves Water Control District	Pump Maintained	15.5 to 16.5
Indian Trails Water Control District		
M-1	Weir	17.5
M-2	Weir	17.5
Royal Palm Beach	Weir	13.5
Unit 11	Weir	19.1
South Indian River Water Control District	Weir	10.5 to 13
No. Palm Beach Heights Water Control District	Weir & Culvert	6 to 8
Seminole Water Control Control District		
Jupiter Village	Weir	6.3
Maplewood	Weir	6.3
Indian Creek	Weir	7.5
Pratt & Whitney	Weir & Pump	20 to 23.5

On a smaller scale, there are numerous storm water retention and percolation ponds throughout the study area. These also hold excess surface water and recharge the aquifer locally.

Water Conservation Area 1 (WCA-1), which forms the southwest border of the study area, was constructed by the U. S. Army Corps of Engineers as part of the original flood control system in south Florida. Water level schedules in the area are set by the Corps and maintained by the SFWMD. Figures 5 and 6 show the maintenance schedule and historical water levels respectively for the conservation area. In addition to direct rainfall, WCA-1 receives water primarily from Lake Okeechobee and the basins surrounding C-51 and L-8.

GROUND WATER LEVELS

Ground Water Level Data

Regional ground water level data in eastern Palm Beach County are limited. The most extensive data consists of four sets of measurements taken by the USGS at 74 observation wells during the periods from 10/27/83 to 11/4/83; from 4/16/84 to 4/25/84; from 11/9/84 to 11/20/84; and from 5/6/85 to 5/8/85. The USGS also collects data continuously on 11 recorder equipped wells in the study area. Other water level data available in the county include measurements made by permitted water users as part of their salt water intrusion or wellfield monitoring programs. While these data are quite useful in monitoring local conditions around wellfields, their usefulness in developing regional maps is extremely limited since data collection is not coordinated regionally and all measurements are not referenced to NGVD. Furthermore, water levels in these wells often reflect changes in local pumping rates or well operation rotations rather than regional trends.

Locations of the USGS wells used in the 1983 to 1985 samplings are shown on Plate 18. Well information and measured water levels are given in Table 5. Well coverage of eastern Palm Beach County is fairly good, however, not all of these wells were measured for water levels during each time period.

The accuracy of the measured water levels relative to NGVD is dependent on the accuracy of the top of casing elevation in NGVD. Prior to 1988, elevations of about half of the water level wells had been surveyed, while the other half had elevations estimated based on USGS 1:24000 topographic quad sheets. In 1988, vertical control of 28 previously unsurveyed wells (all that could be found) was established. The average absolute value of the differences between the estimated and surveyed elevations was 1.45 ft. with actual differences ranging from 2.9 ft. to -3.4 ft. Water levels from the remaining unsurveyed wells probably have a similar range of errors. Six previously surveyed wells were resurveyed in 1988. Two of these had approximately the same elevations in each survey, but the four others showed differences of -0.54, 0.64, 1.9 and 5.46 ft. This sample is biased since several of these wells were resurveyed because the measured water levels seemed anomalous. However, water levels from wells surveyed prior to 1988 are used with caution since the potential for significant errors in the data apparently exists. Unfortunately, the problem was not identified in time to resurvey the wells for this study. Those wells that will continue to be part of the water level network are being resurveyed.

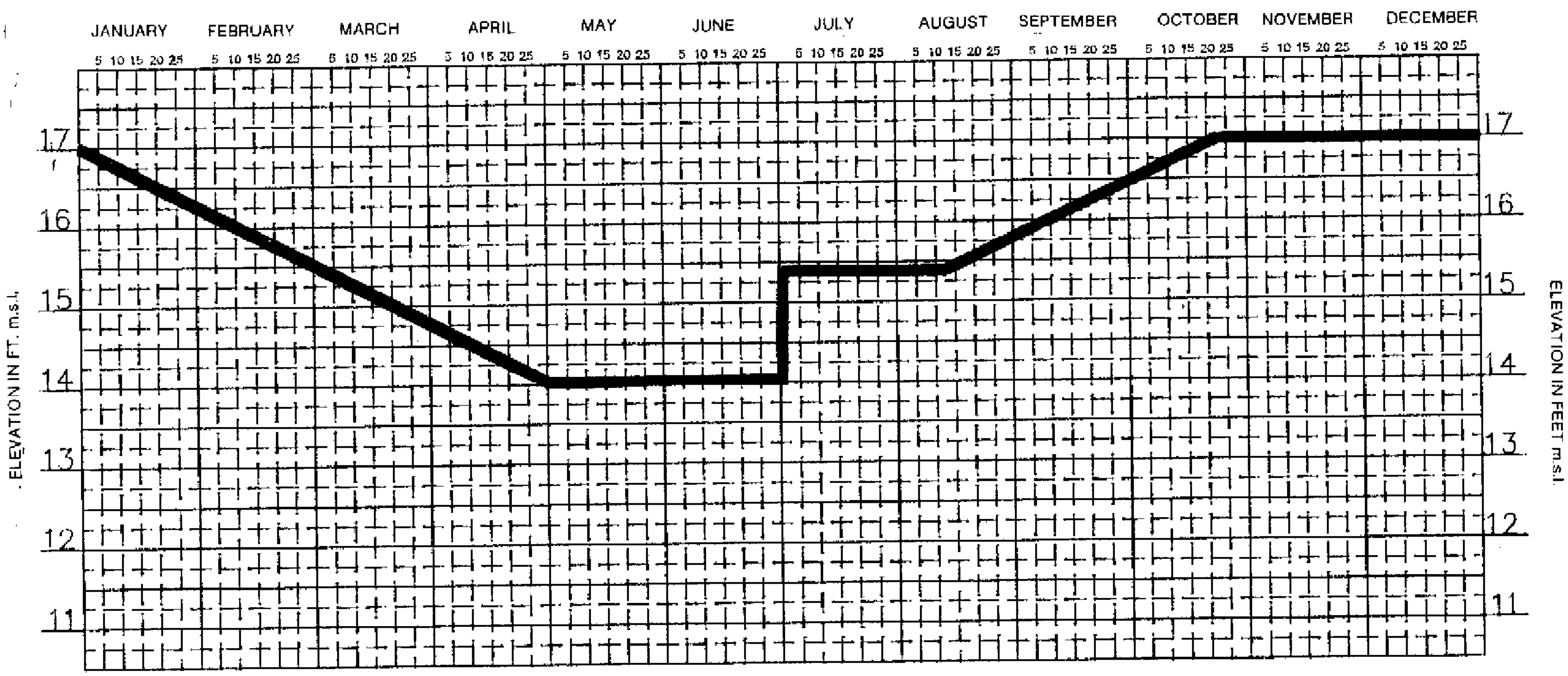

Figure 5 MAINTENANCE SCHEDULE FOR WATER CONSERVATION AREA 1

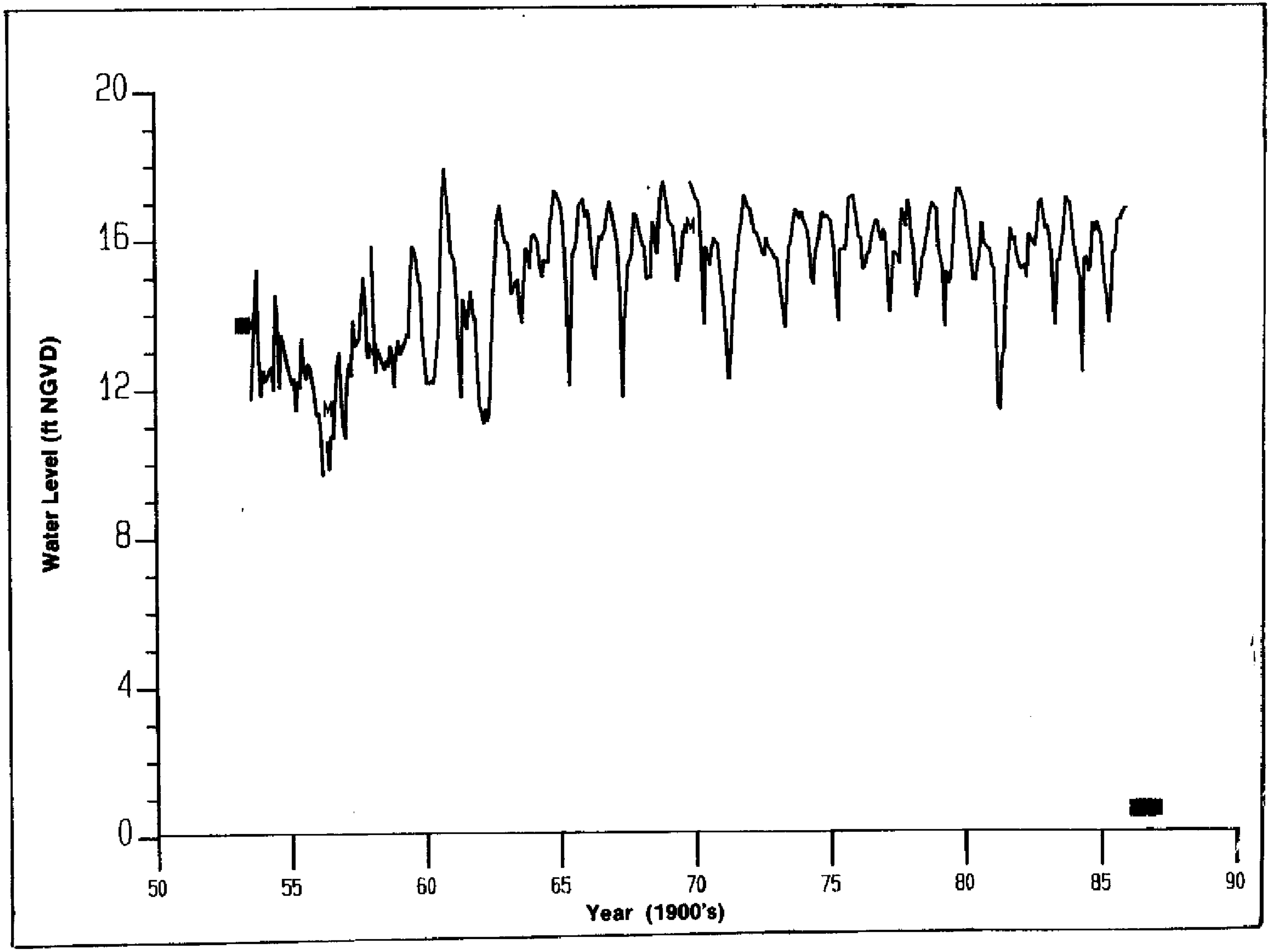

Figure 6 HISTORICAL WATER LEVELS IN WATER CONSERVATION AREA 1 MEASURED AT STATION CA1-8C

Table 5. USGS Regional Water Level Monitoring Wells in Eastern Palm Beach County with Water Level Measurements from October 1983 to May 1985

WELL	LATITUDE	LONGITUDE	x	y	TOTAL DEPTH (FT.)	CASED DEPTH (FT.)	TOP OF CASING (FT NGVD) *ESTIMATED	WATER LEVEL MEASUREMENTS (FT. NGVD) 10/27/83 TO 11/4/83	4/16/84 TO 4/25/84	11/9/84 TO 11/20/84	5/8/85 TO 5/8/85
PB 88	26 36 52	80 3 38	806952	830115	16	16	15.94	6.01	5.94	5.71	4.33
PB-99	26 40 5	80 3 35	807081	849605	18	16	22.65	9.27	8.59	7.76	7.25
PB-109	26 48 41	80 11 49	761935	901400	14	9		19.15	18.23	18.52	18.71
PB-445	26 33 28	80 8 52	778589	809317	11	11	20.2	18.1	17.28	17.5	17.35
PB-492	26 21 20	80 5 32	797270	735936	163	161	14.72	5.38	4.64	4.07	3.25
PB 556	26 21 18	80 5 15	798817	735745	200	190	* 15	5.79	3.99	4.85	3.46
PB-561	26 42 30	80 12 5	760721	863930	11	11			14.23		13.95
PB-563	26 50 27	80 11 56	761234	912099	9		22.6	18.02	17.9	18.14	17.45
PB-564	26 48 31	80 6 58	788309	900566	9		20.52			10.9	11.32
PB-565	26 58 12	80 5 39	795048	959283	22	22		6.58	3.3	2.37	
PB-566	26 56 4	80 9 44	772966	946205	10		* 19		14.53	14.54	15.53
PB-618	26 46 59	80 3 51	805322	891397	36	32	13.52		5.52	5.78	4.72
PB-620	26 47 31	80 3 55	804936	894626			11.75				6.12
PB-634	26 30 50	80 3 35	807492	793585	188		9.93			1.26	
PB-671	26 35 23	80 8 52	778512	820929	119		* 18	14.42	14.31		
PB-683	26 35 24	80 12 43	757540	820895	17	17	20.85		16.93	15.72	15.53
PB-684	26 40 41	80 17 12	732941	852759	18		20.76		13.51	11.92	12.2
PB-685	26 42 8	80 19 22	721102	861480	17		19.49		14.09	12.73	12.14
PB-687	26 55 25	80 11 30	763397	942205	17		18.36		16.67	15.1	
PB-689	26 56 33	80 20 30	714482	948787	17		27.43	27.18	24.24	24.20	23.92
PB-711A	26 55 10	80 8 34	779338	940795	50		16.84		12.09	11.81	10.39
PB-711B	26 55 10	80 8 34	779338	940795	29		16.84		11.4		
PB-715	26 51 14	80 17 31	730862	916665	81	72	26.01	22.77	21.81	21.84	21.07
PB-716	26 51 14	80 17 31	730862	916665	15		25.81	21.96	22.81	21.16	20.41
PB-717	26 55 19	80 17 18	731900	941410	20		24.51	23.65	21.46	21.58	21.03
PB-718	26 52 58	80 7 43	784047	927498	21		* 17	15.85	12.54	11.75	9.5
PB-719	26 50 18	80 7 41	784339	911343	24		18.86		13.25	13.01	12.07

Table 5. USGS Regional Water Level Monitoring Wells in Eastern Palm Beach County with Water Level Measurements from October 1983 to May 1985 (Continued)

WELL	LATITUDE	LONGITUDE	x	y	TOTAL DEPTH (FT.)	CASED DEPTH (FT.)	TOP OF CASING (FT NGVD) *ESTIMATED	WATER LEVEL MEASUREMENTS (FT. NGVD) 10/27/83 TO 11/4/83	4/16/84 TO 4/25/84	11/9/84 TO 11/20/84	5/6/85 TO 5/8/85
PB-732	26 22 18	80 7 1	789133	741736	100	100	13.38	7.46	5.8	7.95	
PB-738	26 31 37	80 12 16	760133	797991	24		* 19	15.83	15.5	15.6	15.56
PB-750	26 38 16	80 16 11	738558	838150	83	80	16.6		13.16	12.6	12.61
PB-751	26 38 16	80 16 11	738558	838150	25	20	16.68		12.99	12.39	12.87
PB-752	26 20 18	80 6 38	791309	729634	23	21	11.86	5.61	4.16	4.36	
PB-789	26 55 50	80 7 18	786190	944881	110		6.86	6.86	4.09	4.24	3.33
PB-799	26 46 19	80 5 46	794928	887283	151	146	16.69		8.64	8.16	
PB-800	26 46 12	80 4 46	800372	886615	67	62	18.34		10.82	10.59	10.1
PB 809	26 41 23	80 5 38	795866	857400	150	145	16.65		12.56	10.41	
PB 830	26 51 6	80 24 14	694365	915669	220	126	22.2	20.47	18.52	19.5	18.9
PB 831	26 51 6	80 24 14	694365	915669	25	21	24.9		22.48	19.97	21.88
PB-832	26 56 11	80 8 12	781288	946968	141		14.17		3.22	3.08	0.68
PB-845	26 46 53	80 6 37	790281	890683	89	84	20.71	15.35	14.71		
PB-875	26 54 39	80 10 29	768949	937595	24	20	18.46		13.46		11.65
PB-876	26 54 39	80 10 29	768949	937595	43	39	18.11		13.56	13.21	11.84
PB-877	26 54 39	80 10 29	768949	937595	108	100	17.43		13.16	13.04	11.36
PB-900	26 25 34	80 8 51	778997	761458	63	63	23.71		14.32	14.4	14.53
PB-921	26 51 53	80 3 14	808454	921109	150	145	19.96		1.58	2.74	
PB 936	26 36 6	80 11 51	762234	825166	15	10	21.63		15.77	15.44	15.11
PB-947	26 24 35	80 4 29	802859	755666	87		15.71	4.49	2.55	3.29	
PB-1063	26 19 50	80 7 43	785414	726767	134	129	14.82	8.18	7		6.74
PB-1084	26 50 27	80 10 2	771560	912166	138	130	17.95	15.68	15.1	15.1	13.8
PB-1085	26 50 27	80 11 57	761143	912099	87	80	18.02	18.02	16.98	17.23	16.01
PB-1089	26 42 26	80 8 47	778681	863542	135	130	15.78	12.71	11.82	11.36	10.43
PB-1094	26 36 29	80 17 14	732902	827314	100	90	14.78		13.61	13.57	12.48
PB-1096	26 31 38	80 9 52	773213	798175	90	80	19.25		17.04	15.82	15.81
PB-1097	26 31 44	80 13 40	752499	798651	90	80	26.09		16.5	16.37	15.15
PB 1098	26 48 35	80 13 2	755325	900753	80	70	18.26	18.56	16.76	17.25	15.77

Table 5. USGS Regional Water Level Monitoring Wells in Eastern Palm Beach County with Water Level Measurements from October 1983 to May 1985 (Continued)

WELL	LATITUDE	LONGITUDE	x	y	TOTAL DEPTH (FT.)	CASED DEPTH (FT.)	TOP OF CASING (FT NGVD) *ESTIMATED	WATER LEVEL MEASUREMENTS (FT. NGVD) 10/27/83 TO 11/4/83	4/16/84 TO 4/25/84	11/9/84 TO 11/20/84	5/6/85 TO 5/8/85
PB-1099	26 52 50	80 10 36	768387	926585	90	80	19.61	17.78	16.75		15.31
PB-1100A	26 20 7	80 13 45	752467	728274	75	65	15.66	10.48	10.34	9.98	9.77
PB-1100B	26 20 7	80 13 45	752467	728274	100	90	15.66	10.46	10.28	10.01	9.76
PB-1101	26 24 5	80 7 18	787513	752529	95	85	20.28	18.96	16.29	15.14	13.95
PB-1104	26 26 45	80 7 18	787403	768684	105	95	17.01	14.78	13.41	12.54	12.6
PB-1105	26 19 38	80 10 10	772047	725467	140	130	16.14	10.32	10.06	10.01	9.29
PB-1107	26 28 8	80 13 17	754721	776854	105	95	25.28		13.99	14.63	13.05
PB-1108	26 24 3	80 14 13	749778	752087	90	80	25.91		13.78	14.74	12.38
PB-1109A	26 51 15	80 17 31	730861	916766	45	35	24.71	22.34	21.96	21.57	21.23
PB-1109B	26 51 15	80 17 31	730861	916766	130	120	24.78	22.32	20.06	22	20.9
PB-1152	26 39 42	80 16 40	735877	846819	112		15.81	13.84	13.42	12.64	13.07
PB-1153	26 40 27	80 13 50	751273	851452	44		16.62	13.37	13.35	12.77	12.38
PB-1155	26 37 55	80 10 26	769879	836220	120		18.06	14.93	15.1	14.29	13.77
PB-1156	26 37 52	80 12 7	760715	835859	115		17.93	15.17	15.41	15.28	14.33
PB-1157	26 42 16	80 13 44	751751	862461	100		18.19	16.12	14.6	14.69	13.88
PB-1460	26 45 53	80 18 27	725966	884225	30		23.54	18.09	16.9	17.82	17.44
PB-1461	26 41 9	80 21 52	707528	855452	45		* 15.5	10.75	10.84	10.55	10.1
PB-1462	26 46 25	80 23 35	698033	887313	40		19.77	13.23	12.93	12.71	12.4
PB-1481	26 43 25	80 26 27	682524	869067	215		12.55	7.02	6.98	7.17	7.3

Regional Levels and Fluctuations

Regional water table maps for April 24-26 and November 9-14, 1984 were developed by Miller (1985a, 1985b) using the available ground water level data in conjunction with selected surface water level data. The water table elevations shown on these maps are erroneous where they were based on data from wells with inaccurate casing elevations (see discussion in preceding section). However, these maps were used to determine water level changes between April and November since the errors had equal effects on both maps. To determine the general flow patterns and water table elevation, the November map was modified using revised water levels based on the 1988 well surveying and using additional surface water level data. The modified map is presented on Plate 19. Modification of one map was considered sufficient for these purposes since water level changes between April and November were generally small and did not significantly affect the regional flow pattern.

Differences between the November and April water levels ranged from 2.15 to -2.51 ft. Typically, water levels are expected to be higher during the wet season than during the dry season. However, the period preceding the November (wet season) 1984 water level measurements was dryer than normal and the period preceding the April (dry season) 1984 measurements was wetter than normal. As a result, the November water levels were slightly lower (0.22 ft. on average) than the April water levels.

The highest water levels in the study area exceed 24 ft. in a large mound in the northwest where surface water drainage is minimal. Water levels decrease sharply to the southwest of the mound to the level of the L-8 canal, which is approximately 12 ft. NGVD. Southeast of the mound, there is a water level plateau above 18 ft. NGVD resulting from the influence of the M canal and the West Palm Beach Water Catchment Area. Water levels to the south of the plateau decline gradually towards C-51 which forms a north/south ground water divide in the study area with its control elevation of 10.5 to 8 ft. NGVD. Water levels to the east of both the mound and plateau also decline gradually reaching sea level at the coast. Although C-51 and the ocean determine the net change in water levels south and east of the mound, water levels and gradients in this area are strongly influenced by the numerous surface water systems present.

In most of the study area south of C-51, water table elevations are controlled by the regulated surface water levels of the LWDD canals. Ground water levels are highest in the LWDD central basin and decline outward as surface water control elevations decline in the surrounding basins. Ground water levels outside the LWDD, in the triangle adjacent to C-51 and WCA-1 and west of SR 441, are largely controlled by C-51, WCA-1, and the Acme Improvement District canals. Ground water levels in this area are also influenced by the Pine Tree Water Control District drainage canals.

Changes in the water table elevation in the study area typically follow seasonal rainfall trends with ground water levels generally higher during the wet summer months than during the dryer winter months. The direct correlation between ground water levels and rainfall is clearly apparent in Figure 7 which shows historic water levels in well PB-732 as compared to rainfall at the nearest rainfall station, MRF-102, in the same period. The ground water response to rainfall is damped in areas heavily influenced by canals. This is shown in Figure 8, which illustrates historical water levels in well PB-900 as compared to rainfall in the same period at

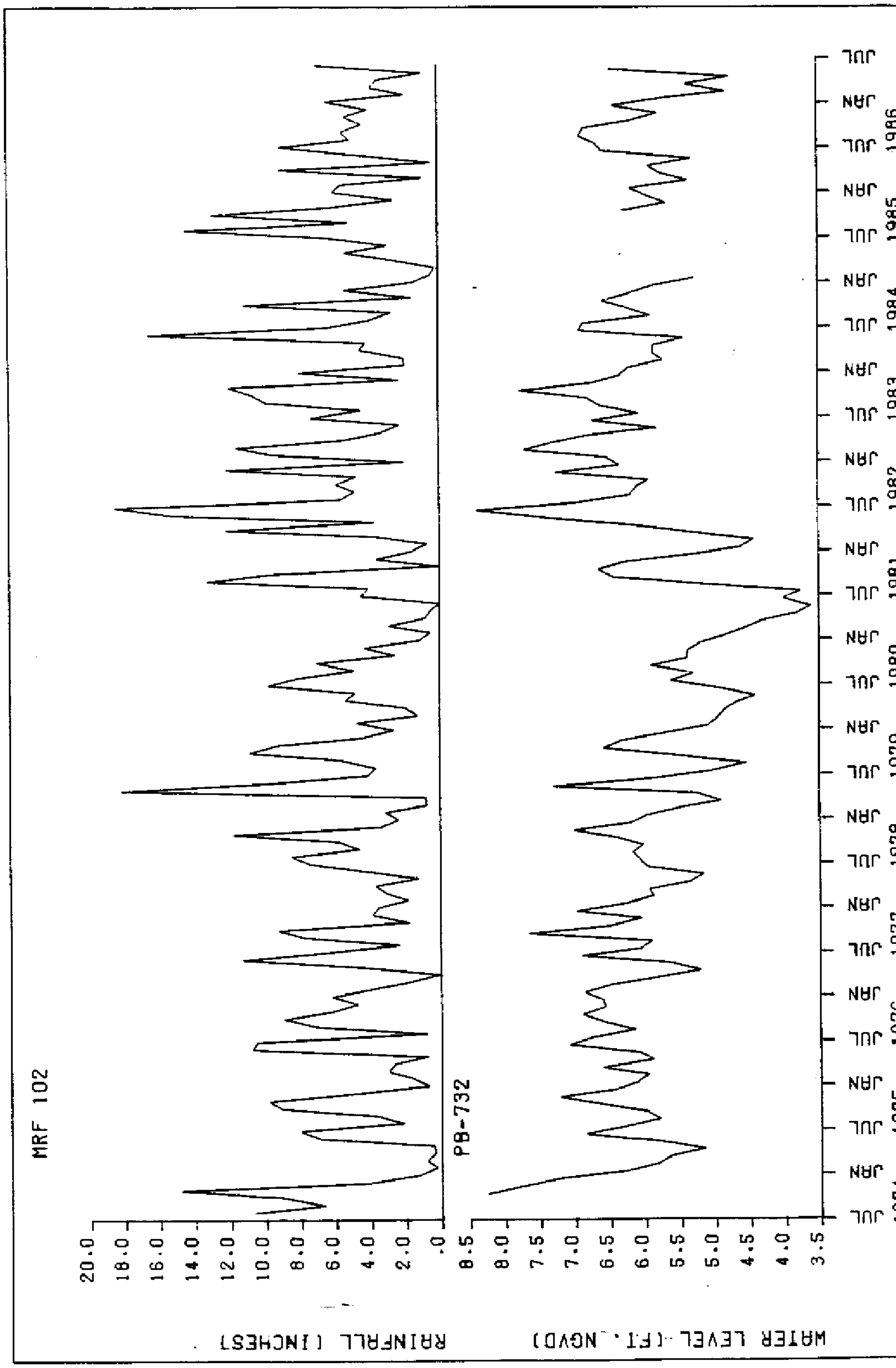

Figure 7 COMPARISON OF RAINFALL AT STATION MRF-102 AND GROUND WATER LEVELS IN WELL PB-732

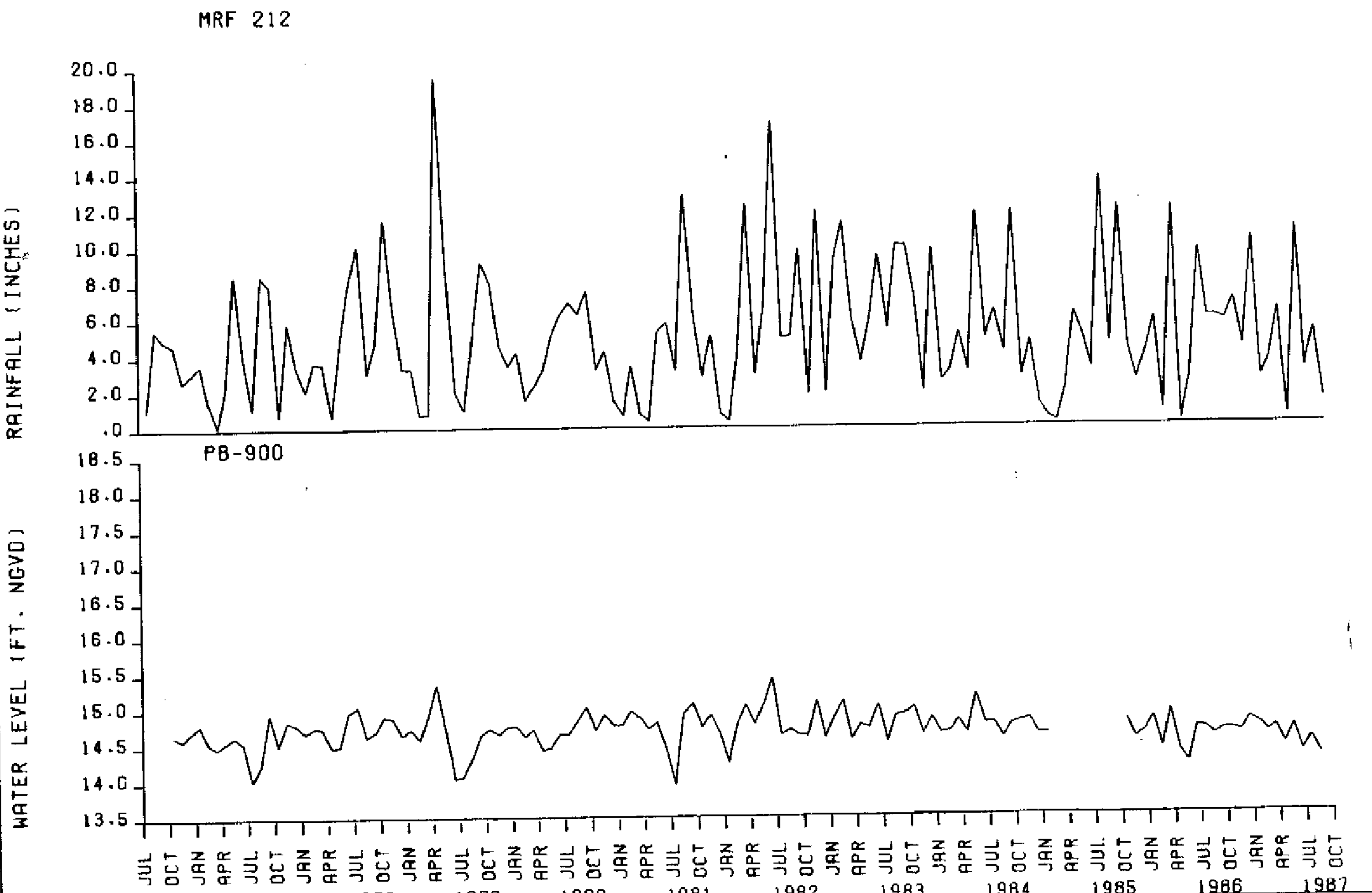

Figure 8 COMPARISON OF RAINFALL AT STATION MRF-212 AND GROUND WATER LEVELS IN WELL PB-900

MRF-212, the closest rainfall station. Levels in PB-900 which is only 21 ft. from a controlled canal in the LWDD show only a slight response to rainfall as compared to the response in well PB-732 which is approximately one quarter mile from the nearest canal. The locations of the wells and rainfall stations are shown on Plate 18 and Figure 9, respectively.

Ground Water Flow

Ground water moves from areas with high water levels (hydraulic heads) to areas of lower water levels at a rate proportional to the hydraulic gradient (difference in heads over distance) and the hydraulic conductivity of the aquifer. Regional ground water flow directions are, in general, perpendicular to the water table contours (equipotential lines) shown on Plate 19.

In the northern part of the county, the primary flow is radially outward from the ground water mound toward three major discharge areas; east to the Intracoastal Waterway and Atlantic Ocean; south and southeast to C-51; and southwest to the L-8 canal. There appears to be little flow to the north.

In the southern part of the study area, ground water generally flows eastward from WCA-1 and outward in all directions from the LWDD upper canal basin system which parallels the Florida Turnpike. Most of the flow from the upper LWDD basin is directed east to the Intracoastal Waterway and north to C-51. Some of the upper basin flow is also directed southwest toward the LWDD basin bordering WCA-1, which also receives ground water flow from WCA-1 due to its low maintenance elevation. Ground water flows out of this basin into the Hillsboro Canal.

Local ground water flow may vary from regional flow patterns in response to local hydraulic gradients. This occurs most commonly in the vicinity of production wells which create local flow gradients toward themselves. Local surface water features may also influence ground water flow.

RAINFALL

Rainfall recharges the Surficial Aquifer System over its entire area. Average annual rainfall ranges from 56 to 62 inches in the study area (MacVicar, 1983). Most of this rain, 42 to 46 inches on average, falls during the wet season from May through October. Average rainfall during the dry season, November through April, is approximately 14 to 17 inches. Wet and dry season durations may vary from year to year.

Rainfall in south Florida is often a localized phenomenon, particularly during the wet season when convective thunderstorms are common. Frequently, these events are very intense and of short duration. Conversely, rainfall from frontal systems is more widespread but occurs less frequently. Given the variable nature of the rainfall patterns, a large number of well distributed gauging stations are needed to reliably determine the rainfall frequency and magnitude in the study area.

Monthly rainfall distribution patterns in the study area from October 1983 to May 1985 were mapped based on data from over 40 rainfall stations in and near the boundaries of the study area. Figure 9 shows the stations used in the study area. The mapping was done using a kriging interpolation and contouring program (Surfer, Golden Software). Kriging interpolation techniques were used based on a study by Tabios and Salas (1985) which concluded that kriging was one of the best methods for

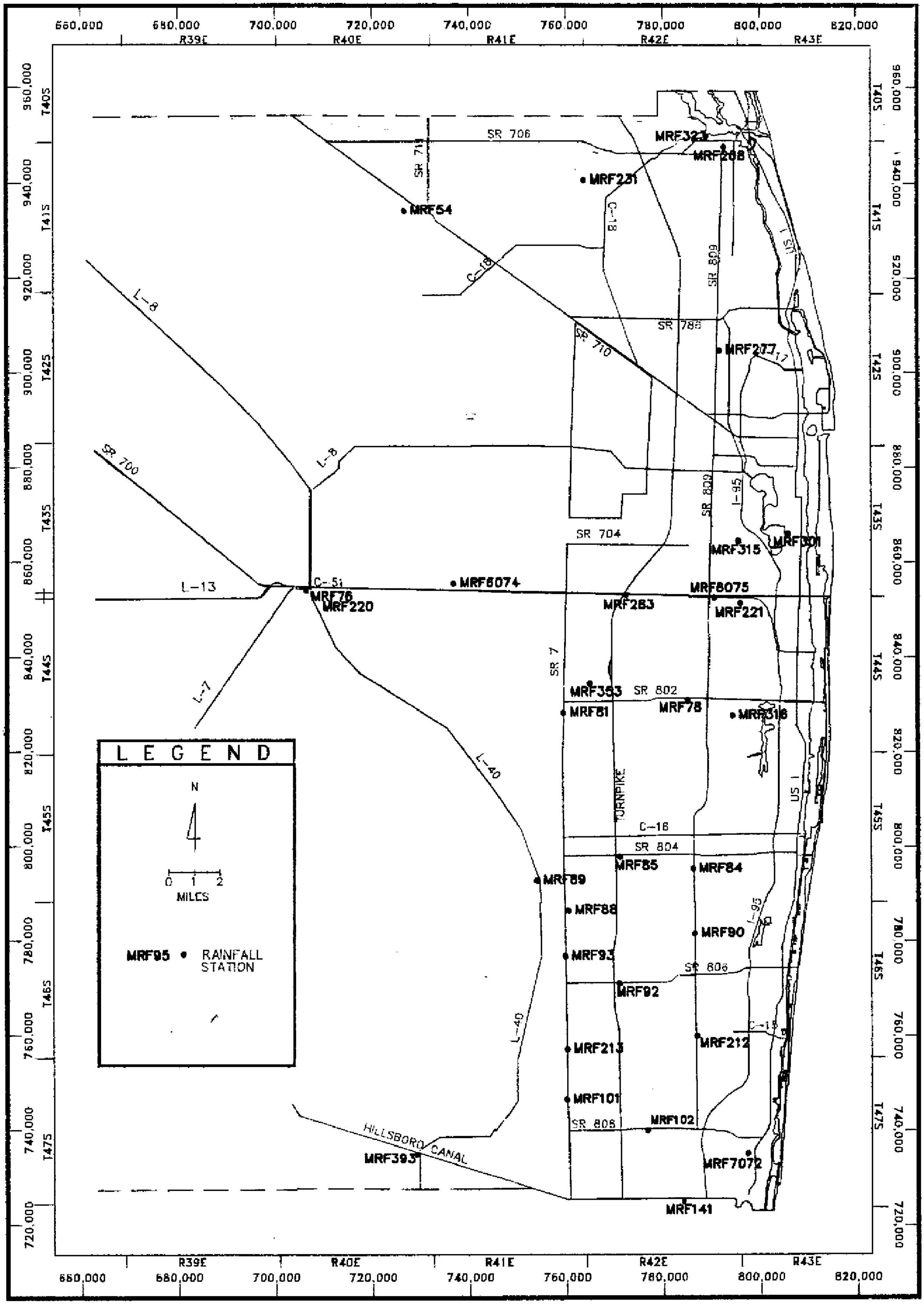

Figure 9 PALM BEACH COUNTY RAINFALL STATIONS WITH DATA AVAILABLE FOR THE CALIBRATION PERIOD

spatial interpolation of precipitation. Results of the mapping, presented in Appendix D, confirm the large spatial variation in rainfall.

Some rainfall does not reach the water table to recharge the aquifer but goes instead to interception, surface water runoff, evapotranspiration, or unsaturated soil storage. The percentage of rainfall reaching the water table to recharge the aquifer is dependent on numerous factors including the water table depth, soil type, vegetation, surficial drainage systems, and relative permeability of the surface. An in-depth investigation of the percentage of rainfall reaching the water table was beyond the scope of this study. However, for development of the ground water flow models presented in later sections of this report, the percentage was assumed to vary between 50 and 100 percent depending on the degree of cultural development inferred from county land use maps. For further discussion, see the recharge portion of the ground water modeling section.

EVAPOTRANSPIRATION

Evapotranspiration (ET), water loss through evaporation and plant transpiration, is the largest source of ground water loss from the system. ET is a complicated process controlled primarily by weather, vegetation, soils, and water availability. Meteorologic factors including net solar radiation, air relative humidity, temperature, and wind speed and duration are dominant in controlling potential ET, the ET rate when not limited by deficiencies in available water (Dunne and Leopold, 1978). Vegetation and soil factors, such as vegetation type, soil type, and soil water availability, become significant in determining actual ET, the ET rate when water supply is limited. The combined effects of all these factors make it difficult to accurately estimate ET. There are numerous methods using different combinations of factors available to estimate ET. Two methods, the Penman Method and the modified Blaney-Criddle Method, were used in this study.

The Penman formula, used in this study to determine potential ET, is based on four major climatic factors, net radiation, air temperature, wind speed and saturation vapor pressure deficit (dryness of the air). Jones et al., 1984, considered this the most reliable method for estimating ET from cropland and used it to calculate potential ET for several locations in Florida, including Hialeah, Florida. Since Hialeah and most of the study area have similar climatological characteristics (they are in the same climatological division, lower east coast, as defined by the National Climatic Center), the Hialeah results were used to estimate maximum potential ET and the monthly distribution of ET in the study area. Table 6 shows the Hialeah data and monthly percentages of annual ET.

The Blaney-Criddle formula incorporates crop type, mean temperature and percentage of annual daylight hours during the month to predict potential ET. The modified formula, used by the Water Use Division of the SFWMD, includes coefficients reflecting the growth stage of the crop and a correction for mean air temperature. In contrast to the Penman method, the Blaney-Criddle formula overpredicts ET for the summer months in Florida, by not accounting for the high percentage of summertime cloud cover (Jones, Allen et al., 1984). This method was used in this study to predict ground water usage for irrigation as a function of crop consumptive water use (as described later in the Calibration Period Water Use section).

TABLE 6. **Monthly Free Water Evaporation and Potential Evaporation for Green Vegetated Surfaces for Hialeah, Florida Based on the Penman Method.**

Month	Hialeah, 25°50' N. Lat.		
	Free Water Evaporation $\alpha = 0.05$ (E_o) (Inches)	Monthly Potential Evaporation-Green Vegetated Surface $\alpha = 0.23$ (ET_p) (Inches)	Percentage of Annual E_o
Jan	3.54	2.68	5
Feb	4.57	3.50	7
Mar	5.75	4.45	8
Apr	7.09	5.59	10
May	7.52	5.94	11
Jun	7.20	5.71	10
Jul	7.76	6.14	12
Aug	7.44	5.87	11
Sep	6.22	4.96	9
Oct	5.12	4.02	7
Nov	3.86	2.91	6
Dec	3.07	2.32	4
Annual	69.13	54.09	100

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GROUND WATER MODELING (Surficial Aquifer System)

INTRODUCTION

The Surficial Aquifer System in eastern Palm Beach County was modeled using the USGS three-dimensional finite-difference ground water flow model code, MODFLOW (McDonald and Harbaugh, 1984). MODFLOW is a fully three-dimensional model with modular code packages to simulate rivers, recharge, wells, drains, and evapotranspiration. No-flow boundaries are implicit around the edges of the model, and within the model no-flow or constant head boundaries may be set. Sources of water external to the model can be represented using the general head boundary package. There are three iterative solution schemes which may be used in the model, the strongly implicit procedure, the slice-successive overrelaxation technique, and the preconditioned conjugate gradient method (Kuiper, 1987). The various MODFLOW packages with their functions and use in the Palm Beach models are shown in Table 7.

The study area was modeled in two parts, north and south, split at the C-51 canal as shown in Figure 10. This allowed finer areal discretization than would have been practical in a single model. However, the north and south discretizations are compatible so that the two models may be combined if desired. The north model extends from C-51 north to the Palm Beach - Martin County line and from the Intracoastal Waterway west to approximately the L-8 canal. The south model extends from C-51 south to the Hillsboro canal and from the Intracoastal Waterway west to Water Conservation Area I.

GENERAL APPROACH

Discretization

Both models were set up with uniform one half mile areal grids, as shown in Figures 11 and 12. They share common cells along the C-51 boundary. Each model was vertically discretized into six layers so that variations in the aquifer's hydraulic conductivity and thickness could be represented. The vertical layering also allowed good representation of both canal and well partial penetration effects. The thickness and vertical extent of layers in each model were varied to follow the hydraulic conductivity zones. Details of the vertical discretization for each model are described in the north and south county layering sections later in this report.

Boundary Conditions

Both models use a combination of no-flow, constant head, and general head boundary conditions. Boundary conditions treated similarly in the two models are discussed below; those specific to each model are discussed later in the individual modeling sections.

The eastern boundary in each model is the Intracoastal Waterway where the freshwater/saltwater interface is assumed to occur. The interface is represented in the models by constant head cells in the first layer underlain by no-flow cells in the lower layers. This is intended to approximate a wedge shaped interface with the freshwater flow forced upward by the saltwater wedge to an outflow point above the saltwater. However, the no-flow cells are not staggered to represent an actual wedge shape since the model cells are one half mile wide and the interface is assumed to

TABLE 7. PACKAGES IN MODFLOW USED IN THE PALM BEACH COUNTY MODELS

MODFLOW PACKAGE	FUNCTION	NORTH MODEL	SOUTH MODEL
BASIC	Model Administration	Used.	Used.
BLOCK CENTERED FLOW	Computation of conductance and storage components of finite-difference equations.	Used.	Used.
RIVER	Simulates effects of river leakage. Rivers may recharge or drain the aquifer depending on the head gradient between the river and the aquifer.	Used to represent all drainage district canals with controlled water levels.	Used to represent Lake Worth Drainage District and ACME Improvement District canals.
RECHARGE	Simulates recharge to the aquifer from infiltration of precipitation.	Used with measured precipitation distributed areally assuming 50 to 100% of the precipitation infiltrates to the aquifer.	Used with measured precipitation distributed areally assuming 50 to 75% of the precipitation infiltrates to the aquifer.
WELL	Simulates a source/sink to the aquifer that is not affected by heads in the aquifer.	Used to represent discharge from wells with individual permits from the SFWMD.	Used to represent discharge from wells with individual permits from the SFWMD.
DRAIN	Simulates discharge from the aquifer to drains.	Used to represent C-18, C-17, and all drainage district canals with uncontrolled water levels.	Used to represent uncontrolled canals in NW corner of model.
EVAPO-TRANSPIRATION	Simulates evapotranspiration where the source of water is the saturated porous medium.	Used to represent ET with a maximum rate of 69"/yr. at land's surface declining linearly to 0 at 7.5' below grade.	As north.
GENERAL HEAD BOUNDARY	Simulates a source/sink of water providing recharge/discharge to the aquifer at a rate proportional to the head difference between the source/sink and the aquifer.	Used to represent C-51, L-8 extension, M Canal, Water Catchment Area, Lake Mangonia and Clear Lake.	Used to represent C-51 and Hillsboro Canals.
STRONGLY IMPLICIT PROCEDURE (SIP)	Solves the model's finite difference equations using the Strongly Implicit Procedure.	Used for final calibration and predictive runs.	Used.
PRECONDITIONED CONJUGATE GRADIENT	Solves the model's finite difference equations using the Preconditioned Conjugate Gradient Method.	Used for early calibration and sensitivity runs when there were convergence problems with SIP.	Not used. Unnecessary, SIP solves faster.

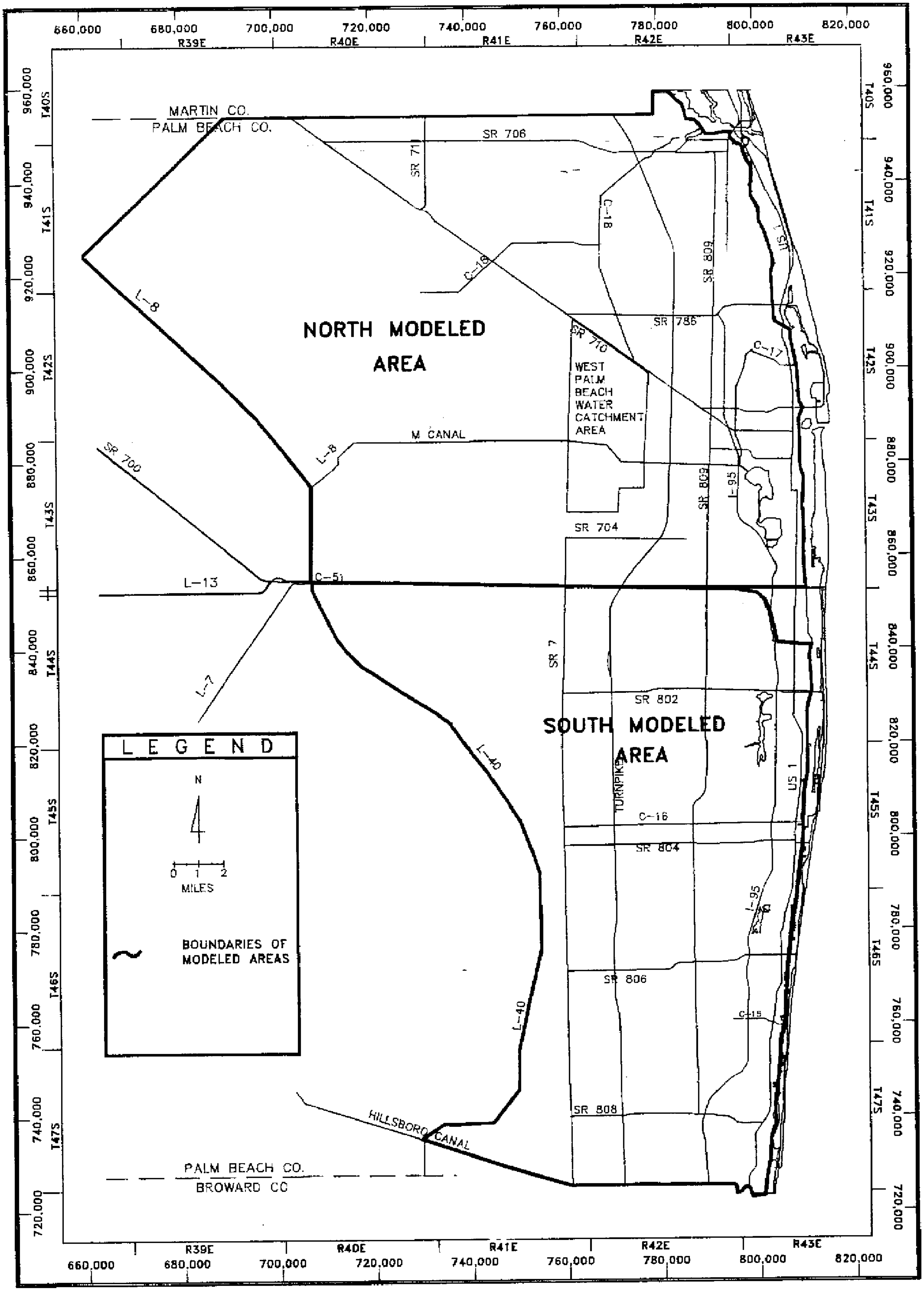


Figure 10 AREAS MODELED WITH THE NORTH AND SOUTH PALM BEACH COUNTY GROUND WATER FLOW MODELS

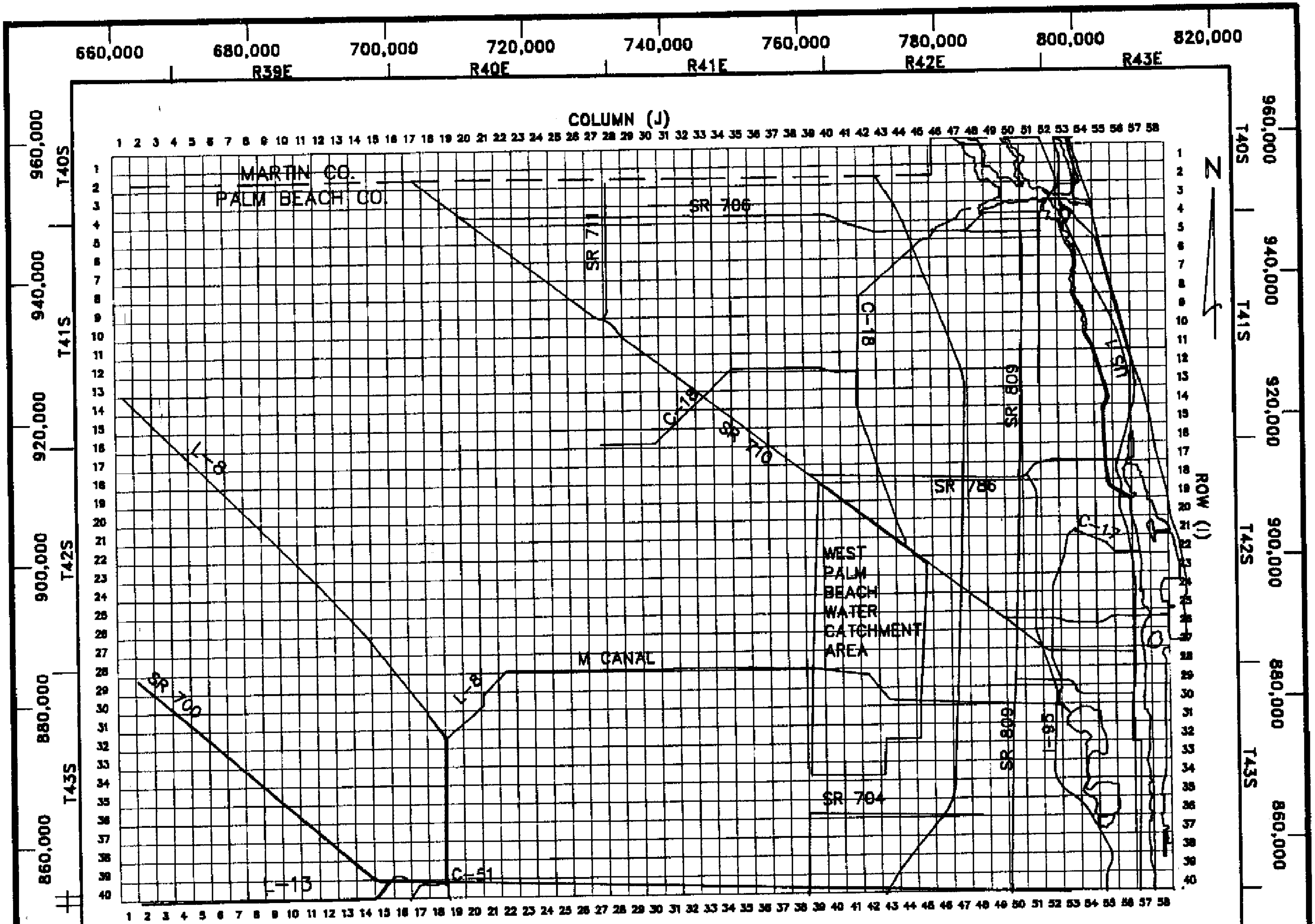


Figure 11 NORTH PALM BEACH COUNTY MODEL GRID

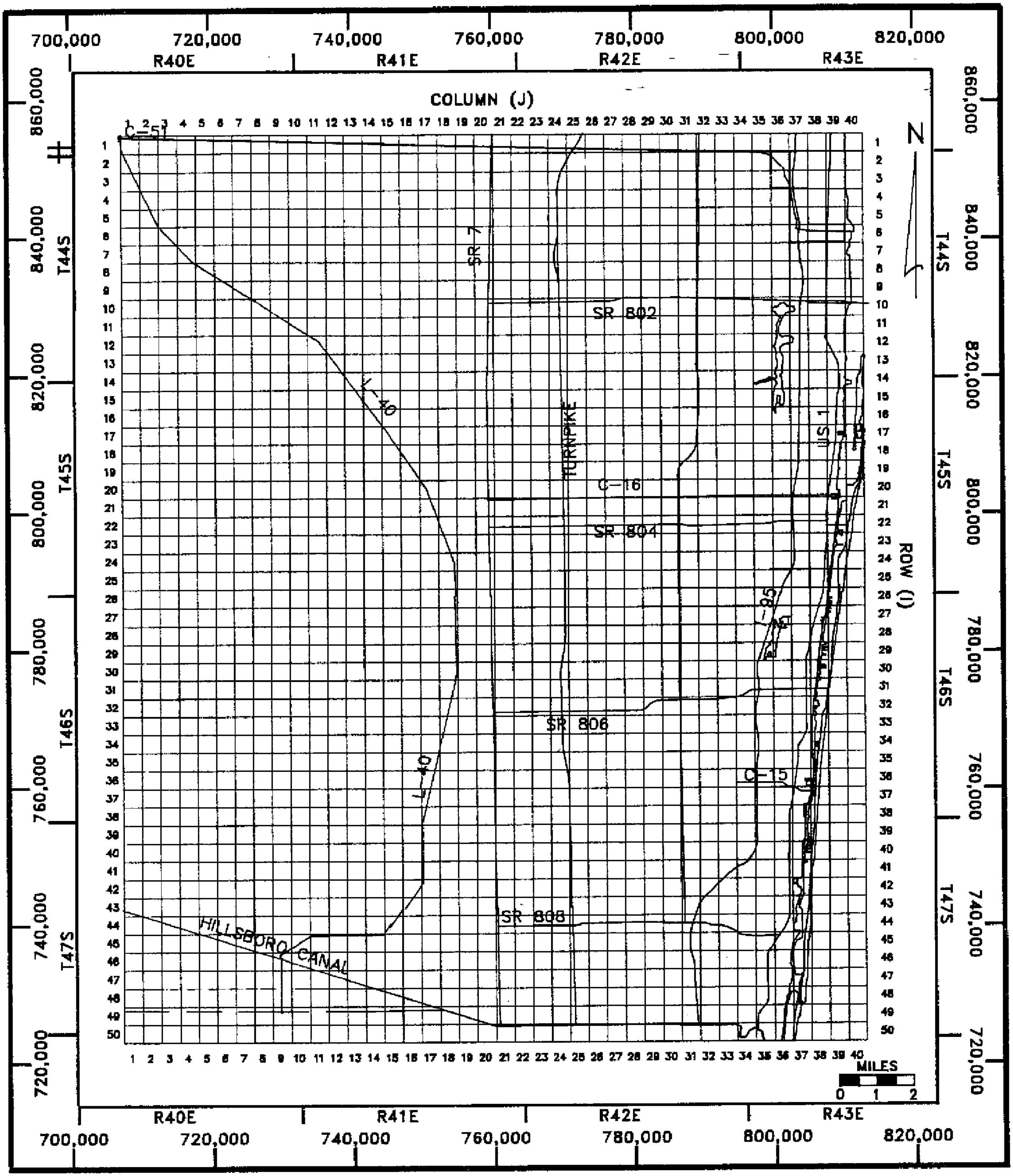


Figure 12 SOUTH PALM BEACH COUNTY MODEL GRID

extend over a lesser area based on available coastal profiles (Scott, 1977). The constant head cells were set to 0.6 ft. NGVD based on the average water levels observed in the Intracoastal Waterway in Palm Beach County by Schneider (1973).

The C-51 and Hillsboro canals are assumed to act as ground water divides and are therefore used as boundaries in the models. In the strict sense, these canals are not true divides since they vertically penetrate only a small part of the aquifer. However, observed water levels indicate that the canals are acting as divides under present conditions, primarily because the canal water levels are being maintained below ambient ground water levels. Significant stress on the aquifer near the C-51 and Hillsboro canals could cause flow under the canals; the model's boundaries should be adjusted accordingly if such stresses occur or must be simulated.

The C-51 and Hillsboro canals are represented in the models by general head boundaries in the first layer (neither of the canals penetrates beneath this layer). The general head boundaries act as constant head sources outside the model with a conductance to the model cell they are located in. Flow between the boundaries and the cells containing them is proportional to the conductance which is based on the length, width, sediment thickness, and sediment hydraulic conductivity of the canal reaches represented by the boundaries. The direction and magnitude of flow is determined by the difference between the heads specified for the boundaries and those simulated for the model cells, thus the boundaries represent the canals acting as either sources to or sinks from the aquifer depending on the canal/aquifer head gradients.

The ground water divide under the canals is represented by no-flow conditions along the outer edges of the cells containing the canals and all the cells underlying them. The underlying cells were left active to allow upward flow in the model to represent upward leakage into the canals.

Hydraulic Characteristics

The Surficial Aquifer System is heterogeneous and anisotropic as a result of its widely varied composition. The system is generally composed of a sand or sand/shell layer overlying limestone/sandstone with selective secondary solutioning. Hydraulic conductivities in the system estimated from pump tests vary over two orders of magnitude with a minimum of 14 and a maximum of 4,000 ft./day. The hydraulics of the system are further complicated by the presence of vertically and areally discontinuous clay zones.

The Surficial Aquifer System was divided into three hydraulic conductivity zones for modeling purposes; a zone of very high permeability representing the Biscayne aquifer (zone 1); a zone of intermediate permeability representing the production zone tapped by most non-Biscayne wells in the north county area (zone 2); and a zone of low permeability representing the remainder of the system (zone 3). Horizontal hydraulic conductivities of 1600, 150, and 50 ft./day were used for zones 1, 2 and 3 respectively. There is little information on the vertical hydraulic conductivity of the Surficial Aquifer System in the study area. For the Palm Beach models, a vertical to horizontal anisotropy ratio of 0.1 was assumed for all zones of the aquifer.

Only two of the zones, 1 and 3, were used in the south county model. The production zone, zone 2, was neglected since most south county pumpage is from zone 1, the Biscayne aquifer, which extends over the bulk of the modeled area and is expected to dominate the flow patterns with its highly transmissive nature. All three zones were used in the north county model where the limited extent of the Biscayne makes permeability differences in the other two zones more significant.

Clay lenses, which are present but not well defined in the aquifer, were not represented explicitly in the models since their discontinuous nature gives them a local rather than regional influence.

Recharge

Recharge to the aquifer from precipitation is simulated by the recharge package in MODFLOW. The package, as used in the Palm Beach models, specifies the amount of recharge applied to each active cell in the top layer of each model. The recharge may be applied uniformly or varied areally over the modeled areas.

Recharge in the Palm Beach models was based on precipitation and varied areally using recharge factors of 1 (100%) , 0.75 (75%) , and 0.5 (50%) related to land use by the following simplifying assumptions:

1) 100% of the precipitation reaches the water table in areas composed of predominantly of wetlands such as the West Palm Beach Water Catchment Area and the Corbett Wildlife Refuge. (Note: there were no such areas in the active portion of the south county model).

2) 75% of the precipitation reaches the water table in areas where the predominant land use types are agricultural, undeveloped, vacant, golf courses, recreation, very low residential, low residential, or medium residential.

3) 50% of the precipitation reaches the water table in developed areas where the land use type is predominantly high residential or commercial/industrial.

The resulting distribution of recharge in the north and south county models is shown in Figures 13 and 14. The land use maps used to determine the recharge distribution were developed by the SFWMD Resource Planning Department (Lashua, written correspondence) and are shown in Appendix E.

Recharge during the steady state phase of model calibration was based on an average rainfall of 61 in./year. Recharge during the transient calibration period was varied monthly and distributed areally based on precipitation data collected at 31 rainfall stations in or near the modeled areas (refer to Figure 9). The recharge estimates for the predictive runs were based on long term rainfall averages (MacVicar, 1983) of 61 in. per year, 45 in. per wet season and 17 in. per dry season.

Evapotranspiration

Loss of ground water to evapotranspiration (ET) was represented in the models with the ET package. As the package was used, the modeled ET rate has a maximum when the water table is at land surface and declines linearly with depth to a designated extinction depth below which there is no ET. Thus, the actual rate varies areally throughout the model and temporally, from time step to time step, as a function of aquifer heads relative to land surface. Maximum ET rates in the model were based on calculations of free water evaporation by Jones et al. (1984) using the

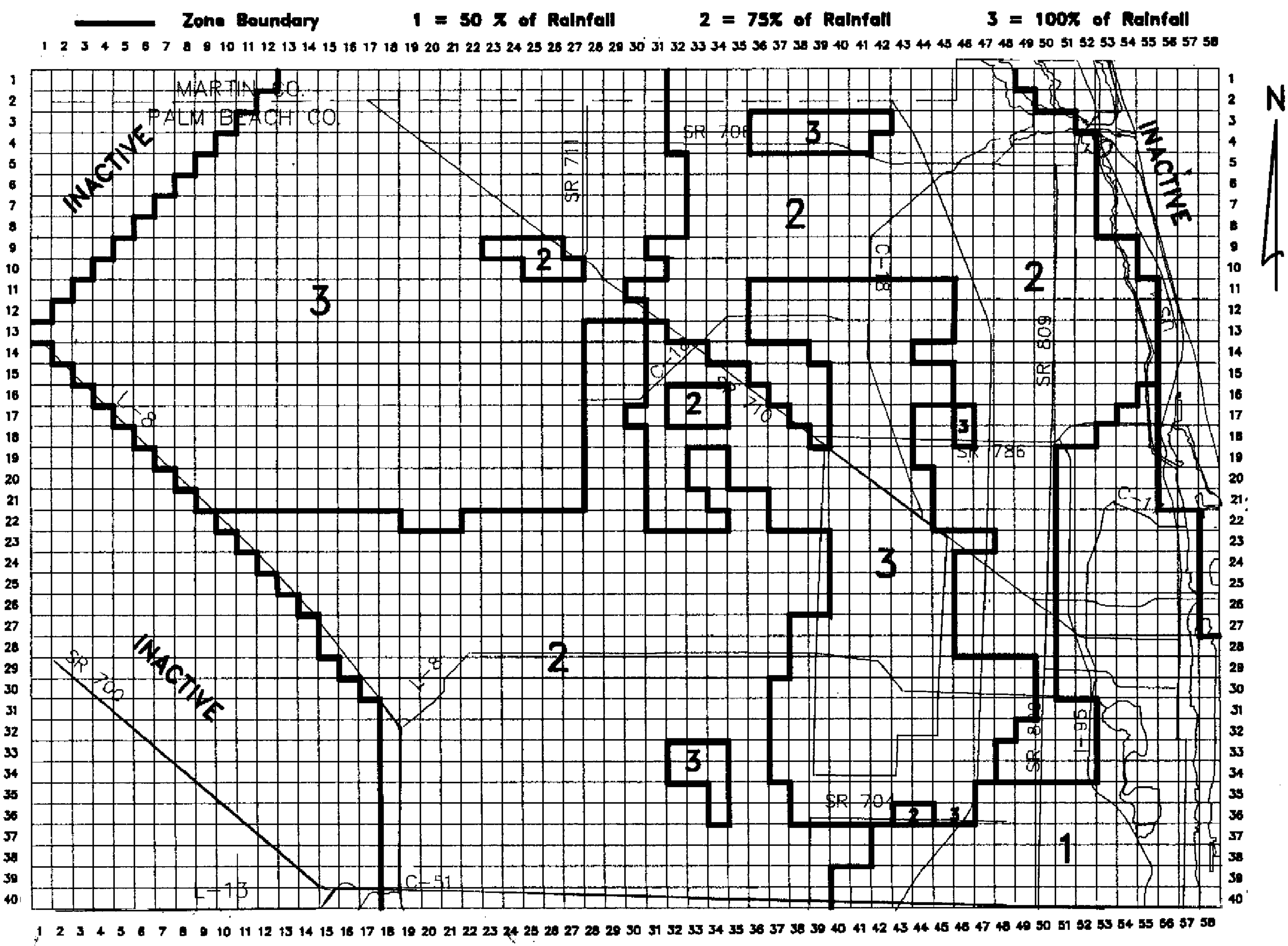


Figure 13 NORTH PALM BEACH COUNTY MODEL RECHARGE ZONES

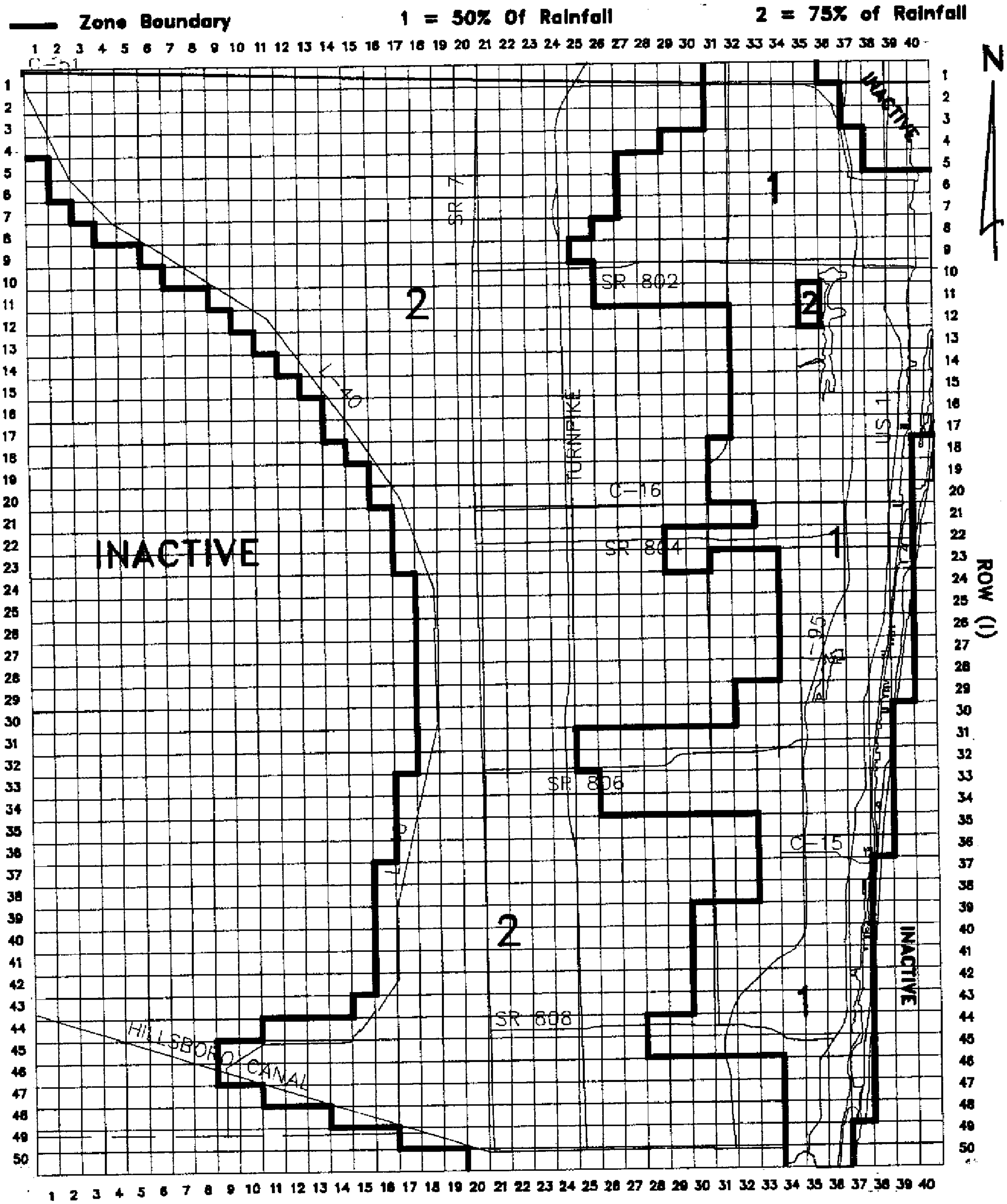


Figure 14 SOUTH PALM BEACH COUNTY MODEL RECHARGE ZONES

Penman method with data from the Hialeah, Florida weather station. The annual average ET rate was 69 in., while monthly values ranged from 3 to 7.8" in. as shown in Table 6. Average dry season (November through April) ET was 3.51 inches. The extinction depth used in the modelling was set to 7.5 ft. below land surface, the value used by Land (1975) in modeling southeast Palm Beach County.

Canals/Lakes

Canals and lakes were represented in the models using either the drain, river, or general head boundary packages. The general head boundary package was used to represent canals with controlled heads along the model boundaries, as previously discussed in the boundary condition section. It was also used to represent the West Palm Beach Water Catchment Area, the M canal, Clear Lake, and Lake Mangonia in the north county model. The river package was used to represent all other controlled canals in the models while the drain package was used to represent all canals with uncontrolled water levels.

The river package functions similarly to the general head boundary package. It represents each canal reach as a source of water outside the aquifer with a conductance to the aquifer based on the canal length, width or wetted perimeter, sediment thickness, and sediment hydraulic conductivity within each model cell. Flow between the canal and the aquifer is determined by the head difference existing between the canal reach and the model cell containing it and is proportional to the conductance. Heads in the river reaches are set to the canals' control elevations. Flow direction may be either from the river reaches to the aquifer or vice versa depending on the direction of the head gradient. Thus, river nodes may serve as either a source or sink of water with respect to the aquifer with both flow volume and direction varying according to the head gradients.

The drain package is similar to the general head boundary and river packages except that the drain package simulates flow in one direction only, from the aquifer to the drain, while the other two packages simulate flow either into or out of the aquifer. The drain conductances are analogous to the river and general head boundary conductances. Flow into the drains occurs when the simulated aquifer head is greater than the specified drain elevation. The flow is proportional to the conductance and the difference between the aquifer head and the drain elevation. When the elevation of the drain is greater than the aquifer head, no flow occurs. Drains were used in the models to represent canals where water levels are not maintained at specified heads but are controlled by weirs or structures. The drain elevations were set to the canal weir or structure elevations.

SOUTH COUNTY MODEL

South Model Vertical Discretization

The model was divided into six layers of variable thickness. Figures 15 and 16 illustrate the vertical discretization scheme and resulting model layering for several conceptual aquifer cross sections. The discretization was designed to achieve layering such that:

1. Layer 1 contains all river, drain, recharge and evapotranspiration cells. Further, it is thick enough so that the simulated water table declines likely to occur in the modeling will not cause the cells to become excessively thin or dry out.

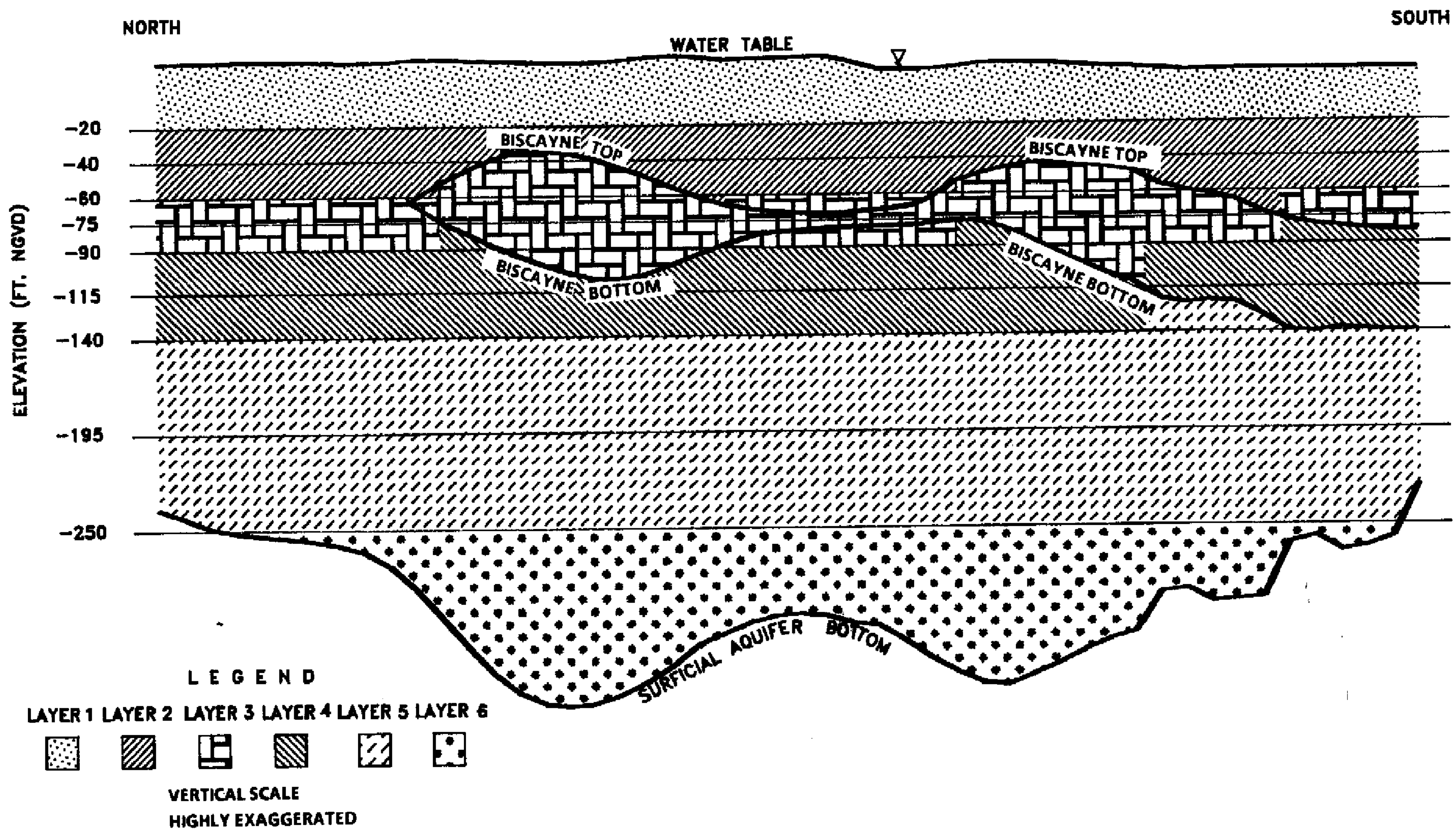


Figure 15 SOUTH PALM BEACH COUNTY VERTICAL DISCRETIZATION FOR MODELING CONCEPTUAL CROSS SECTION 1

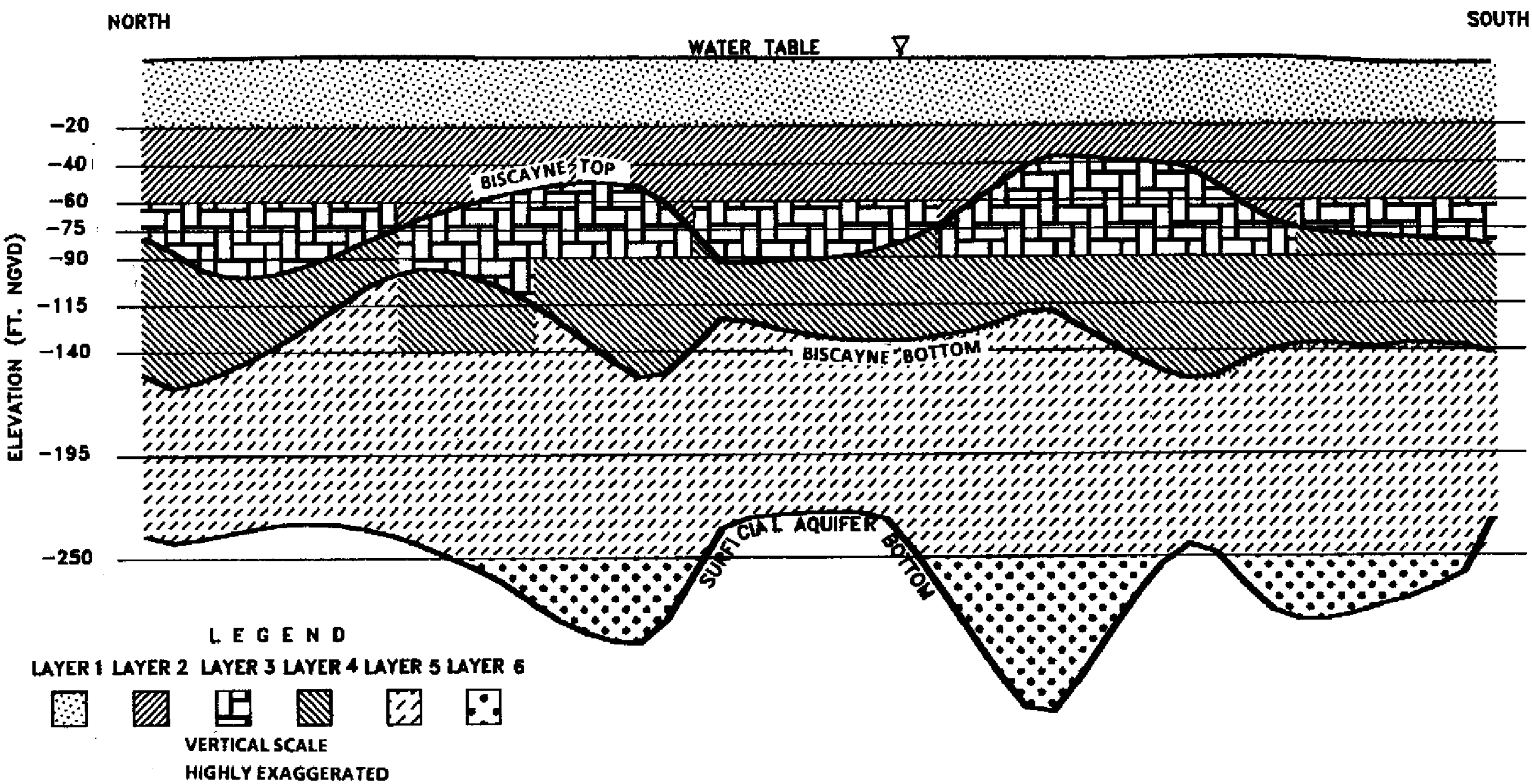


Figure 16 SOUTH PALM BEACH COUNTY VERTICAL DISCRETIZATION FOR MODELING CONCEPTUAL CROSS SECTION 2

2. The upper part of the aquifer, where most of the flow is expected to occur, is represented in the model (layers 1 to 4) with a finer discretization than the lower part of the aquifer (layers 5 and 6). Thus, layers 1, 2, 3, and 4, (where the canals, recharge, evapotranspiration, and most of wells are represented) are generally thinner than layers 5 and 6 (except where the aquifer itself thins out in layer 5 or 6).

3. Any cell in the model represents material from only one hydraulic conductivity zone.

Layer 1 extends from the water table to -20 ft. NGVD and is composed entirely of zone 3. The bottom of layer 2 and the tops and bottoms of layers 3, 4, 5 and 6 do not correspond to any particular depths since they were adjusted to best represent the aquifer's hydraulic conductivity zones and bottom slope. The discretization scheme for these layers is rather complicated and follows a two step process. First, arbitrary layer limits were set to meet certain criteria. Then, if necessary, the resulting layer tops and/or bottoms were adjusted to meet additional criteria.

The arbitrary layer limits were set to meet the following criteria:

1. The bottom of layer 3 (top of layer 4) is approximately the average midpoint of the Biscayne zone in its thickest parts so that the zone could be represented as 2 model layers (3 and 4) where it is thickest.

2. The top of layer 3 coincides with the approximate average top of the Biscayne zone where it is present in layer 3.

3. The bottom of layer 4 (top of layer 5) coincides with the approximate bottom of the Biscayne zone where it is present in layer 4.

4. The bottom of layer 5 (top of layer 6) is the approximate average surficial aquifer bottom in the active model area.

Based on these criteria, the initial, arbitrary layering for the south model is as follows:

- Layer 2 extends from -20 to -60 ft. NGVD,
- Layer 3 extends from -60 to -90 ft. NGVD,
- Layer 4 extends from -90 to -140 ft. NGVD,
- Layer 5 extends from -140 ft. NGVD to -250 ft. NGVD or the bottom of the aquifer if it occurs above -250 ft. NGVD.
- Layer 6 extends from -250 ft. NGVD to the bottom of the aquifer (note that layer 6 is inactive in the model where the aquifer bottom occurs at depths above -250 ft. NGVD).

This layering was used in the model wherever the Surficial Aquifer System was represented with only one hydraulic conductivity zone. This included areas where the Biscayne zone is not present and areas where the Biscayne zone is less than 20 feet thick. The Biscayne zone was not represented where it was less than 20 feet thick because its influence on regional flow becomes insignificant as it becomes very thin.

In the rest of the model, where both the Biscayne and non-production hydraulic conductivity zones are represented, the bottom of layer 2 (top of layer 3); bottom of layer 3 (top of layer 4); and bottom of layer 4 (top of layer 5) were modified as necessary, so that:

1) Only one hydraulic conductivity zone is represented in each node.

2) The Biscayne zone is represented only in layers 3 and 4.

3) The Biscayne is represented in layer 3 or 4 only if it makes up more than half of the initial unmodified layer.

The computer program written and used for the discretization is included in Appendix F to provide the explicit details of the layer adjustment process. The resulting thicknesses of model layers 2 through 6 by cell are presented in Appendix G. The consequent distribution of the Biscayne zone (Zone 1) in layers 3 and 4 is shown in Figures 17 and 18.

South Model Transmissivities

Transmissivities in the model vary directly with changes in layer thickness and hydraulic conductivity zonation. The effective transmissivity of layer 1 also varies with saturated thickness in response to water table fluctuations (the water table never dropped below the bottom of layer 1). The MODFLOW code computes the effective transmissivity for layer 1 using its simulated water table elevations and input data on cell hydraulic conductivity and layer base elevation. Transmissivities for layers 2 through 6 were calculated from the layer thicknesses and hydraulic conductivity zonation and input to the model directly. The input data are given in Appendix H.

The composite model transmissivity (sum of the transmissivities in all layers) which approximates the total transmissivity of the Surficial Aquifer system is shown contoured in Figure 19. Layer 1 transmissivities for the composite calculation were estimated based on the average water table level.

South Model Boundaries

The south model's active area extends southward from C-51 to the Hillsboro Canal and westward from the Intracoastal Waterway to Water Conservation Area 1. Boundary conditions for each model layer are shown in Figures 20 to 23.

The Hillsboro Canal and C-51 are treated as ground water divides using general head boundaries as discussed in the ground water modeling introduction. The canal widths used to calculate the boundary conductances were estimated from aerial photos. C-51 widths ranged from 90 to 200 ft. and the Hillsboro Canal widths ranged from 80 to 200 ft. Canal sediment vertical hydraulic conductivities for the calculations were estimated as 0.5 ft./day for both canals based on the model calibrations (further discussion in Model Calibration section). The canal widths and calculated canal conductances are given in Appendix I, table I-1, which summarizes the general head boundary input data.

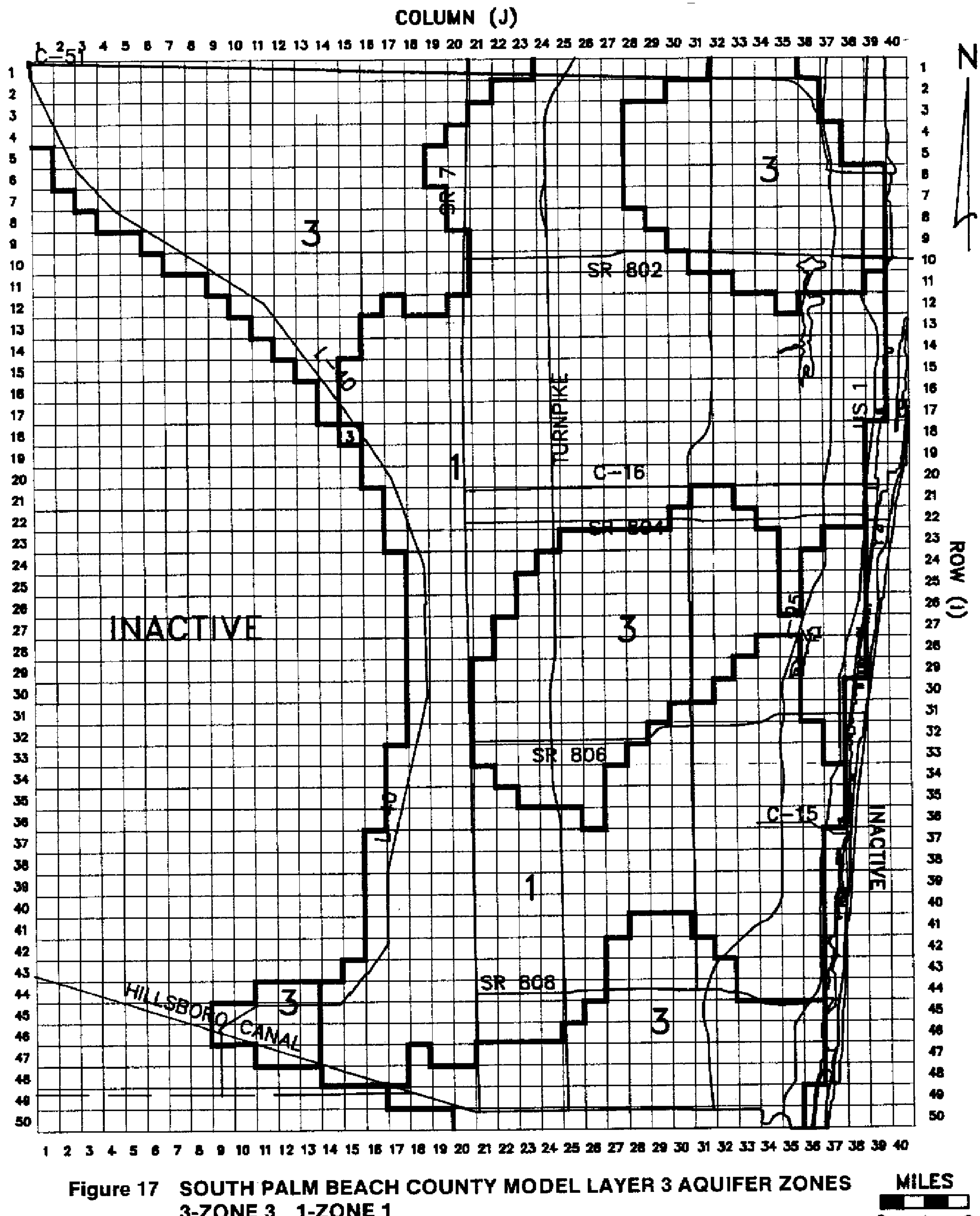


Figure 17 SOUTH PALM BEACH COUNTY MODEL LAYER 3 AQUIFER ZONES
3-ZONE 3 1-ZONE 1

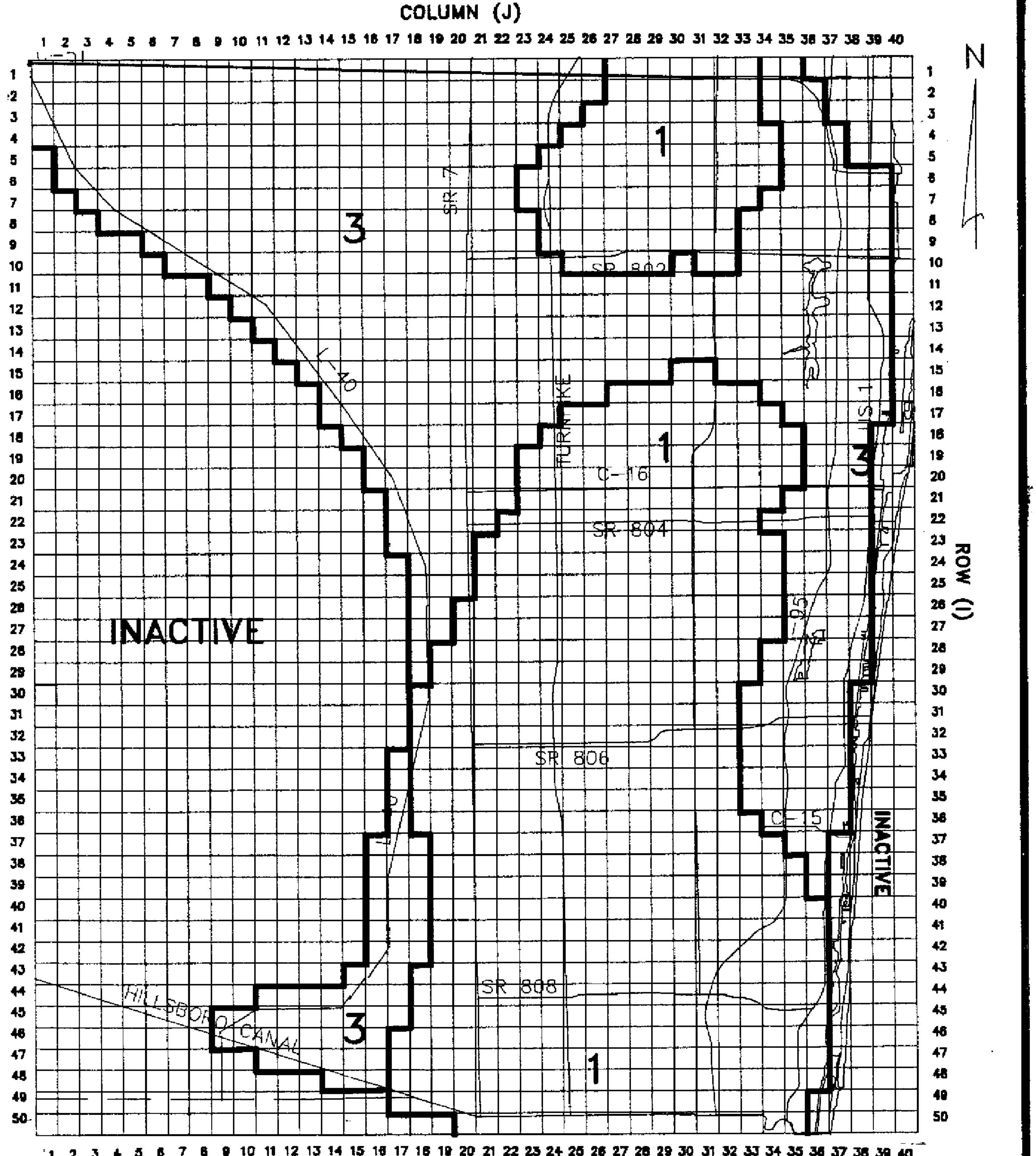


Figure 18 SOUTH PALM BEACH COUNTY MODEL LAYER 4 AQUIFER ZONES
1-ZONE 1 3-ZONE 3

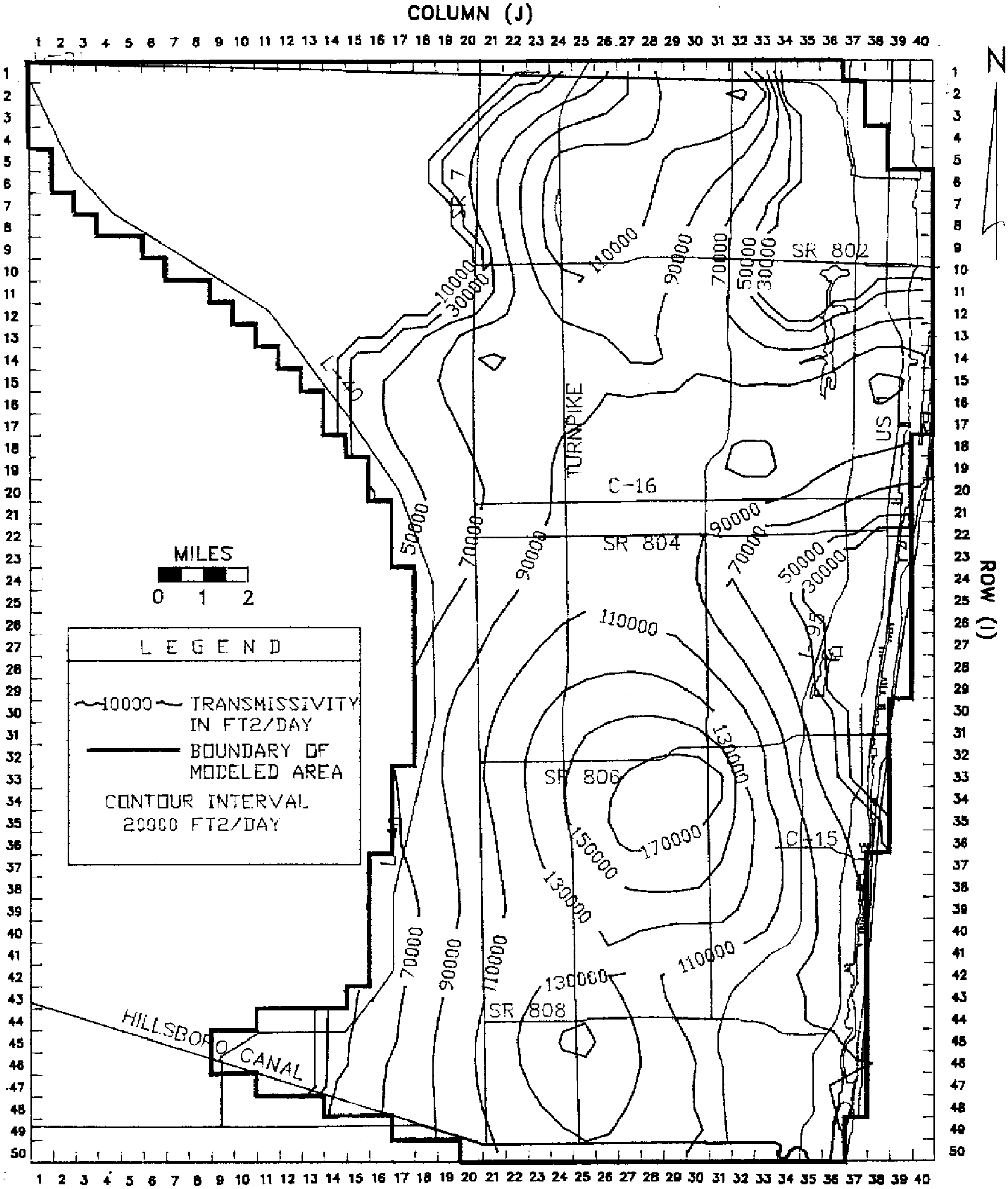


Figure 19 COMPOSITE TRANSMISSIVITY OF THE SOUTH PALM BEACH COUNTY MODEL

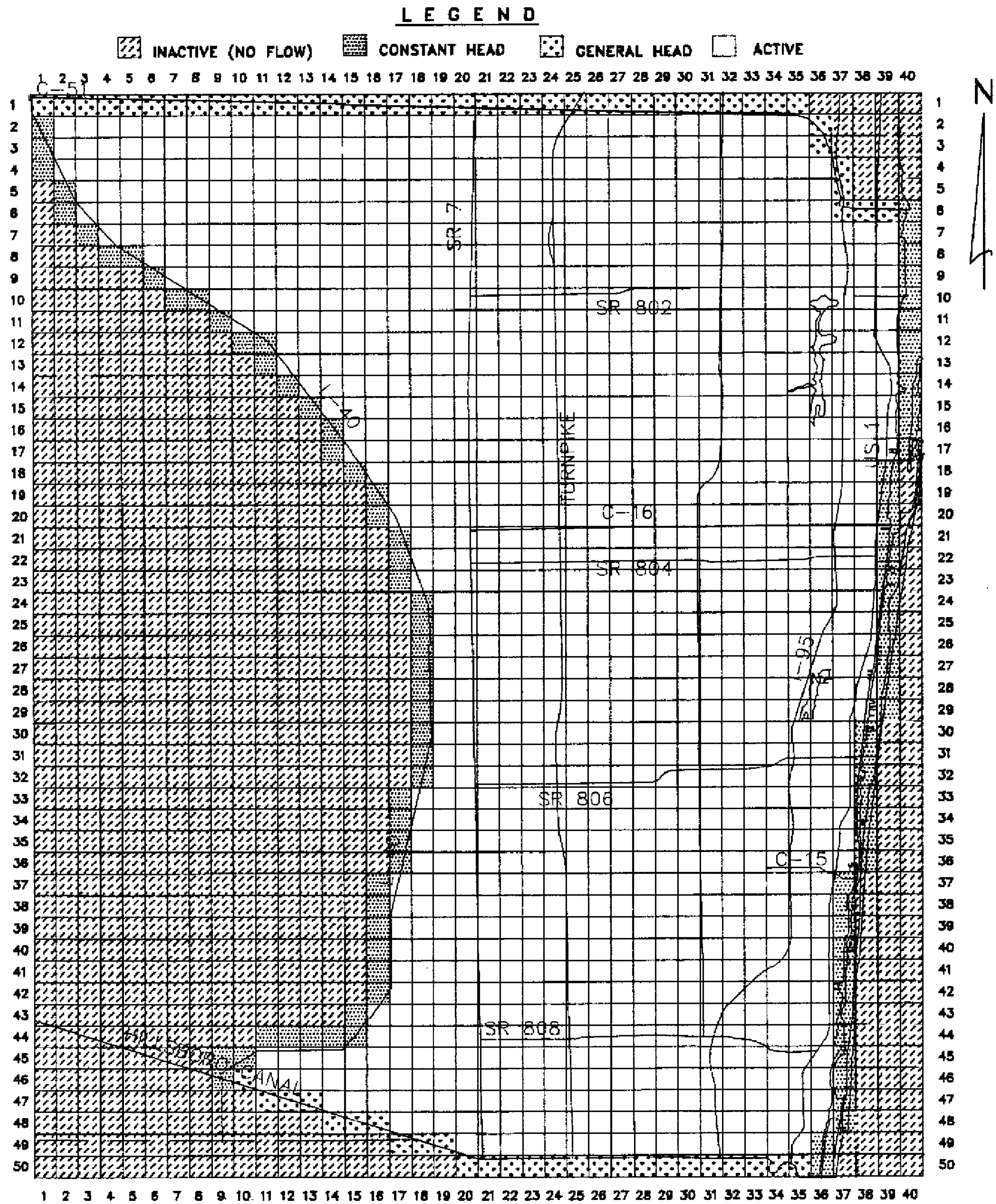


Figure 20 SOUTH PALM BEACH COUNTY MODEL LAYER 1 CELL TYPES

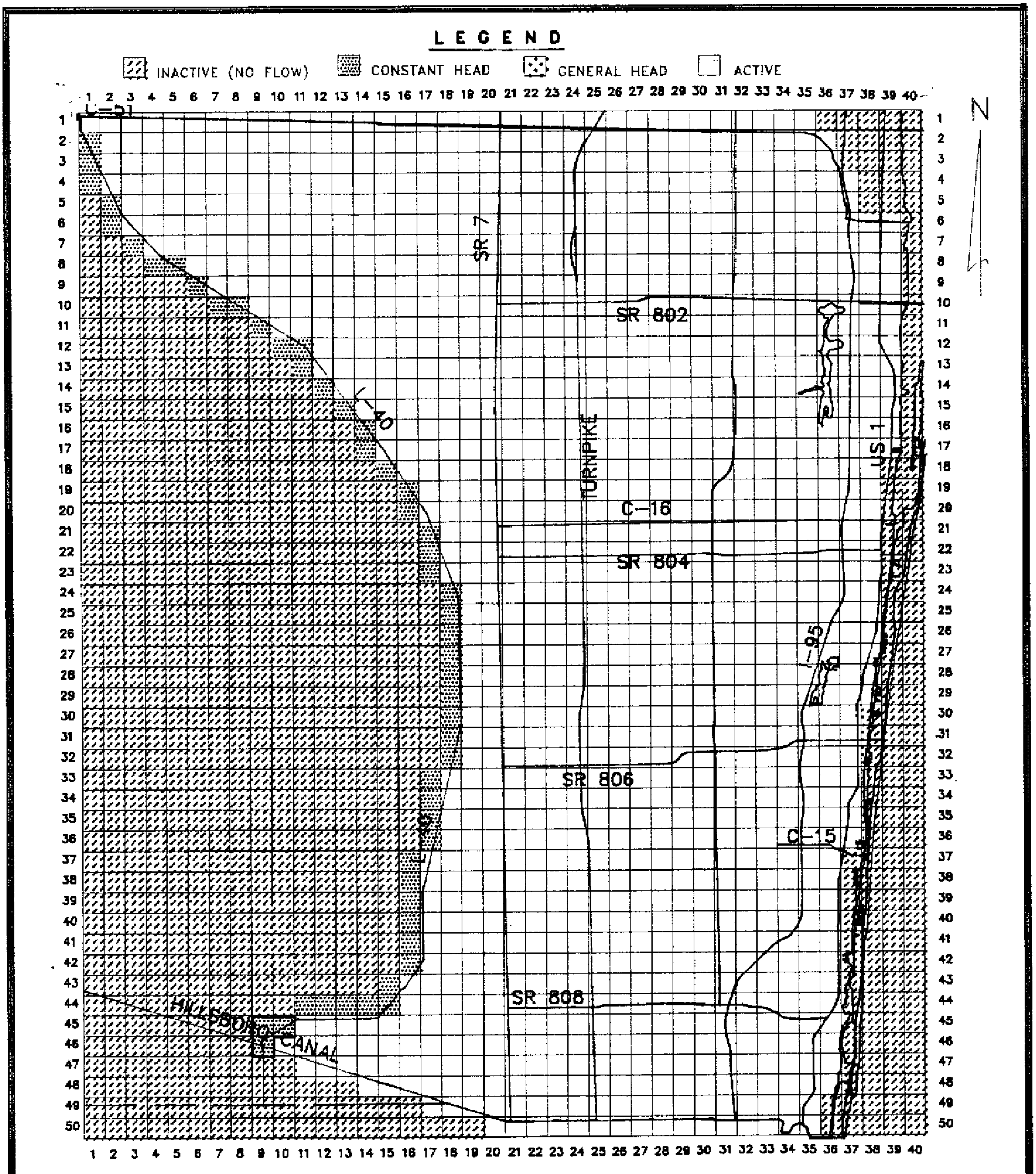


Figure 21 SOUTH PALM BEACH COUNTY MODEL LAYERS 2,3,4 CELL TYPES

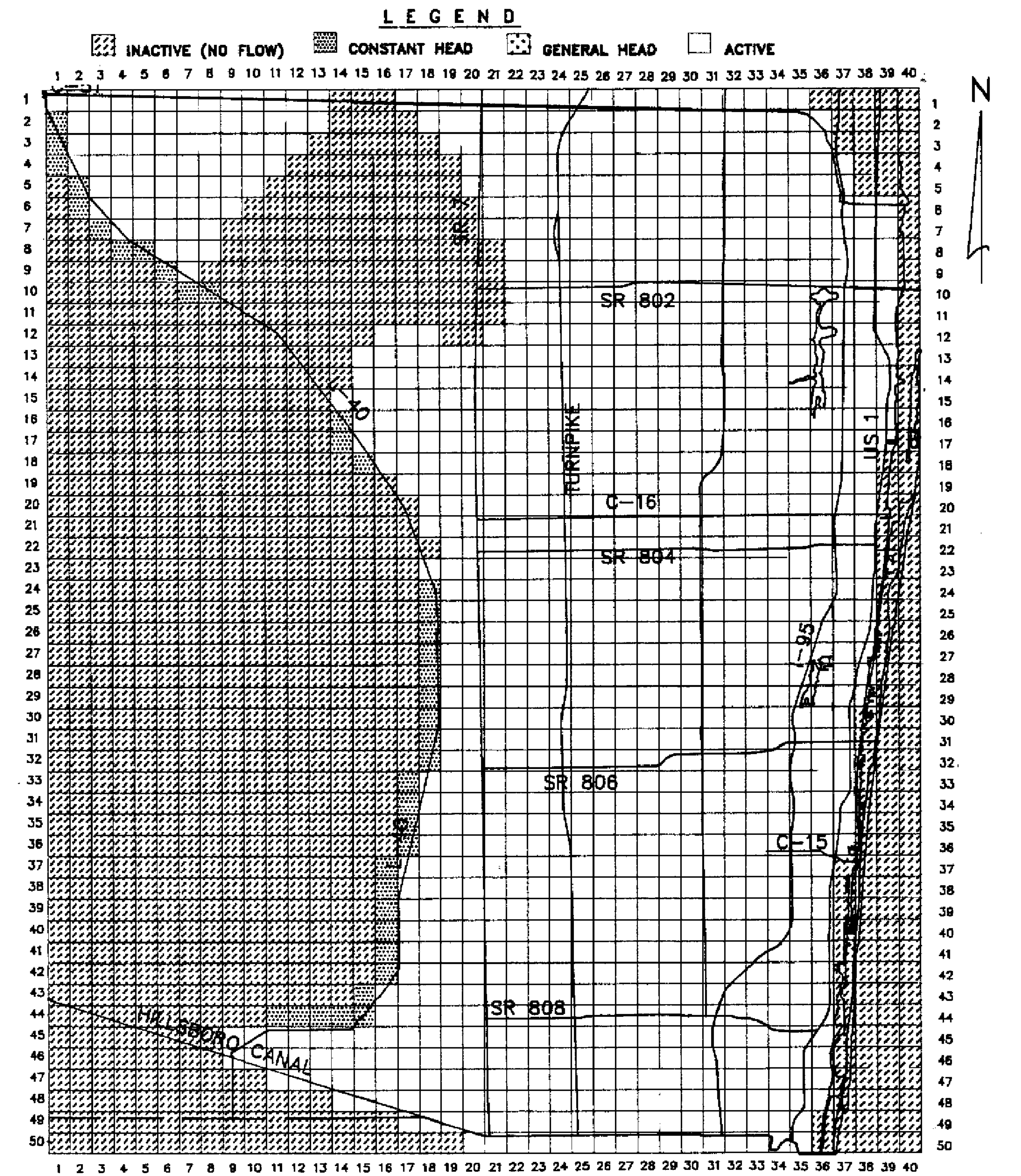


Figure 22 SOUTH PALM BEACH COUNTY MODEL LAYER 5 CELL TYPES

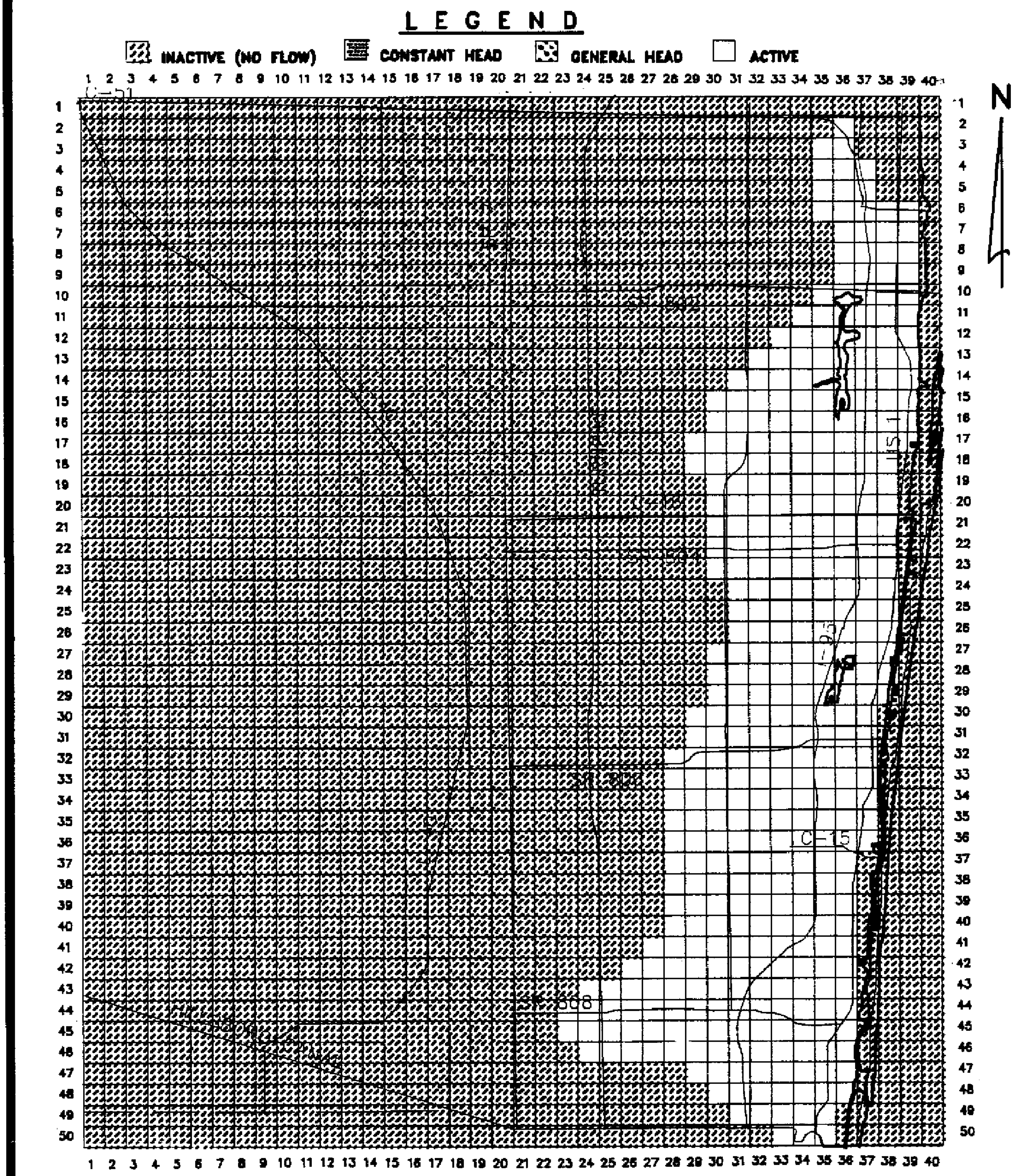


Figure 23 SOUTH PALM BEACH COUNTY MODEL LAYER 6 CELL TYPES

Water Conservation Area 1 was treated as a constant head boundary in all layers. Its head was set at 15.4 ft., the average value during the calibration period, November 1983 to May 1985. Historically, water levels in the conservation area have fluctuated several feet, however, because the fluctuations are not predictable, the 15.4 ft. assumption was also used for the predictive runs. Impacts of neglecting fluctuations during the calibration period are discussed in the calibration section.

The Intracoastal Waterway and saltwater/freshwater interface were treated as a combination constant head/no-flow boundary as discussed previously in the boundary condition section.

South Model Canals

Canals in the southern study area include the LWDD canals, the Acme Improvement District canals, and miscellaneous canals. These canals were represented with the river and drain packages in the model. All canal sediments were assumed to be one foot thick with a hydraulic conductivity of 0.5 ft./day (determined by model calibration).

The LWDD and Acme Improvement District canals have controlled water levels and were represented in the model using the river package. Because these canal systems are so extensive, most cells in the first model layer contained canal reaches represented as rivers as shown in Figure 24. Control elevations in the Lake Worth Drainage District ranged from sea level to 15.5 ft. NGVD. The canal reach conductances for the LWDD canals were computed assuming widths for 30 ft. for the lateral canals and 50 ft. for the equalizing canals. Control elevations in the Acme Improvement District were set to 12.5 ft. north of the C-23 canal and 13.5 ft. south of it. Conductances for Acme canals were computed using widths of 30 ft. Appendix I, tables I-2 and I-3 summarize the river node input data.

Most of the remaining canals in the southern study area are part of the Pine Tree Drainage District which is located west of the Acme Improvement District, between C-51 and the Water Conservation Area. There is little specific information available on those canals. They were assumed to be uncontrolled and were modeled as drains with cutoff elevations equal to the Acme Improvement canal control elevations. Canal densities and an average canal width 10 ft. were estimated from Mark Hurd aerial photographs. Appendix I, table I-4 summarizes the resulting drain input data for these canals.

NORTH COUNTY MODEL

North Model Vertical Discretization

The model was divided into six layers of variable thickness. The tops and bottoms of the model layers do not correspond to any particular aquifer depths since the layers were adjusted to best match the aquifer's hydraulic zones and bottom. Figures 25 to 27 illustrate the vertical discretization scheme and resulting model layering for three conceptual aquifer cross sections. The discretization was designed to achieve layering similar to that in the south county model, except in the north model, cells may represent a mixture of materials from different hydraulic conductivity zones. The discretization scheme was again a complicated two step process of setting arbitrary layer limits and then adjusting them to best match the hydraulic conductivity zones. The arbitrary layer limits were set identical to those

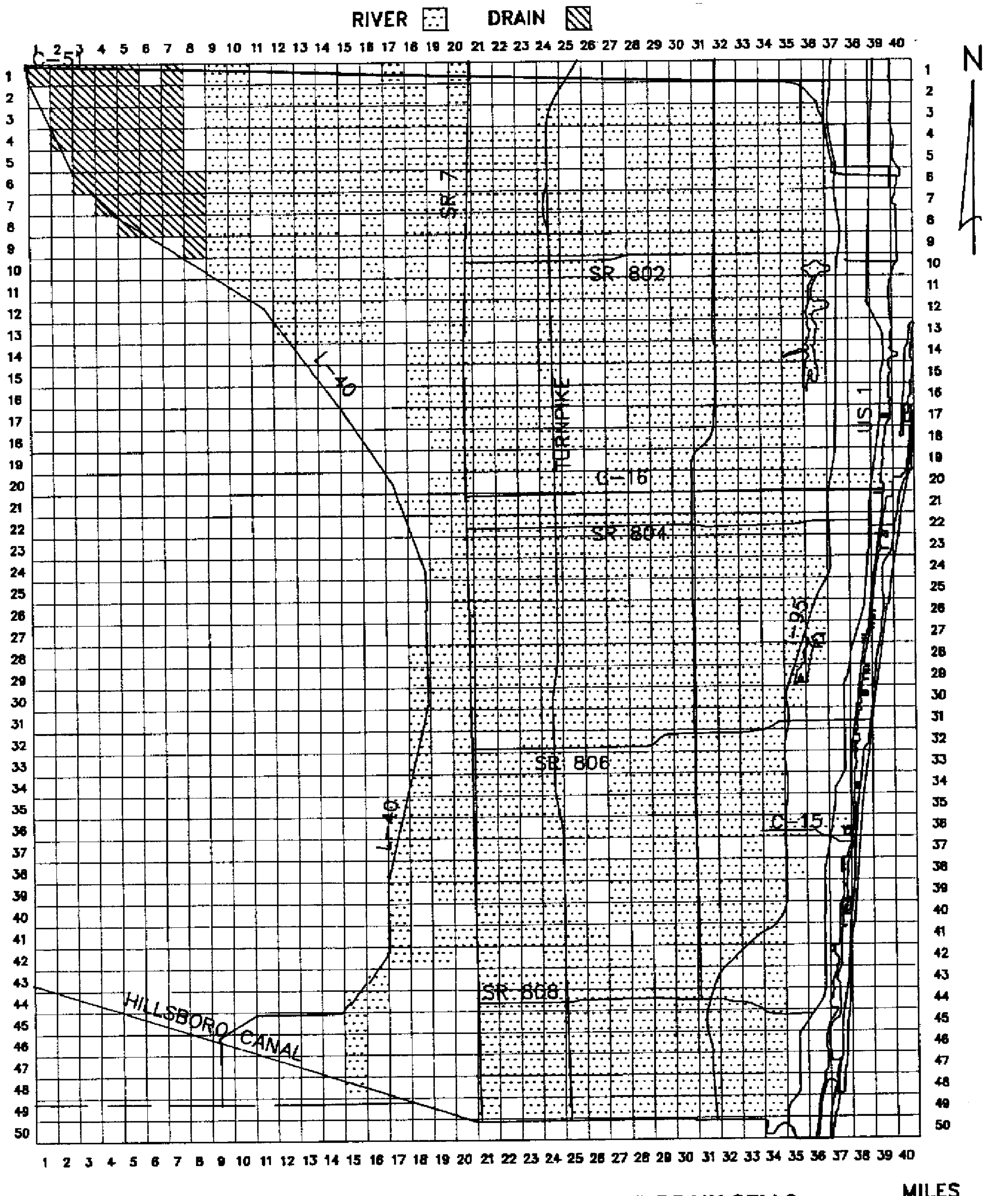


Figure 24 SOUTH PALM BEACH COUNTY MODEL RIVER AND DRAIN CELLS

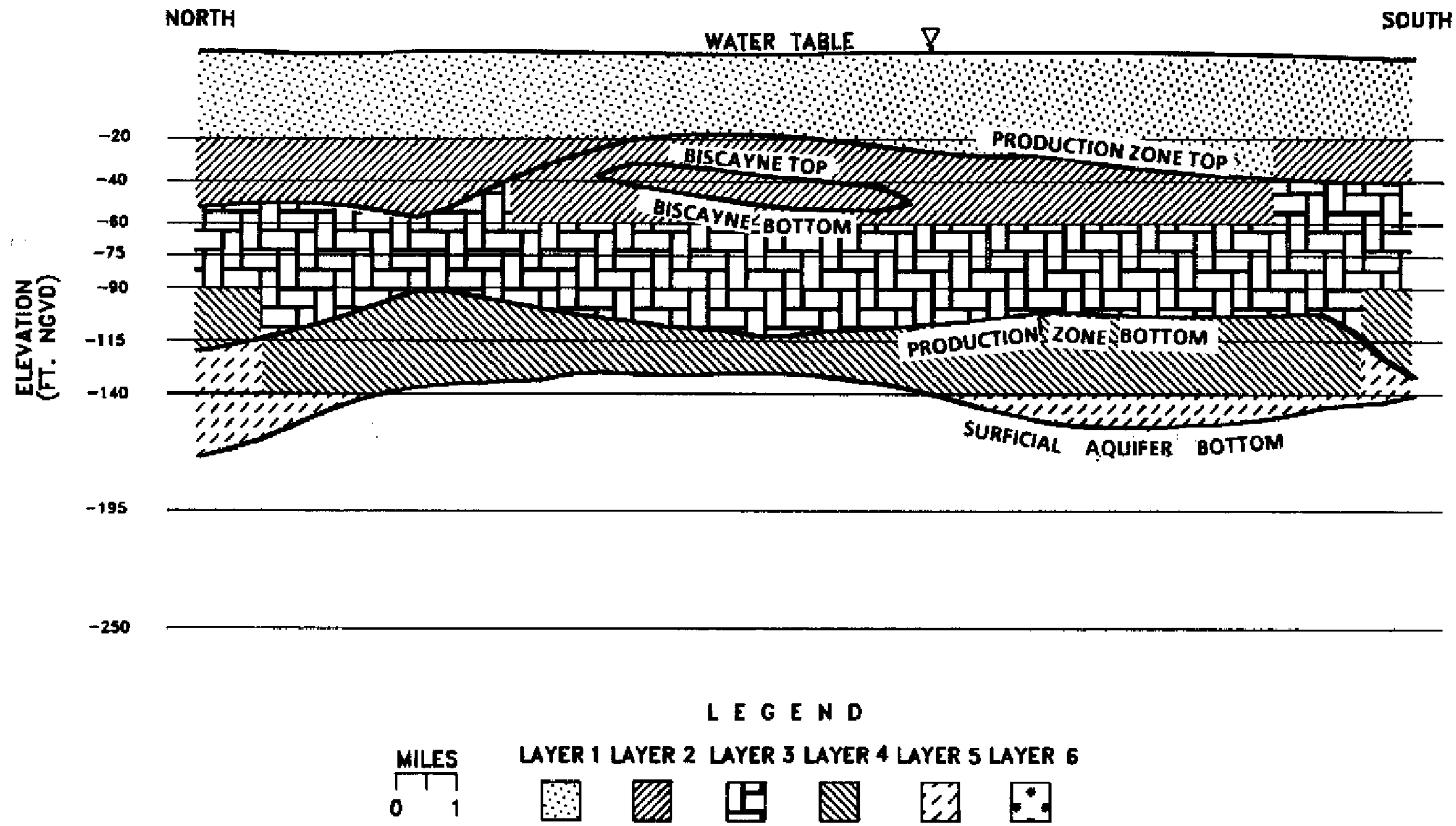


Figure 25 NORTH PALM BEACH COUNTY VERTICAL DICRETIZATION FOR MODELING CONCEPTUAL CROSS SECTION 1

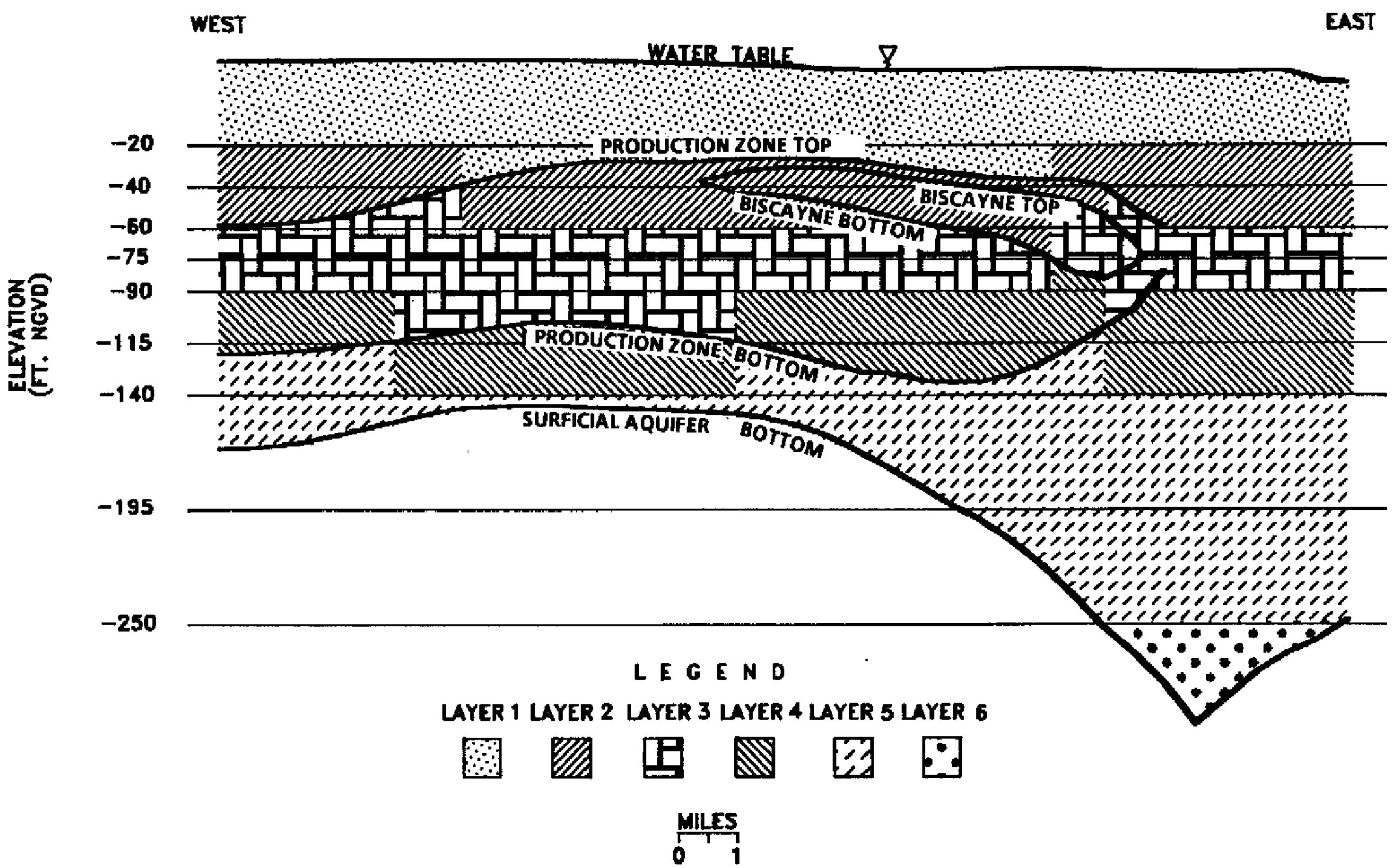


Figure 26 NORTH PALM BEACH COUNTY VERTICAL DISCRETIZATION FOR MODELING CONCEPTUAL CROSS SECTION 2

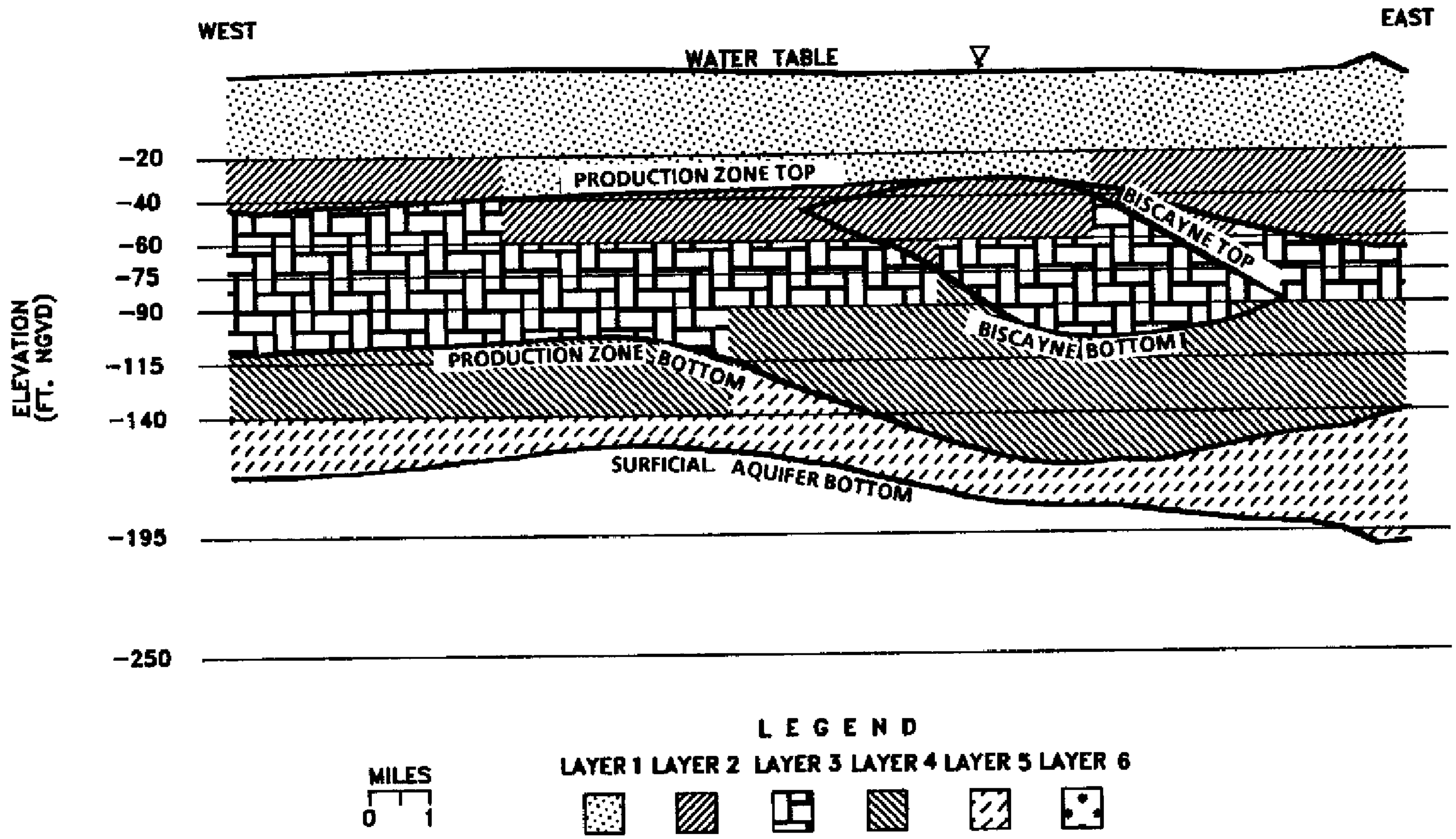


Figure 27 NORTH PALM BEACH COUNTY VERTICAL DISCRETIZATION FOR MODELING CONCEPTUAL CROSS SECTION 3

in the south model (refer to south model vertical discretization section) to maintain compatibility between the models. However, the following layer adjustments were much more complicated in the north model than in the south since an additional conductivity zone (the production zone) had to be included.

Adjustments in the north county model were made to the bottom of layer 1 (top of layer 2); bottom of layer 2 (top of layer 3); bottom of layer 3 (top of layer 4); and bottom of layer 4 (top of layer 5) to meet the following hydraulic conductivity zone distribution criteria:

1) Layer 1 contains only zone 3.

2) Cells in layers 3 and 4 are composed only of zone 1 where at least 20 ft. of zone 1 was contained in the unadjusted layers.

3) Layers 5 and 6 do not contain zone 2 except where layer 4 is composed of zone 1.

4) Zone 1, the Biscayne zone, was represented only where it was greater than 10 ft. thick.

The computer program written and used for the discretization is included in Appendix J to provide the explicit details of the layer adjustment process. The resulting thicknesses of each model layer by cell are given in Appendix K. The distribution of hydraulic conductivity zones in each layer are shown in Figures 28, 29, 30, and 31. The percentage of the cell thickness comprised by each hydraulic conductivity zone is given in Appendix L for layers 2, 3, 4, and 5 where some models represent material from more than one zone.

North Model Transmissivities

Transmissivities in the model vary directly with changes in layer thickness and hydraulic conductivity zonation. The transmissivity of layer 1 also varies with water table fluctuations (the water table never dropped below the bottom of layer 1). The MODFLOW code computes the transmissivity for layer 1 using its simulated water table elevations and input data on cell hydraulic conductivity and layer thickness. Transmissivities for layers 2 through 6 were calculated from the layer thicknesses and hydraulic conductivity zonation and input to the model directly. The input data are given in Appendix M.

The composite model transmissivity (sum of the transmissivities in all layers) which approximates the total transmissivity of the Surficial Aquifer System is shown contoured in Figure 32. Layer 1 transmissivities for the composite calculation were estimated based on the average water table level.

North Model Boundaries

The north model's active area extends north to south from the Palm Beach/Martin county line to the C-51 canal and east to west from the Intracoastal Waterway to the L-8 canal. Boundary conditions for each model layer are shown in Figures 33 to 36.

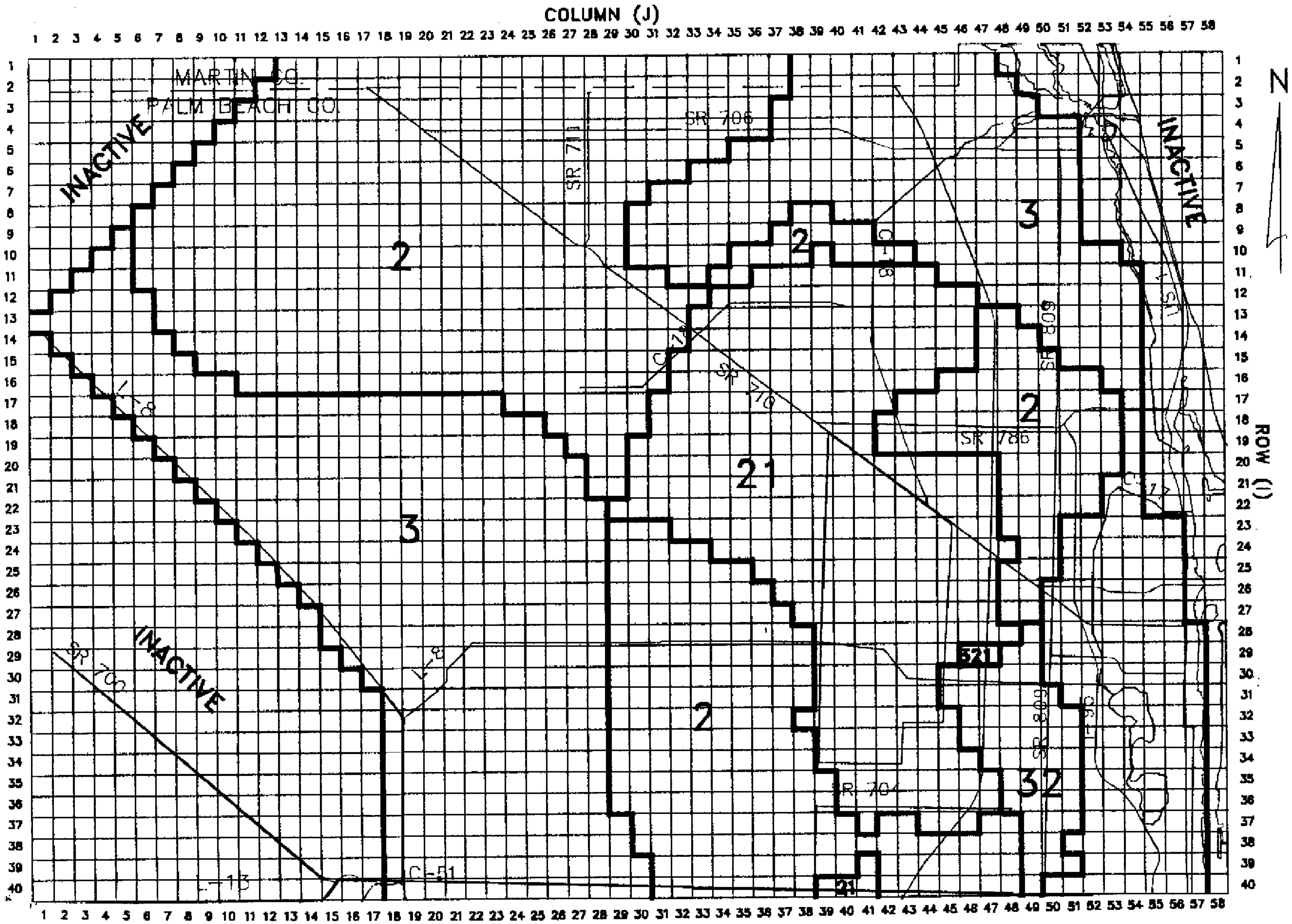


Figure 28 NORTH PALM BEACH COUNTY MODEL LAYER 2 AQUIFER ZONES

3-ZONE 3, 32-ZONE 3 AND 2, 2-ZONE 2, 21-ZONES 2 AND 1, 1-ZONE 1

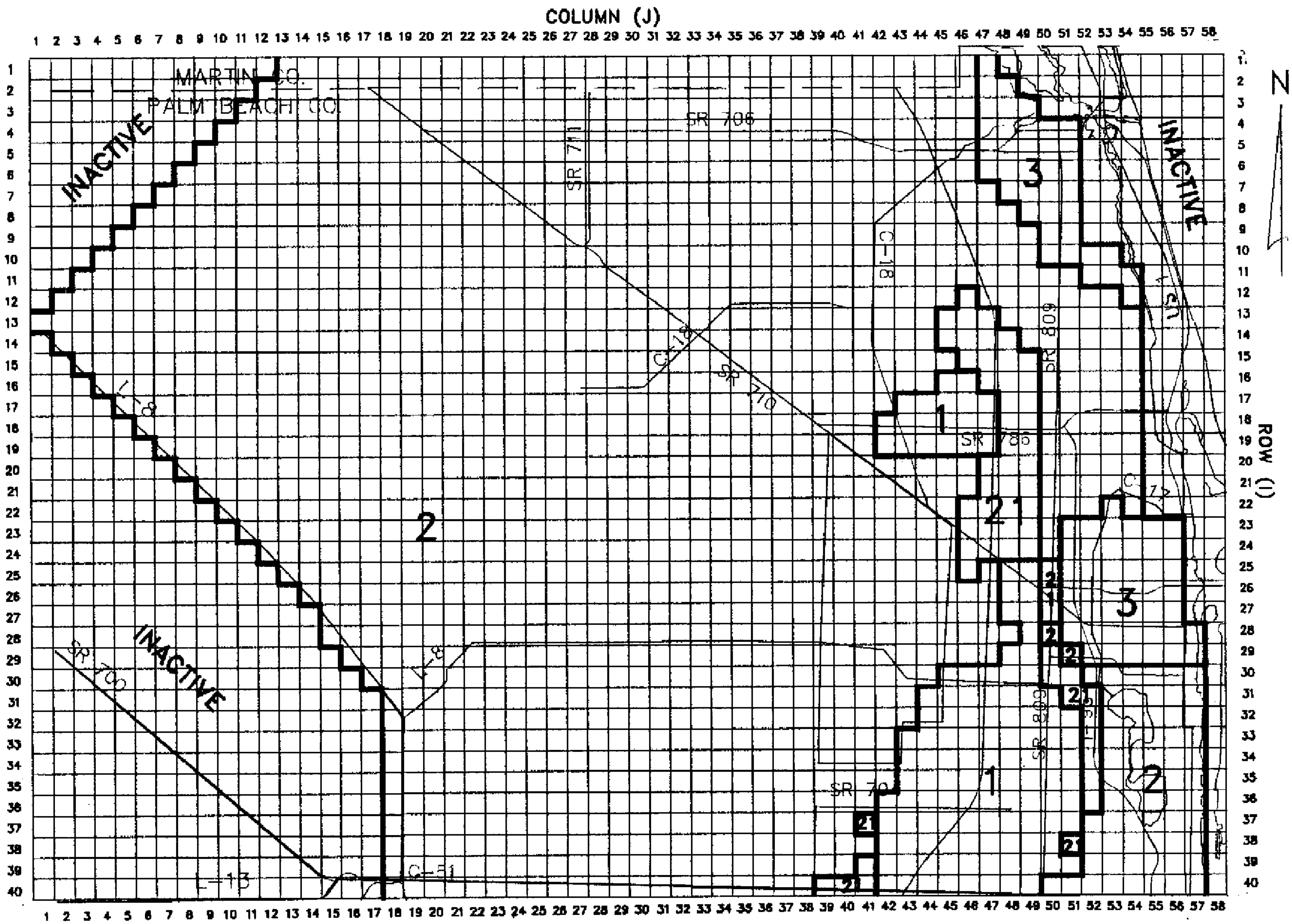


Figure 29 NORTH PALM BEACH COUNTY MODEL LAYER 3 AQUIFER ZONES

3-ZONE 3, 32-ZONES 3 AND 2, 2-ZONE 2, 21-ZONES 2 AND 1, 1-ZONE 1

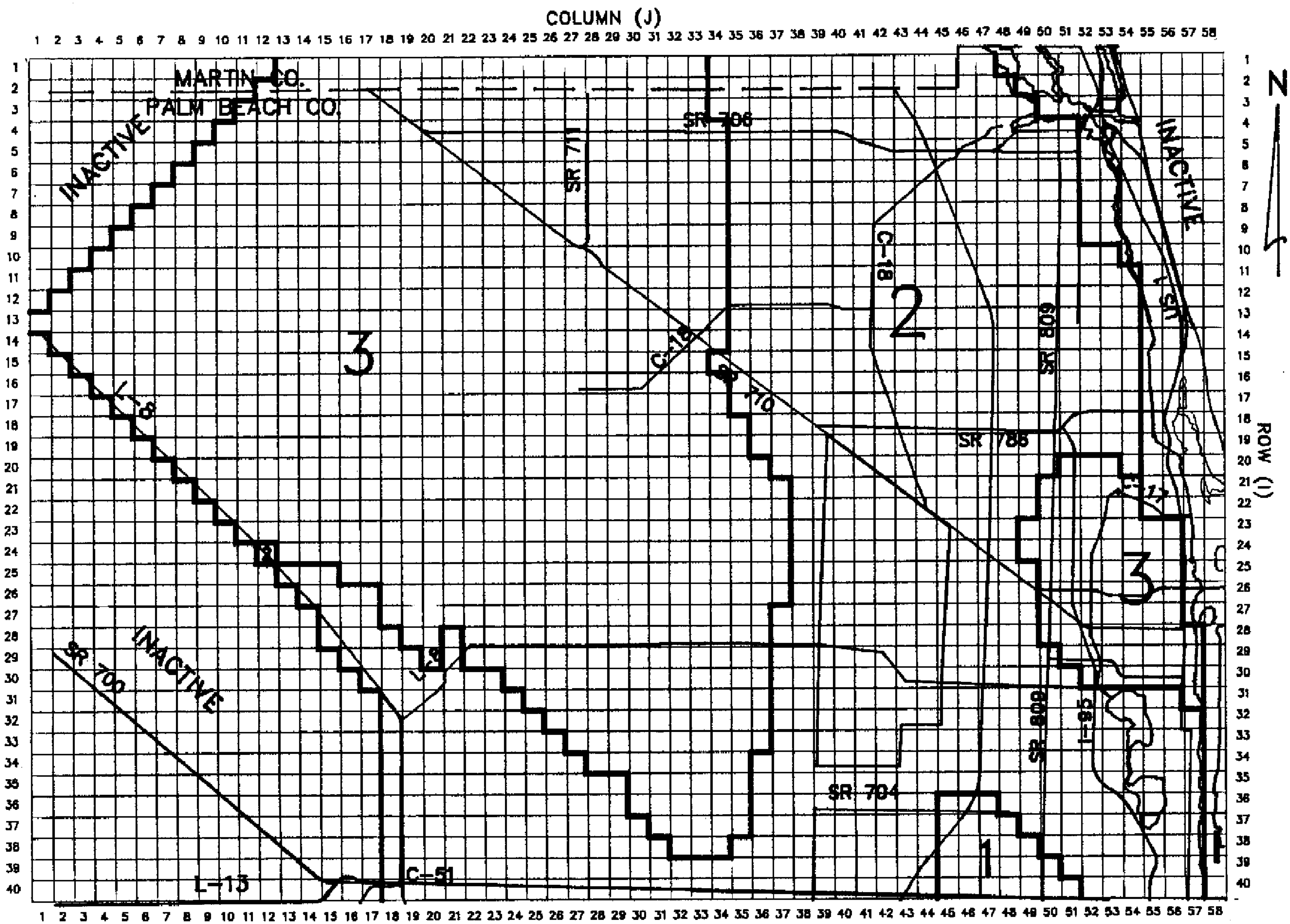


Figure 30 NORTH PALM BEACH COUNTY MODEL LAYER 4 AQUIFER ZONES

3-ZONE 3, 32-ZONES 3 AND 2, 2-ZONE 2, 21-ZONES 2 AND 1, 1-ZONE 1

MILES
0 1 2

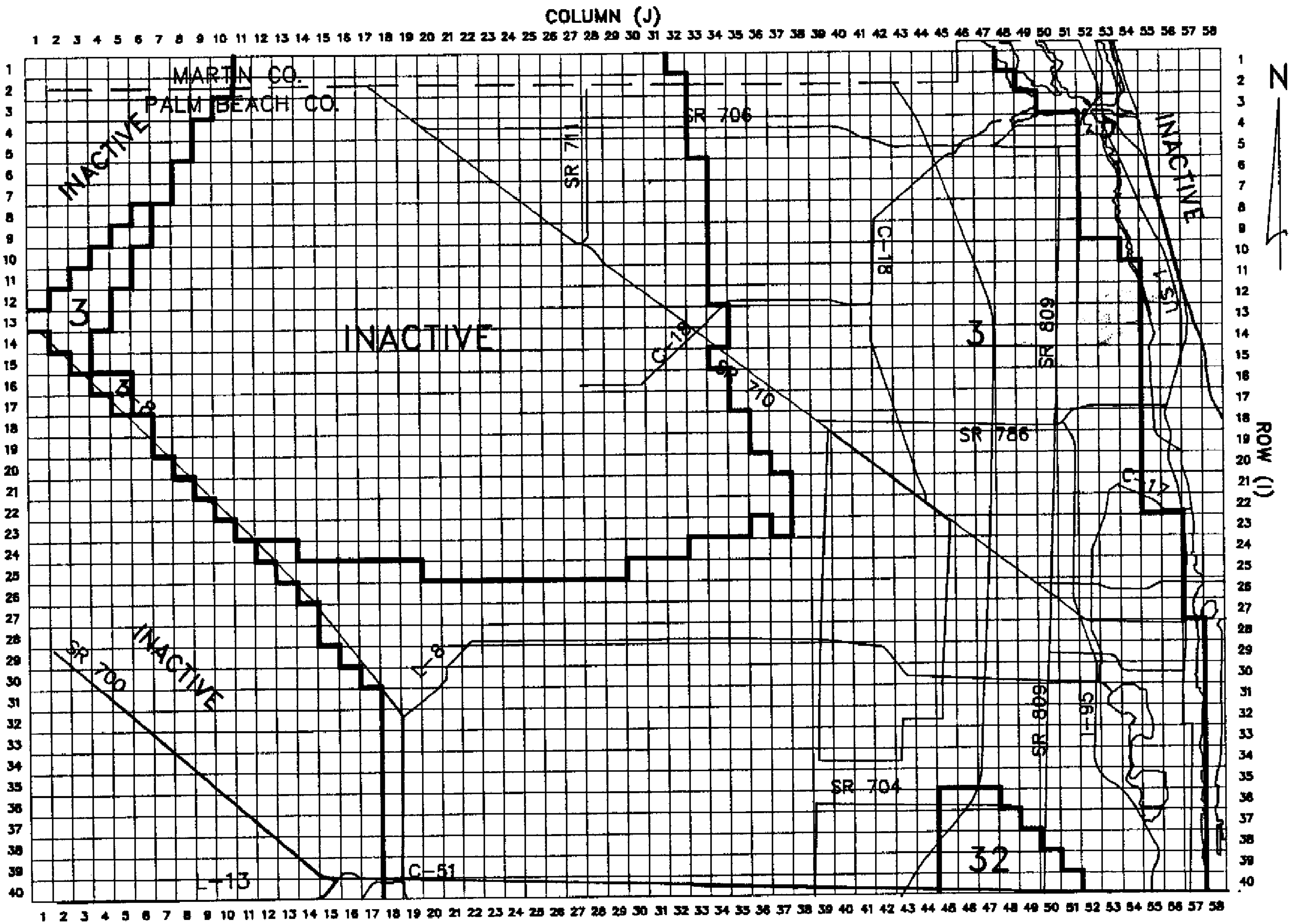


Figure 31 NORTH PALM BEACH COUNTY MODEL LAYER 5 AQUIFER ZONES
3—ZONE 3, 32—ZONES 3 AND 2, 2—ZONE 2, 21—ZONES 2 AND 1, 1—ZONE 1

MILES
0 1 2

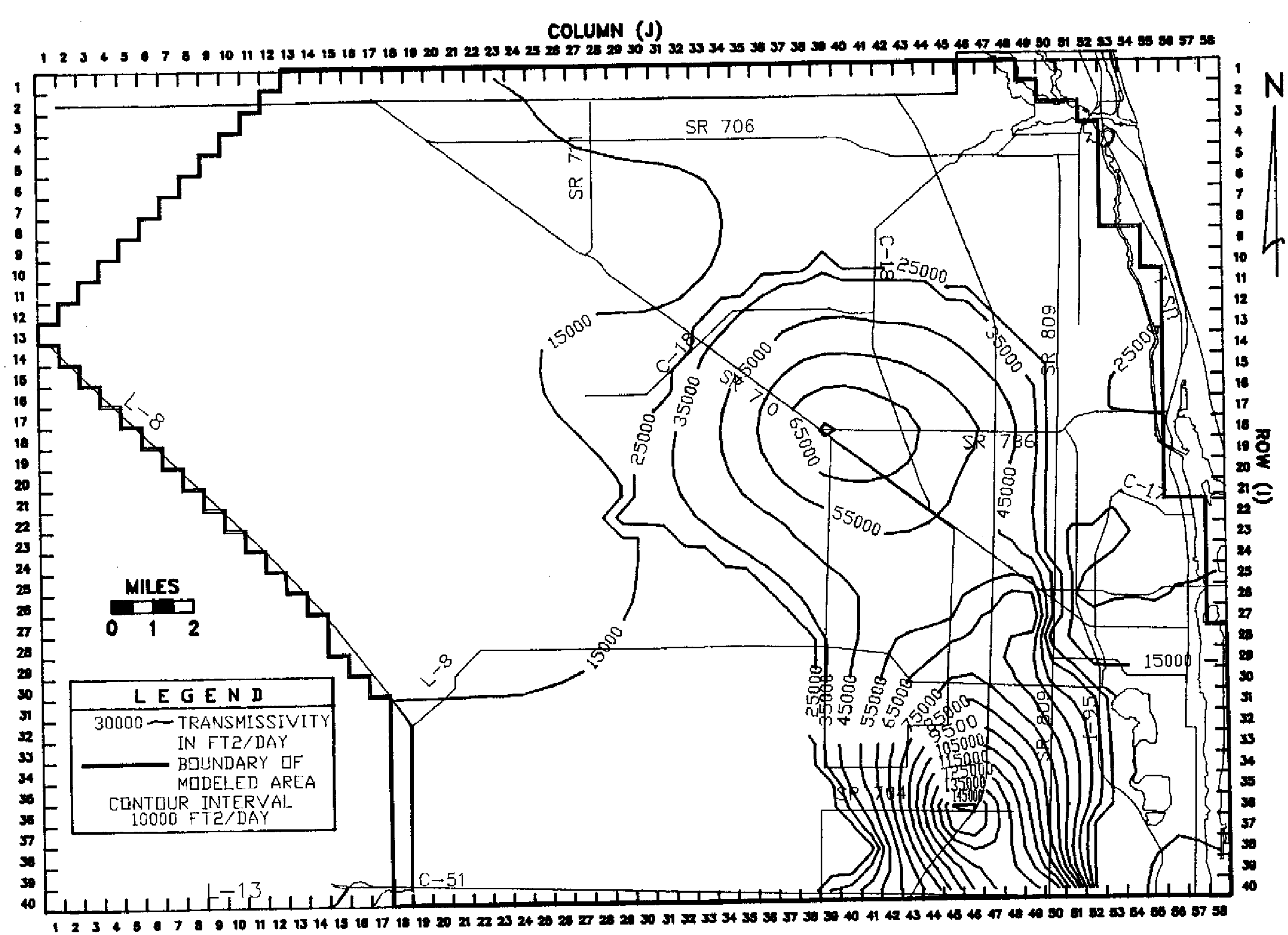


Figure 32 COMPOSITE TRANSMISSIVITY OF THE NORTH PALM BEACH COUNTY MODEL

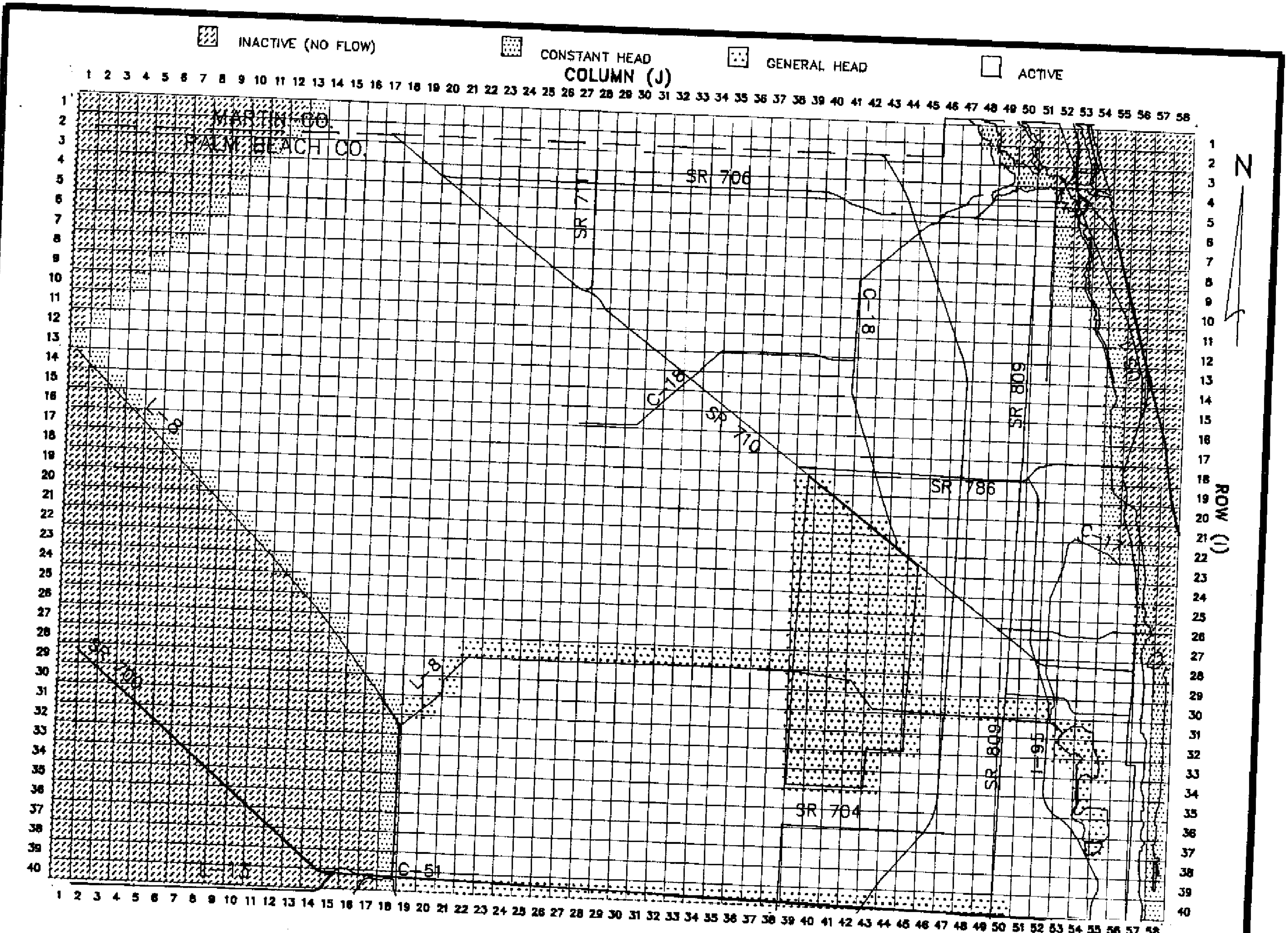


Figure 33 NORTH PALM BEACH COUNTY MODEL LAYER 1 CELL TYPES

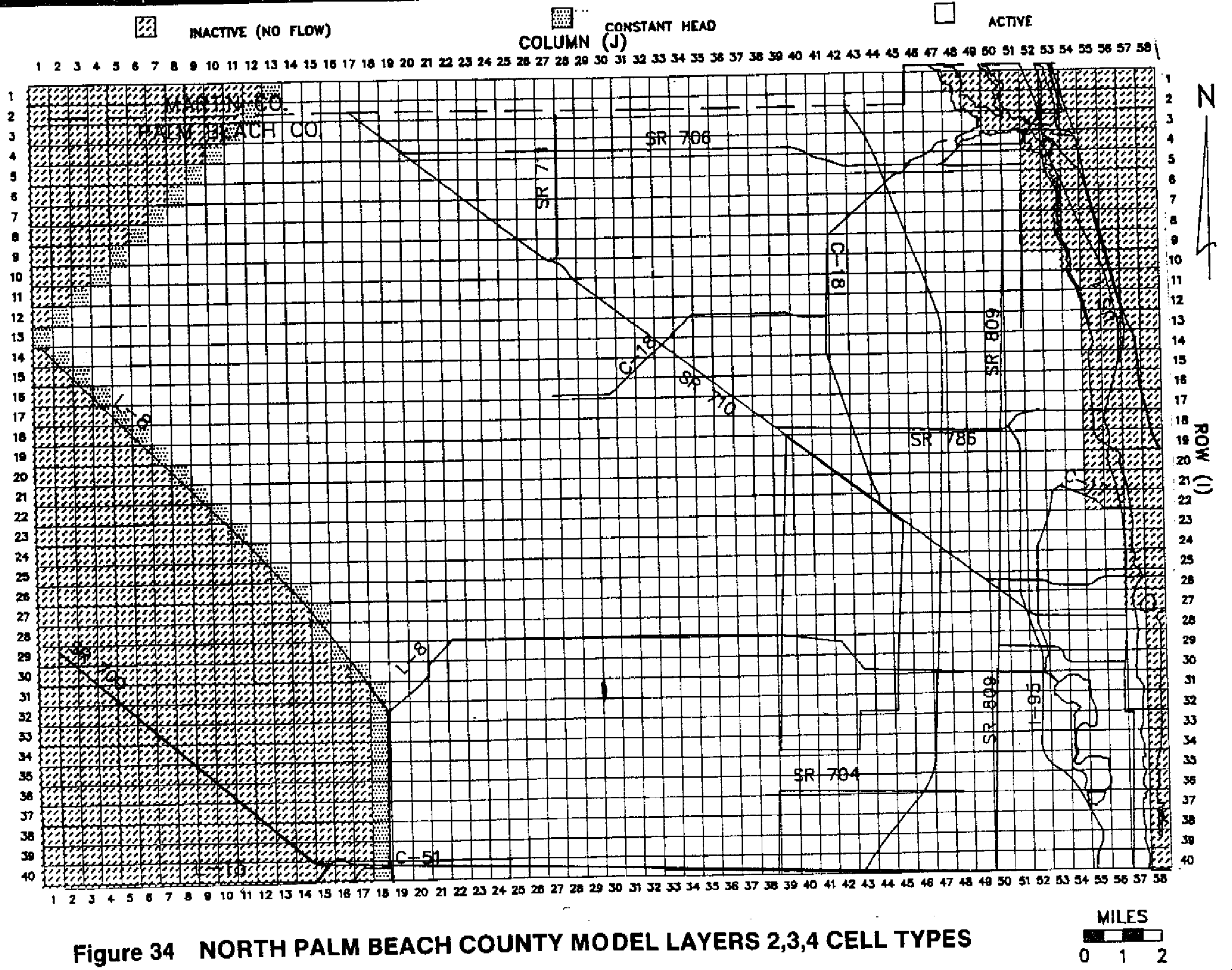


Figure 34 NORTH PALM BEACH COUNTY MODEL LAYERS 2,3,4 CELL TYPES

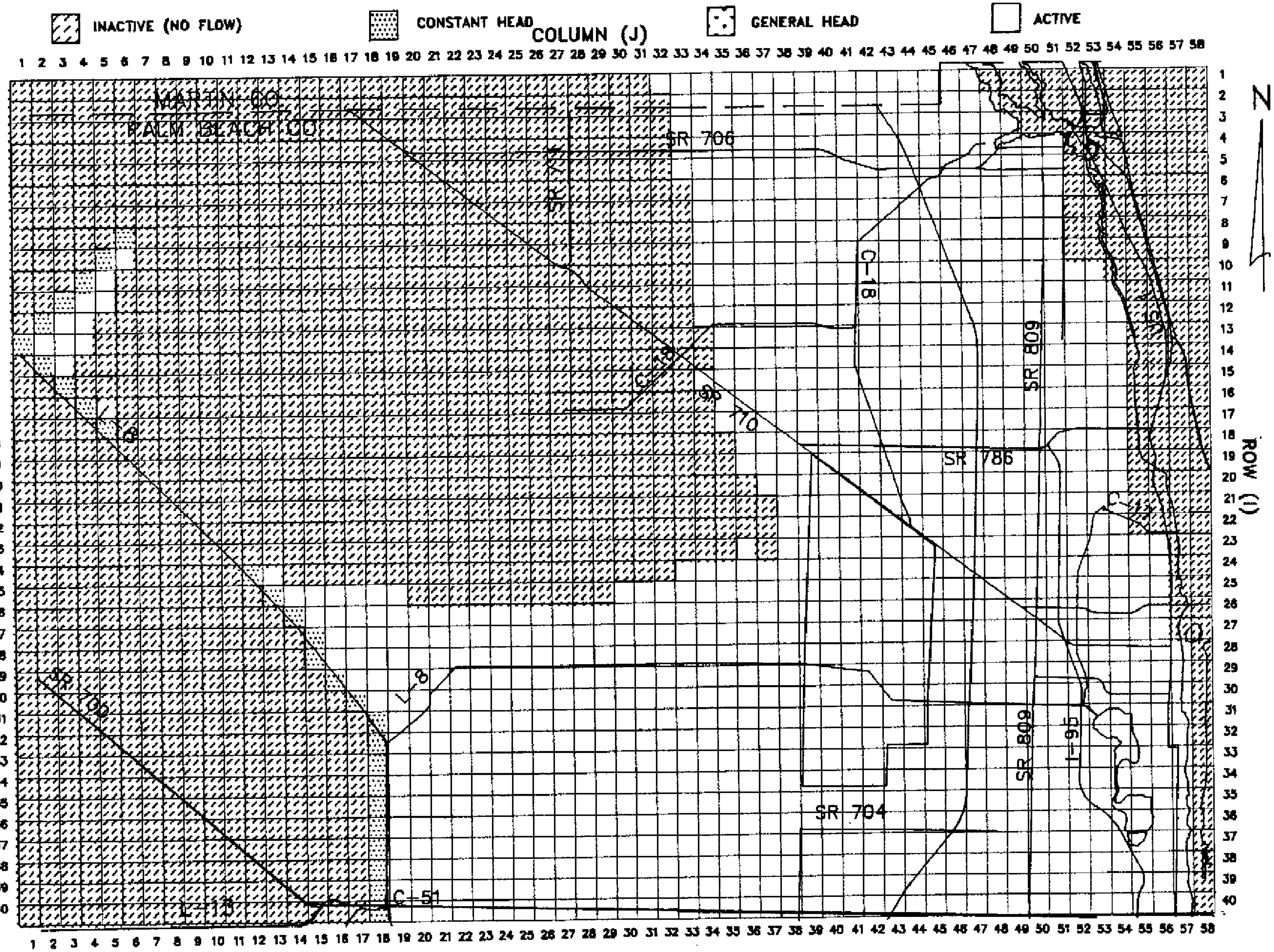


Figure 35 NORTH PALM BEACH COUNTY MODEL LAYER 5 CELL TYPES

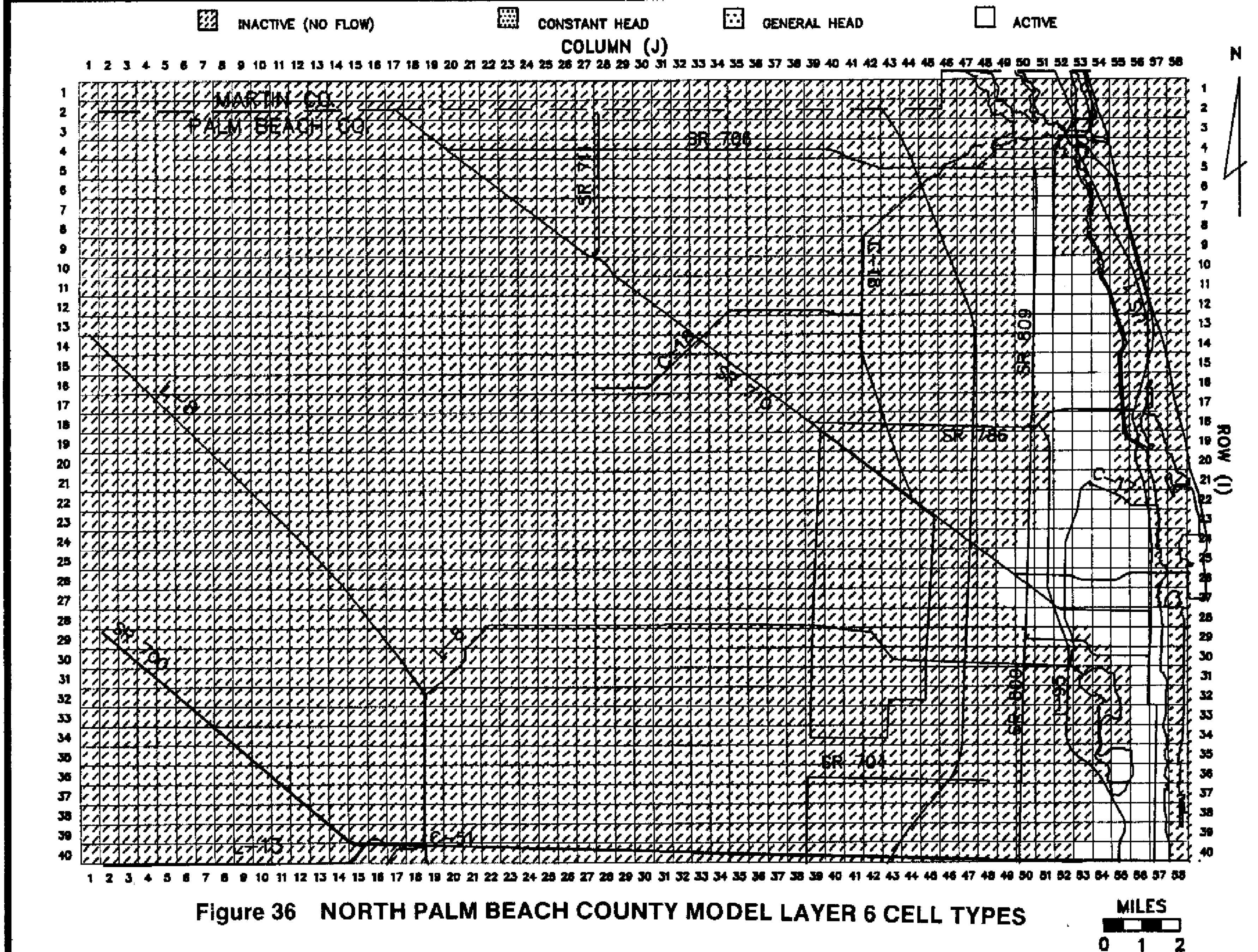


Figure 36 NORTH PALM BEACH COUNTY MODEL LAYER 6 CELL TYPES

The C-51 canal is treated as a ground water divide as previously discussed. The L-8 canal, which forms most of the western boundary of the model's active area was treated as a constant head boundary with an elevation of 12.5 ft. NGVD for the calibration period (its average value during that period) and during predictive simulations. A constant head boundary was also used in the northwest corner of the model where water level maps show a ground water mound generally exists. Water levels along the boundary were varied from 12 ft. to 24 ft. according to the water level map on Plate 19.

There is little water level data available along the northern border of the modeled area. Most water table maps (Plate 19; Miller, 1985a, 1985b) show equipotential contours almost perpendicular to the county line implying a no flow or limited flow condition. The northern boundary of the model was therefore set to a no flow boundary.

North Model Canals

Canals were represented in the model with the river package where canal water levels are maintained and with the drain package where levels are not maintained. The distribution of cells containing rivers and drains in model layer 1 is shown in Figure 37. The canals do not penetrate model layers 2, 3, 4, 5 or 6. Sediment in all canals was assumed to be 1 foot thick with a hydraulic conductivity of 0.5 ft./day (determined by model calibration) for calculation of the river and drain conductances.

Only one of the numerous canal systems in the north model area, the Loxahatchee Groves Water Control District (Plate 15), has maintained levels (refer to Table 4). Appendix N, table N-1 summarizes the widths, control elevations, and river package input data for these canals. The remaining canal systems are not maintained (refer to Table 4) and were represented with the drain package. Appendix N, table N-2 summarizes the widths, weir elevations and drain package input for these canals.

CALIBRATION

Introduction

Ideally, the Palm Beach county models would have been calibrated to steady state conditions using predevelopment data and to transient conditions using data from an extended period with changing conditions. Unfortunately, regional water level data in Palm Beach County are sparse. There are little or no data for predevelopment conditions and available county wide measurements are limited to four sets of data collected by the USGS between October 1983 and May 1985 at 74 observation wells (locations shown on Plate 18). These data sets, presented in Table 5, were used to calibrate the Palm Beach County models. The models were calibrated with a dual approach. First, a steady state calibration was made against the average water levels measured from 10/83 to 5/85 (the calibration period) using average recharge and discharge values for the period in the model. Next, a transient calibration was made against changes in measured water levels during the same period using monthly time steps in the models with recharge and discharge varied accordingly.

The water level data were not ideally suited to either the steady-state or transient calibration. Water levels were not actually at steady state during any of

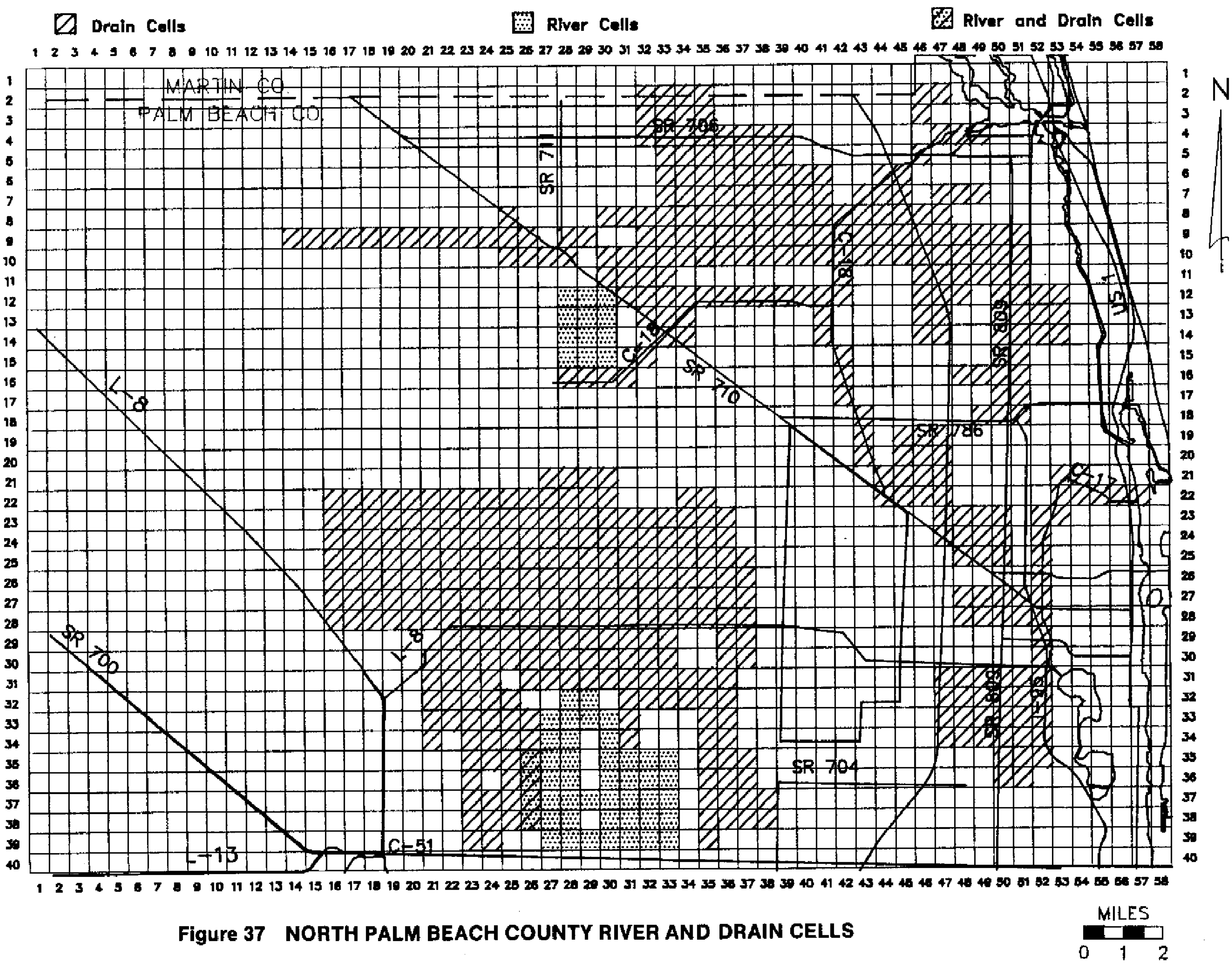


Figure 37 NORTH PALM BEACH COUNTY RIVER AND DRAIN CELLS

the measurement periods for a true steady state calibration, however, changes in measured levels were generally small and the total measurement period is quite short for a transient calibration. Some of the data are further limited because the observation well elevations were never surveyed or because the reliability of the surveying is questionable (see previous discussion in Hydrology Section).

The sensitivity of the measured water levels to rainfall and changes in surface water levels further complicates the calibration. The water table responds almost immediately to rainfall as previously discussed. Thus, a local rainstorm during any of the measuring periods could result in water level increases in selected wells reflecting a local phenomena rather than a regional trend. Temporary changes in canal levels would have a similar effect on local water levels.

Calibration Period Water Use

Individual water use permits were used as the basis for estimating the magnitude and location of ground water pumpage during the calibration period. Well locations and depths are given in the permit staff reports. Monthly public water supply pumpage for the calibration period was obtained directly from reports submitted to the District as part of the permit limiting conditions. Pumpage by other users was estimated based on crop water requirements determined by a modified Blaney-Criddle method less the effective monthly rainfall (explained below). Water use by general permit holders was not modeled because the quantities were not significant compared to individual permit use.

Reported public water supply pumpage in the study area during the 18 month calibration period was 63.85 billions gallons (an average of 118.24 mgd). Sixty-eight percent of this was from the south study area with the remainder from the north study area. Average monthly pumpages for the period by utility and wellfield are given in Table 8. Wellfield locations are shown on Plate 20. Model node locations and pumpage by month for each utility are given in Appendix O.

Almost all non-public water supply consumptive ground water use in the study area was for irrigation. Irrigation water use may be divided into two categories. Agricultural water use, primarily for small vegetables and nursery plants, and non-agricultural water use, primarily for golf course and landscaping irrigation. All of the agricultural acreage, 3,708 acres, irrigated during the calibration period was in the southern modeled area. The total non-agricultural acreage irrigated in the same period was 6,440 acres with 4,692 acres (73% of the total) in the southern study area and the remainder in the northern area.

Non-agricultural and agricultural water use estimates were made based on the modified Blaney-Criddle formula for determining evapotranspiration used by the SFWMD in the water use permitting process. The Blaney-Criddle formula was used to maintain consistency between permitted and modeled water use. The modified Blaney-Criddle formula (as described in SFWMD Permit Information Manual, Volume 3) was used to determine monthly evapotranspiration of the irrigated vegetation on a permit by permit basis. Measured rainfall was then subtracted from the calculated ET to determine the supplemental water requirement for each permittee for each month in the calibration period. The supplemental water requirement corrected for irrigation efficiency is the estimated water use. Irrigation efficiencies of 75 and 50 percent were used for spray and flood irrigation, respectively. Some permits were for combined ground and surface water use with no specified

TABLE 8. EASTERN PALM BEACH COUNTY AVERAGE MONTHLY PUBLIC WATER SUPPLY USE FOR THE MODEL CALIBRATION PERIOD - NOV. 1983 TO MAY 1985

NORTH COUNTY AREA

PERMIT #	UTILITY	WELL FIELD	AVERAGE MONTHLY PUMPAGE (MILLION GALLONS)
50-00010	JUPITER	MAIN	167.955
50-00030	MANGONIA	MAIN	13.005
50-00135	PALM BEACH CO.	8W	189.927
50-00135	PALM BEACH CO.	1W	7.528
50-00178	CENTURY	MAIN	29.5
50-00365	SEACOAST	LILAC	31.267
50-00365	SEACOAST	HOOD	217.634
50-00365	SEACOAST	RICHARDS RD.	61.164
50-00365	SEACOAST	OLD DIXIE	30
50-00444	ROYAL PALM BEACH	OKEECHOBEE	37.16
50-00460	RIVIERA BEACH	EAST	126.566
50-00460	RIVIERA BEACH	WEST	85.415
50-00501	PRATT-WHITNEY	MAIN	30.042
50-00562	MEADOWBROOK	MAIN	25.261
50-00653	GOOD SAM. HOSP.	MAIN	7.808
50-00713	CONSOLIDATED	MAIN	5.745

SOUTH COUNTY AREA

PERMIT #	UTILITY	WELL FIELD	AVERAGE MONTHLY PUMPAGE (MILLION GALLONS)
50-00036	PALM SPRINGS	MAIN	104.755
50-00083	ATLANTIS	MAIN	19.529
50-00177	DELRAY BEACH	MAIN & WEST	337.929
50-00179	JAMAICA BAY	MAIN	1.285
50-00234	LAKE WORTH	MAIN	198.376
50-00346	HIGHLAND BEACH	MAIN	36.85
50-00367	BOCA RATON	EAST	0
50-00367	BOCA RATON	WEST	908.308
50-00401	PALM BEACH CO.	SYSTEM 9	186.471
50-00464	ACME IMPROV. DIST.	MAIN	45.644
50-00499	BOYNTON BEACH	MAIN	248.968
50-00506	MANALAPAN	MAIN	22.578
50-00506	MANALAPAN	BOOSTER	2.612
50-00511	PALM BEACH CO.	SYSTEM 3	58.618
50-00572	NATIONAL MHP	MAIN	4.634
50-00575	LANTANA	MAIN	583.393
50-00584	PALM BEACH CO.	SYSTEM 2	24.93
50-00612	VILLAGE OF GOLF	MAIN	8.834
50-01007	FLA WATER SERV.	MAIN	13.595
50-01092	A.G. HOLLEY HOSP.	MAIN	4.631
50-01283	ARROWHEAD MHP	MAIN	4.408

distribution among the two. In these cases, the percentage of ground water use was based on the percentage of well capacity relative to total water withdrawal capacity.

The locations of permitted agricultural and non-agricultural wells used in the model calibration are shown on Plate 21. Permit information, well locations in the models, and monthly water use estimates for the calibration period are given in Appendix O.

Steady State Calibration Approach

The steady state calibrations were based on the assumption that ground water levels during the calibration period were fluctuating around a steady state condition as a result of seasonal variations in rainfall, pumpage, evapotranspiration and canal levels. Further, the average measured ground water levels during the period were assumed to approximate steady state levels under average annual conditions. Thus, the steady state calibrations were made based on comparison of simulated water levels under typical annual recharge/discharge conditions versus the average measured water levels in surveyed wells during the calibration period. Data from all surveyed wells were used in the calibrations to provide a sufficient distribution of calibration points. The model calibrations are not unique since there are numerous input parameters which can be adjusted in various combinations to give equivalent matches between the simulated and sparse measured heads.

Input parameters initially varied in the calibration runs included recharge, evapotranspiration, canal conductances, aquifer hydraulic conductivities, and the horizontal to vertical hydraulic conductivity anisotropy ratio. The aquifer hydraulic conductivities and anisotropy were returned to their original values after several calibration runs when the model proved much more sensitive to the other factors. Thus, recharge, evapotranspiration, and canal conductances were the only parameters changed as a result of the calibrations. Factors not varied in the calibration runs were well discharges and boundary conditions. Boundary conditions were set as previously described and well discharges were set at averages for the calibration period computed as described in the water use section.

The recharge and evapotranspiration rates in the models were initially combined into one net recharge term to simplify the modeling. However, this approach proved unsuccessful in the northwest portion of the north model where the modeled heads mounded to levels well above land surface. Water mounded in that particular area of the model because there are no canals for surface water drainage of excess water and the low transmissivities of the aquifer prevents rapid drainage through ground water underflow. In actuality, that area is marshy and does flood during the wet season; however, the model does not handle flow or ponding above land surface well, which results in simulation of an extreme unrealistic mound. Further examination of rainfall and precipitation rates showed that potential annual free water surface evaporation exceeds average annual rainfall. When evapotranspiration and rainfall were separated and set accordingly in the models, the problem was resolved.

The north and south models were calibrated concurrently to maintain consistency between models. The calibrated canal sediment conductivities, the hydraulic conductivities of aquifer zones 1, 2, and 3, the maximum recharge, and the evapotranspiration parameters were the same for both models. Calibrated steady state model parameters are shown in Table 9. Unique aspects of each model

TABLE 9. STEADY STATE MODEL PARAMETERS

Hydraulic Conductivity	
Biscayne Zone	1600 ft./day
Production Zone	150 ft./day
Non-Production Zone	50 ft./day
Vertical to Horizontal Anisotropy Ratio	0.1
Canal Sediment Bottom Thickness	1 ft.
Canal Sediment Hydraulic Conductivity	0.5 ft./day

Recharge 60"/yr, 45"/yr, or 30"/yr based on rainfall of 60"/yr and recharge factors of 100, 75 or 50 percent based on land use.

Evapotranspiration maximum of 69.13 in/yr at land surface declining linearly to 0 at 7.5 feet below land surface.

calibration and comparisons of the measured and simulated water levels for each model are described in separate north and south calibration sections.

Transient Approach

The transient calibration runs were made to determine the best specific yield value for the models based on comparison of simulated changes in ground water levels versus measured changes during the calibration period. The transient calibration runs simulated conditions from October 1983 to May 1985 using 15 day time steps. Well pumpages, rainfall, and evapotranspiration were varied monthly. Canal levels were not varied. The simulated heads from the calibrated steady state runs for average annual conditions were used as initial heads in the transient runs. Since these heads are not representative of the transient conditions existing in the aquifer system in October 1983, model results from the first six months of the simulations were not used for calibration. Sensitivity runs with the starting heads increased and decreased twenty-five percent showed that the starting heads had little influence on the modeled results after this period.

The transient calibrations were hindered by the small changes in measured ground water levels. Measured levels in the north and south county modeled areas changed an average of only 0.48 ft and 0.56 ft respectively from April to October 1984 and 0.75 ft and 0.52 ft respectively from October 1984 to May 1985. Unfortunately, head changes of these magnitudes can be attributable to several factors not fully represented in the models. The most important of these in the Palm Beach models are surface water levels and localized rainfall. As previously discussed, aquifer heads are extremely sensitive to canal levels. Although maintained canal levels are relatively stable in the long term, there is some variability in levels on a monthly basis. Canal levels were not varied monthly in the model during the calibration period both because of data deficiencies and because of the complexity of generating the model data sets. Therefore, changes in ground water levels resulting from changes in canal levels are not represented in the models. Precipitation recharge was varied monthly and areally according to measured rainfall during the calibration period. However, local rainfall is not necessarily well represented in the model in areas without rainfall stations. Further, the recharge is applied in the models evenly over the monthly stress periods, while actual aquifer recharge is occurring sporadically over the month.

Due to the limitations discussed, which resulted in marginal agreement between simulated and measured water level changes (discussed in the Calibration Results below), the transient runs were used only to estimate specific yield and to double check the model calibration. The models were run with specific yields varying from 0.3 to 0.1 and the specific storage coefficient for the lower layers fixed at 1×10^{-6}. A specific yield of 0.25 was selected based on the transient calibration results which are described in the following north and south model calibration sections.

North County Model Calibration Results

Calibrated steady state heads in model layer 1 representing average annual conditions in the aquifer during the calibration period are shown in Figure 38. Simulated heads in other layers are not shown since differences between layers are slight. Average measured water levels in observation wells with surveyed elevations and more than one measurement during the calibration period are shown on the same figure. Differences between the simulated steady state water levels and the average measured water levels in these wells during the calibration period are

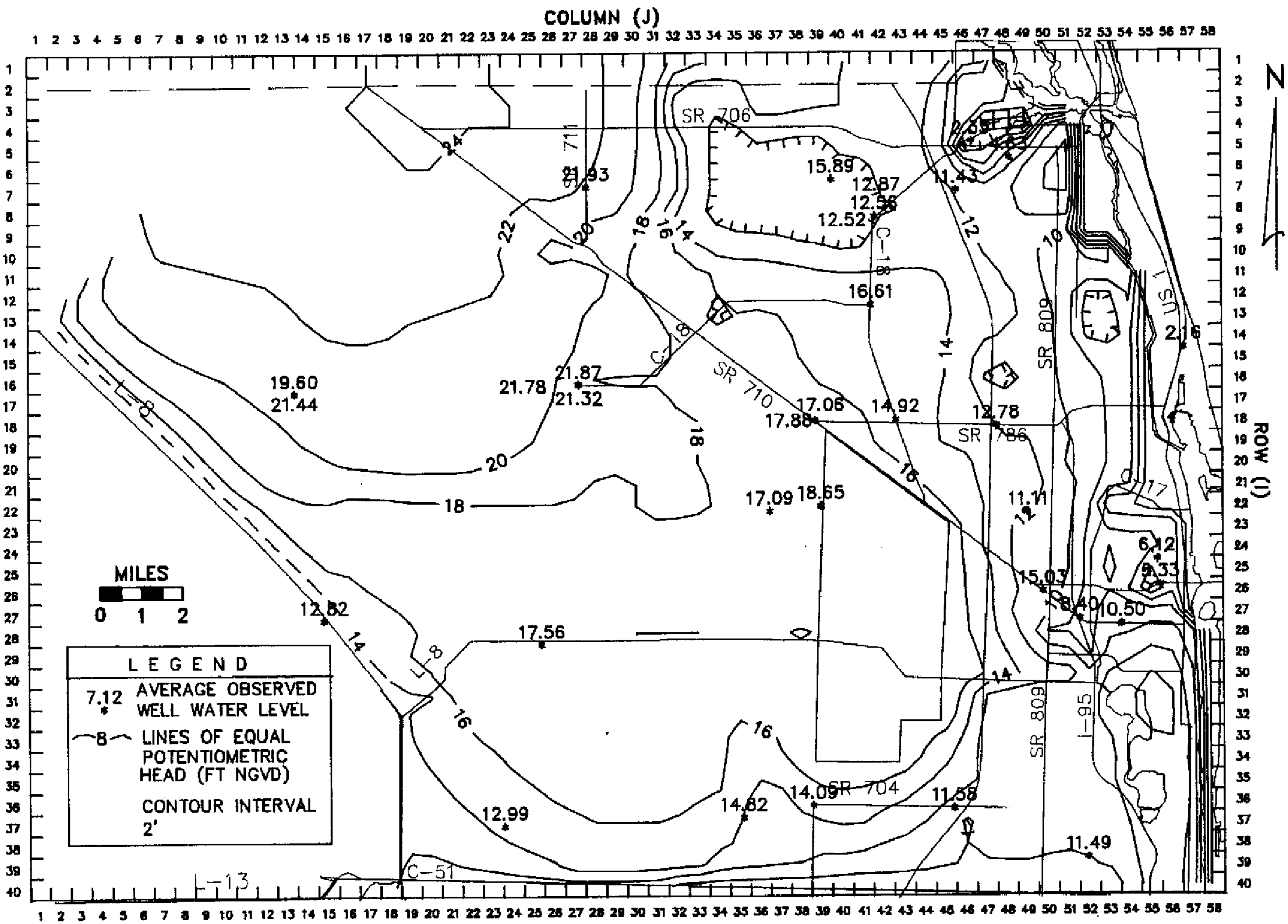


Figure 38 NORTH PALM BEACH COUNTY STEADY STATE CALIBRATION WATER LEVELS IN LAYER 1

shown in Figure 39. Differences between the average measured levels and minimum and maximum measured levels are shown in the same figure. The simulated steady state water levels match the average measured water levels fairly well. The shape of the simulated water table (Figure 38) appears reasonable with no apparent areal trend in differences from the average measured water levels. Almost half of the simulated observation well water levels were within the range of measured water levels (Figure 39). The remaining simulated well levels were within about one foot of the measured range in most cases with exceptions at wells PB-687, PB-1109-A, PB-715, PB-845 and PB-789.

The worst match between simulated and measured observation well water levels occurred at well PB-687. Its elevation was resurveyed so the well head elevation should be accurate. This well is located at the edge of the South Indian River Water Control District which was represented in the model using drain nodes with control elevations from 10.5 to 13 feet. The steady state simulated levels in this area reflect these control elevations. PB-687 is one quarter mile from the nearest drainage canal, but it is located in a drain cell in the model. This discretization results in simulated levels lower than actual levels, although a difference of over four feet is extreme. Apparently either the area is not well drained (measured water levels are only 2-3 feet below land surface) as a result of low hydraulic conductivity zones not represented in the model or there are errors in the reported measurements.

PB-1109 and PB-715 are part of a nested well cluster at the western end of C-18. Simulated levels for both, which are significantly lower than measured levels, are largely controlled by the drain cells representing C-18. The measured levels seem anomalously high given the wells' close proximity to C-18 where the surface water levels are generally 3 to 4 ft. lower than the measured well levels. C-18 does drain the aquifer in that area, and it is possible that there is a high ground water to surface water head gradient in the area resulting from some local, low permeability aquifer material not represented in the model. Such a gradient was not measured within the nested well depths, so the low permeability zone would be expected to occur at less than 35 ft (the depth of the shallowest well) if it is present. These wells were not resurveyed during this study, so it is also possible that the well elevations are erroneous.

Transient calibration runs were made for specific yields of 0.1, 0.2 and 0.3. Agreement between simulated and measured water level changes (as determined by the sum of squares of the residuals) was significantly better for the 0.2 and 0.3 specific yield runs than for the 0.1 runs. However, the sum of squares of the residuals were not significantly different for the 0.2 and 0.3 runs. Therefore, a specific yield of 0.25 was chosen for the remainder of the modeling. The differences between simulated and measured water level changes from the end of April 1984 to the beginning of November 1984 and from the beginning of November 1984 to the beginning of May 1985 for the selected specific yield of 0.25 are shown in Figures 40 and 41. Agreement between simulated and measured changes is marginal because the model is not well suited to simulate the small changes that occurred during these periods as previously discussed.

South County Model Calibration Results

Calibrated steady state heads in model layer 1 representing average annual conditions in the aquifer during the calibration period are shown in Figure 42. Simulated heads in other layers are not shown since differences between layers are

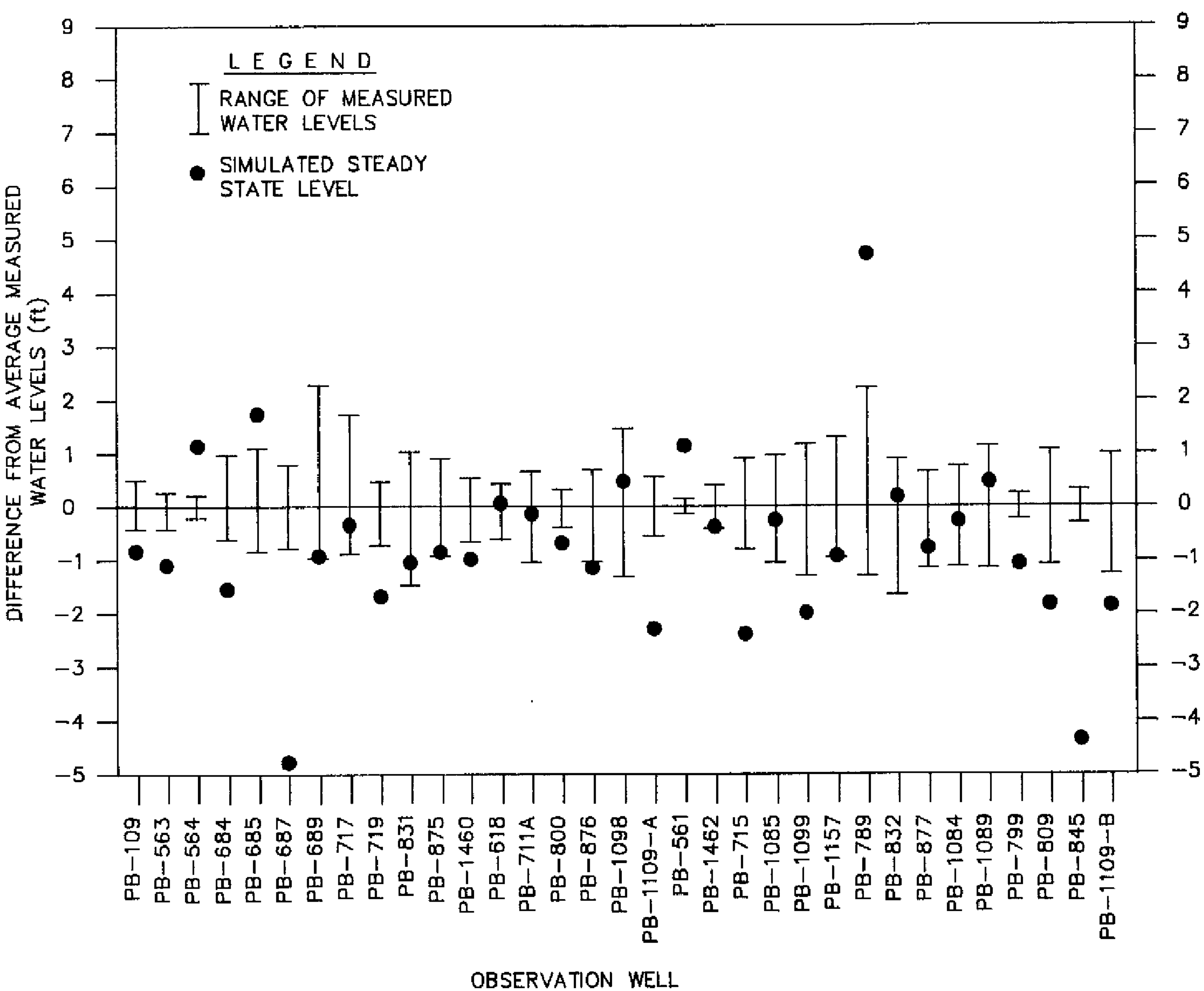


Figure 39 NORTH PALM BEACH COUNTY MODEL STEADY STATE CALIBRATION RESIDUALS FROM AVERAGE MEASURED WATER LEVELS

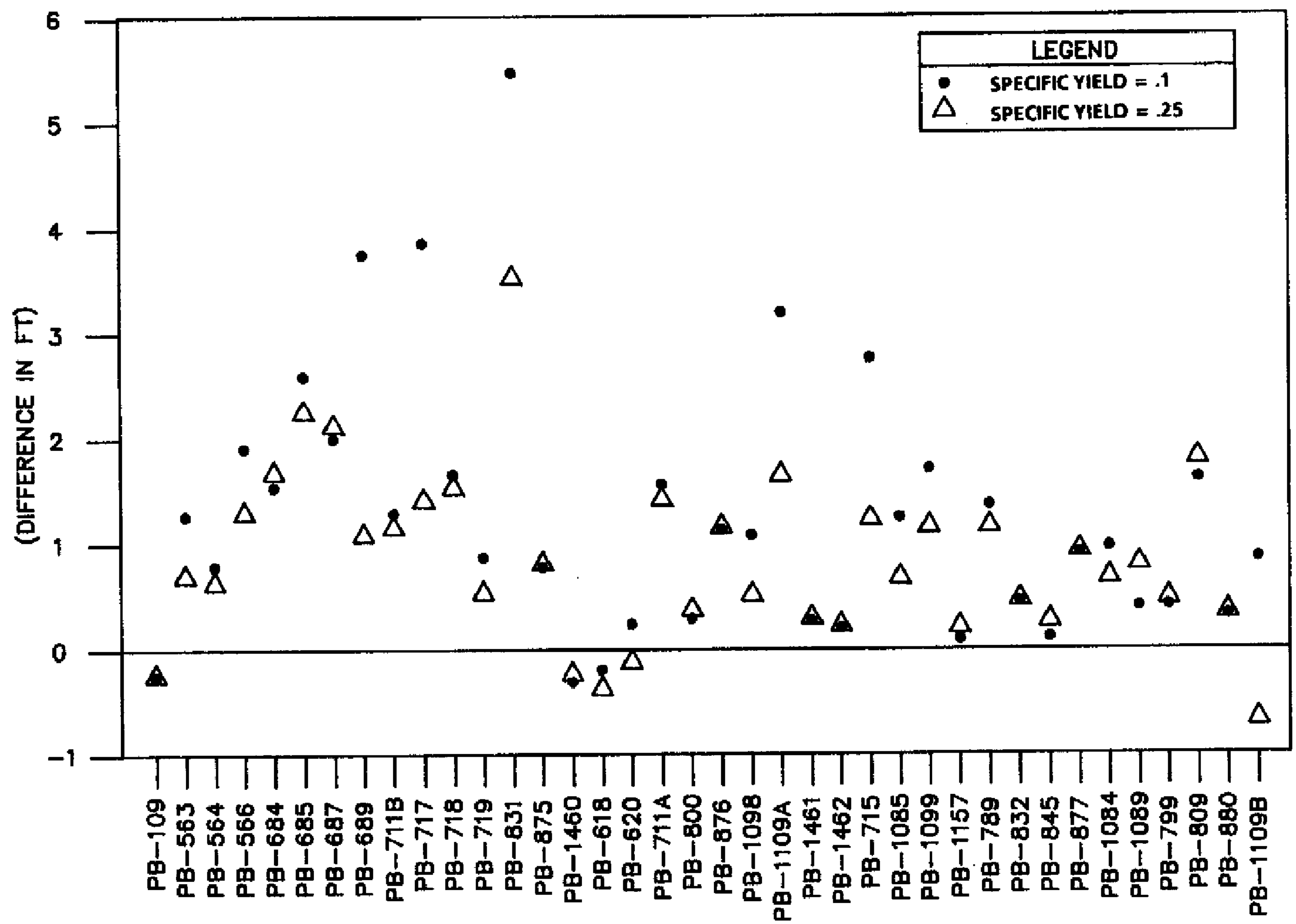


Figure 40 DIFFERENCE BETWEEN SIMULATED AND MEASURED WATER LEVEL CHANGES FROM THE END OF APRIL 1984 TO THE BEGINNING OF NOVEMBER 1984 NORTH PALM BEACH COUNTY MODEL

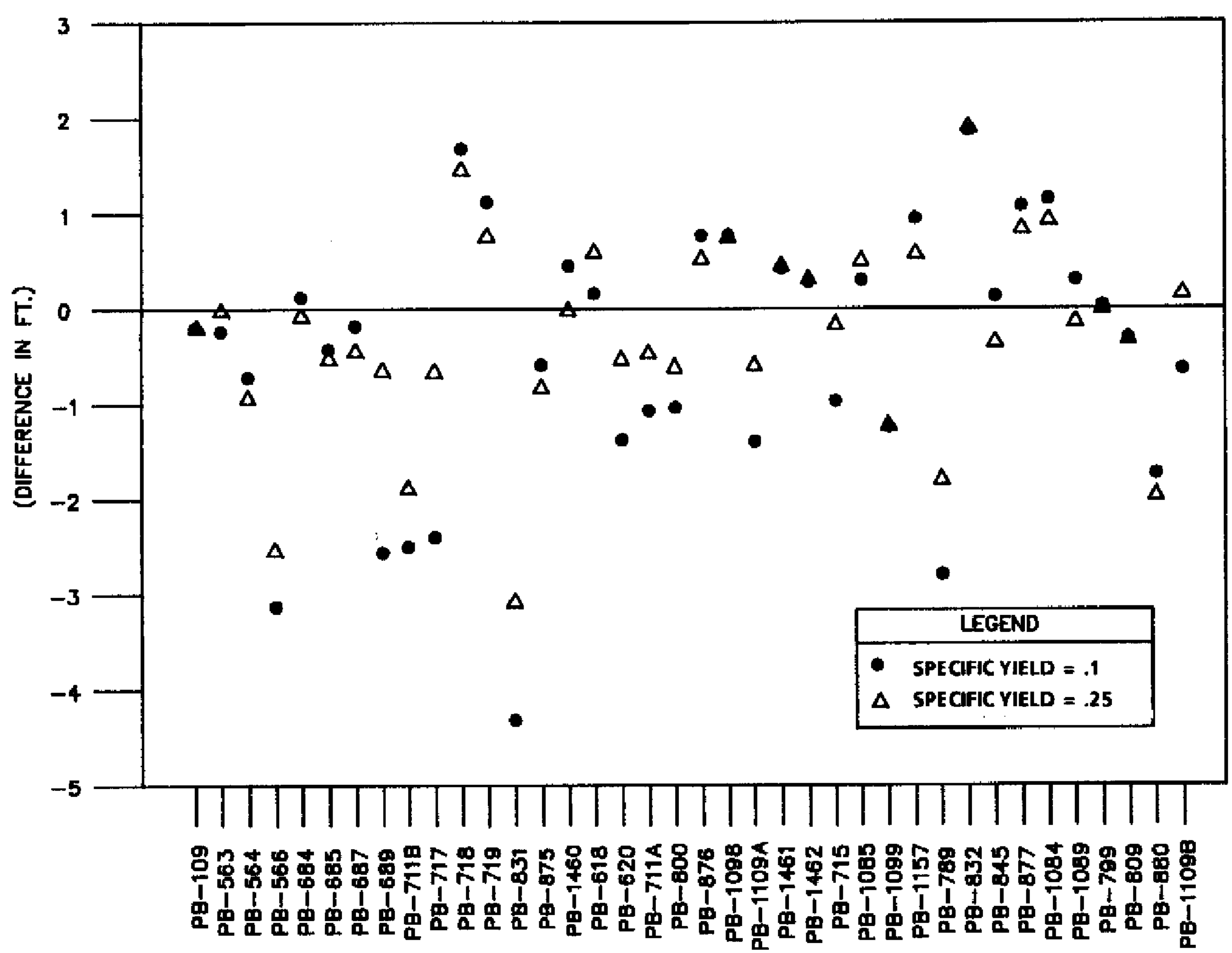


Figure 41 DIFFERENCE BETWEEN SIMULATED AND MEASURED WATER LEVEL CHANGES FROM THE BEGINNING OF NOVEMBER 1984 TO THE BEGINNING OF MAY 1985 - NORTH PALM BEACH MODEL

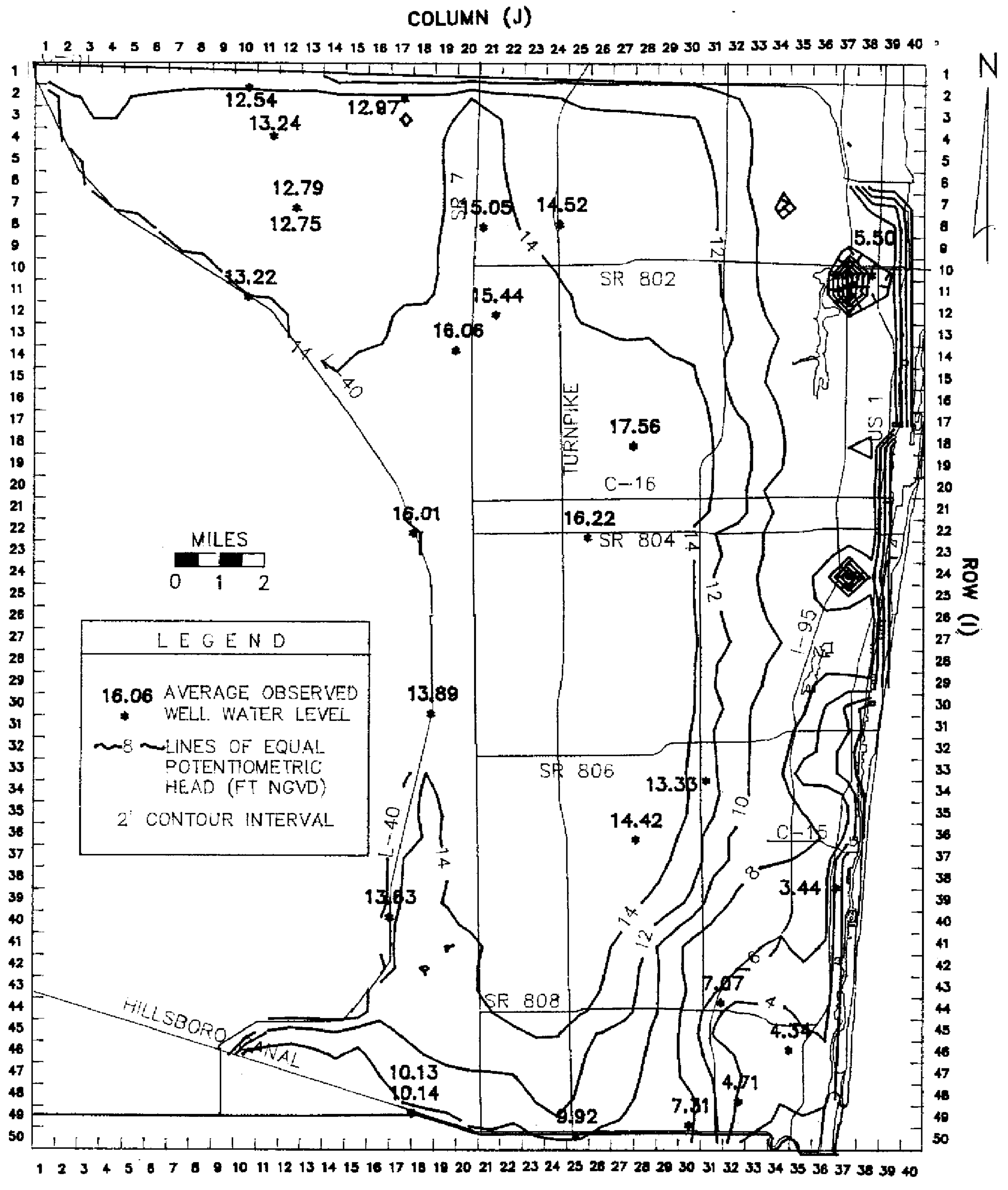


Figure 42 SOUTH PALM BEACH COUNTY MODEL STEADY STATE CALIBRATION WATER LEVELS IN LAYER 1

slight. Average water levels in all observation wells with surveyed elevations and more than one measurement during the calibration period are shown on the same figure. Differences between simulated steady state water levels and average measured water levels at each observation well are shown in Figure 43. Differences between the average measured levels and minimum and maximum measured levels are shown in the same figure.

The simulated steady state water levels match the average measured water levels well. The shape of the simulated water table (Figure 42) is consistent with the average measured levels with no apparent areal trend in discrepancies between the two. Simulated water levels are within the range of measured water levels for half of the observation wells (Figure 43) and are within a half foot of the measured range for most of the remaining wells with the exception of PB-1155 which is within a foot and PB-445 which is off by about two feet. It is possible that the measured water level in PB-445 is erroneous since its elevation was not resurveyed.

The differences between simulated and measured water level changes in observation wells from the end of April 1984 to the beginning of November 1984 and from the beginning of November 1984 to the beginning of May 1985 for a specific yield of 0.25 are shown in Figures 44 and 45. Agreement between the simulated and observed changes is marginal as it was in the north county model. However, in the south county model, changes in specific yield had little effect on the simulated changes and did not significantly affect the match between simulated and measured levels as determined by the sum of square of the residuals. A specific yield of 0.25 was used in the remainder of the modeling to maintain consistency with the north model.

SENSITIVITY ANALYSIS

Approach

Sensitivity analyses were conducted on both models by varying the aquifer hydraulic conductivities, anisotropy ratio, canal sediment hydraulic conductivity, evapotranspiration parameters, and recharge factors. The effects of the parameter changes under steady state conditions were determined by comparing simulated heads and mass balances from the sensitivity runs to those from an unchanged base run. The base run parameters were as follows:

1) For the north and south model recharge factor runs - base run parameters were equal to their final calibrated values.

2) For all other south model runs - base run parameters were equal to their final calibrated values except for canal sediment hydraulic conductivity which was double (1 ft/day) its final calibration value.

3) For all other north model runs - base run parameters were equal to their final calibrated values except for canal sediment hydraulic conductivity and non-Biscayne production zone hydraulic conductivity, which were both double (1 ft/day and 300 ft/day respectively) their final calibration values.

4) For all north model runs - the base runs were made with North Palm Beach County Water Control District Units 11 and 14 misrepresented as rivers. These units are represented as drains (a more appropriate representation for regional flow) in the calibration and predictive runs.

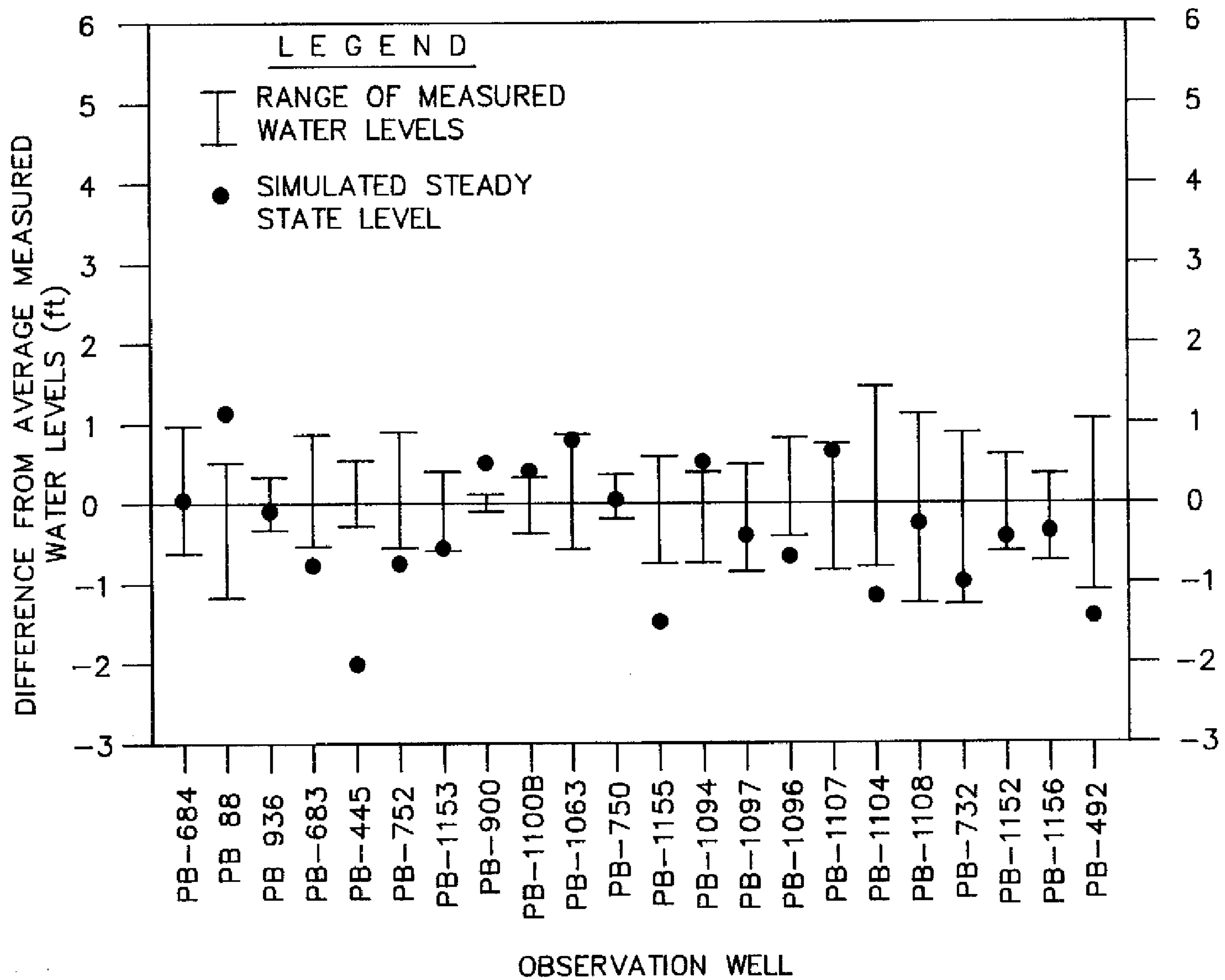


Figure 43 SOUTH PALM BEACH COUNTY MODEL STEADY STATE CALIBRATION RESIDUALS FROM AVERAGE MEASURED WATER LEVELS

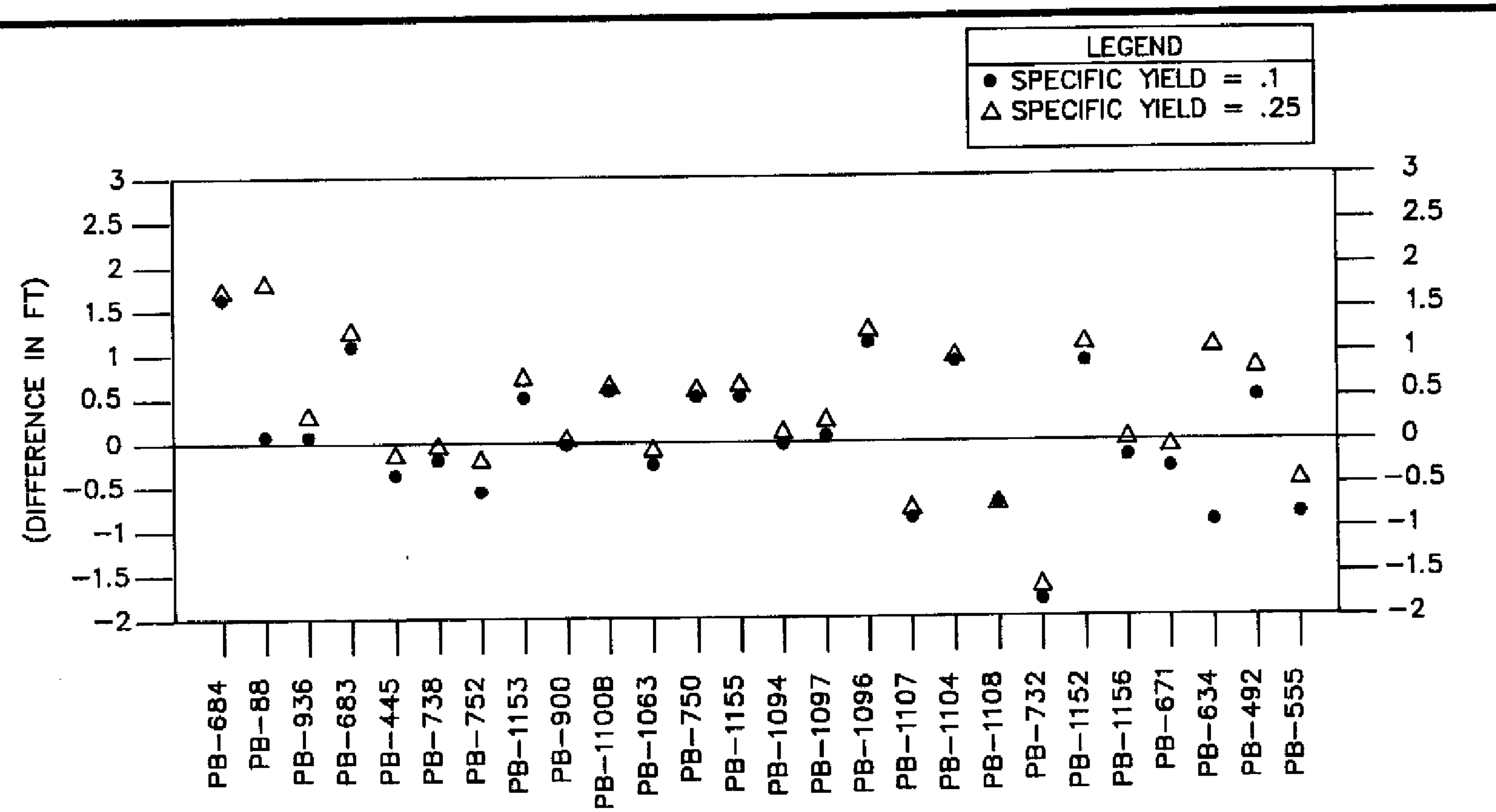


Figure 44 DIFFERENCE BETWEN SIMULATED AND MEASURED WATER LEVEL CHANGES FROM THE END OF APRIL 1984 TO THE BEGINNING OF NOVEMBER 1984 SOUTH PALM BEACH COUNTY MODEL

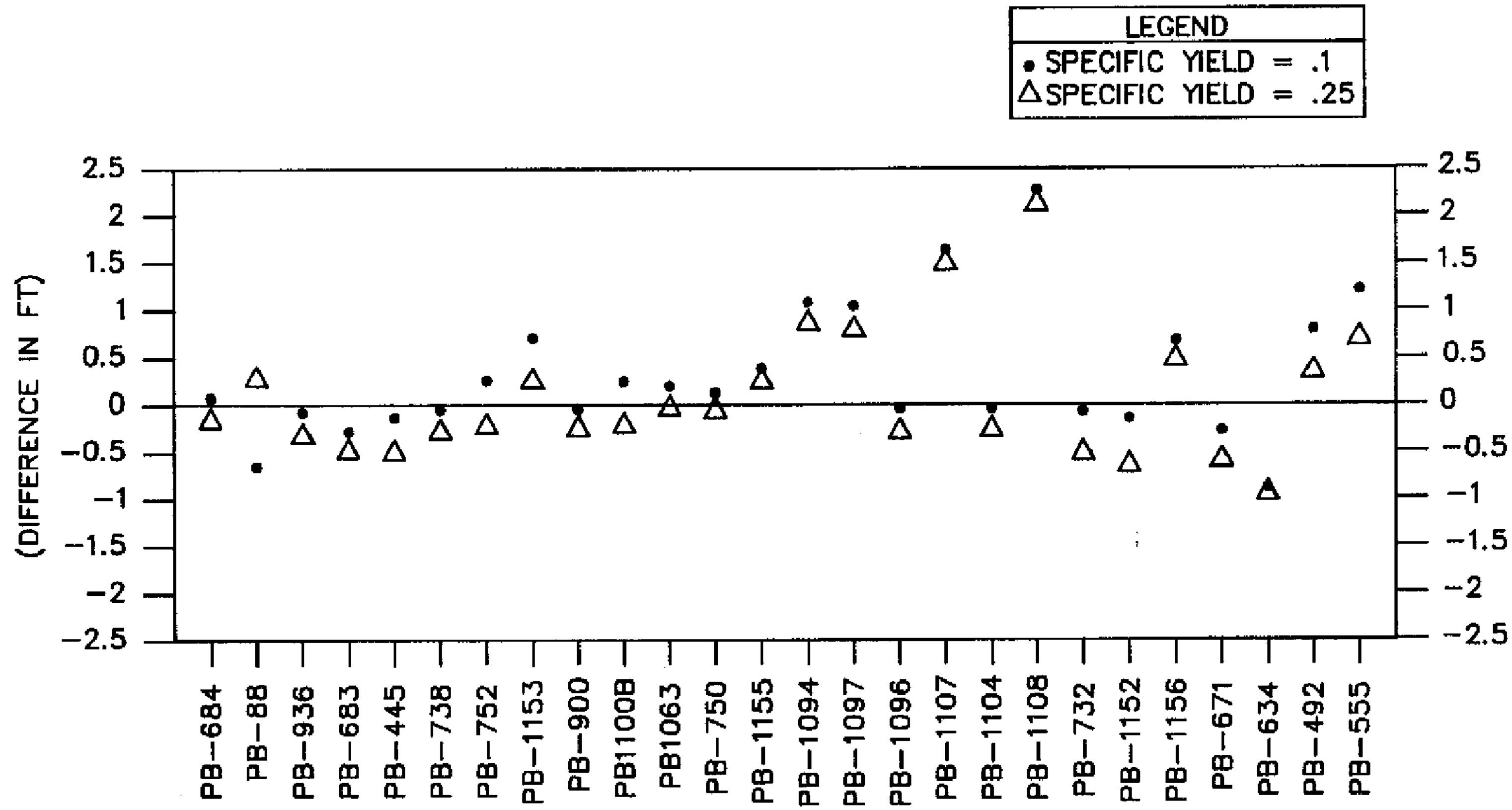


Figure 45 DIFFERENCE BETWEEN SIMULATED AND MEASURED WATER LEVEL CHANGES FROM THE BEGINNING OF NOVEMBER 1984 TO THE BEGINNING OF MAY 1985 SOUTH PALM BEACH COUNTY MODEL

Differences between base run parameters and the final calibrated parameters are due to calibration adjustments made after the sensitivity runs were complete.

Results

The north county model sensitivity runs and their results are summarized in Table 10. The resulting head changes are shown in Figures P-1 to P-11 in Appendix P. Mass balance summaries are shown in Figures 46 to 51. The south county model sensitivity runs and their results are summarized in Table 11. The water level changes resulting from the various parameter changes are shown in Appendix P, Figures P-12 to P-24. Mass balance summaries for the sensitivity runs are shown in Figures 52 to 57. The sensitivity of simulated water levels to parameter changes varied throughout the models primarily as a function of surface water systems and wellfield influences. Parameter changes had different effects in model areas with canals than in areas without them and, further, had different effects in areas where canals water levels are maintained than in areas where they are not.

Water Levels

Modeled ground water levels in the study area were least sensitive to parameter changes in the vicinity of the West Palm Beach Water Catchment Area where no significant water level changes were observed during the sensitivity runs. This is the result of the strong influence of the catchment area on ground water levels in the underlying aquifer combined with the lack of stress on the aquifer under the area.

Simulated ground water levels in areas with canal systems with maintained water levels were fairly insensitive to most parameter changes. Changes in canal sediment hydraulic conductivity had the greatest influence in these areas. Decreased sediment conductivity which retarded the aquifer-canal connection resulted in decreased ground water levels where the canals are recharging the aquifer and increased ground water levels where they are draining it. Both effects are evident in the southeastern study area where levels drop in the south end of the LWDD's 15.5 ft basin but rise in the adjacent 4.5 ft. basin. Increasing the canal sediment hydraulic conductivity had the opposite effect.

Ground water levels in areas where canal levels are not maintained were also primarily sensitive to changes in canal sediment hydraulic conductivities. Decreased hydraulic conductivity caused ground water level increases as the canals became less effective drains. Similarly, hydraulic conductivity increases caused ground water level decreases but to a lesser extent.

Ground water levels in model areas with no canals were influenced mainly by changes in the evapotranspiration parameters. This was particularly evident in the northwest corner of the model where the ground water mound increased up to 10 feet when maximum evapotranspiration was reduced 25%, and precipitation in the area exceeded evapotranspiration. These increases are unrealistic since such water levels are above land surface. However, they demonstrate both the importance of evapotranspiration in maintaining realistic water levels in that area and the limitations of modeling only the ground water component in areas which flood and experience overland flow. In such areas, a coupled ground water/surface water flow model would provide a better representation of the physical system. Water levels in undrained areas were also sensitive to the evapotranspiration extinction depth; when

TABLE 10. NORTH PALM BEACH COUNTY MODFLOW SENSITIVITY ANALYSES

CHANGE*	FIG.	Head Change Min/Max		RESULTS
		Layer 1	Layer 3	
Doubled K's and VCONT'S in all layers.	P-1	-3.7/2.7	-3.6/2.8	Water levels increased .5 to 1 ft. in the immediate vicinity of most wellfields. They declined in undrained areas near drained areas or constant head boundaries which act as drains. Primary influence in east and northeast portion of model. Mass balance showed net increases in drain outflow and general head inflow.
Halved K's and VCONT's in all layers.	P-2	-5.7/4.7	-5.9/4.6	Opposite effect of when K's, VCONT's doubled except changes greater.
Decrease vertical to horizontal anisotropy ratio to 0.01.	P-3 P-4	-.5/4.8	-1/4.3	Water levels increased in undrained areas near drained areas or constant head boundaries which act as drains. Decreased in layer 3 near wellfields. Mostly effects in eastern third of model. Mass balance shows small decreases in drain outflow, river leakage inflow, and general head boundary inflow and outflow.
Increase vertical to horizontal anisotropy ratio to 1.	None	-.9/.2	-.9/.3	Very little change in water levels. Little change in mass balance.
Decrease canal sediment hydraulic conductivity to 0.1 ft/day.	P-5 P-6	-1.8/5.5	-1.2/4.4	Water levels increased in drainage areas (unmaintained drainage district canals). They decreased near eastern segment of M canal. Slight decreases near controlled NPBCWCD units 11 and 14. Mass balance shows large decrease in drain outflow, increased ET, and net decreases in both river leakage and general head boundary flow as inf low and outflow from both were reduced.
Increase canal sediment hydraulic conductivity to 10 ft/day.	P-7	-2.5/2.1	-2.4/1.7	Opposite of when canal sediment conductivity decreased; not quite as extensive. Mass balance also shows opposite trend, except greater changes in general head boundary inflow and drain outflow and smaller change in ET.
Reduce ET 25% to 0.0118 ft/day (52in./yr.).	P-8	0/11.7	0/11.7	Water levels increase primarily in the undeveloped, undrained northwest model area. (Note: Model heads above land surface, unrealistic.) Mass balance shows increases in drain outflow, decreases in general head boundary inflow and outflow.
Halve ET extinction depth to 3.25 ft.	P-9	0/2.9	0/2.9	Water levels increase in areas where water levels are close to land surface, primarily undrained uncontrolled areas. Mass balance shows large increase in drain outflow, small increases in general head boundary and river leakage outflow.

*Note: All changes are relative to a steady state base run with calibrated parameters except canal sediment hydraulic conductivity = 1 ft/day and non-Biscayne production zone hydraulic conductivity = 300 ft/day.
K = Aquifer Hydraulic Conductivity VCONT = Vertical Conductance

TABLE 10. NORTH PALM BEACH COUNTY MODFLOW SENSITIVITY ANALYSES

CHANGE*	FIG.	Head Change Min/Max		RESULTS
		Layer 1	Layer 3	
Set recharge factor to 0.75 throughout model	P-10	-1.6/2.9	-1.6/2.8	Water levels increased in areas where the recharge factor is increased from 0.5 to 0.75 and decreased in areas where it is decreased from 1 to 0.75. Water level changes are restricted to the immediately vicinity of the recharge factor changes. Mass balance shows decrease in recharge and ET.
Change recharge factors from 1.0, 0.75 and 0.5 to 0.9, 0.8 and 0.7 respectively.	P-11	-0.6/2.4	-0.6/2.3	Water levels increased in areas where the recharge factor is increased from 0.5 to 0.7. Water levels decreased more than 0.5 ft where recharge factor is decreased from 1.0 to 0.9 only in the northwest corner of the model. Little change in water levels (< .5 ft) where recharge factor is increased from 0.75 to .80. Mass balance shows little change.

*Note: All changes are relative to a steady state base run with calibrated parameters except canal sediment hydraulic conductivity = 1 ft/day and non-Biscayne production zone hydraulic conductivity = 300 ft/day.
K = Aquifer Hydraulic Conductivity VCONT = Vertical Conductance

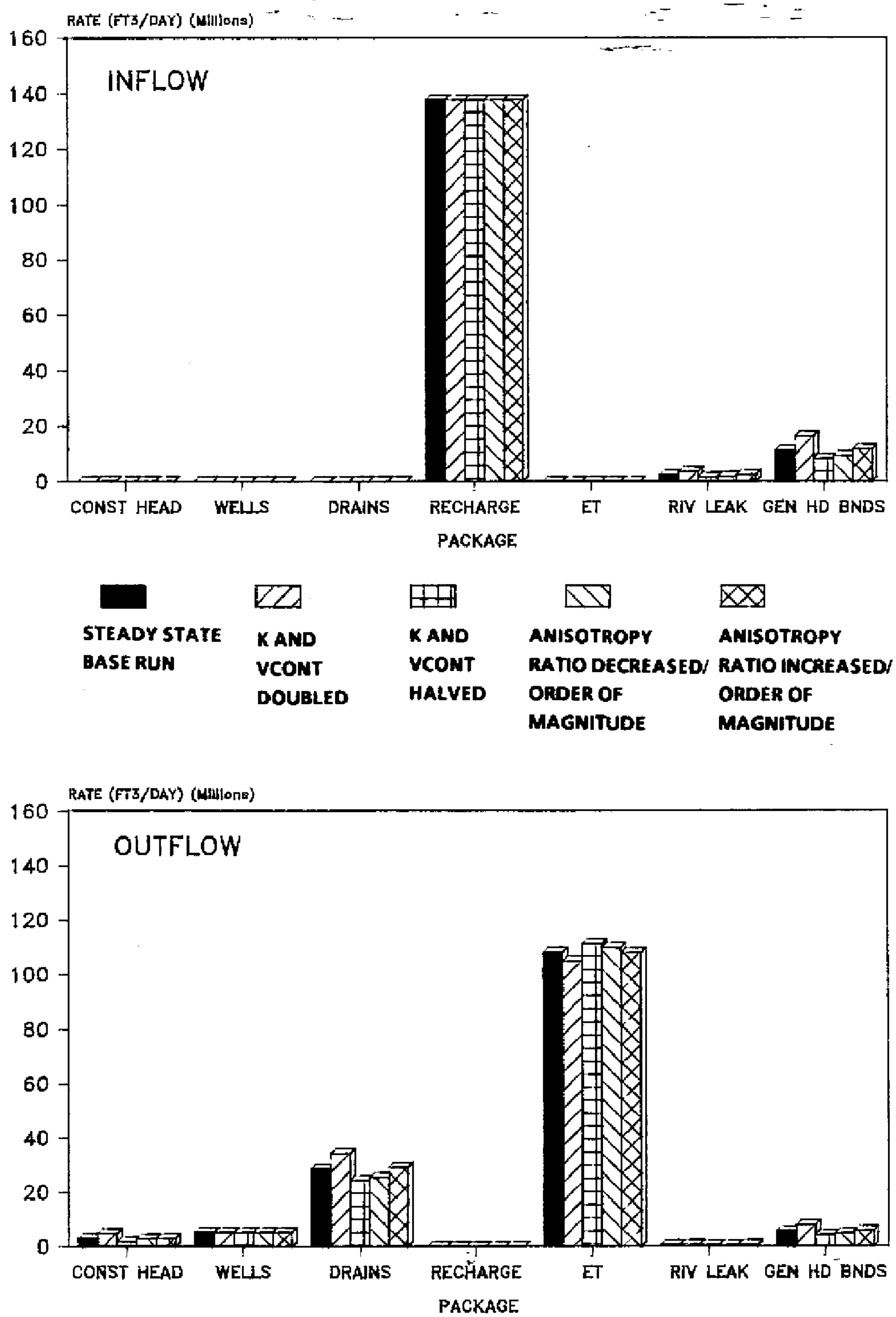


Figure 46 NORTH MODEL INFLOW AND OUTFLOW MASS BALANCES FOR BASE RUN AND HYDRAULIC CONDUCTIVITY, VERTICAL CONDUCTANCE, AND VERTICAL TO HORIZONTAL ANISOTROPY RATIO SENSITIVITY SIMULATIONS

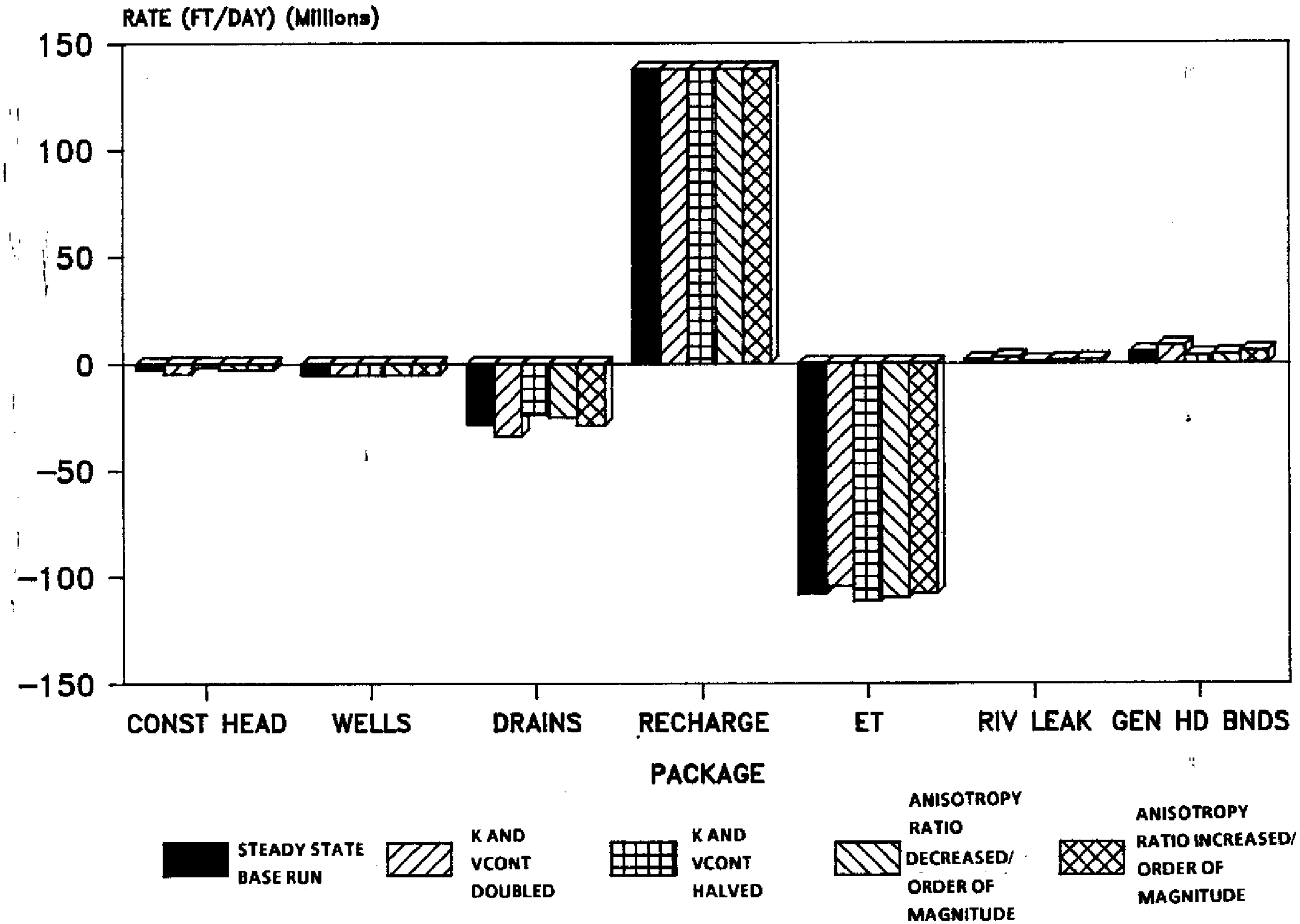


Figure 47 NORTH MODEL NET MASS BALANCE FOR BASE RUN AND HYDRAULIC CONDUCTIVITY, VERTICAL CONDUCTANCE, AND VERTICAL TO HORIZONTAL ANISOTROPY RATIO SENSITIVITY SIMULATIONS

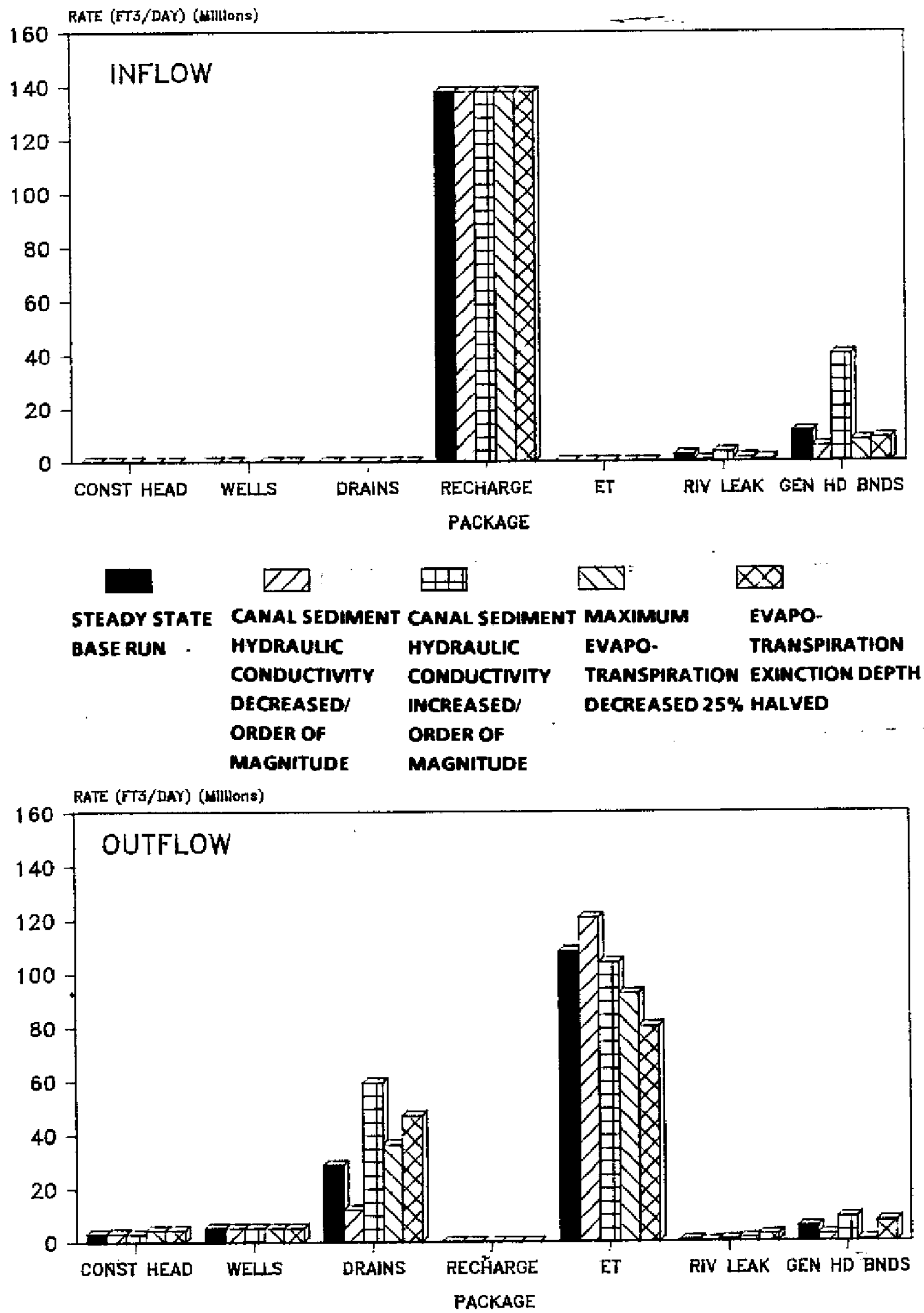


Figure 48 NORTH MODEL INFLOW AND OUTFLOW MASS BALANCES FOR BASE RUN AND CANAL SEDIMENT HYDRAULIC CONDUCTIVITY AND EVAPOTRANSPIRATION SENSITIVITY SIMULATIONS

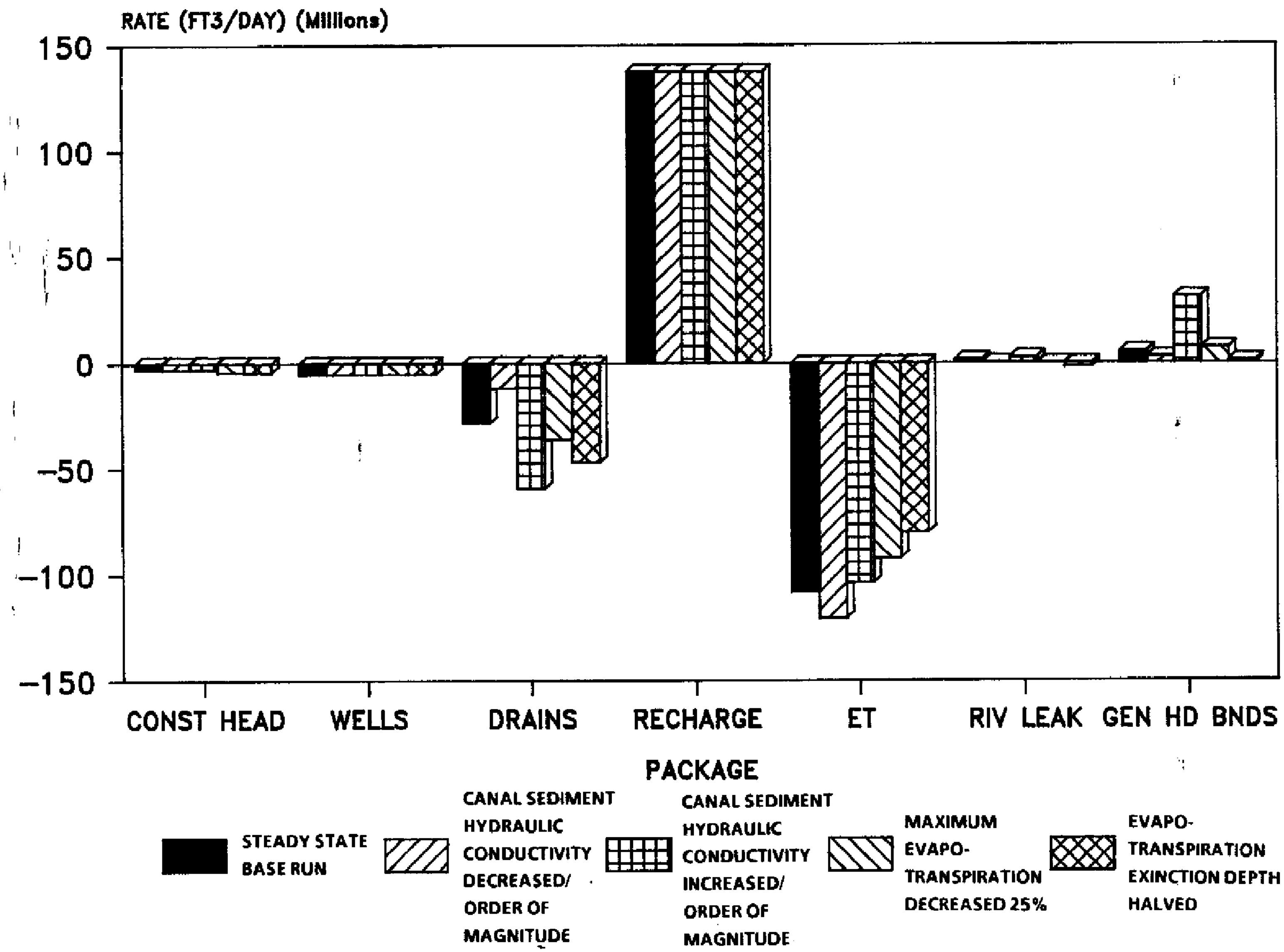


Figure 49 NORTH MODEL NET MASS BALANCE FOR BASE RUN AND CANAL SEDIMENT HYDRAULIC CONDUCTIVITY AND EVAPOTRANSPIRATION SENSIVITY SIMULATIONS

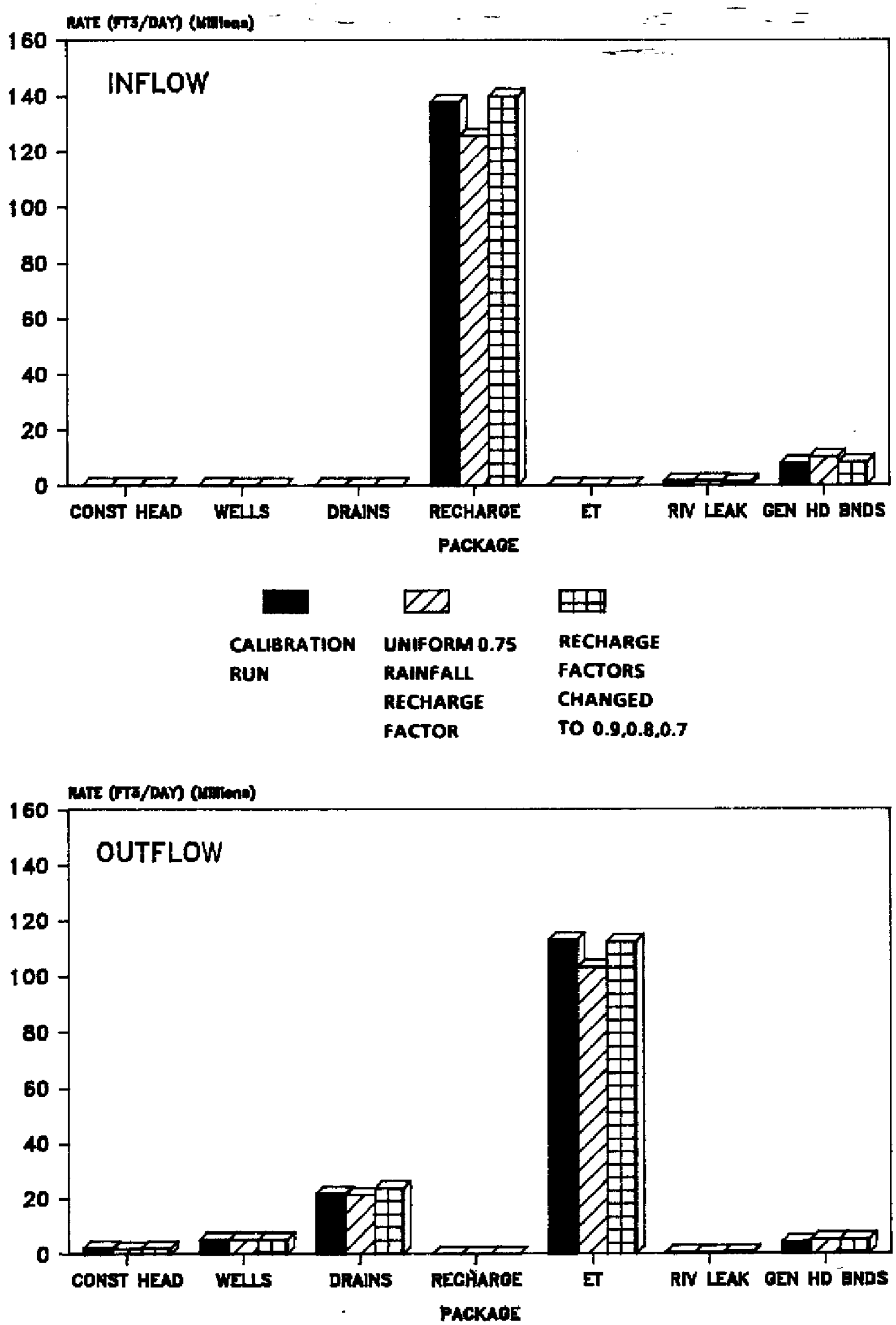


Figure 50 NORTH MODEL INFLOW AND OUTFLOW MASS BALANCES FOR CALIBRATION RUN AND RECHARGE FACTOR SENSITIVITY SIMULATIONS

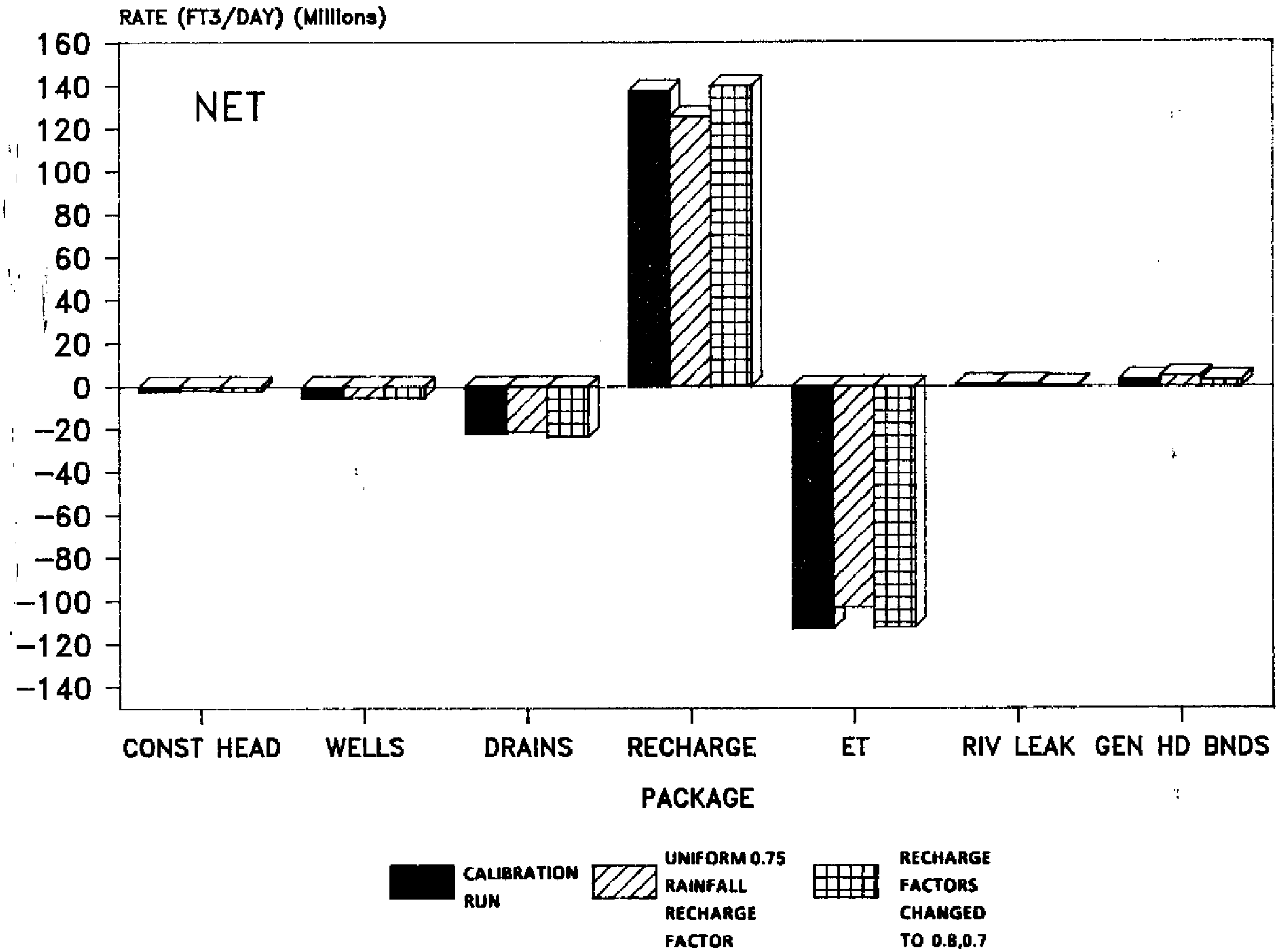


Figure 51 NORTH MODEL NET MASS BALANCE FOR CALIBRATION RUN AND RECHARGE FACTOR SENSITIVITY SIMULATIONS

TABLE 11. SOUTH PALM BEACH COUNTY MODFLOW SENSITIVITY ANALYSES

CHANGE*	FIG.	Head Change Min/Max		RESULTS
		Layer 1	Layer 3	
Doubled K's and VCONT'S in all layers.	P-12 P-13	-1.6/4.9	-1.5/5.0	Water level increases around coastal wellfields where canal recharge is insignificant. Increases in areas where controlled canals act as drains that are adjacent to areas of higher control elevations; this results from increased inflow from the adjacent areas. Decreases in controlled areas losing water to areas with lower control elevations. Primarily effects areas where differences in canal control elevations are greatest. Effect is damped in layer 3. Mass balance shows decreases in both river and general head boundary inflow and outflow.
Halved K's and VCONT's in all layers.	P-14 P-15	-10.5/2.4	-10.7/2.3	Largest decrease in water levels in coastal wellfield areas (decreases were >increases above). Also decreases in the vicinity of canal control elevation transitions. Increases in undrained areas. Mass balance shows decreases in both river and general head boundary inflow and outflow.
Decrease vertical to horizontal anisotropy ratio to .01.	P-16 P-17	-5.6/1.7	-4.1/1.7	Increases in undrained areas. Changes in the vicinity of canal control elevation changes in layer 1; increases near changes where control levels are higher, decreases where levels are lower. Decreases in layer 3 in the vicinity of major wellfields. Little change in mass balance.
Increase vertical to horizontal anisotropy ratio to 1.	None	-.5/.9	-.4/.7	Very little change in water levels. Little change in mass balance.
Decrease canal sediment hydraulic conductivity to .1 ft/day.	P-18	-2/4	-1.9/3.8	Water level increases in areas where canals act as drains; decreases where canals provide recharge. Mass balance shows increased ET and large decreases in river outflow exceeding large decreases in river inflow..
Increase canal sediment hydraulic conductivity to 10 ft/day.	P-19 P-20	-3.3/2.3	-2.5/1.5	Opposite effect of decreases in canal sediment hydraulic conductivity, except changes occur over a tighter transition area. Mass balance shows opposite of when sediment conductivity decreased except ET shows little decrease.
Reduce ET 25% to .0118 ft/day (52 in./yr.).	P-21	0/1.5	0/1.4	Water level increases of greater than .5' were limited to the western model area where there are no controlled canals. Mass balance shows decrease in ET, decrease in river inflow and increase in river outflow.
Halve ET extinction depth to 3.25 ft.	P-22	0/2.4	0/2.4	Water levels increase in areas where they are close to the surface, primarily the central basin of the LWDD and undrained, uncontrolled areas. Mass balance shows decrease in ET.

*Note: All changes are relative to a steady state base run with calibrated parameters.
K = Aquifer Hydraulic Conductivity VCONT = Vertical Conductance

TABLE 11. SOUTH PALM BEACH COUNTY MODFLOW SENSITIVITY ANALYSES

CHANGE*	FIG.	Head Change Min/Max		RESULTS
		Layer 1	Layer 3	
Set recharge factor to 0.75 throughout model	P-23	0/3.2	0/3.2	Water levels increase in areas where recharge factor is increased from 0.5 to 0.75. Increases are greatest in the middle of these areas and decline near areas of no recharge change in the west and near the constant head boundaries in the east. Mass balance shows increase in recharge, decrease in ET and increase in river outflow exceeding increase in river inflow.
Change recharge factors from 0.75 and 0.5 to 0.8, and 0.7 respectively.	P24	0/2.6	0/2.6	Water levels increase in areas where recharge factor is increased from 0.5 to 0.7. Water level changes where the recharge factor is increased from 0.75 to 0.8 were less than 0.5 ft. Mass balance shows increase in recharge, decrease in ET and increase in river outflow exceeding increase in river inflow.

*Note: All changes are relative to a steady state base run with calibrated parameters.
K = Aquifer Hydraulic Conductivity VCONT = Vertical Conductance

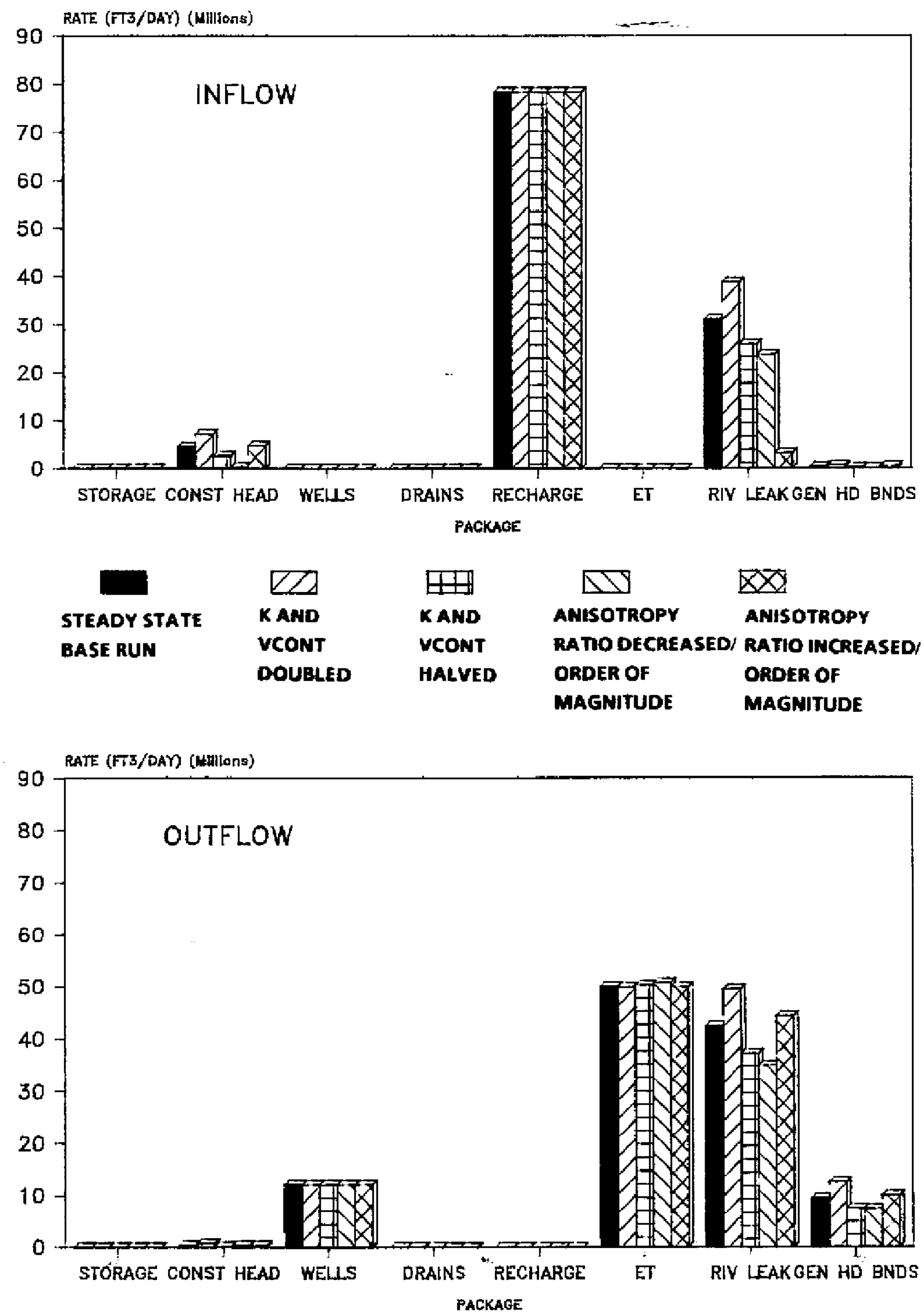


Figure 52 SOUTH MODEL INFLOW AND OUTFLOW MASS BALANCES FOR BASE RUN AND HYDRAULIC CONDUCTIVITY, VERTICAL CONDUCTANCE, AND VERTICAL TO HORIZONTAL ANISOTROPY RATIO SENSITIVITY SIMULATIONS

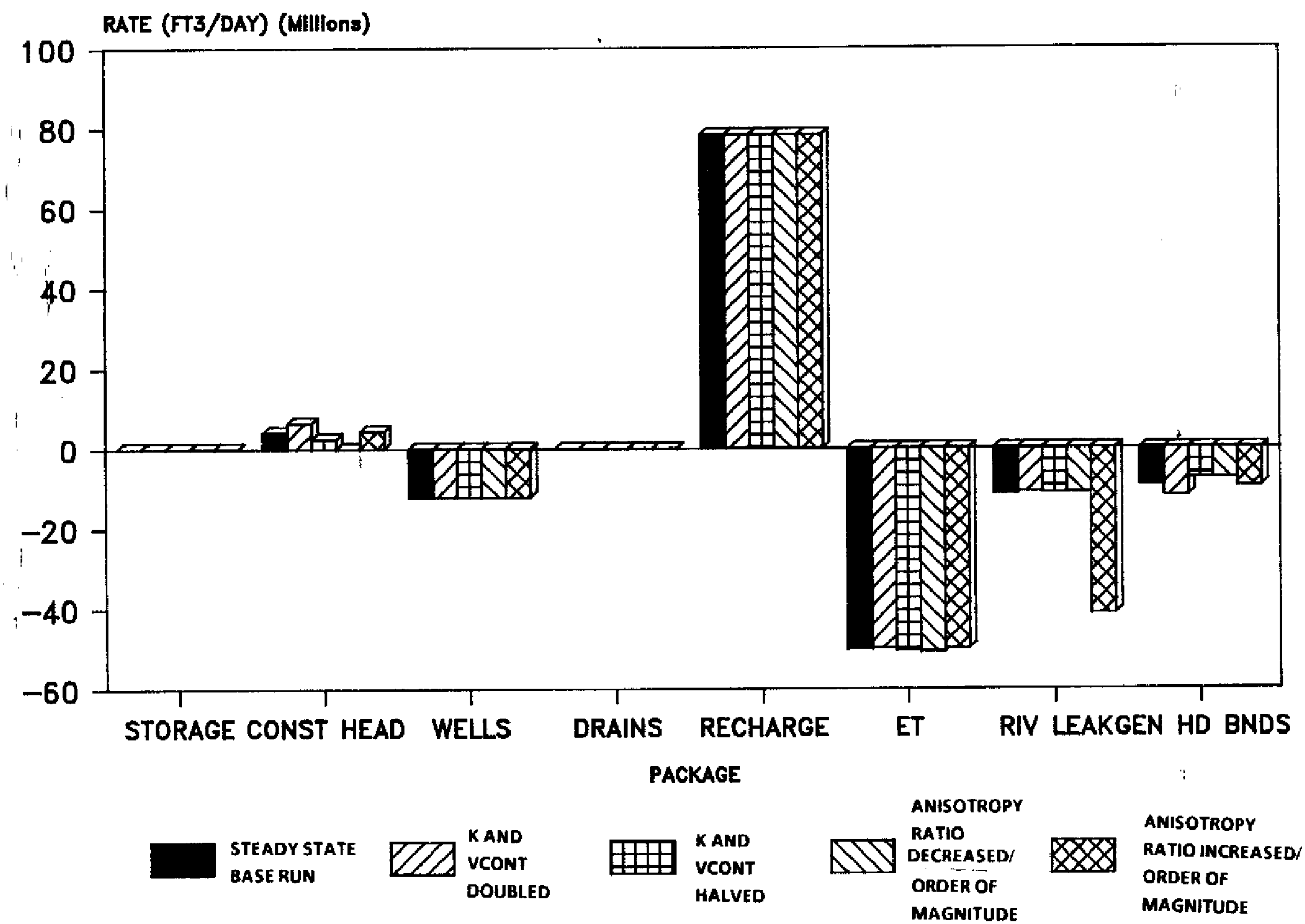


Figure 53 SOUTH MODEL NET MASS BALANCE FOR BASE RUN AND HYDRAULIC CONDUCTIVITY, VERTICAL CONDUCTANCE, AND VERTICAL TO HORIZONTAL ANISOTROPY RATIO SENSITIVITY SIMULATIONS

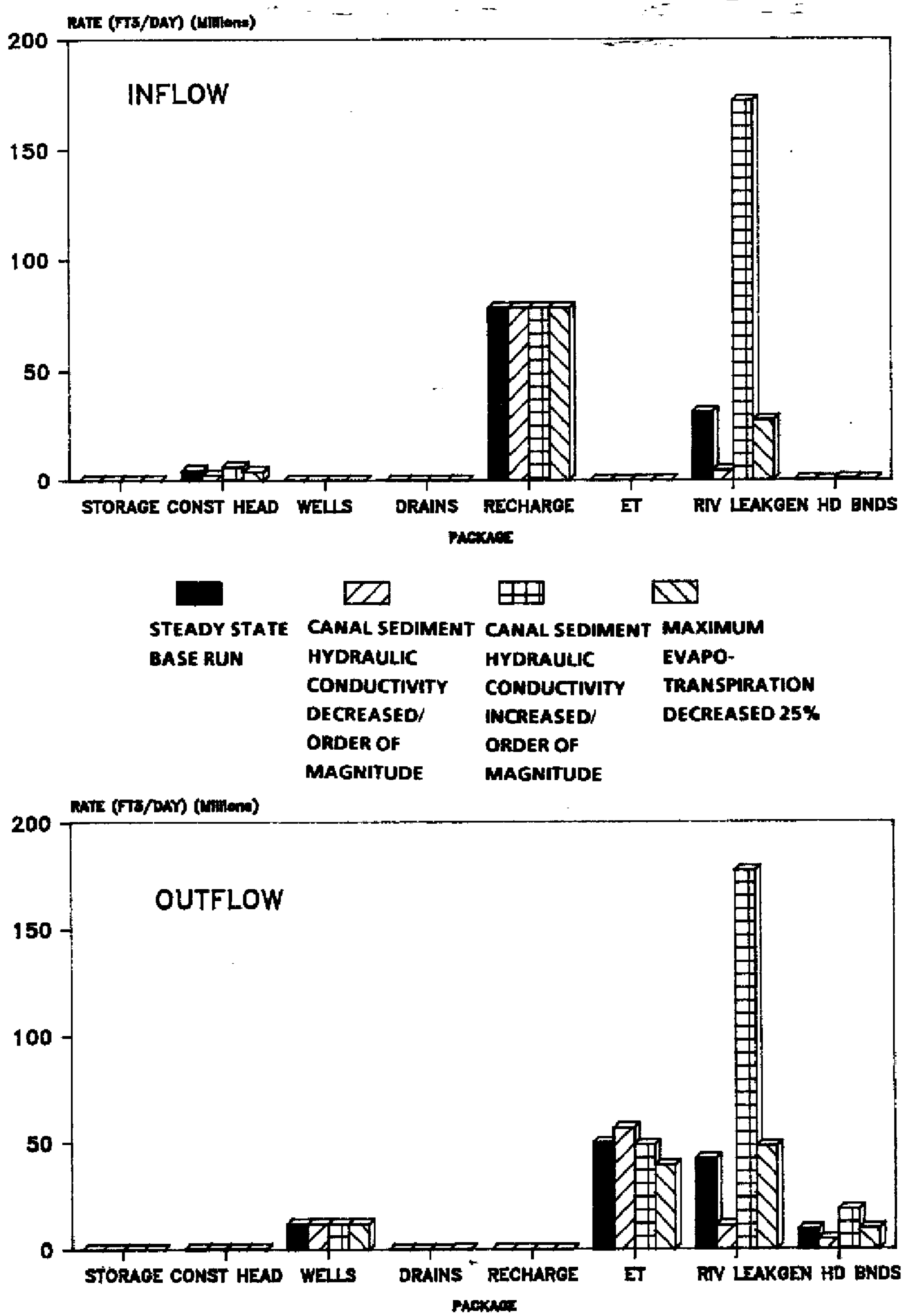


Figure 54 SOUTH MODEL INFLOW AND OUTFLOW MASS BALANCE FOR BASE RUN AND CANAL SEDIMENT HYDRAULIC CONDUCTIVITY AND EVAPOTRANSPIRATION SENSITIVITY SIMULATIONS

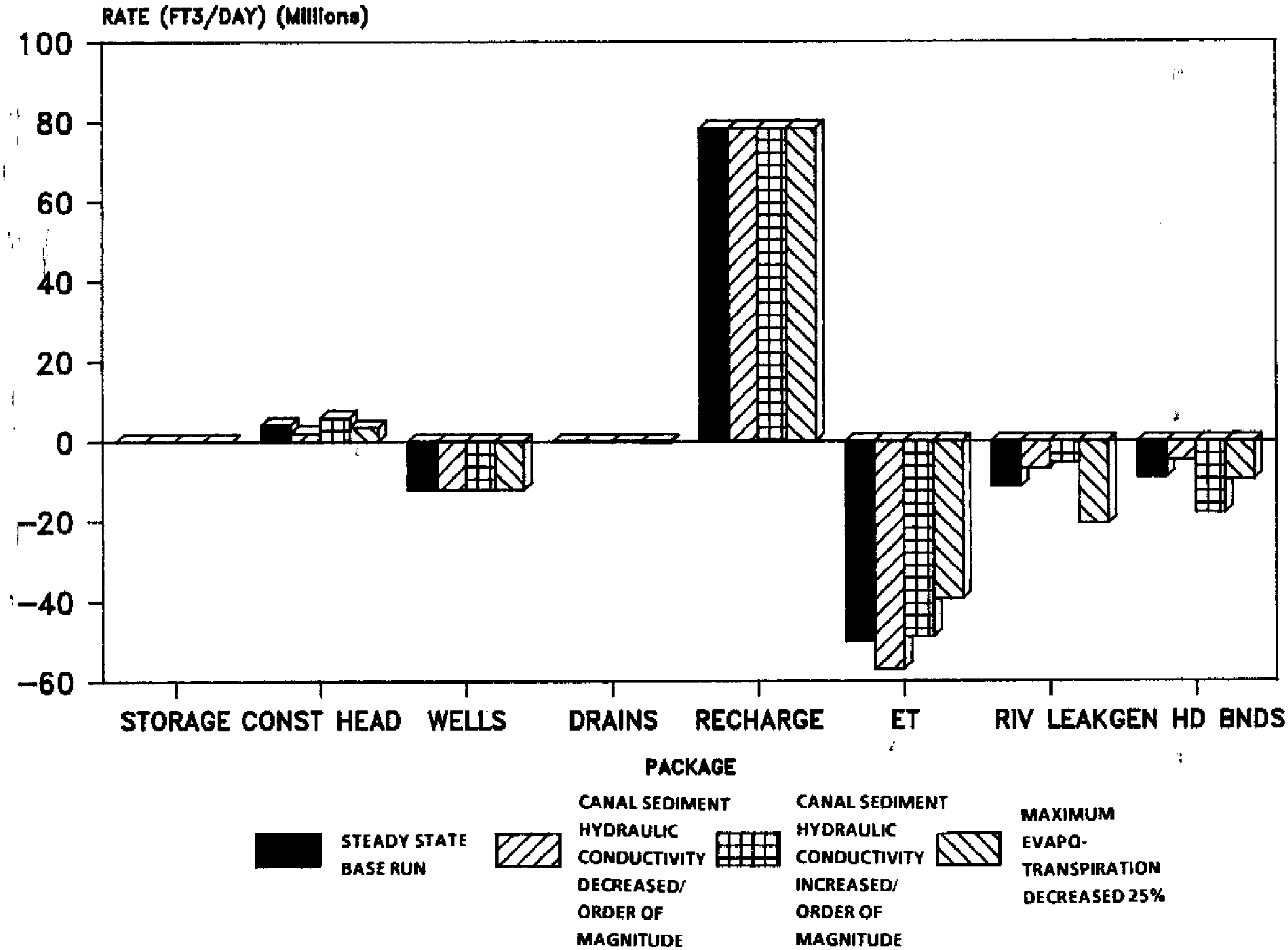
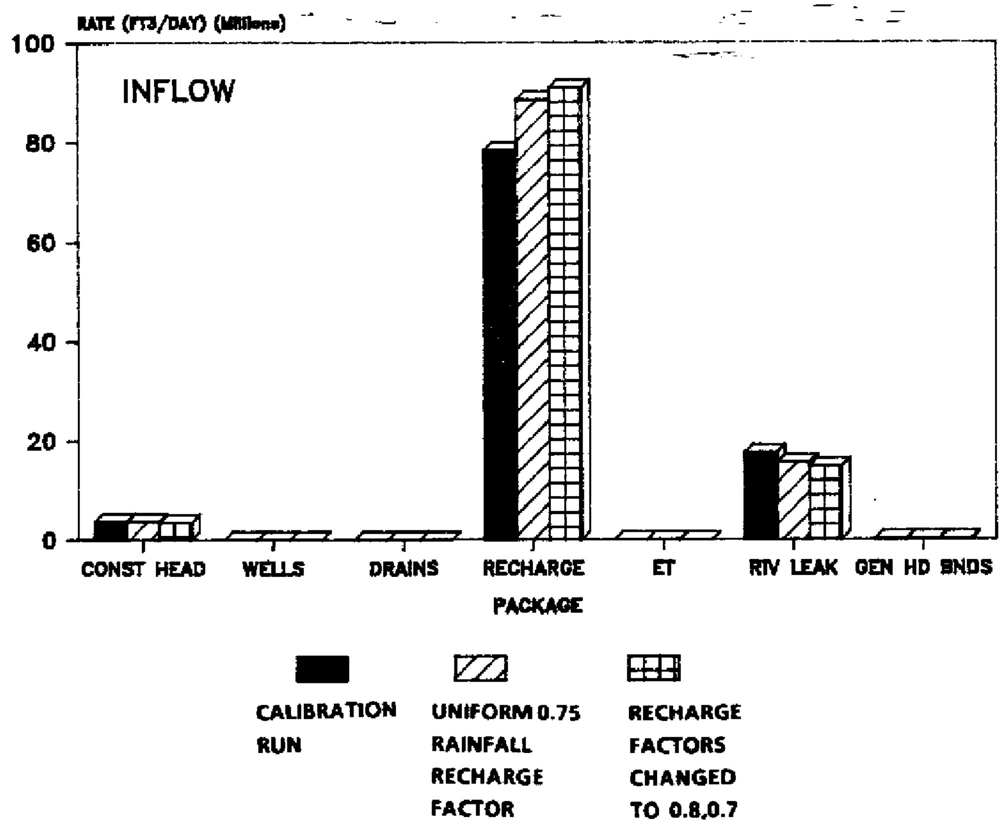


Figure 55 SOUTH MODEL NET MASS BALANCE FOR STEADY STATE BASE RUN AND CANAL SEDIMENT HYDRAULIC CONDUCTIVITY AND EVAPOTRANSPIRATION SENSITIVITY SIMULATIONS



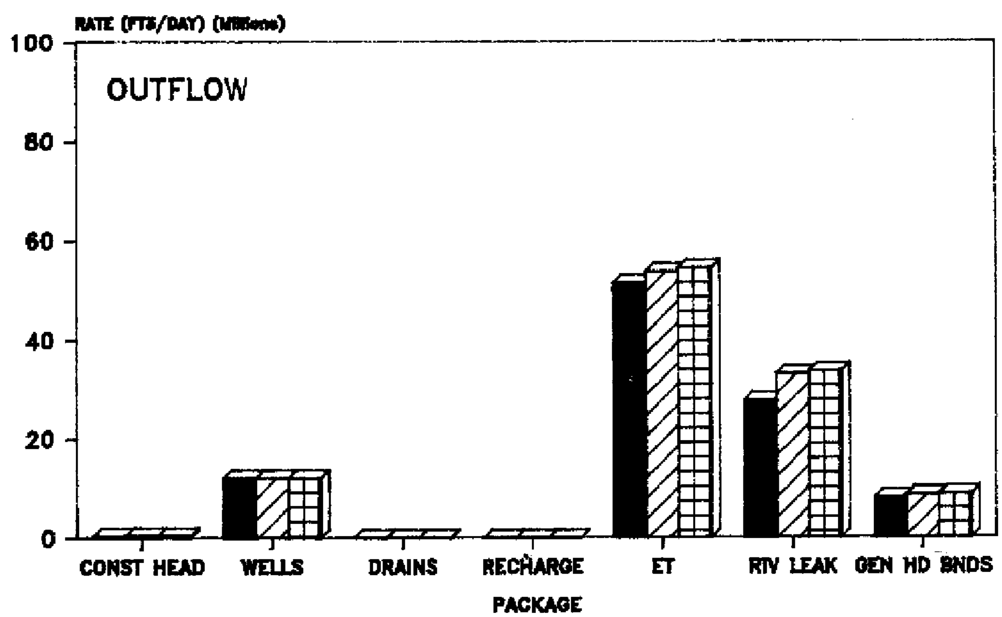


Figure 56 SOUTH MODEL INFLOW AND OUTFLOW MASS BALANCES FOR CALIBRATION RUN AND RECHARGE FACTOR SENSITIVITY SIMULATIONS

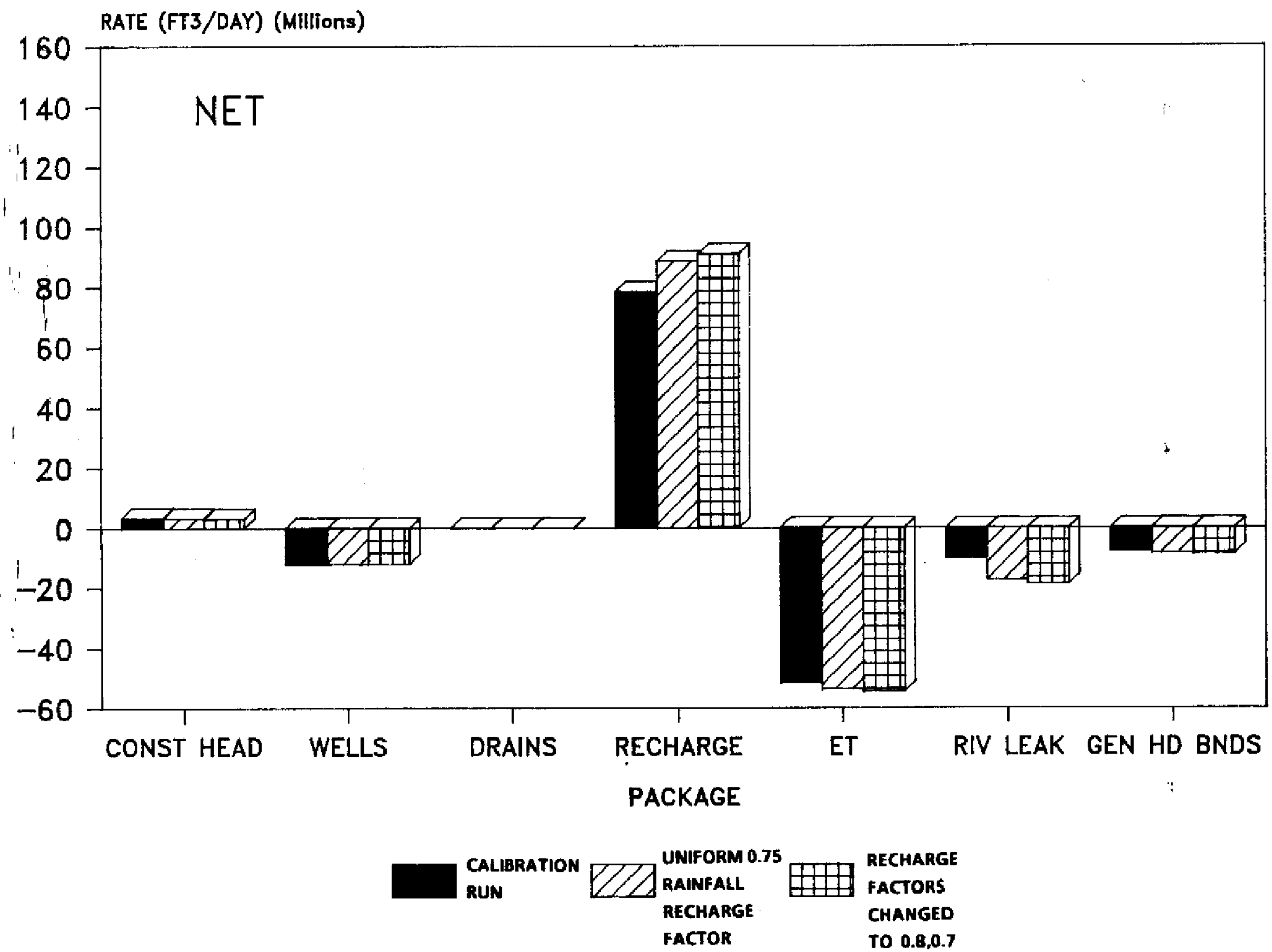


Figure 57 SOUTH MODEL NET MASS BALANCE FOR CALIBRATION RUN AND RECHARGE FACTOR SENSITIVITY SIMULATIONS

the depth was decreased, water levels increased. Again, this demonstrates the importance of evapotranspiration in undrained areas.

Ground water levels in the vicinity of wellfields were sensitive to changes in aquifer horizontal and vertical conductivity, and to changes in the vertical to horizontal anisotropy ratio.

Ground water levels in the northeast corner of the model were extremely sensitive to changes in aquifer hydraulic conductivities, the horizontal to vertical anisotropy ratio, and canal sediment conductivities. This is due primarily to the effects of the Jupiter Wellfield in combination with the no flow and constant head boundaries in the area, the C-18 canal and the North Palm Beach Water Control District Unit 23.

Mass Balance

The influence of parameter changes on the various components of model inflow and outflow may be observed by comparing mass balances from the sensitivity runs. Changes in canal sediment hydraulic conductivity and in ET parameters caused the largest changes in the flow components.

Inflow and outflow from drain nodes, river nodes and general head boundary nodes were influenced directly by changes in canal sediment hydraulic conductivity. Increases in sediment conductivity increased conductance from these nodes to the aquifer thereby increasing both inflow and outflow through the nodes. Decreases in canal sediment hydraulic conductivity had the opposite effect. The changes are nonlinear. ET was affected indirectly by changes in canal sediment hydraulic conductivity as a result of ground water level changes. Where ground water levels were increased by the changes, ET rates increased (recall that the ET rate is a function of depth to water); similarly where ground water levels decreased, ET rates decreased. The net effect, in the north model, was an increase in ET rates with decreased canal sediment hydraulic conductivity and vice versa.

Changes in ET parameters affected ET outflow directly and drain outflow indirectly. Obviously, decreasing either the maximum ET rate or the ET extinction decreased the ET outflow. However, the same changes also increased drain outflow indirectly by increasing ground water levels. The opposite would be expected if the ET parameters were increased.

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PREDICTIVE SIMULATIONS

INTRODUCTION

Predictive simulations of a variety of meteorologic and management scenarios were run with the calibrated north and south county models. The scenarios were designed to: a) evaluate Surficial Aquifer System conditions and identify potential problem areas under the different scenarios, and b) determine the impacts of several factors including water use, surface water system management, dry season conditions and drought conditions on the aquifer system.

Identification of problem areas focused primarily on the potential for saltwater intrusion along the coast. Intrusion potential from eastward migration of connate brackish water in the western portion of the study area is not addressed since the location and extent of the connate water is not well defined regionally.

The models are not well suited for determining the actual occurrence of saltwater intrusion. Approximating the fresh water zone at the saltwater/freshwater interface in the models as being bounded by a vertical no flow line topped by a constant head node was felt to be sufficient for simulating regional flow. However, the approximation is crude when compared to models that actually calculate the position of the saltwater/freshwater wedge. Without using a variable density solute transport model or a sharp interface model, saltwater intrusion cannot be considered quantitatively. However, flow direction, flow magnitude, and coastal water levels simulated by the flow models can be used as indicators of where potential for intrusion exists. Further, these indicators can be used to compare the relative potential for intrusion under different conditions.

Simulated flow direction, flow magnitude, and water levels in the model nodes adjacent to the constant head nodes representing the Intracoastal Waterway were used as saltwater intrusion indicators as follows:

a) Potential for intrusion was considered high where simulated flow is from the constant head nodes into the modeled area. As the models are set up, this implies saltwater flow into the system. This potential is assumed to increase directly with the magnitude of westward flow.

b) Potential for intrusion was considered moderate where simulated water levels in the nodes adjacent to the constant head nodes are less than 4 ft. NGVD. Selection of the 4 ft. criteria is empirical, based on data from saltwater intrusion monitoring programs at Lantana and Lake Worth which show saltwater intrusion occurring with coastal heads of 4 ft. or less. This potential is assumed to increase with declines in simulated coastal heads.

c) Potential for intrusion was considered low where simulated heads adjacent to the constant head nodes were greater than 4 ft. NGVD. The potential is assumed to decrease with increases in simulated coastal heads.

Selection of the 4 ft. NGVD criteria is not intended to imply that intrusion will necessarily occur when coastal heads are less than 4 ft. or that it will not occur when they are greater. There are numerous other factors which combine with the coastal heads in determining the occurrence and extent of saltwater intrusion.

The models were also used to identify areas where water table drawdowns resulting from withdrawals are likely to have adverse environmental impacts on wetlands. Numerous wetlands exist in the study area, particularly in the northwest. A regionalized map of wetlands in the study area developed from information provided by the District's Resource Control Department is shown in Figure 58. Ground water withdrawals were considered likely to cause adverse environmental impacts on these wetlands where simulated water level drawdowns resulting from the withdrawals extend under the mapped wetland areas. The likelihood and probable extent of adverse impacts is assumed to increase proportionally with the amount of drawdown.

Two levels of ground water use, allocated and buildout, were considered in the simulations. Allocated water use simulations represent all present ground water users with individual water use permits pumping at their total allocations. Buildout water use simulations represent projected future public water supply use for one possible buildout development scheme. The allocated water use runs are intended to provide insight into aquifer conditions and potential problems likely to exist presently or in the near future. The buildout water use runs are intended to provide insight into the same issues in the long term. Both allocated and buildout water use runs were made for the following scenarios:

- average annual conditions; simulated by steady state model runs with average annual recharge, average annual evapotranspiration, and existing surface water system management.

- average dry season conditions; simulated by six month transient model runs with average dry season recharge, average dry season evapotranspiration, and existing surface water management.

- 90 and 180 day droughts; simulated by 90 and 180 day transient model runs with no rainfall recharge, average evapotranspiration, and existing surface water system management.

Additional simulations were made to determine the impacts of water use and the impacts of maintained surface water systems. Allocated water use impacts were determined by comparing the results of simulations with no water use to simulations with allocated water use. Impacts from increasing water use to buildout levels were determined by comparing simulations with buildout water use to those with allocated water use. The impacts of maintained surface water systems are determined in a similar manner by comparing the results of allocated water use simulations with maintained surface water systems (represented using the river package) to simulations with the same systems unmaintained (represented using the drain package).

ALLOCATED WATER USE

It is useful in permitting additional water use to know the theoretical stress on the aquifer from already permitted use. Water use permits in Palm Beach County are typically valid for a period of up to ten years from the date of issuance. The allocated quantity when the permit is issued is intended to meet the permittee's maximum need during the period. Since permit expiration dates are staggered, actual water use at any given time is not necessarily representative of allocated water use.

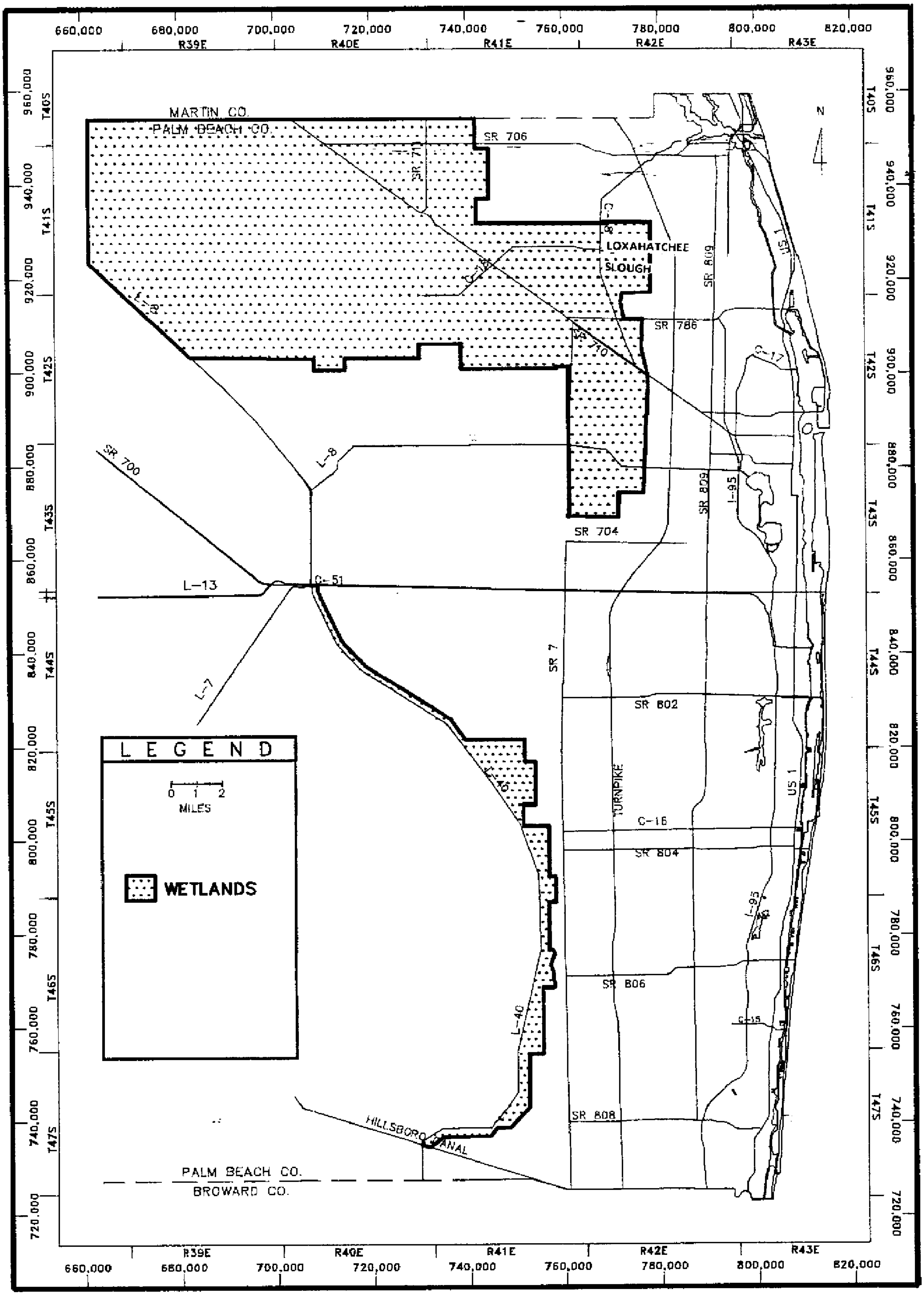

Figure 58 REGIONAL WETLANDS IN EASTERN PALM BEACH COUNTY

The allocated water use for the simulations represents most individual water use permit allocations as of February 1989 for public water supply use and July 1988 for other uses. Industrial and dewatering ground water uses, which typically have onsite retention or adjacent reinjection of water, were not considered in the allocated water use. General permit water use was not included in the models because records suggest that total general permit allocations are small compared to individual permit allocations. For discussion purposes herein, allocated ground water use has been subdivided into three use types: public water supply, agricultural, and non-agricultural. The first two are self-explanatory; the third, non-agricultural use, includes all other uses, but consists predominantly of golf course and landscape irrigation.

Public water supply comprises the largest class of consumptive ground water use in eastern Palm Beach County, with permitted allocations from the Surficial Aquifer System totaling 68.22 billion gallons per year as of February 1989. Thirty permitted users presently operate 53 wellfields in the study area. Current allocations for these public water supplies are given in Table 12. Other permit information and model cell locations for each utility are given in Appendix Q, Tables Q-1 and Q-2. Total public water supply allocations for ground water from the south study area (45.68 billion gallons per year) are about twice those from the north area (22.53 billion gallons per year). The difference between the north and south ground water allocations is due to several factors; greater population density and higher per capita demand in the south, and use of surface water rather than ground water by the City of West Palm Beach in the north.

There are 45 individual permits for agricultural ground water use in the study area, mostly for small vegetable and nursery plant irrigation, as described in Appendix Q. About half of these permits are for ground water use alone, the other half are for a combination of ground water and surface water use. The total water use allocation for these permits is 8.85 billion gallons per year, ninety-nine percent of which is permitted in the south county area. Since most permits for combined ground water/surface water use do not specify an allocation breakdown between the two, a percentage of the allocation, equal to the ground water percent of total permitted surface and ground water withdrawal capacities, was arbitrarily used in the ground water modeling.

Individual non-agricultural water use permits for ground water in the study area are summarized in Appendix Q. Sixty-three percent of these permits are for ground water use alone, the rest are for combined ground water/surface water use. The total non-agricultural allocation in the study in 1988 was 19.60 billion gallons per year; 13.39 bgy in the south and 5.20 bgy in the north.

AVERAGE ANNUAL CONDITIONS (Allocated Water Use)

Average annual conditions in the Surficial aquifer were approximated by steady state model simulations using estimates of average annual recharge and evapotranspiration (refer to previous discussions in Ground Water Modeling, Introduction, Recharge and Evapotranspiration). Simulated water levels in layer 1 under these conditions are shown in Figures 59 and 60. Levels in other layers were similar and are therefore not shown. The mass balances with the modeled inflow and outflow components are given in Table 13.

The simulated ground water levels are generally similar to the water levels generated in the steady state calibration runs. Ground water levels in most of the

TABLE 12. EASTERN PALM BEACH COUNTY PUBLIC WATER SUPPLY ALLOCATIONS - SURFICIAL AQUIFER SYSTEM - FEBRUARY 1989

NORTH PALM BEACH COUNTY AREA

PERMIT #	UTILITY	WELL FIELD(S)	MILLIONS OF GALLONS PER YEAR
50-00010	JUPITER	ALL	4927.5
50-00030	MANGONIA	MAIN	230
50-00135	PALM BEACH CO.	8W	*2752
50-00135	PALM BEACH CO.	1W	* 305
50-00178	CENTURY	MAIN	594
50-00186	JUNO BEACH	MAIN	127
50-00365	SEACOAST	PALM BCH. GDNS.	918
50-00365	SEACOAST	HOOD RD.	4500
50-00365	SEACOAST	N. PALM BCH.	822.5
50-00365	SEACOAST	BURMA RD.	822.5
50-00444	ROYAL PALM BEACH	OKEECHOBEE	849
50-00460	RIVIERA BEACH	EAST	975
50-00460	RIVIERA BEACH	WEST	2275
50-00501	PRATT-WHITNEY	MAIN	1070
50-00562	MEADOWBROOK	MAIN	625
50-00605	LION COUNTRY	MAIN	58
50-00653	GOOD SAM. HOSP.	MAIN	91
		TOTAL	20399 MGY

SOUTH PALM BEACH COUNTY AREA

PERMIT #	UTILITY	WELL FIELD(S)	MILLIONS OF GALLONS PER YEAR
50-00036	PALM SPRINGS	ALL	1606
50-00083	ATLANTIS	MAIN	267.8
50-00135	PALM BEACH CO.	SYSTEM 2	*1529
50-00135	PALM BEACH CO.	SYSTEM 5	* 305
50-00177	DELRAY BEACH	ALL	5610
50-00179	JAMAICA BAY	MAIN	78
50-00234	LAKE WORTH	MAIN	2850
50-00346	HIGHLAND BEACH	MAIN	508
50-00367	BOCA RATON	ALL	15750
50-00401	PALM BEACH CO.	SYSTEM 9	3220
50-00464	ACME IMPROV. DIST.	MAIN	2120
50-00499	BOYNTON BEACH	ALL	8470
50-00506	MANALAPAN	MAIN	472
50-00511	PALM BEACH CO.	SYSTEM 3	1580
50-00572	NATL MOBILE IND.	MAIN	87.6
50-00575	LANTANA	MAIN	695
50-00612	VILLAGE OF GOLF	MAIN	237
50-01007	FLA WATER SERVICES	MAIN	215
50-01092	A.G. HOLLEY HOSP.	MAIN	64
50-01283	ARROWHEAD MHP	MAIN	56
		TOTAL	39523 MGY

*Percentage of total allocation for Permit 50-00135-W based on average use.

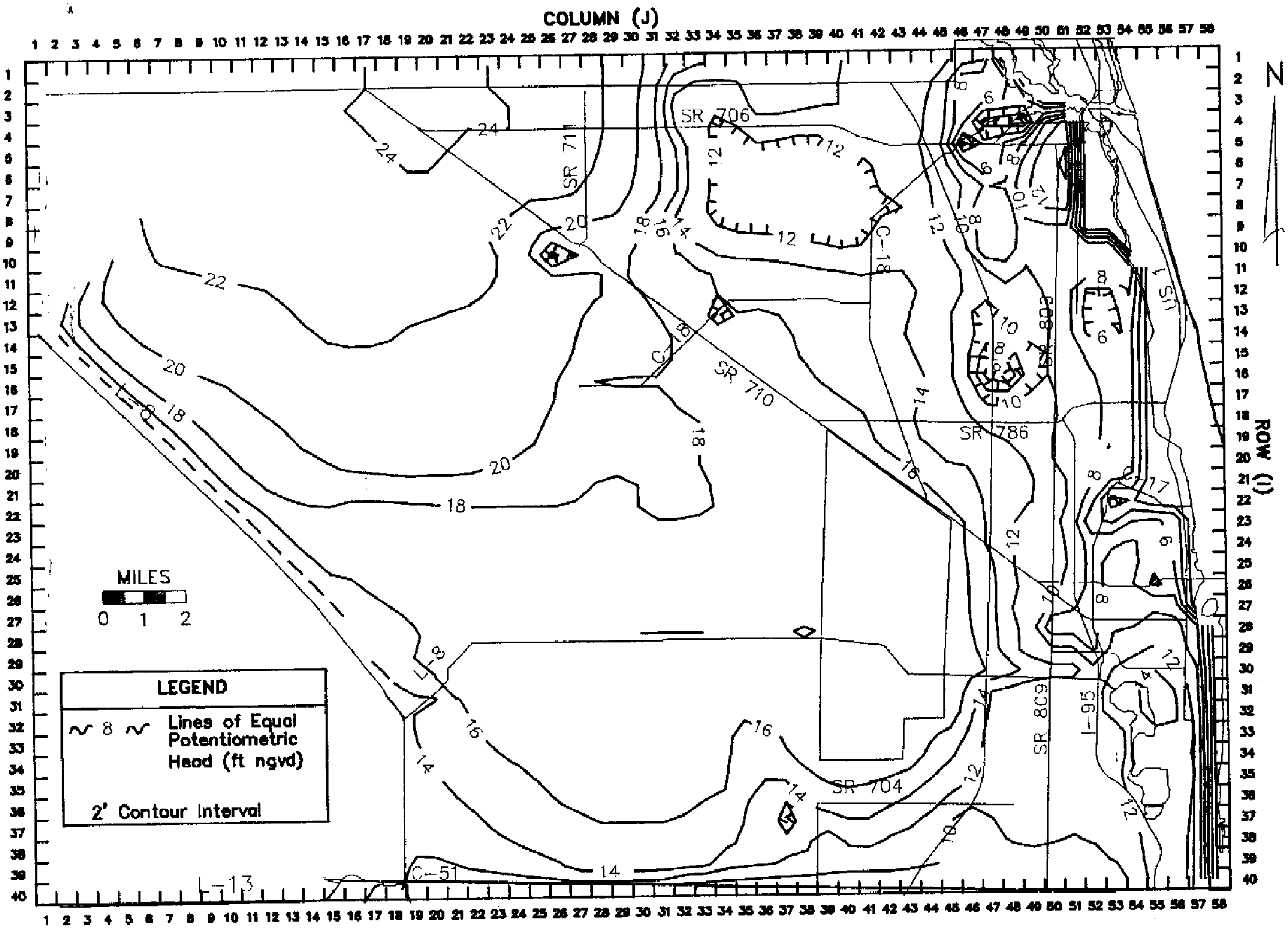

Figure 59 SIMULATED STEADY STATE GROUND WATER LEVELS IN NORTHEASTERN PALM BEACH COUNTY (MODEL LAYER 1) UNDER AVERAGE ANNUAL CONDITIONS WITH ALLOCATED WATER USE

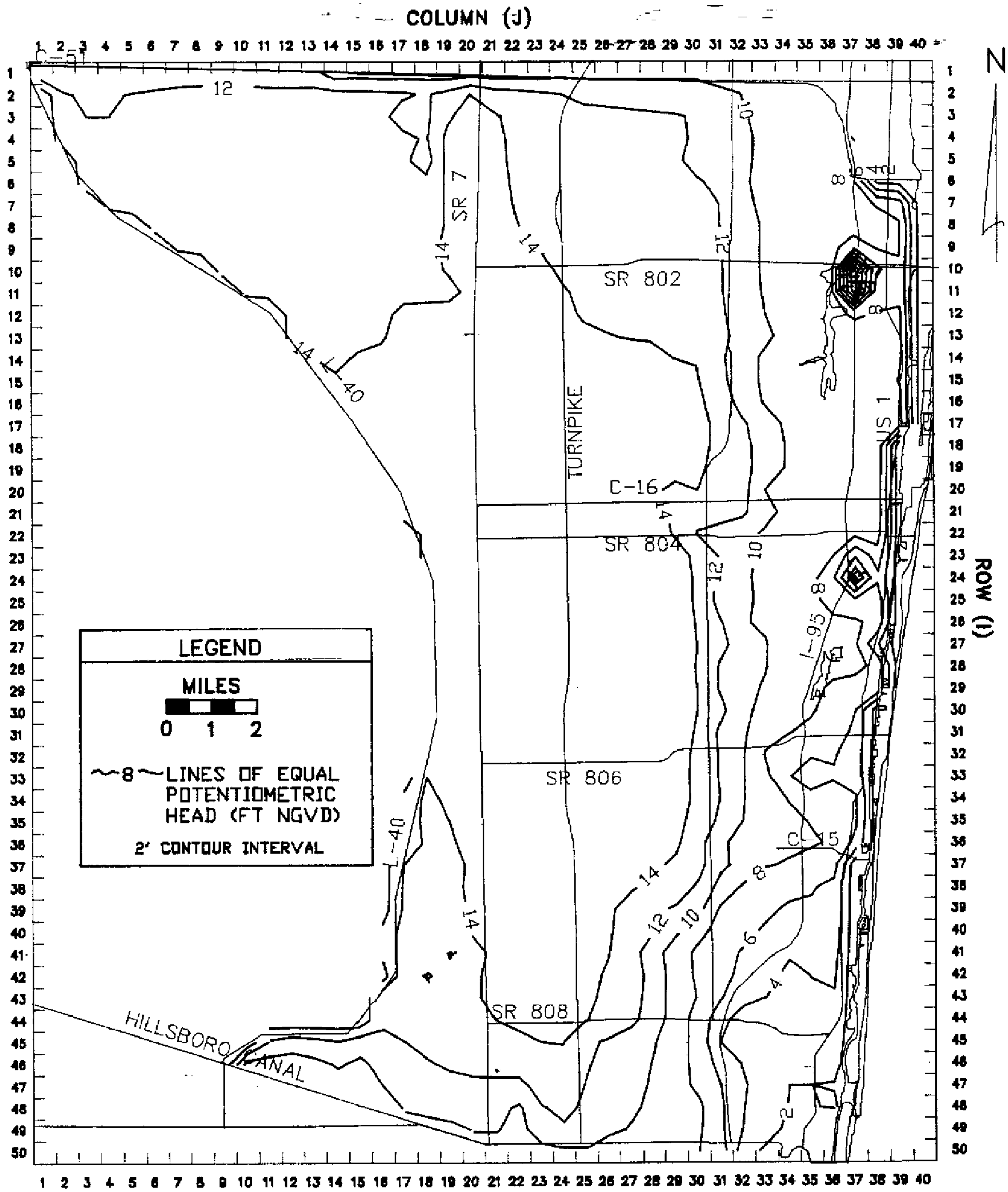

Figure 60 SIMULATED STEADY STATE GROUND WATER LEVELS IN SOUTHEASTERN PALM BEACH COUNTY (MODEL LAYER 1) UNDER AVERAGE ANNUAL CONDITIONS WITH ALLOCATED WATER USE

TABLE 13
MODEL MASS BALANCES FOR :
AVERAGE ANNUAL CONDITIONS WITH ALLOCATED WATER USE

North Model	IN* (ft^3/day) x10^3	OUT* (ft^3/day) x10^3	NET* (ft^3/day) x10^3	IN%	OUT%
NW boundary	0	413	-412	0.0	0.3
L-8 boundary	55	1324	-1269	0.0	0.9
Intracoastal	0	509	-509	0.0	0.4
Maintained Canals	612	327	285	0.4	0.2
WPBWCS	8292	173	8120	5.6	0.1
Rain Infiltration	137858	0	137858	93.9	0.0
C-51	0	3934	-3934	0.0	2.7
Wells	0	10039	-10039	0.0	6.8
Drainage canals	0	20587	-20587	0.0	14.0
Evapotranspiration	0	109515	-109515	0.0	74.6
Storage	0	0	0	0	0
Total	146818	146821	-3	100	100

South Model	IN* (ft^3/day) x10^3	OUT* (ft^3/day) x10^3	NET* (ft^3/day) x10^3	IN%	OUT%
WCA-1	3822	13	3809	3.6	0.0
Intracoastal	0	315	-315	0.0	0.3
Acme Canals	753	848	-96	0.7	.8
LWDD Canals	22111	23033	-921	21.0	21.9
C-51	1	4726	-4725	0.0	4.5
Hillsboro Canals	178	3046	-2869	0.2	2.9
Rain Infiltration	78350	0	78350	74.5	0.0
Wells	0	23867	-23867	0.0	22.7
Drainage Canals	0	10	-10	0.0	0.0
Evapotranspiration	0	49357	-49357	0.0	46.9
Storage	0	0	0	0	0
Total	105215	105214	1	100	100

*Numbers rounded to nearest thousand.
**WPBWCS = West Palm Beach Catchment System

southern study area reflect the maintained surface water system elevations, as do those in the vicinity of the West Palm Beach Water Catchment System in the northern study area. Drawdowns are apparent around many major wellfields including Jupiter, Seacoast and Riviera Beach in the northern area and Lake Worth, Boynton Beach, Acme, and Delray Beach in the southern area. There is little noticeable effect from several other large wellfields, including Boca Raton and the Palm Beach County Systems, which are located in more transmissive portions of the aquifer and within the Lake Worth Drainage District where recharge from maintained canals keeps ground water drawdowns small. The opposite effect of drainage canals is evident in the ground water level depressions in the vicinity of the South Indian River Water Control District and North Palm Beach Water Control District Unit 2 where canal levels are not maintained.

The mass balances show that precipitation is by far the most important source of recharge to the aquifer under average conditions. Recharge from the Lake Worth Drainage District and the West Palm Beach Water Catchment System are also significant. Evapotranspiration accounts for the largest loss of ground water from the study area. It is more significant in the northern study area, where ground water levels in undeveloped area are close to land surface, than in the southern area which is largely developed. Well withdrawals are significant in both the north and south, although more so in the south where withdrawals are greater. Ground water drainage to canals is also significant. In particular, drainage to maintained canals under average annual conditions exceeds recharge from them over the study area. This does not negate the importance of these canals in recharging the aquifer and maintaining ground water levels in portions of the study area, however, their effect as drains in other areas should not be overlooked.

Simulated flow and water levels indicate low potential for saltwater intrusion in most of the study area with two exceptions. Simulated water levels in the southeast corner adjacent to the Intracoastal range from 3.9 to 1.4 ft NGVD, indicating a moderate potential for saltwater intrusion. Permitted users in this area include the City of Boca Raton (east wellfield), the Boca Raton Hotel and Club, and the Royal Palm Yacht and Country Club. In the northern study area, moderate potential for intrusion exists near the Seacoast North Palm Beach wellfield where simulated water levels between the wellfield and the Intracoastal are 2.2 ft NGVD.

DRY SEASON CONDITIONS (Allocated Water Use)

Conditions in the aquifer system at the end of an average dry season were approximated by transient, 180 day simulations using average dry season recharge and evapotranspiration. The simulated heads for average annual conditions were used as initial heads for the transient runs. The simulated water levels in layer 1 under average dry season conditions are shown in Figures 61 and 62. The difference between these water levels and those simulated for average annual conditions are shown in Figures 63 and 64. Results for the other layers are similar and are therefore not shown. The mass balances with the modeled inflow and outflow components at the end of the simulations are given in Table 14.

Simulated declines in ground water levels during the dry season are generally small, less than one foot. In portions of the study area where maintained surface water systems provide recharge to the aquifer (i.e. the Lake Worth Drainage District, ACME Improvement District, area of the West Palm Beach Catchment System), ground water level drops were insignificant (less than 0.5 feet). Declines

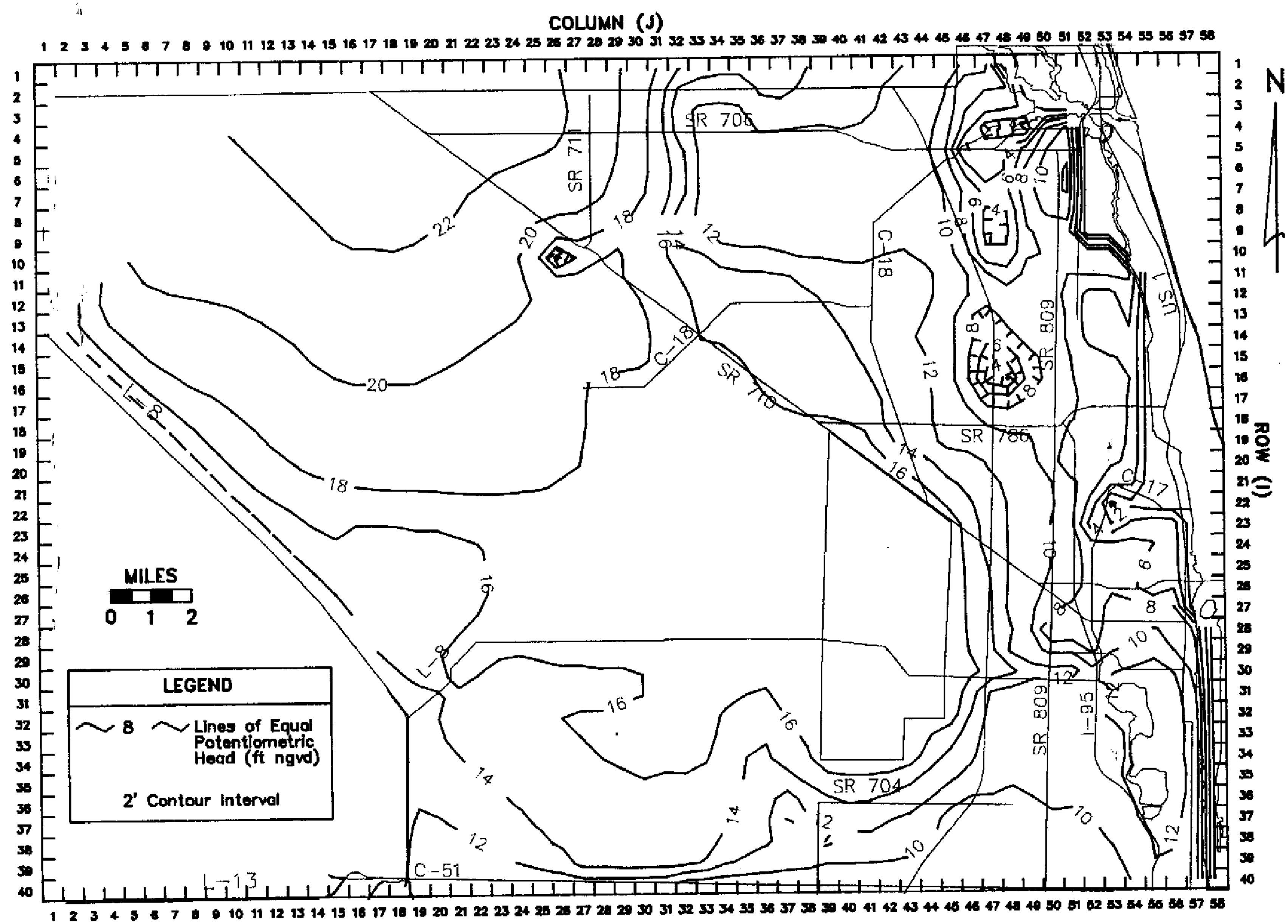

Figure 61 SIMULATED GROUND WATER LEVELS IN NORTHEASTERN PALM BEACH COUNTY (MODEL LAYER1) AT THE END OF THE DRY SEASON WITH ALLOCATED WATER USE

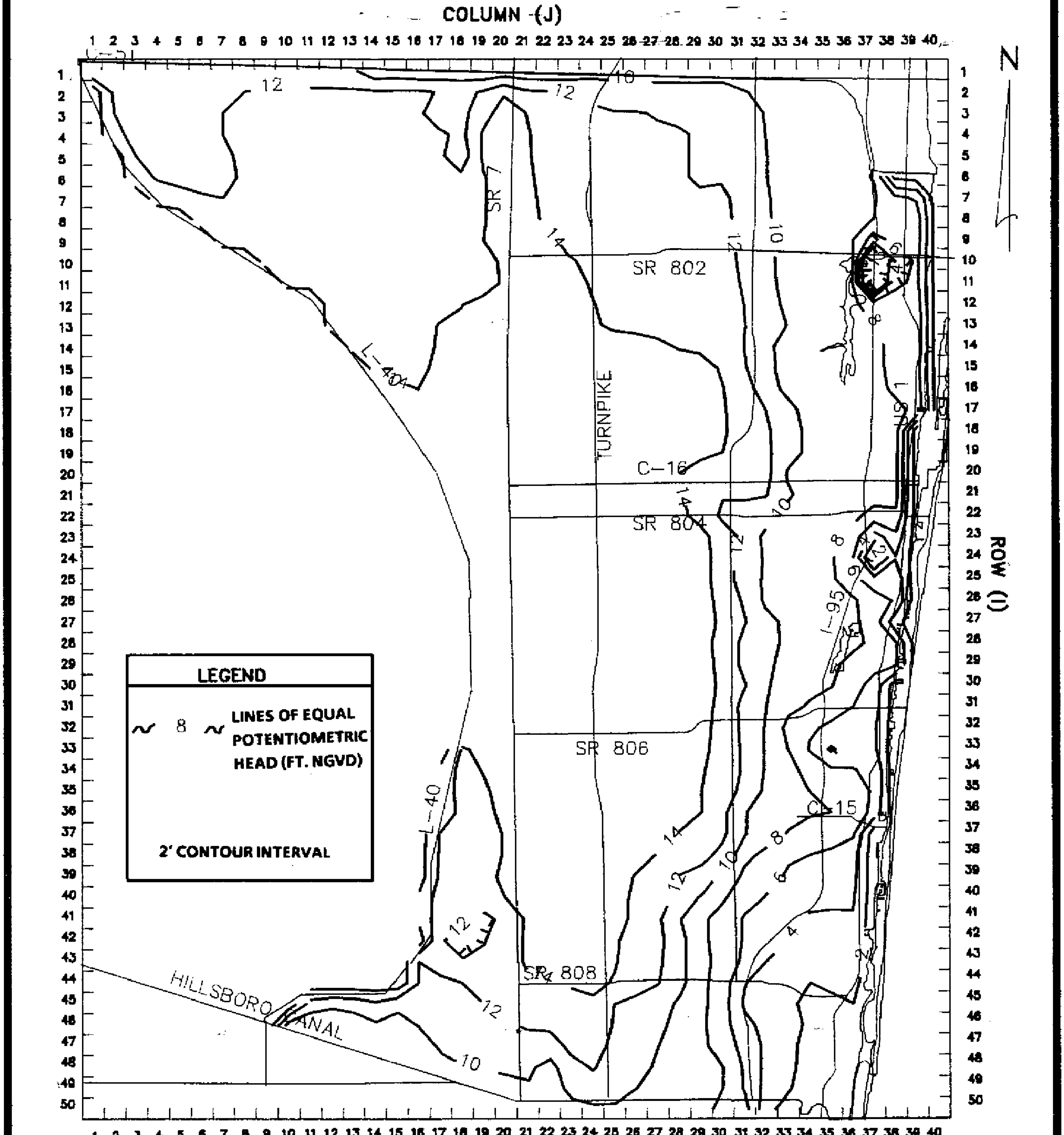

Figure 62 SIMULATED GROUND WATER LEVELS IN SOUTHEASTERN PALM BEACH COUNTY (MODEL LAYER 1) AT THE END OF THE DRY SEASON WITH ALLOCATED WATER USE

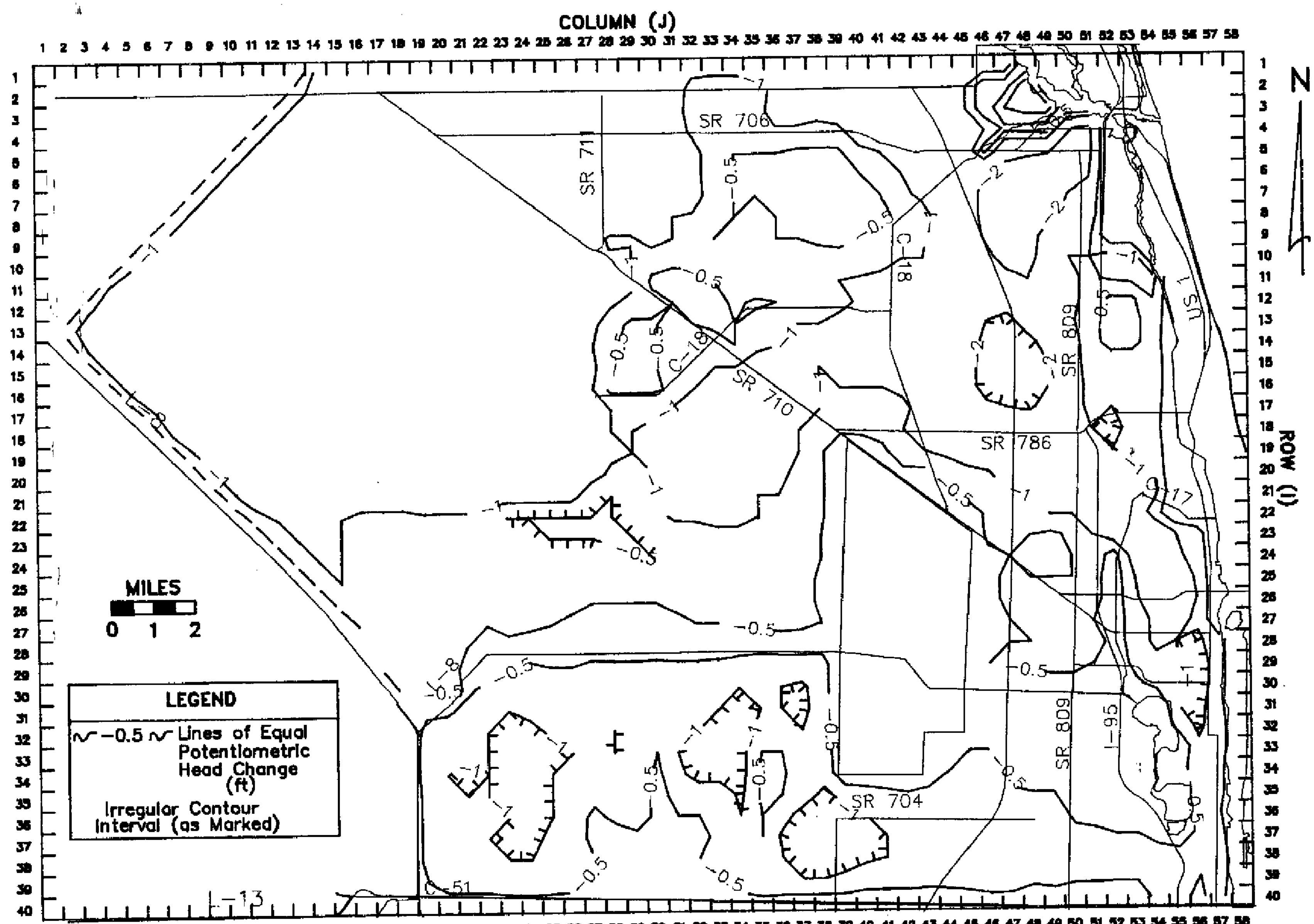

Figure 63 SIMULATED DECLINE IN GROUND WATER LEVELS IN NORTHEASTERN PALM BEACH COUNTY (MODEL LAYER 1) DURING THE DRY SEASON WITH ALLOCATED WATER USE

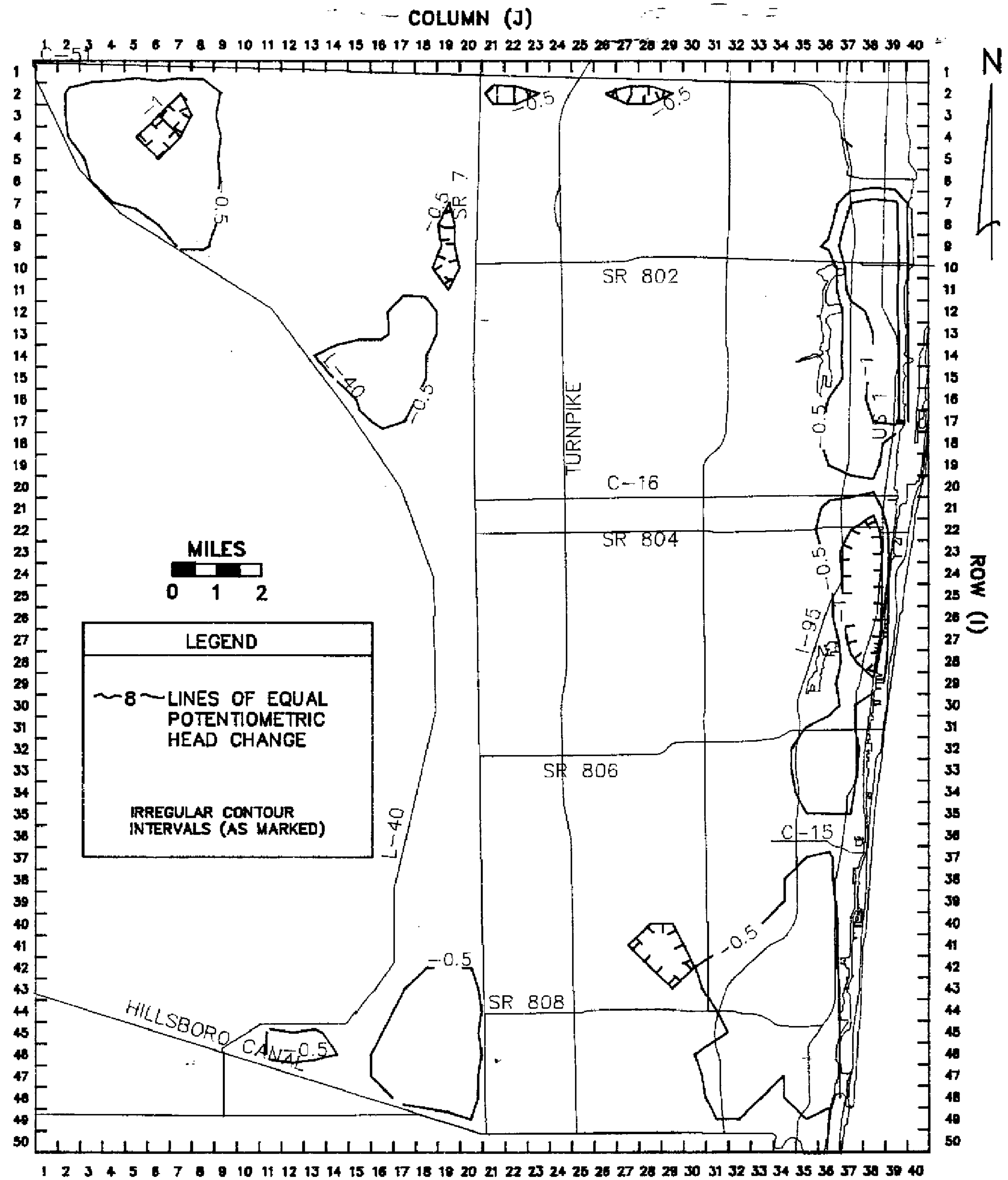

Figure 64 SIMULATED DECLINE IN GROUND WATER LEVELS IN SOUTHEASTERN PALM BEACH COUNTY (MODEL LAYER 1) DURING THE DRY SEASON WITH ALLOCATED WATER USE

TABLE 14
MODEL MASS BALANCES FOR:
END OF DRY SEASON CONDITIONS WITH ALLOCATED WATER USE

North Model	IN* (ft^3/day) x10^3	OUT* (ft^3/day) x10^3	NET* (ft^3/day) x10^3	IN%	OUT%
NW boundary	47	152	-105	0.0	0.2
L-8 boundary	98	905	-807	0.1	0.9
Intracoastal	0	437	-437	0.0	0.4
Maintained Canals	1204	24	1180	1.2	0.0
WPBWCS	12102	85	12016	12.2	0.1
Rain Infiltraion	78473	0	78473	79.0	0.0
C-51	0	2637	-2637	0.0	2.6
Wells	0	10039	-10039	0.0	10.1
Drainage canals	0	12240	-12240	0.0	12.3
Evapotranspiration	0	72813	-72813	0.0	73.3
Storage	7410	0	7410	7.5	0.0
Total	99335	99334	1	100	100

South Model	IN* (ft^3/day) x10^3	OUT* (ft^3/day) x10^3	NET* (ft^3/day) x10^3	IN%	OUT%
WCA-1	4395	3	4392	5.3	0.0
Intracoastal	0	258	-258	0.0	0.3
Acme Canals	1765	16	1749	2.1	0.0
LWDD Canals	31024	17175	13849	37.4	20.7
C-51	33	3462	-3429	0.0	4.2
Hillsboro Canal	276	2283	-2008	0.3	2.8
Rain Infiltration	44591	0	44591	53.7	0.0
Wells	0	23867	-23867	0.0	28.8
Drainage Canals	0	0	0	0.0	0.0
Evapotranspiration	0	35948	-35948	0.0	43.3
Storage	929	0	929	1.1	0.0
Total	83013	83013	-1	100	100

* Numbers rounded to nearest thousand.
**WPBWCS = West Palm Beach Catchment System

were greatest, 1 to 2 feet, in the vicinity of several large wellfields, Jupiter, Seacoast, Lake Worth and Boynton Beach, where there is no surface water recharge.

The mass balances show total recharge and discharge decreases during the dry season. Rainfall is still the most important source of recharge to the aquifer system, although it makes up a smaller percentage of total recharge than it does under average conditions. Recharge from maintained surface water systems increased both in terms of total recharge volume and percent of total recharge. There was little change in the relative importance of the various outflows from the aquifer.

The areas with potential for saltwater intrusion indicated by the simulated ground water flow and water levels are similar to but more extensive than the areas under average annual conditions. The area with heads less than 4 ft. in the southeast extends a mile further north and the potential for intrusion within the area increases with the minimum simulated head dropping 0.6 ft. to 0.9 ft. NGVD. Simulated heads drop 0.7 ft. to 1.5 ft. NGVD east of the Seacoast North Palm Beach wellfield indicating increased potential for intrusion there. Further, simulated heads east of the Boynton Beach east wellfield and the Gulfstream Golf Club drop to 3.9 and 2.6 ft. NGVD respectively indicating a moderate potential for intrusion.

90 AND 180 DAY DROUGHTS (Allocated Water Use)

Transient simulations with no precipitation recharge were used to approximate severe droughts of 90 and 180 days duration. The runs used average dry season ET and were started from the head distribution simulated for average annual conditions. The simulated declines in water levels in layer 1 resulting from the 90 day drought are shown in Figures 65 and 66. Those resulting from the 180 day drought are shown in Figures 67 and 68. The mass balances with the modeled inflow and outflow components at the end of the simulations are given in Tables 15 and 16.

The areal distribution of simulated ground water level declines during droughts with no rainfall recharge was similar to the distribution of declines in the dry season. However, the water table drops were greater after the 90 day drought than at the end of the dry season, and they became greater still after a 180 day drought. Drawdowns during drought conditions became increasingly significant in the vicinity of wellfields. Simulated ground water drawdowns after a 180 day drought were largest (greater than 6 feet) in the vicinity of the Jupiter and Seacoast (Hood Road) wellfields. There were also extensive drawdowns (greater than 4 feet) in the undrained northwest portion of the study area and in the northeast area just south of the Loxahatchee River. The greater decline in these areas is probably caused by two factors. The areas are undrained and, therefore, have water levels closer to land surface than most of the remaining area. Thus evapotranspiration, which is a function of depth to water, continues longer and at a higher rate in the undrained areas during a drought which results in greater water level declines.

Drawdowns of over 2 feet in the Riviera Beach, Royal Palm Beach, Lake Worth, Boynton Beach and Seacoast wellfields and over 3 feet in the Jupiter and Seacoast (Hood Road) wellfields occurred after a 90 day drought. Drops of over 3 and 6 feet occurred in the same wellfields after a 180 day drought. Ground water level declines also occurred in portions of the Lake Worth Drainage District, generally in the vicinity of changes in canal control elevations. Apparently, canal recharge alone is not sufficient to keep up with ground water underflow from basins with

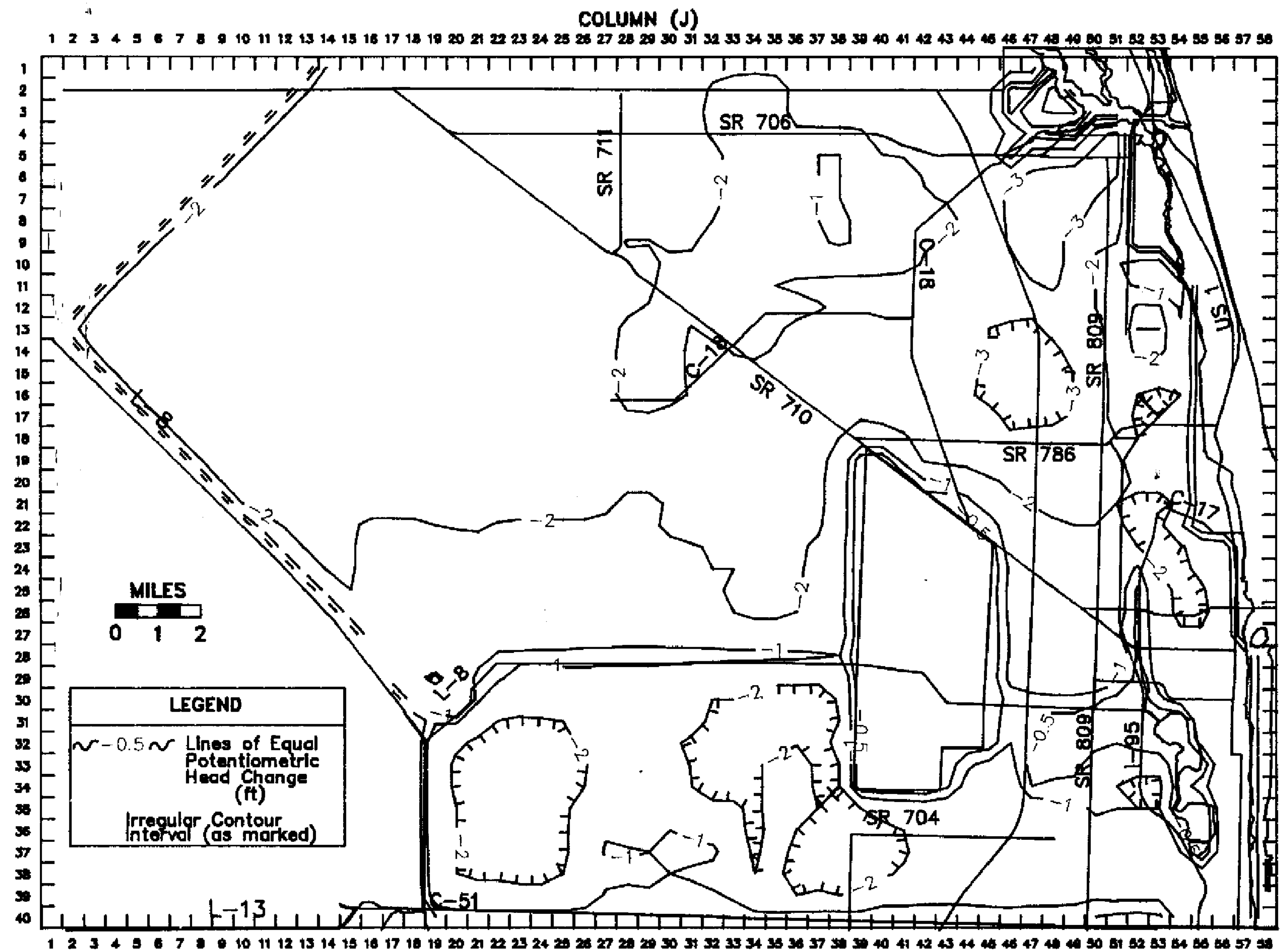

Figure 65 SIMULATED DECLINE IN GROUND WATER LEVELS IN NORTHEASTERN PALM BEACH COUNTY (MODEL LAYER 1) DURING A 90 DAY DROUGHT WITH NO RECHARGE FROM RAINFALL AND ALLOCATED WATER USE

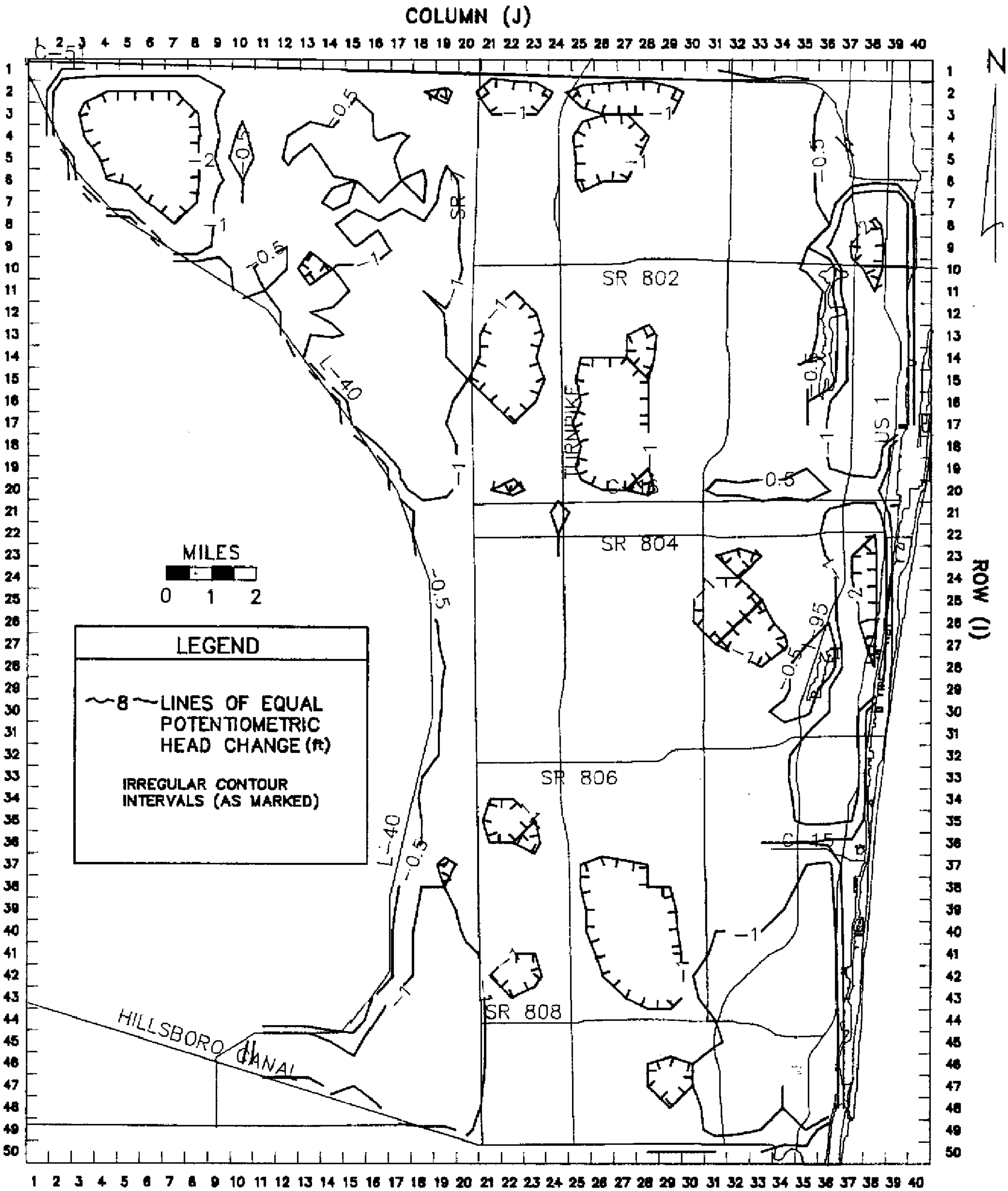

Figure 66 **SIMULATED DECLINE IN GROUND WATER LEVELS IN SOUTHEASTERN PALM BEACH COUNTY (MODEL LAYER 1) DURING 90 DAY DROUGHT WITH NO RAINFALL RECHARGE AND ALLOCATED WATER USE**

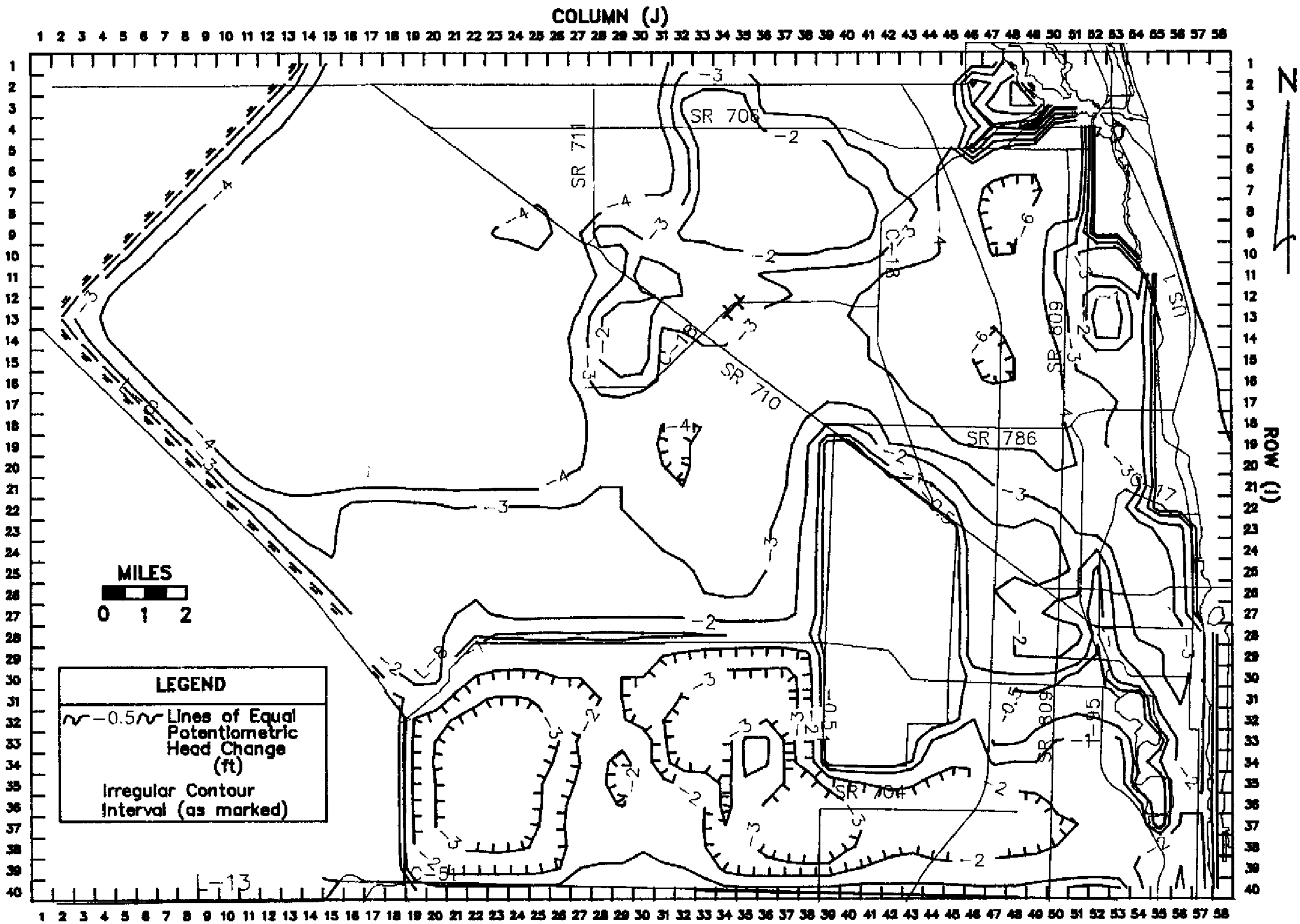

Figure 67 SIMULATED DECLINE IN WATER LEVELS IN NORTHEASTERN PALM BEACH COUNTY (MODEL LAYER 1) DURING A 180 DAY DROUGHT WITH NO RAINFALL RECHARGE AND ALLOCATED WATER USE

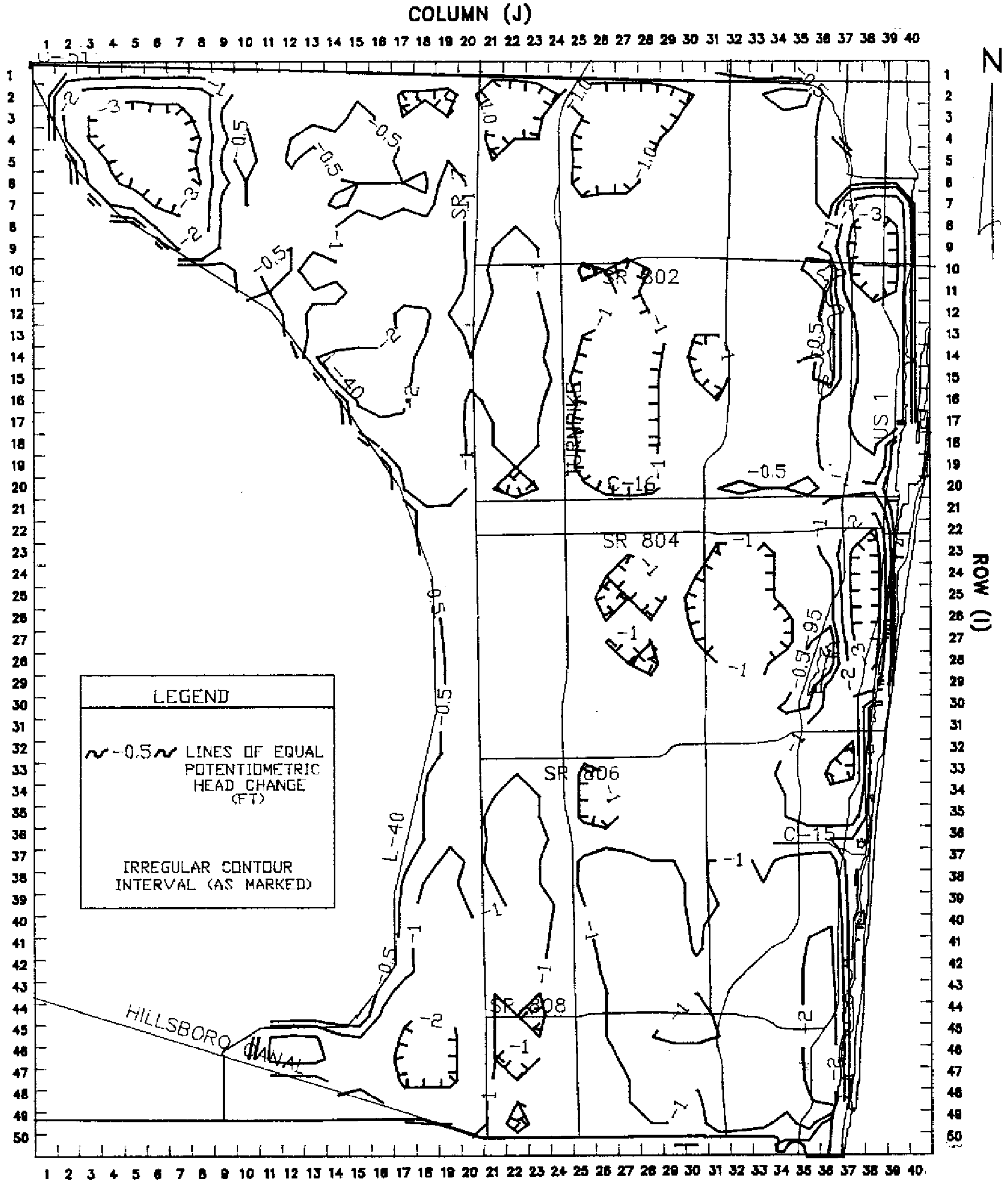

Figure 68 **SIMULATED DECLINE IN GROUNDWATER LEVELS IN SOUTHEASTERN PALM BEACH COUNTY (MODEL LAYER 1) DURING A 180 DAY DROUGHT WITH NO RAINFALL RECHARGE AND ALLOCATED WATER USE**

TABLE 15
MODEL MASS BALANCES FOR :
CONDITIONS AFTER A 90 DAY DROUGHT WITH ALLOCATED WATER USE

North Model	IN* (ft^3/day) x10^3	OUT* (ft^3/day) x10^3	NET* (ft^3/day) x10^3	IN%	OUT%
NW boundary	329	45	284	0.5	0.1
L-8 boundary	196	439	-243	0.3	0.6
Intracoastal	0	383	-383	0.0	0.5
Maintained Canals	2604	0	2604	3.7	0.0
WPBWCS	20318	13	20305	28.7	0.0
Rain Infiltration	0	0	0	0.0	0.0
C-51	59	1144	-1085	0.1	1.6
Wells	0	10039	-10039	0.0	14.2
Drainage canals	0	5218	-5218	0.0	7.4
Evapotranspiration	0	53489	-53489	0.0	75.6
Storage	47266	0	47266	66.8	0.0
Total	70772	70771	1	100	100

South Model	IN* (ft^3/day) x10^3	OUT* (ft^3/day) x10^3	NET* (ft^3/day) x10^3	IN%	OUT%
WCA-1	5560	0	5560	8.2	0.0
Intracoastal	1	223	-223	0.0	0.3
Acme Canals	5163	0	5163	7.6	0.0
LWDD Canals	47153	11521	35632	69.4	17.0
C-51	162	1880	-1719	0.2	2.8
Hillsboro Canal	556	1355	-799	0.8	2.0
Rain Infiltration	0	0	0	0.0	0.0
Wells	0	23867	-23867	0.0	35.1
Drainage Canals	0	0	0	0.0	0.0
Evapotranspiration	0	29109	-29109	0.0	42.8
Storage	9354	0	9354	13.8	0.0
Total	67948	67956	-8	100	100

* Numbers rounded to nearest thousand.
**WPBWCS = West Palm Beach Catchment System

TABLE 16
MODEL MASS BALANCES FOR :
CONDITIONS AFTER A 180 DAY DROUGHT WITH ALLOCATED WATER USE

North Model	IN* (ft^3/day) x10^3	OUT* (ft^3/day) x10^3	NET* (ft^3/day) x10^3	IN%	OUT%
NW boundary	530	16	514	1.0	0.0
L-8 boundary	269	177	92	0.5	0.3
Intracoastal	0	308	-308	0.0	0.6
Maintained Canals	3100	0	3100	6.0	0.0
WPBWCS	21485	0	21485	41.6	0.0
Rain Infiltration	0	0	0	0.0	0.0
C-51	184	750	-566	0.4	1.4
Wells	0	10039	-10039	0.0	19.4
Drainage canals	0	3293	-3293	0.0	6.3
Evapotranspiration	0	37091	-37091	0.0	71.8
Storage	26105	0	26105	50.5	0.0
Total	51674	51673	1	100	100

South Model	IN* (ft^3/day) x10^3	OUT* (ft^3/day) x10^3	NET* (ft^3/day) x10^3	IN%	OUT%
WCA-1	5823	0	5823	9.0	0.0
Intracoastal	3	179	-177	0.0	0.3
Acme Canals	5515	0	5515	8.5	0.0
LWDD Canals	50215	10602	39613	77.2	16.3
C-51	215	1738	-1523	0.3	2.7
Hillsboro Canal	615	1233	-618	1.0	1.9
Rain Infiltration	0	0	0	0.0	0.0
Wells	0	23867	-23867	0.0	36.7
Drainage Canals	0	0	0	0.0	0.0
Evapotranspiration	0	27416	-27416	0.0	42.2
Storage	2647	0	2647	4.1	0.0
Total	65033	65035	-2	100	100

* Numbers rounded to nearest thousand.
**WPBWCS = West Palm Beach Catchment System

higher control elevations to basins with lower control elevations under drought conditions.

The mass balances show that leakance from maintained canals increases to become the most important source of recharge to the aquifer during droughts. In the southern study area, this recharge is almost enough to match outflow from the aquifer system in most areas. Release of water from aquifer storage, primarily through dewatering at the water table, makes up the remaining outflow. Water released from storage is more significant in the northern study area where the maintained surface water systems are not as extensive. Evapotranspiration and losses to drainage canals decrease throughout the study area as a result of head declines. Well withdrawals become more significant relative to total outflow from the aquifer, particularly in the southern study area where allocated withdrawal rates approach evapotranspiration rates.

Simulated ground water flow and heads along the Intracoastal show high salt water intrusion potential in the southeastern corner of the study area east of the Boca Raton Hotel and Yacht Club and the Royal Palm Yacht and Country Club during a 90 day drought with allocated water use. The intrusion potential becomes higher during a 180 day drought and the area affected extends one mile further north to include the area east of the Boca Raton East Wellfield. The simulations also show high intrusion potential east of the Gulf Stream Golf Course wellfield and during a 180 day drought.

The simulations show moderate potential for salt water intrusion during a 90 day drought with allocated water use in the areas east of the Boynton Beach East Wellfield, the Gulf Stream Golf Course, the Boca Raton East Wellfield, the Delray Beach South Wellfield, and the Seacoast North Palm Beach Wellfield. The 180 day drought simulations with allocated water use show increased intrusion potential in these areas and an additional area of moderate potential east of the Boca Teeca Corporation, Highland Beach, Seacoast Burma and Riviera Beach wellfields.

IMPACTS OF ALLOCATED WATER USE

The impacts of allocated ground water withdrawals on the Surficial Aquifer System under average annual, average dry season and 90 day drought conditions were determined by comparing the results of simulations with the withdrawals to equivalent simulations without the withdrawals. The simulated drawdowns in model layer 1 caused by allocated water use under average annual conditions are shown in Figures 69 and 70. Drawdowns under average dry season and 90 day drought conditions are similar as are drawdowns in the lower model layers.

The largest simulated drawdowns in the study area, greater than 10 feet, occur at the Lake Worth wellfield. Substantial drawdowns also occurred at the Boynton Beach, Delray Beach, Jupiter, and Seacoast wellfields which had drawdowns greater than 8, 4, 4 and 4 feet respectively. Wellfield drawdowns were smaller in the more transmissive areas of the aquifer and in areas with surface water recharge to the aquifer. These areas are largely concurrent in the southern study area where the Lake Worth Drainage District overlies the Biscayne aquifer. However, drawdowns still exceed 2 feet at the Boca Raton, Boynton #6 and Palm Beach County System 1 wellfields in these area.

Comparison of the mass balance results (Tables 13 and 17) showed that the ground water withdrawals cause a decrease in outflow from evapotranspiration and

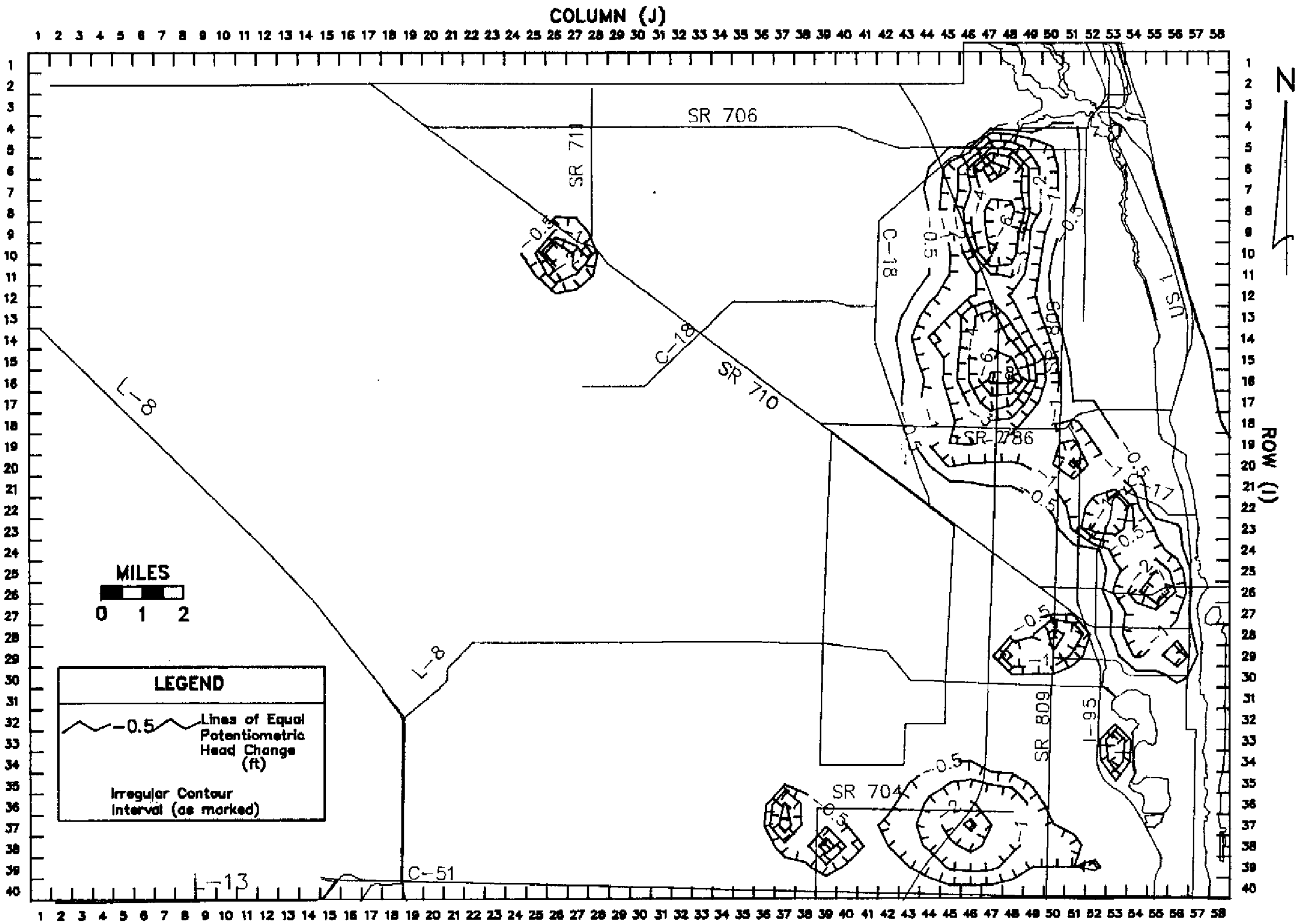

Figure 69 SIMULATED DRAWDOWN IN GROUND WATER LEVELS IN NORTHEASTERN PALM BEACH COUNTY (MODEL LAYER 1) RESULTING FROM ALLOCATED GROUND WATER USE UNDER AVERAGE ANNUAL CONDITIONS

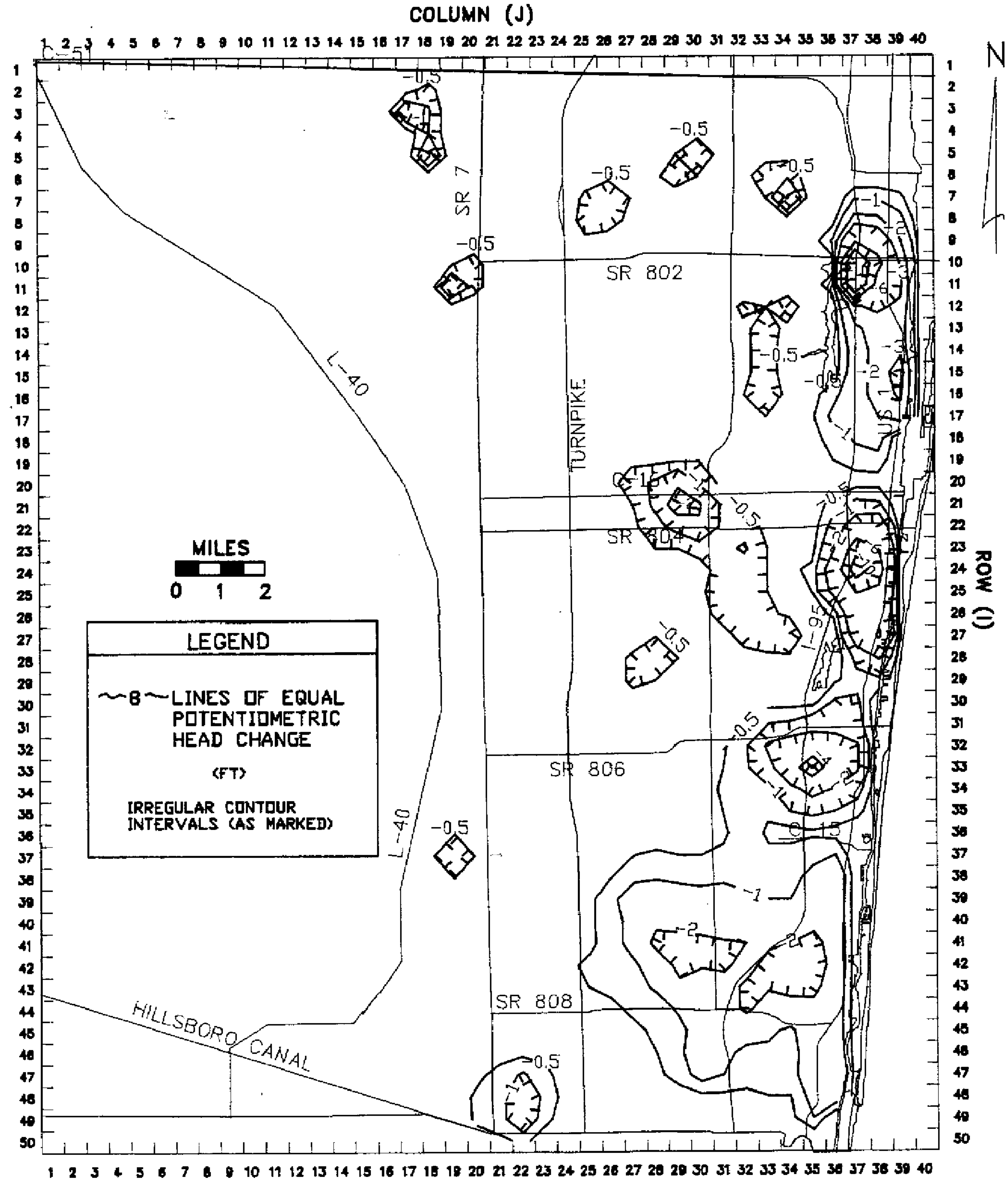

Figure 70 SIMULATED DRAWDOWN IN SOUTHERN PALM BEACH COUNTY (MODEL LAYER 1) RESULTING FROM ALLOCATED GROUND WATER USE UNDER AVERAGE ANNUAL CONDITIONS

TABLE 17
MODEL MASS BALANCES FOR :
AVERAGE ANNUAL CONDITIONS WITH NO WATER USE

North Model	IN* (ft^3/day) x10^3	OUT* (ft^3/day) x10^3	NET* (ft^3/day) x10^3	IN%	OUT%
NW boundary	0	413	-413	0.0	0.3
L-8 boundary	55	1324	-1269	0.0	0.9
Intracoastal	0	536	-536	0.0	0.4
Maintained Canals	610	332	278	0.4	0.2
WPBWCS	7643	223	7420	5.2	0.2
Rain Infiltration	137858	0	137858	94.3	0.0
C-51	0	4420	-4420	0.0	3.0
Wells	0	0	0	0.0	0.0
Drainage canals	0	23609	-23609	0.0	16.2
Evapotranspiration	0	115310	-115310	0.0	78.9
Storage	0	0	0	0.0	0.0
Total	146167	146168	-1	100	100

South Model	IN* (ft^3/day) x10^3	OUT* (ft^3/day) x10^3	NET* (ft^3/day) x10^3	IN%	OUT%
WCA-1	3754	14	3741	3.9	0.0
Intracoastal	0	448	-448	0.0	0.5
Acme Canals	299	1057	-758	0.3	1.1
LWDD Canals	13615	32167	-18552	14.2	33.4
C-51	0	4800	-4800	0.0	5.0
Hillsboro Canal	164	3445	-3281	0.2	3.6
Rain Infiltration	78350	0	78350	81.5	0.0
Wells	0	0	0	0.0	0.0
Drainage Canals	0	10	-10	0.0	0.0
Evapotranspiration	0	54241	-54241	0.0	56.4
Storage	0	0	0	0.0	0.0
Total	96182	96181	1	100	100

* Numbers rounded to nearest thousand.
**WPBWCS = West Palm Beach Catchment System

an increase in surface water system inflow recharge. Both result from the simulated water level drawdowns caused by the withdrawals.

Ground water withdrawals are significantly increasing the potential for salt water intrusion along the coast in much of the study area south of C-51. Simulated coastal drawdowns south of Highland Beach are typically 1 to 2 ft. as a result of allocated withdrawals by the Boca Raton Hotel and Yacht Club, the Royal Palm Yacht and Country Club, Boca Raton, Highland Beach, and the Boca Teeca Corporation. Drawdowns are also 1 to 2 feet east of the Delray Beach wellfield and are 2 to 6 ft. east of the Boynton Beach and Gulfstream Golf Club wellfields. North of C-51, presently allocated withdrawals have a significant effect on salt water intrusion potential only in the areas east of the Seacoast North Palm Beach, Seacoast Burma, and Riviera Beach eastern wellfields where simulated coastal drawdowns are 1 to 2 ft. Many of the allocated withdrawals in these problem areas are being reviewed by the SFWMD through the water use permitting process.

Simulations show that potential environmental impacts on wetlands resulting from presently allocated withdrawals are limited primarily to the east half of the Loxahatchee Slough in the northern study area. Simulated cumulative drawdowns from the Seacoast Hood Road wellfield and the Jupiter wellfield at the southeast edge of the slough are approximately 3 feet under average annual conditions and near 4 feet under 90 day drought conditions. Cumulative drawdowns under the northeast corner of the slough are 1 to 2 ft. under the same conditions. Simulated drawdowns of 0.5 ft. or more extend approximately one mile beyond the slough's eastern boundary under average conditions and one and a half miles beyond it under drought conditions. Based on the regional wetland map, there are also potential environmental impacts near the Pratt Whitney wellfield. A more rigorous definition of wetlands in that area will be necessary to better define the impacts.

EFFECTS OF MAINTAINED SURFACE WATER SYSTEMS (Allocated Water Use)

The importance of surface water systems with maintained water levels in recharging the aquifer system, diminishing ground water drawdowns, and preventing saltwater intrusion was evaluated by comparing the results of simulations with and without recharge from these systems. Allocated water use simulations without surface water system recharge (except from the boundary canals, C-51, L-8, Hillsboro, and WCA-1, since boundary conditions were not changed) were run for average annual conditions, dry season conditions, and a 90 day drought. Since the maintained canal systems provide drainage as well as recharge for the aquifer system, they were represented as drains (with cut-off elevations equal to the canal maintenance elevations) in the no recharge simulations. The West Palm Beach Water Catchment System was not represented in the simulations since it provides little ground water drainage.

Simulated ground water levels for average annual conditions with no recharge from maintained surface water systems are shown in Figures 71 and 72. In portions of the study area, these levels are significantly lower than simulated levels for the same conditions with surface water recharge. This is clear in Figures 73 and 74 which show the decline in water levels under average annual conditions when surface water recharge is eliminated. Surface water recharge has the greatest influence on ground water levels in the vicinity of large ground water withdrawals. Ground water levels near the Boca Raton, Boynton Beach, ACME Improvement District, and Seacoast (Hood Road) wellfields are three to four feet higher with

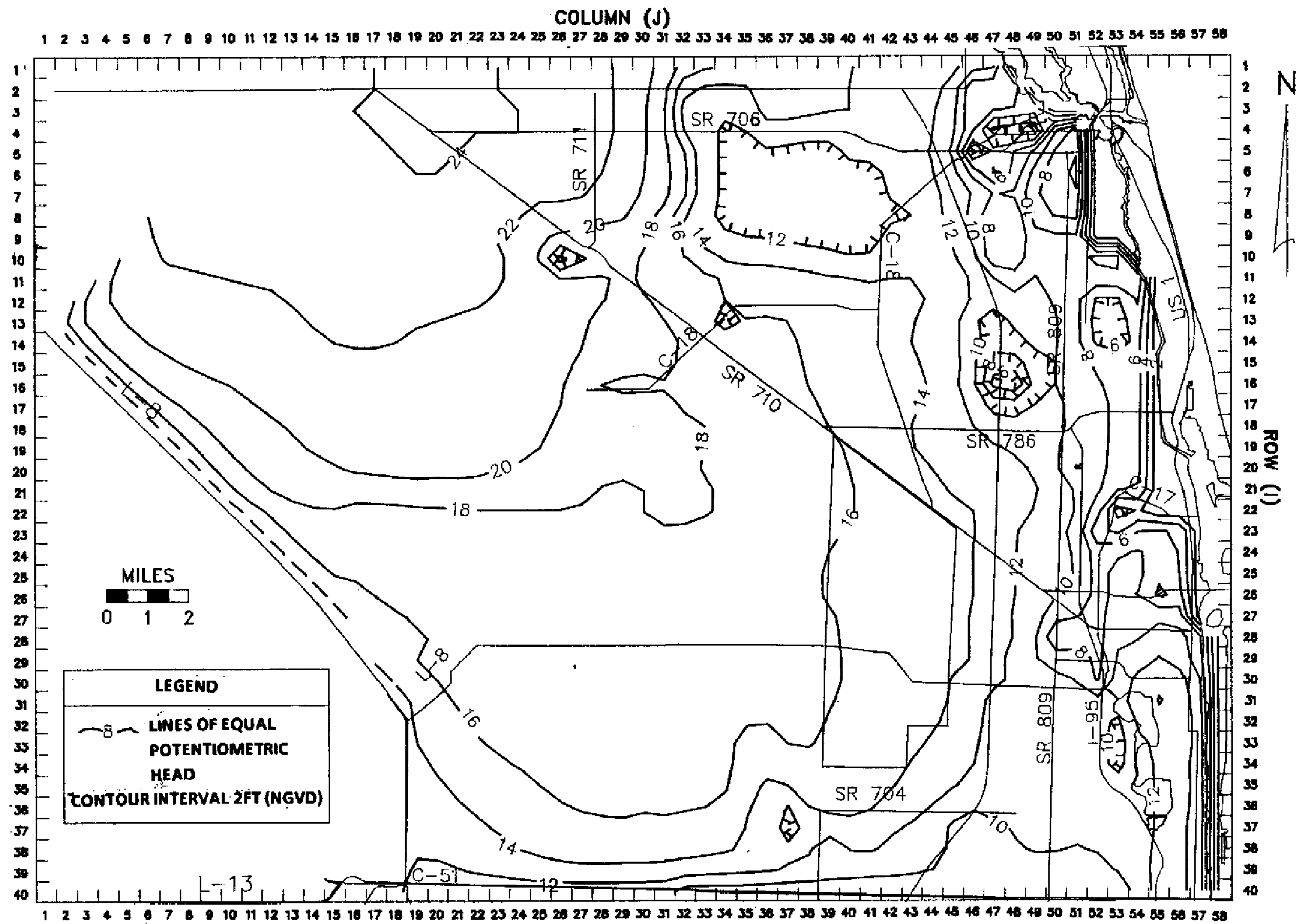

Figure 71 SIMULATED GROUND WATER LEVELS IN NORTHEASTERN PALM BEACH COUNTY (MODEL LAYER 1) WITH NO RECHARGE FROM SURFACE WATER SYSTEMS UNDER AVERAGE ANNUAL CONDITIONS

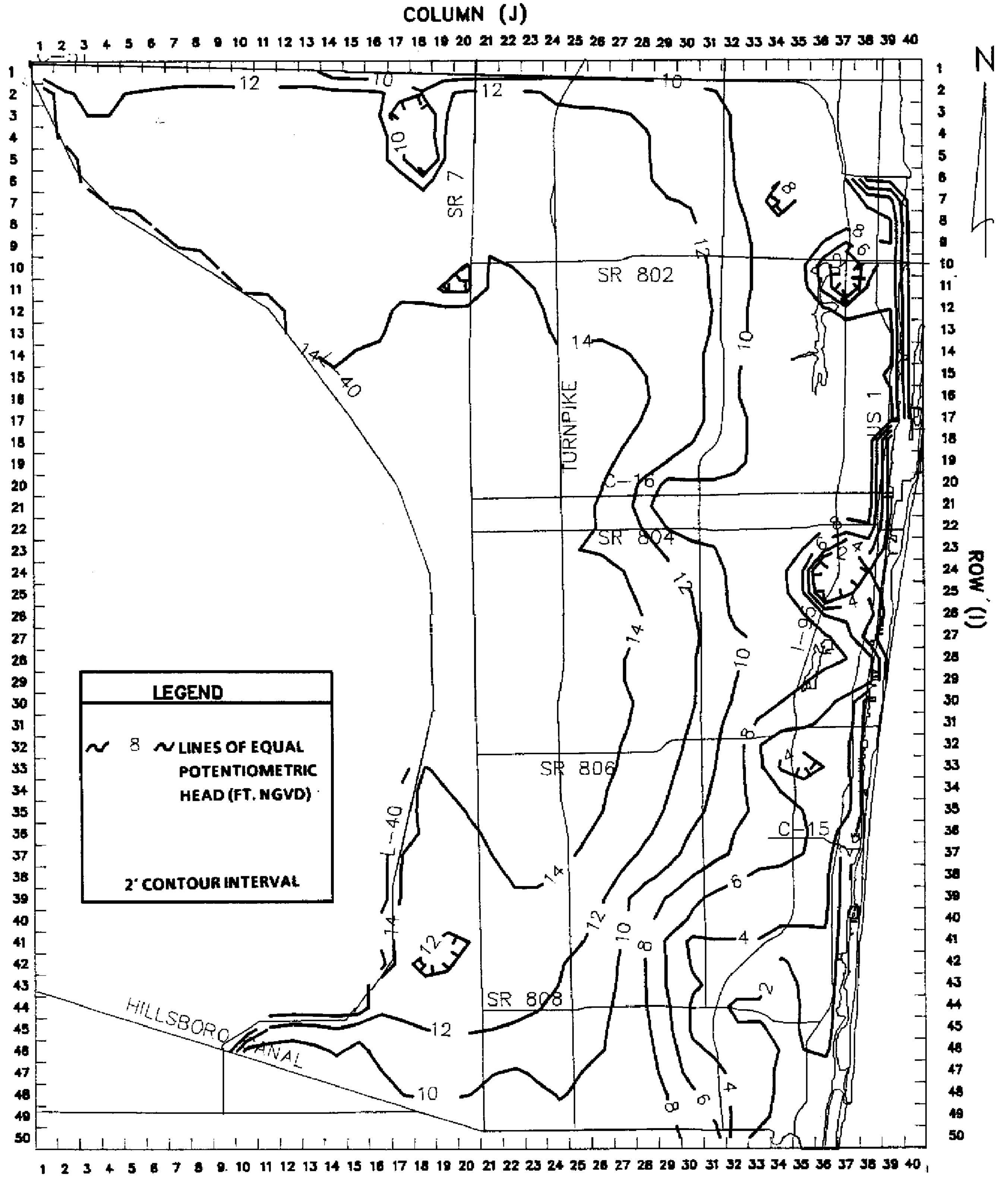

Figure 72 SIMULATED GROUND WATER LEVELS IN SOUTHEASTERN PALM BEACH COUNTY (MODEL LAYER 1) WITH NO RECHARGE FROM SURFACE WATER SYSTEMS UNDER AVERAGE ANNUAL CONDITIONS

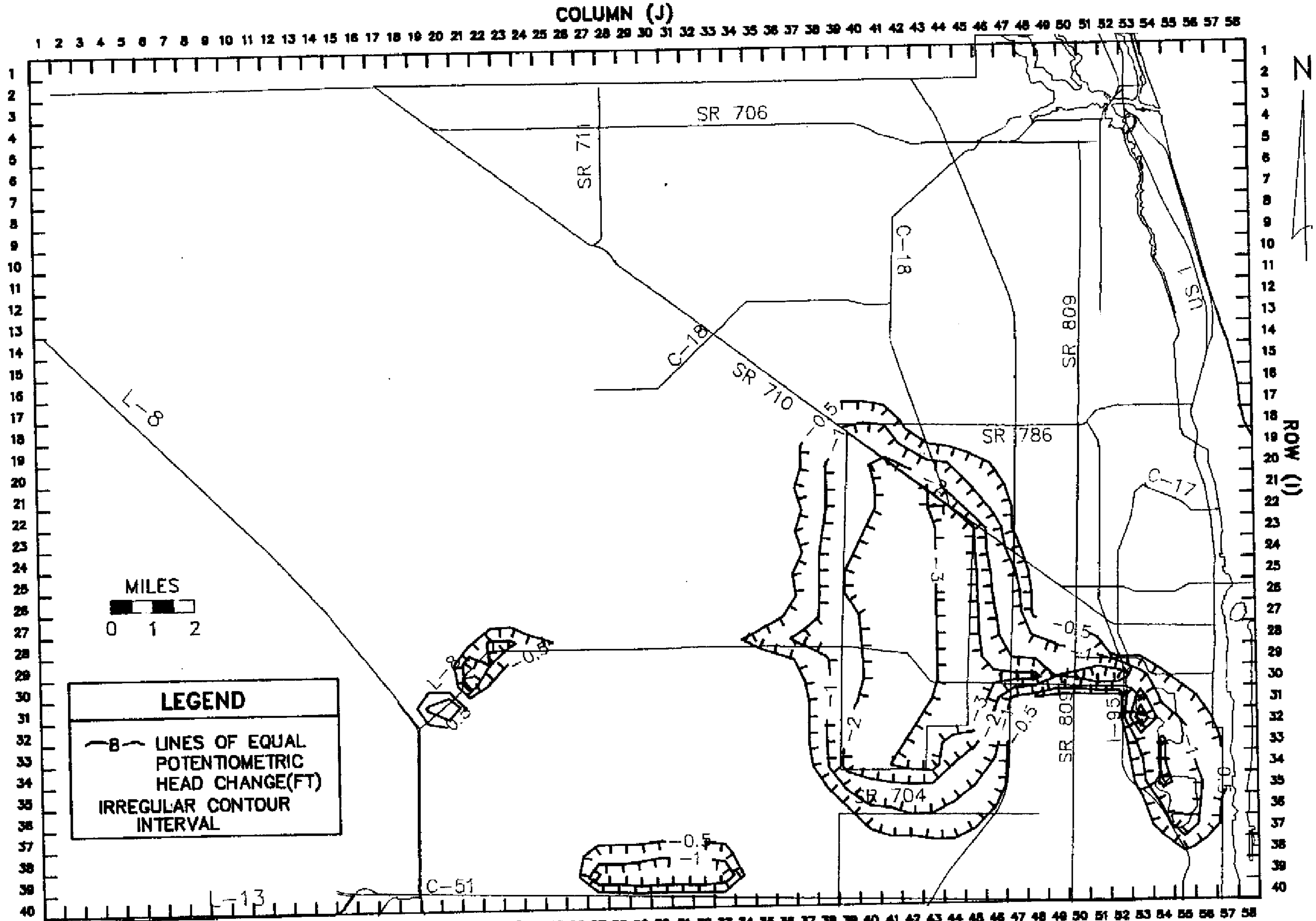

Figure 73 SIMULATED DECLINE IN GROUND WATER LEVELS IN NORTHEASTERN PALM BEACH COUNTY (MODEL LAYER 1) AS A RESULT OF ELIMINATING RECHARGE FROM SURFACE WATER SYSTEMS UNDER AVERAGE ANNUAL CONDITIONS

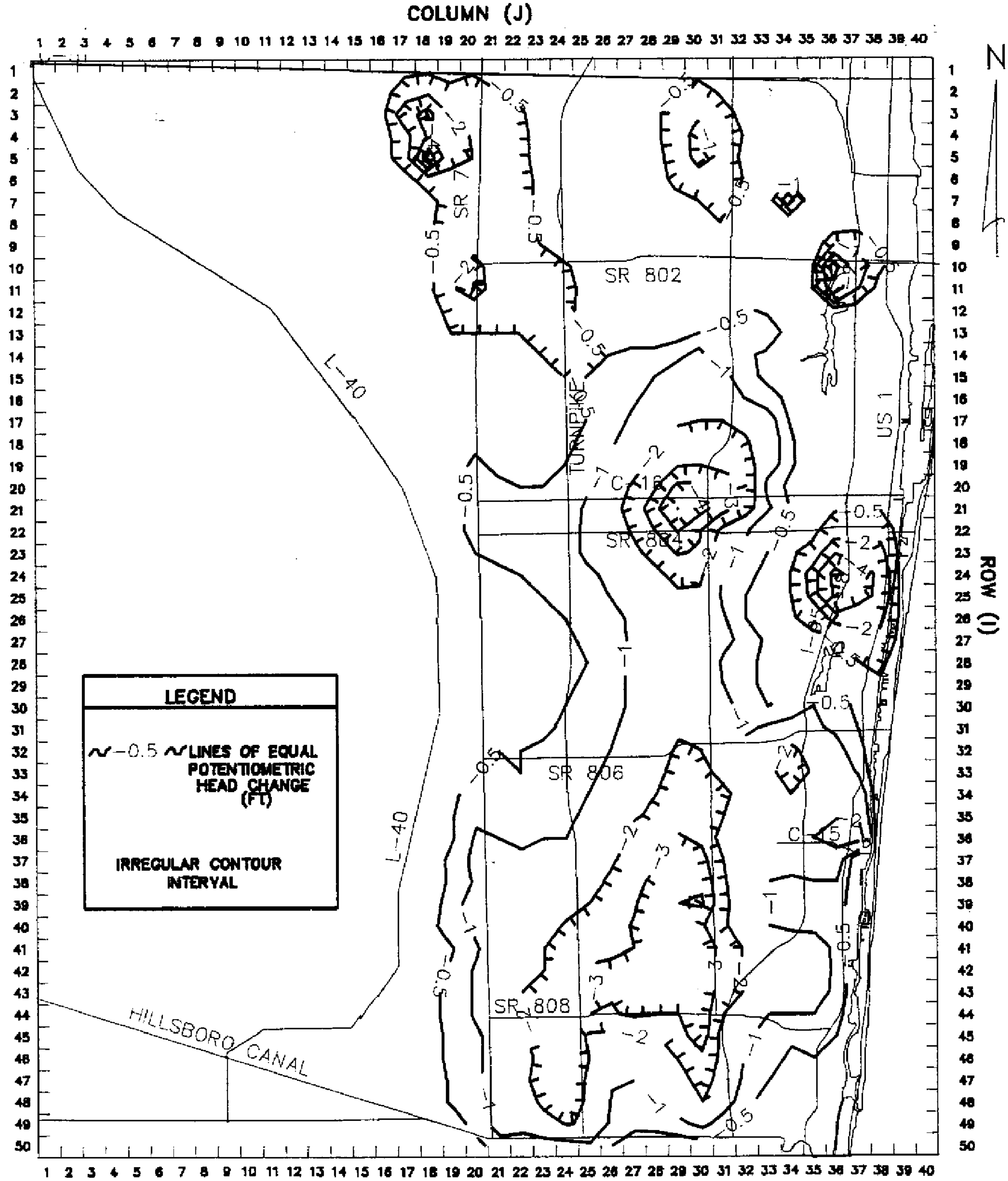

Figure 74 SIMULATED DECLINE IN GROUND WATER LEVELS IN SOUTHEASTERN PALM BEACH COUNTY (MODEL LAYER 1) AS A RESULT OF ELIMINATING RECHARGE FROM SURFACE WATER SYSTEMS UNDER AVERAGE CONDITIONS

surface water recharge than they would be without it under average annual conditions. Recharge effects are also influential in the vicinity of the West Palm Beach Water Catchment System where surface water recharge elevates ground water levels 2 to 3 feet under the water catchment area and 1 to 2 feet in the vicinity of Lake Mangonia and Clear Lake.

Surface water recharge to the aquifer becomes even more significant under dry season and drought conditions. The general areas influenced by the recharge are the same as under average annual conditions, however, the total area affected is larger and the degree of influence is greater. This is illustrated in Figures 75 and 76 which show the additional simulated ground water level declines at the end of the dry season resulting from eliminating surface water system recharge and in Figures 77 and 78 which show the analogous declines after a 90 day drought.

The mass balances for the no surface water recharge simulations are given in Tables 18, 19, and 20 for average annual conditions, dry season conditions, and a 90 day drought respectively. In all the mass balances, evapotranspiration and ground water drainage to canals decreased when surface water recharge was eliminated. This is a direct effect of the lowered water levels discussed above. The effect was particularly pronounced in the southern study area where evapotranspiration decreases ranged from 23% for average annual conditions to 66% for the 90 day drought and decreases in drainage into LWDD canals ranged from 42% for average annual conditions to 70% for the 90 day drought.

Maintained surface water systems are generally considered quite important in preventing salt water intrusion. The no surface water recharge simulations verify that this is true for certain portions of the study area under drought conditions, however, it is not uniformly true for the entire study area under present conditions.

In the southern study area, the LWDD canal network does little to reduce saltwater intrusion potential north of C-16. However, the network does reduce the potential for salt water intrusion during the dry season and droughts along the coast south of C-16 where simulated ground water levels without surface water recharge in some areas are less than 4 ft. NGVD indicating a moderate potential for salt water intrusion and in other areas are less than 0.6 ft. NGVD indicating probable intrusion occurrence. The simulations show that recharge from the canals raises ground water levels in the area from 0.2 to 2.6 ft. with an average of about 0.9 ft. under dry season conditions and 0.4 to 3.7 ft. with an average of about 1.5 ft. under 90 day drought conditions. These increases significantly reduce the potential for intrusion along most of this stretch although there are areas where intrusion remains probable or moderate intrusion potential still exists even with the recharge (see discussions under average annual, average dry season, and 90 and 180 days drought sections). Canal recharge has the greatest influence in the vicinity of the Boynton Beach east wellfield where it increases water levels almost 4 ft. under 90 day drought conditions and reduces the potential for intrusion from probable to moderate.

In the northern study area, maintained systems had no significant effect on the salt water intrusion potential. Clear Lake and Lake Mangonia, the closest maintained surface water bodies to the ocean, do keep ground water levels a foot or so higher along the coast under drought conditions than they would be otherwise. However, since the increase is from 9 or 10 to 10 or 11 ft. NGVD, the effect on intrusion potential is negligible.

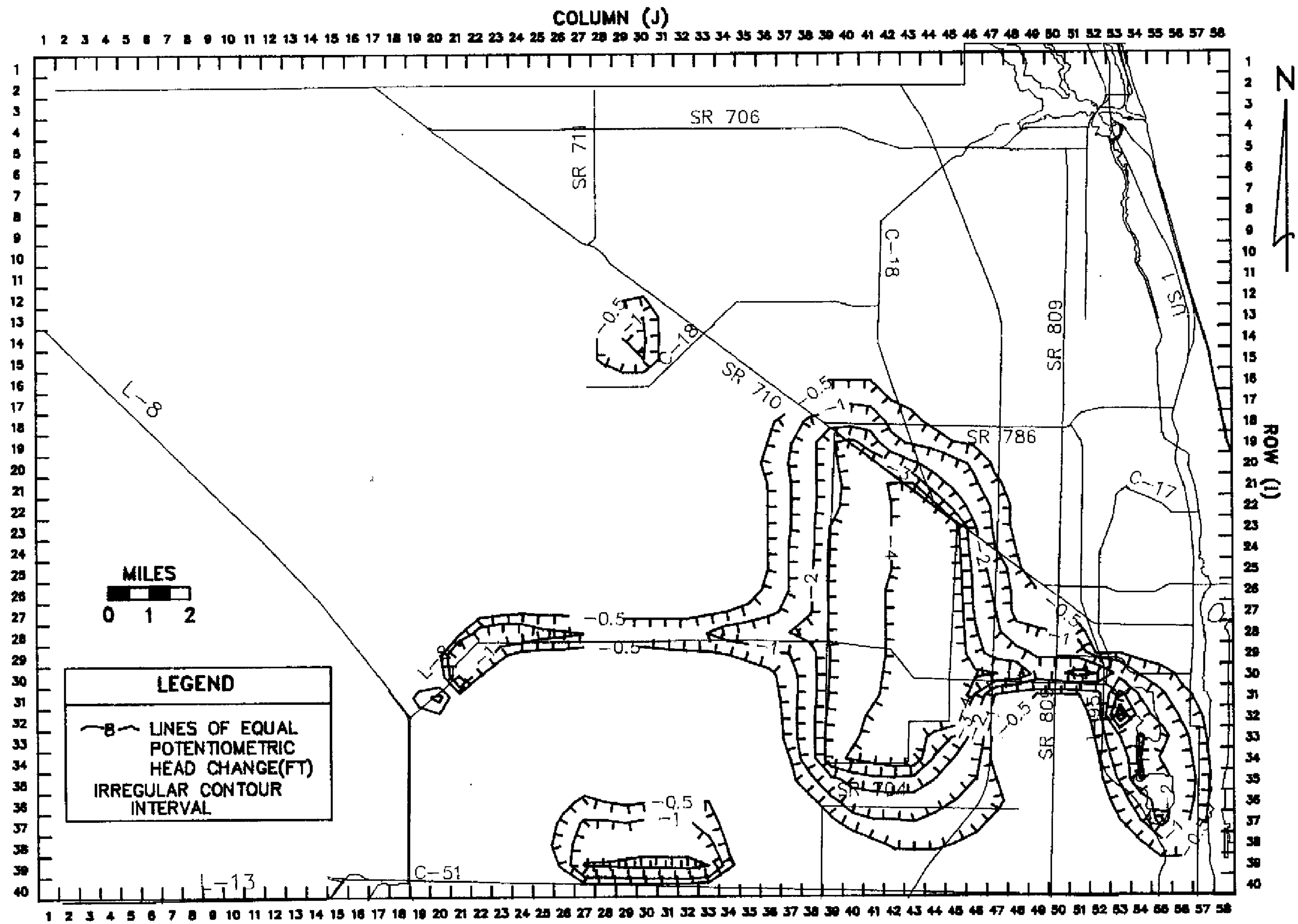

Figure 75 SIMULATED DECLINE IN GROUND WATER LEVELS IN NORTHEASTERN PALM BEACH COUNTY (MODEL LAYER 1) AS A RESULT OF ELIMINATING RECHARGE FROM SURFACE WATER SYSTEMS DURING THE DRY SEASON

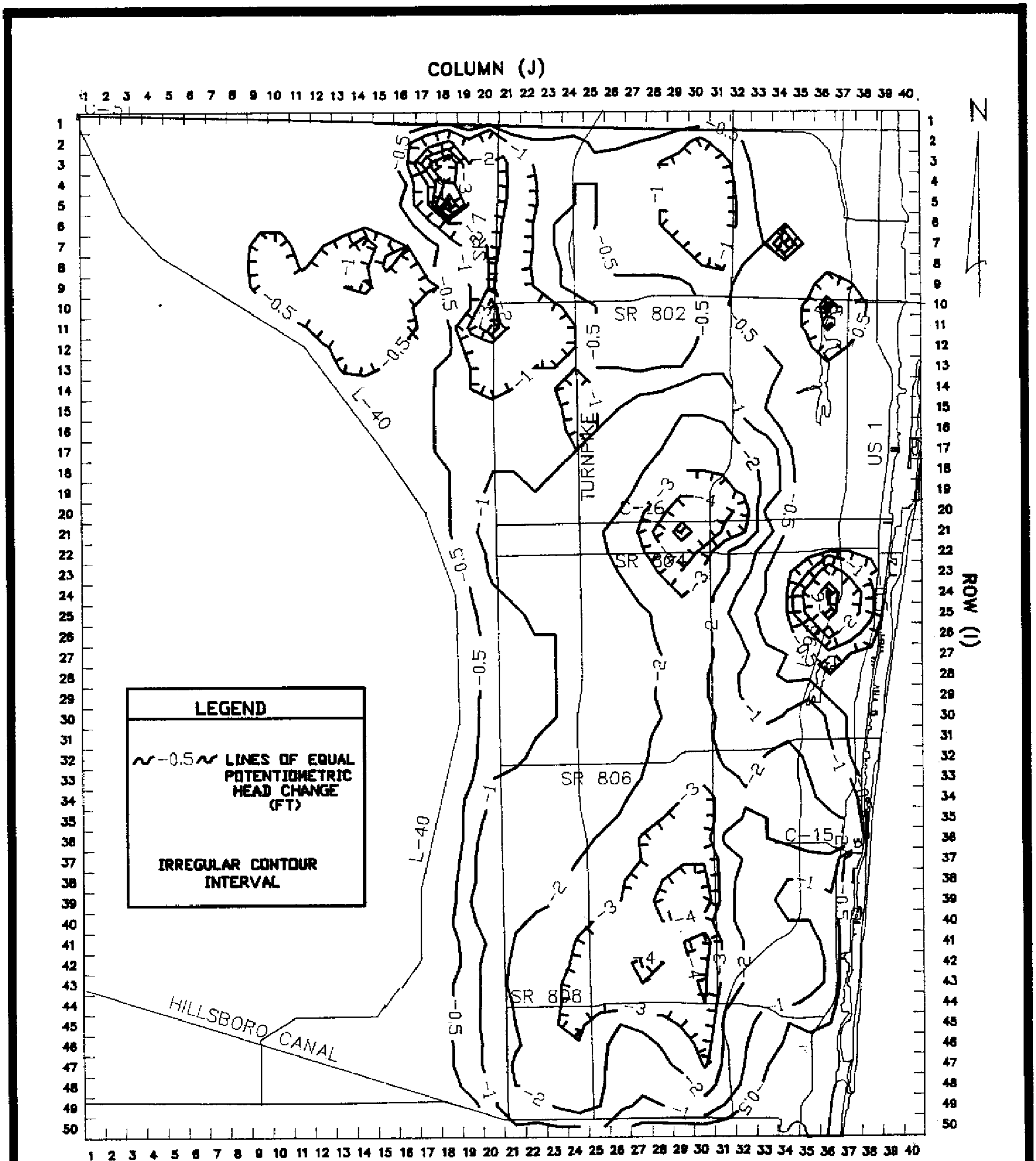

Figure 76 SIMULATED DECLINE IN GROUND WATER LEVELS IN SOUTHEASTERN PALM BEACH COUNTY (MODEL LAYER 1) AS A RESULT OF ELIMINATING RECHARGE FROM SURFACE WATER SYSTEMS DURING THE DRY SEASON

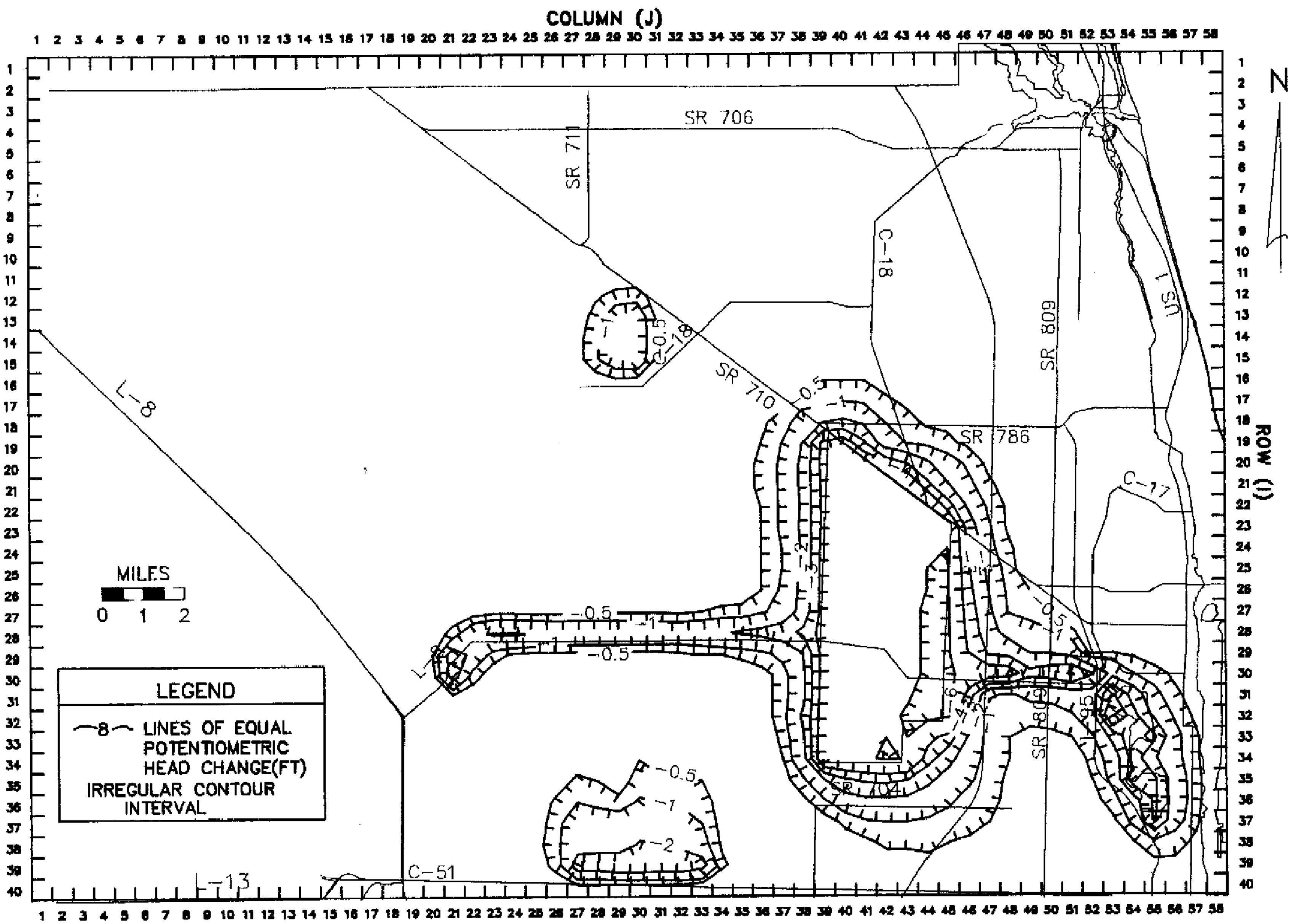

Figure 77 SIMULATED DECLINE IN GROUND WATER LEVELS IN NORTHEASTERN PALM BEACH COUNTY (MODEL LAYER1) AS A RESULT OF ELIMINATING RECHARGE FROM SURFACE WATER SYSTEMS DURING A 90 DAY DROUGHT

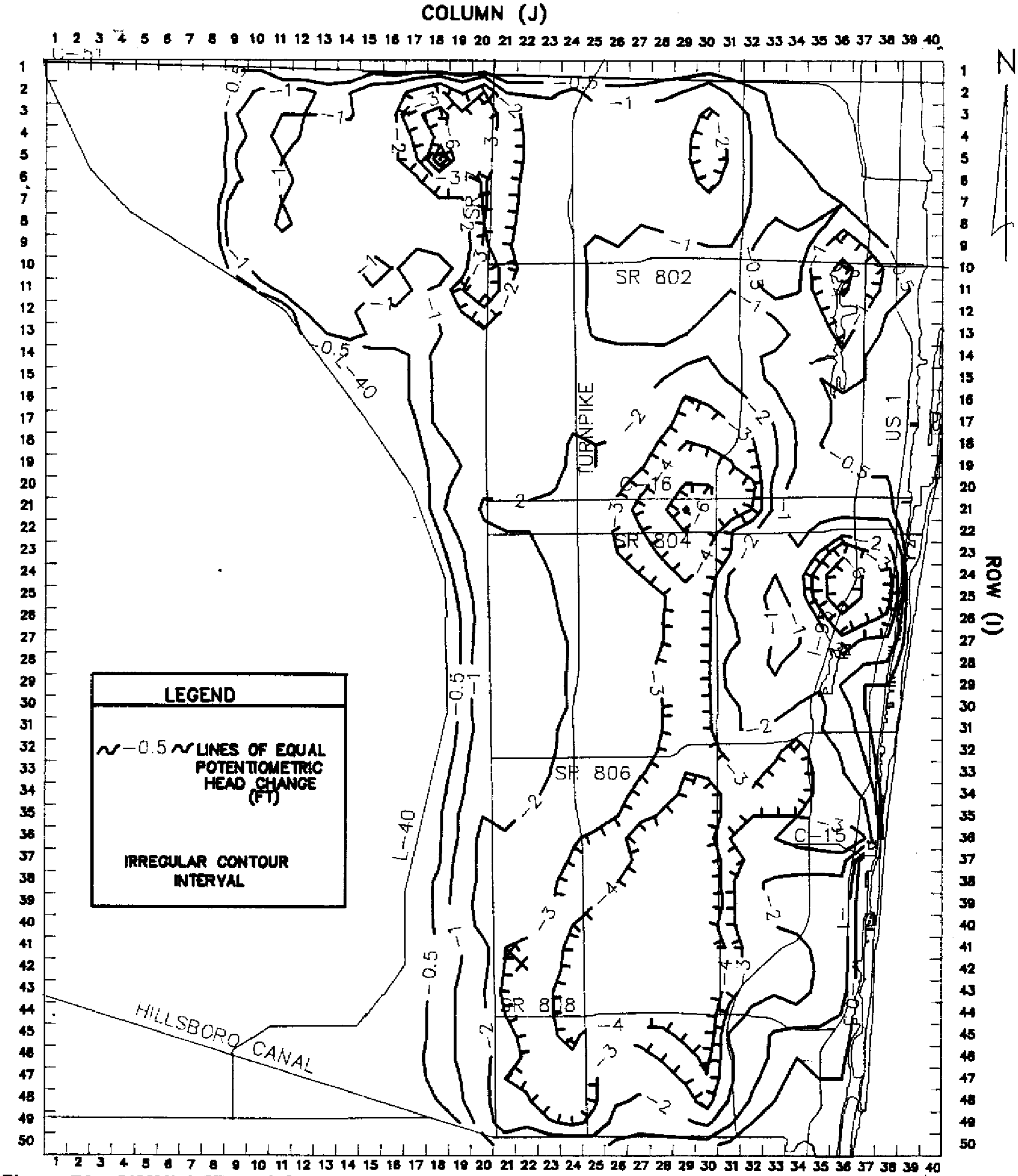

Figure 78 SIMULATED DECLINE IN GROUND WATER LEVELS IN SOUTHEASTERN PALM BEACH COUNTY (MODEL LAYER1) AS A RESULT OF ELIMINATING RECHARGE FROM SURFACE WATER SYSTEMS DURING A 90 DAY DROUGHT

TABLE 18
MODEL MASS BALANCES FOR :
AVERAGE ANNUAL CONDITIONS WITH NO RECHARGE FROM SURFACE WATER AND ALLOCATED WATER USE

North Model	IN* (ft^3/day) x10^3	OUT* (ft^3/day) x10^3	NET* (ft^3/day) x10^3	IN%	OUT%
NW boundary	0	412	-412	0.0	0.3
L-8 boundary	55	1348	-1294	0.1	1.0
Intracoastal	0	503	-504	0.0	0.4
Maintained Canals	0	0	0	0.0	0.0
WPBWCS	0	0	0	0.0	0.0
Rain Infiltration	137858	0	137858	99.9	0.0
C-51	0	3680	-3680	0.0	2.7
Wells	0	10039	-10039	0.0	7.3
Drainage canals	0	17969	-17969	0.0	13.0
Evapotranspiration	0	103966	-103966	0.0	75.4
Storage	0	0	0	0.0	0.0
Total	137913	137920	-6	100	100

South Model	IN* (ft^3/day) x10^3	OUT* (ft^3/day) x10^3	NET* (ft^3/day) x10^3	IN%	OUT%
WCA-1	4094	6	4088	5.0	0.0
Intracoastal Canals	0	266	-266	0.0	0.3
Acme Canals	0	0	0	0.0	0.0
LWDD Canals	0	0	0	0.0	0.0
C-51	3	4273	-4270	0.0	5.2
Hillsboro Canal	274	2275	-2001	0.3	2.8
Rain Infiltration	78350	0	78350	94.7	0.0
Wells	0	23867	-23867	0.0	28.9
Drainage Canals	0	14104	-14104	0.0	17.1
Evapotranspiration	0	37931	-37931	0.0	45.9
Storage	0	0	0	0.0	0.0
Total	82721	82722	1	100	100

* Numbers rounded to nearest thousand.
**WPBWCS = West Palm Beach Catchment System

TABLE 19
MODEL MASS BALANCES FOR :
END OF DRY SEASON CONDITIONS WITH NO SURFACE WATER RECHARGE AND ALLOCATED WATER USE

North Model	IN* (ft^3/day) x10^3	OUT* (ft^3/day) x10^3	NET* (ft^3/day) x10^3	IN%	OUT%
NW boundary	47	152	-105	0.5	0.2
L-8 boundary	98	920	-822	0.1	1.0
Intracoastal	0	430	-429	0.0	0.5
Maintained Canals	0	0	0	0.0	0.0
WPBWCS	0	0	0	0.0	0.0
Rain Infiltration	78473	0	78473	89.2	0.0
C-51	0	2267	-2266	0.0	2.6
Wells	0	10039	-10039	0.0	11.4
Drainage canals	0	9330	-9330	0.0	10.6
Evapotranspiration	0	64832	-64832	0.0	73.7
Storage	9350	0	9350	10.6	0.0
Total	87968	87971	-2	100	100

South Model	IN* (ft^3/day) x10^3	OUT* (ft^3/day) x10^3	NET* (ft^3/day) x10^3	IN%	OUT%
WCA-1	4885	0	4885	8.3	0.0
Intracoastal	0	226	-226	0.0	0.4
Acme Canals	0	8	-8	0.0	0.0
LWDD Canals	0	7559	-7559	0.0	12.8
C-51	33	2790	-2756	0.1	4.7
Hillsboro Canal	434	1321	-887	0.7	2.2
Rain Infiltration	44591	0	44591	75.5	0.0
Wells	0	23867	-23867	0.0	40.4
Drainage Canals	0	0	0	0.0	0.0
Evapotranspiration	0	23314	-23314	0.0	39.5
Storage	9142	0	9142	15.5	0.0
Total	59084	59084	0	100	100

* Numbers rounded to nearest thousand.
**WPBWCS = West Palm Beach Catchment System

TABLE 20
MODEL MASS BALANCES FOR :
CONDITIONS AFTER A 90 DAY DROUGHT WITH NO SURFACE WATER RECHARGE AND ALLOCATED WATER USE

North Model	IN* (ft^3/day) x10^3	OUT* (ft^3/day) x10^3	NET* (ft^3/day) x10^3	IN%	OUT%
NW boundary	329	45	284	0.6	0.1
L-8 boundary	194	446	-252	0.3	0.8
Intracoastal	0	376	-376	0.0	0.6
Maintained Canals	0	0	0	0.0	0.0
WPBWCS	0	0	0	0.0	0.0
Rain Infiltration	0	0	0	0.0	0.0
C-51	61	749	-688	0.1	1.3
Wells	0	10039	-10039	0.0	17.4
Drainage canals	0	3257	-3257	0.0	5.6
Evapotranspiration	0	42849	-42849	0.0	74.2
Storage	57180	0	57180	99.0	0.0
Total	57765	57762	3	100	100

South Model	IN* (ft^3/day) x10^3	OUT* (ft^3/day) x10^3	NET* (ft^3/day) x10^3	IN%	OUT%
WCA-1	6327	0	6327	14.9	0.0
Intracoastal	3	166	-163	0.0	0.4
Acme Canals	0	0	0	0.0	0.0
LWDD Canals	0	3356	-3356	0.0	7.9
C-51	173	1009	-836	0.4	2.4
Hillsboro Canal	1124	420	705	2.6	1.0
Rain Infiltration	0	0	0	0.0	0.0
Wells	0	23867	-23867	0.0	56.0
Drainage Canals	0	0	0	0.0	0.0
Evapotranspiration	0	13782	-13782	0.0	32.4
Storage	34967	0	34967	82.1	0.0
Total	42594	42599	-5	100	100

* Numbers rounded to the nearest thousand.
**WPBWCS = West Palm Beach Catchment System

Maintained surface water systems in the north are important in maintaining wetlands. Surface water system recharge has the greatest effect on wetlands in the West Palm Beach Water Catchment Area where simulations show ground water level drops of 2 to 3 and 4 to 6 feet when surface water recharge is eliminated under average annual and 90 day drought conditions respectively. This would undoubtedly have a significant impact on the wetlands.

BUILDOUT PUBLIC WATER SUPPLY USE

Buildout public water supply use estimates for the model simulations were made by the SFWMD Land and Water Planning Division (Lashua, written communication, 1988). These estimates were based on 1985 water demand, buildout population projections and estimated per capita water use. Buildout water use for the percentage of the buildout population present as of 1985 was set at the 1985 use levels. Water use for the remainder of the buildout population was based on a per capita water use of 170 gallons per day per capita (gpcd). The total buildout water use estimate is the sum of the two. Applying the 1985 per capita rates for the 1985 population and the 170 gpcd rate to newer/future residents recognizes existing consumption rates within established communities while assuming that newer/future residents will use low volume plumbing fixtures, modern landscape (xeriscape) and irrigation practices along with other water conservation techniques.

Table 21 presents the 1985 population and per capita water use data by utility. These data are based on pumpage data submitted to the SFWMD Resource Control Department and population estimates made by the SFWMD Land and Water Use Planning Division. An average per capita water use 170 gpcd was estimated for the study area based on this data after it was adjusted for some of the very high users. The estimated total buildout population in the study area is 1.58 million based on the Palm Beach County Metropolitan Planning Organization Traffic Analysis Zones (TAZ) data. This population was distributed among the public water suppliers as shown in Table 22 using the TAZ data and utility service areas. Table 22 also gives the estimated buildout per capita and total water demand by utility.

Projected public water supply use in the study area at buildout is 109.62 bgy. This use is fairly evenly distributed between the north (52.69 bgy) and the south (56.93 bgy) portions of the study area. Some utilities presently have allocations which exceed the projected buildout demands (see Table 22). This is generally due to differences between the per capita demand rates used herein and the rates used when the permits were issued. In these cases, the allocated water use was used in the buildout simulations.

IMPACTS OF BUILDOUT PUBLIC WATER SUPPLY USE

The impacts of increasing public water supply use to projected buildout levels under average annual, average dry season and 90 day drought conditions were determined by comparing the results of simulations with allocated water use to equivalent simulations with projected buildout public water supply use. Surface water system management and non-public water supply ground water use were not changed for the buildout simulations. However, the rainfall recharge factors were adjusted to reflect projected changes in land use at buildout (see maps in Appendix E). Projected public water supply pumpage was distributed to existing and proposed utility wellfields based on information provided by the SFWMD Resource Control Department. Where there are no plans (or no plans have been submitted) for additional wellfields, additional projected water use at buildout was assigned to the

TABLE 21: 1985 ESTIMATE OF POPULATION AND WATER USAGE
(Eastern Palm Beach County)

UTILITY	POPULATION SERVED	GPCD	MG/YEAR	PERCENT OF USE RES	PERCENT OF USE COM/IND
Acme Improvement	10,950	153	613.49	90	10
Arrowhead MHP	1,054	135	51.91	100	0
Atlantis	1,605	423	247.59	100	0
Boca Raton	63,645	522	12,129.90	92	8
Boynton Beach	54,304	163	3,221.27	95	5
Century Village	11,012	82	339.15	90	10
Consolidated Utility	2,064	89	66.23	90	10
Delray Beach	47,624	214	3,725.22	90	10
Fla. Water Service	2,194	215	172.37	98	2
Village of Golf	987	310	111.72	100	0
Highlands Beach	2,706	471	465.18	100	0
Jamaica Bay MHP	574	73	15.28	100	0
Juno Beach	1,474	171	92.00	98	2
Jupiter	21,909	282	2,258.35	96	4
Lake Worth	30,112	218	2,399.05	90	10
Lantana	9,124	200	665.26	70	30
Manalapan	986	797	286.90	100	0
Mangonia Park	964	475	167.25	25	75
Meadowbrook MHP	8,548	90	279.34	90	10
National Mobile	997	125	45.66	100	0
Northern Pines MHP	691	43	10.73	100	0
PB County Sys #1(1W&8W)	44,730	150	2,446.29	86	14
PB County Sys #2	35,158	52	664.10	86	14
PB County Sys #3	28,306	74	762.37	86	14
PB County Sys #5	3,060	42	46.45	86	14
PB County Sys #9	51,492	136	2,554.56	86	14
Palm Springs	27,731	137	1,391.21	93	7
Riviera Beach	34,249	205	2,559.30	85	15
Royal Palm Beach	7,305	189	504.29	93	7
Seacoast Utility	57,847	199	4,193.48	93	7
Tequesta	8,641	140	442.32	90	10
West Palm Beach	86,295	270	8,491.57	87	13
Sub-Total:	658,368	212	51,399.76		
Self Suppliers:	53,583	151	2,953.23		
TOTAL:	686,306		54,352.99		

GPCD = Gallons Per Capita Per Day
RES = Residential Use
COM/IND = Commercial/Industrial Use

SOURCE: Population by the Water Use Planning and Management, RPD
Water Pumpage Data by the Water Use Division, RCD

TABLE 22: PALM BEACH COUNTY PUBLIC WATER SUPPLY BUILDOUT WATER USE ESTIMATES

UTILITY	BUILDOUT POPULATION	PER CAPITA DEMAND (GPCD)	BUILDOUT PUMPAGE MG/YR	ALLOCATED WATER USE MG/YR
ACME IMPR. DISTRICT	50701	166	3080.05	2120
ARROWHEAD MHP.	3233	159	187.12	56
ATLANTIS UTIL. CO.	1969	376	270.18	268
CITY OF BOCA RATON*	121677	354	15730.79	15750
CITY OF BOYNTON BEACH*	111083	166	6744.41	8470
CENTURY UTILITIES	11012	82	329.15	594
DELRAY BEACH *	69136	201	5082.38	5610
FLA. WATER SERVICE *	1663	230	139.42	215
VILLAGE OF GOLF*	2178	233	185.62	237
HIGHLAND BEACH	3708	390	527.35	508
JAMAICA BAY MHP*	1559	134	76.39	78
JUNO BEACH*	1884	171	114.96	127
TOWN OF JUPITER	119706	191	8326.65	4928
LAKE WORTH UTILITIES	41595	205	3111.57	2850
TOWN OF LANTANA*	8666	201	636.84	695
TOWN OF MANALAPAN*	1120	722	295.21	472
MANGONIA PARK*	1878	327	223.96	230
MEADOWBROOK MHP*	12901	117	549.44	625
NATIONAL MOBILE IND.	3218	156	183.47	88
PBC SYSTEM 1(1W & 8W)	92879	173	5853.33	3057
PBC SYSTEM 2	94973	136	4705.23	1529
PBC SYSTEM 3	57567	135	2843.40	1580
PBC SYSTEM 5	80063	166	4853.22	305
PBC SYSTEM 9	107811	166	6531.41	3220
VILLAGE OF PALM SPRGS.	33504	143	1749.42	1606
CITY OF RIVIERA BEACH *	39113	194	3014.48	3338
ROYAL PALM BEACH	29845	175	1901.72	849
SEACOAST UTILITIES	192741	179	12563.65	7057
TOTAL	1297343		89810.82	66462

*DENOTES PUBLIC WATER SUPPLIES WITH 1988 WATER USE ALLOCATIONS THAT EXCEED PROJECTED BUILDOUT PUMPAGES.

existing wellfield cells in the model to represent expansion of these wellfields. The cell distribution of modeled public water supply buildout pumpage is given in Appendix Q, Table Q-3 and Q-4.

Simulated ground water drawdowns (model layer 1) in the study area as a result of increasing public water supply use to projected buildout levels under 90 day drought conditions are shown in Figures 79 and 80. Drawdowns under other conditions and in other layers are similar and are therefore not shown.

Ground water level drawdowns from increased pumpage at buildout are restricted to the vicinity of the new wellfields or wellfields with increased pumpage. Projected drawdowns are larger in the north study area where the pumpage increases are greater and transmissivities are lower than in the south. The largest simulated drawdowns, 8 ft., are at the Jupiter and Seacoast Hood Road wellfields. Fairly large drawdowns, about 6 ft., are also projected at the Seacoast Burma and Seacoast North Palm Beach wellfields. Smaller drawdowns, 1 to 4 ft., are projected for the Royal Palm Beach, Lake Worth, Acme, and the Palm Beach County System wellfields (1, 2, 3, and 9).

The mass balance results for the buildout runs, given in Tables 23 to 25, show increases in surface water recharge to the aquifer, decreases in ground water drainage to canals, and decreases in evapotranspiration when ground water withdrawals are increased to buildout levels. These changes are small relative to the overall mass balance components although they may be important on a local scale.

The buildout increases affected salt water intrusion and environmental impact potential only near the Jupiter and Seacoast wellfields. The increases caused approximately 3 feet of additional drawdown at the northeast corner of the Loxahatchee Slough and 4 feet of additional drawdown at the southeast corner. These drawdowns would be expected to have adverse impacts on the slough. Increased potential for salt water intrusion occurs east of the Seacoast North Palm Beach wellfield where simulated heads drop 1 to 2 feet along the coast as a result of the pumpage increases. These drawdowns increase the salt water intrusion potential in the area from moderate to probable.

Fortunately, Jupiter already plans to shift its additional withdrawals to the Floridan aquifer which should allow them to meet their demand without causing adverse impacts. It appears that Seacoast Utilities will need to seek alternatives as well if they are to meet their buildout demands without adverse environmental impacts or salt water intrusion problems.

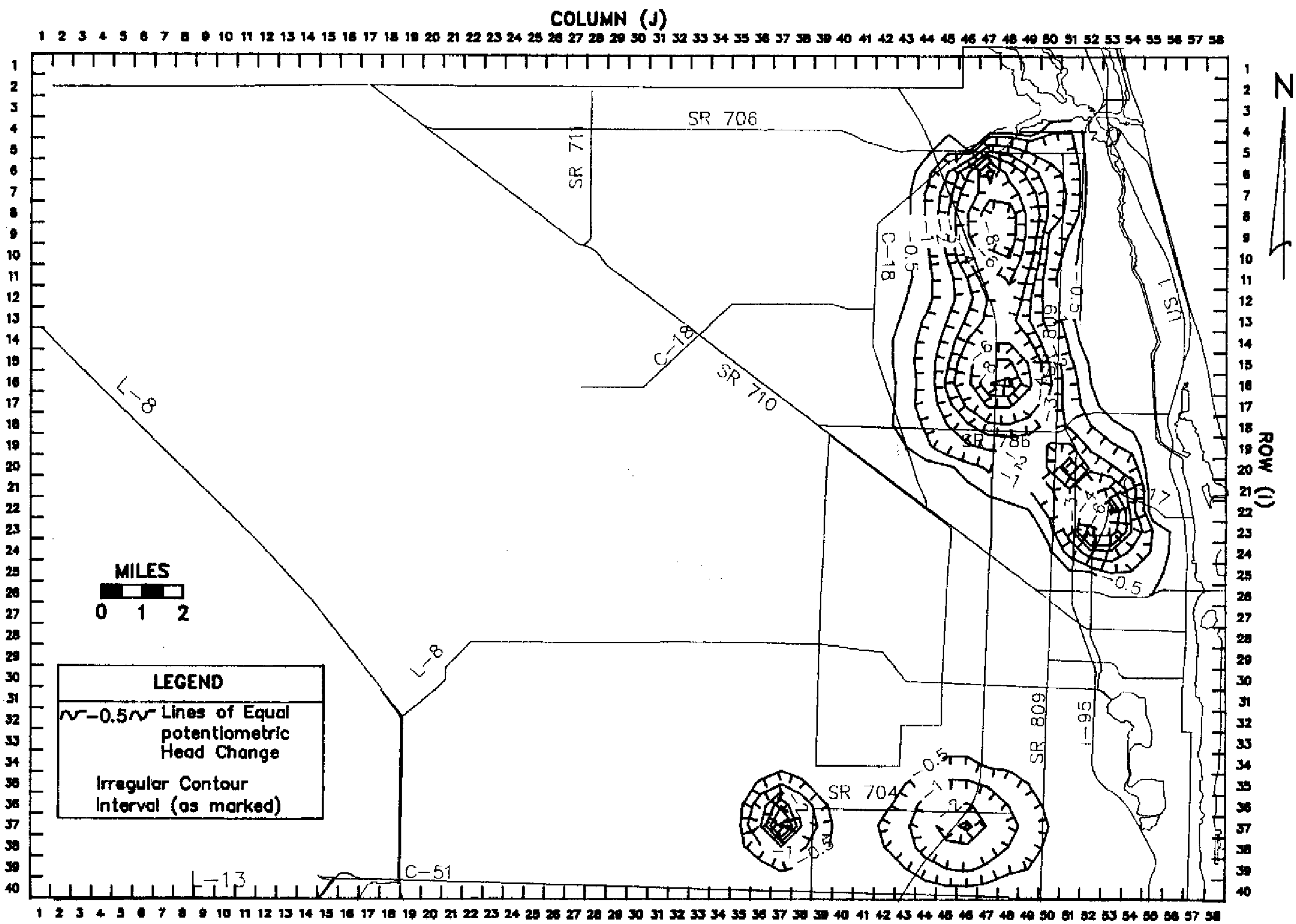

Figure 79 SIMULATED GROUND WATER DRAWDOWN IN NORTHEASTERN PALM BEACH COUNTY (MODEL LAYER 1) DURING A 90 DAY DROUGHT AS A RESULT OF INCREASING WATER USE TO PROJECTED BUILDOUT LEVELS

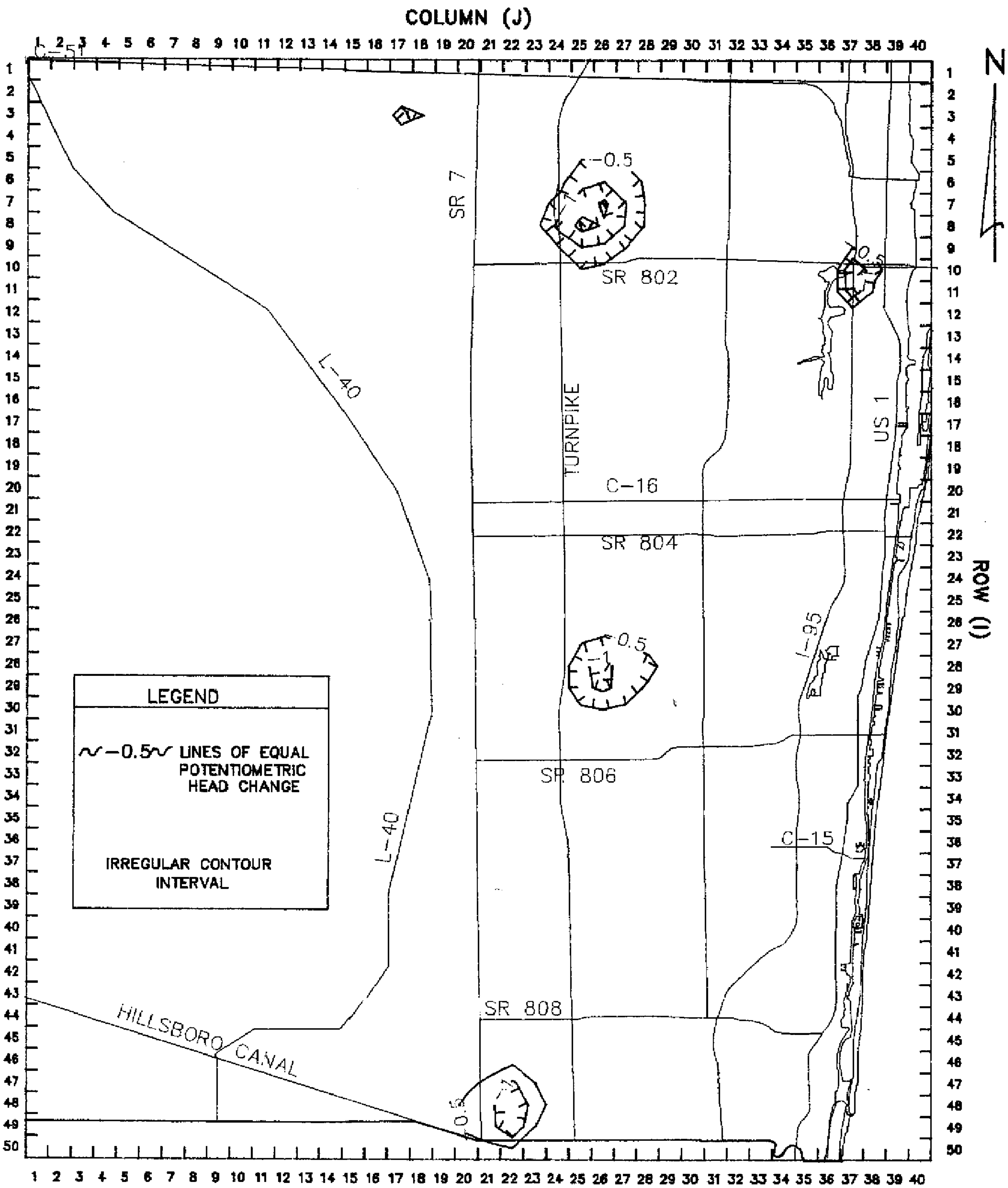

Figure 80 SIMULATED GROUND WATER DRAWDOWN IN SOUTHEASTERN PALM BEACH COUNTY (MODEL LAYER 1) DURING A 90 DAY DROUGHT AS A RESULT OF INCREASING WATER USE TO PROJECTED BUILDOUT LEVELS

TABLE 23
MODEL MASS BALANCES FOR:
AVERAGE ANNUAL CONDITIONS WITH BUILDOUT WATER USE

North Model	IN* (ft^3/day) x10^3	OUT* (ft^3/day) x10^3	NET* (ft^3/day) x10^3	IN%	OUT%
NW boundary	0	413	-413	0.0	0.3
L-8 boundary	55	1324	-1269	0.0	0.9
Intracoastal	0	485	-485	0.0	0.3
Maintained Canals	613	326	287	0.4	0.2
WPBWCS	8458	173	8286	5.8	0.1
Rain Infiltration	137858	0	137858	93.8	0.0
C-51	0	3574	-3574	0.0	2.4
Wells	0	14671	-14671	0.0	10.0
Drainage Canals	0	19323	-19323	0.0	13.2
Evapotranspiration	0	106697	-106697	0.0	72.6
Storage	0	0	0	0.0	0.0
Total	146985	146986	-1	100	100

South Model	IN* (ft^3/day) x10^3	OUT* (ft^3/day) x10^3	NET* (ft^3/day) x10^3	IN%	OUT%
WCA-1	4230	0	4230	3.9	0.0
Intracoastal	0	340	-340	0.0	0.3
Acme Canals	969	696	273	0.9	0.7
LWDD Canals	23610	23350	260	22.0	21.8
C-51	2	4696	-4694	0.0	4.4
Hillsboro Canal	177	2876	-2699	0.2	2.7
Rain Infiltration	78350	0	78350	73.0	0.0
Wells	0	26761	-26761	0.0	24.9
Drainage Canals	0	10	-10	0.0	0.0
Evapotranspiration	0	48607	-48607	0.0	45.3
Storage	0	0	0	0.0	0.0
Total	107338	107336	2	100	100

* Numbers rounded to nearest thousand.
**WPBWCS = West Palm Beach Water Catchment System

TABLE 24
MODEL MASS BALANCES FOR :
AVERAGE DRY SEASON CONDITIONS WITH BUILDOUT WATER USE

North Model	IN* (ft^3/day) x10^3	OUT* (ft^3/day) x10^3	NET* (ft^3/day) x10^3	IN%	OUT%
NW boundary	47	152	-105	0.1	0.2
L-8 boundary	98	905	-807	0.1	0.9
Intracoastal	0	407	-407	0.0	0.4
Maintained Canals	1207	24	1183	1.2	0.0
WPBWCS	12307	85	12221	12.2	0.1
Rain Infiltration	78473	0	78473	77.9	0.0
C-51	0	2235	-2235	0.0	2.2
Wells	0	14671	-14671	0.0	14.6
Drainage Canals	0	11168	-11168	0.0	11.1
Evapotranspiration	0	71043	-71043	0.0	70.6
Storage	8558	0	8558	8.5	0.0
Total	100691	100691	0	100	100

South Model	IN* (ft^3/day) x10^3	OUT* (ft^3/day) x10^3	NET* (ft^3/day) x10^3	IN%	OUT%
WCA-1	4831	0	4831	5.6	0.0
Intracoastal	0	286	-286	0.0	0.3
Acme Canals	2146	16	2130	2.5	0.0
LWDD Canals	32990	17928	15062	38.5	20.9
C-51	34	3431	-3398	0.0	4.0
Hillsboro Canal	274	2105	-1830	0.3	2.5
Rain Infiltration	44591	0	44591	52.0	0.0
Wells	0	26761	-26761	0.0	31.2
Drainage Canals	0	0	0	0.0	0.0
Evapotranspiration	0	35238	-35238	0.0	41.1
Storage	897	0	897	1.1	0.0
Total	85764	85765	-2	100	100

* Numbers rounded to nearest thousand.
**WPBWCS = West Palm Beach Water Catchment System

TABLE 25
MODEL MASS BALANCES FOR :
90 DAY DROUGHT CONDITIONS WITH BUILDOUT WATER USE

North Model	IN* (ft^3/day) x10^3	OUT* (ft^3/day) x10^3	NET* (ft^3/day) x10^3	IN%	OUT%
NW boundary	329	45	284	0.4	0.1
L-8 boundary	196	439	-243	0.3	0.6
Intracoastal	0	356	-356	0.0	0.5
Maintained Canals	2606	0	2606	3.6	0.0
WPBWCS	20518	13	20505	28.0	0.0
Rain Infiltration	0	0	0	0.0	0.0
C-51	205	891	-686	0.3	1.2
Wells	0	14671	-14671	0.0	20.0
Drainage Canals	0	4488	-4488	0.0	6.1
Evapotranspiration	0	52312	-52312	0.0	71.4
Storage	49361	0	49361	67.4	0.0
Total	73216	73214	1	100	100

South Model	IN* (ft^3/day) x10^3	OUT* (ft^3/day) x10^3	NET* (ft^3/day) x10^3	IN%	OUT%
WCA-1	5566	0	5566	8.5	0.0
Intracoastal	1	221	-220	0.0	0.3
Acme Canals	5346	0	5346	8.2	0.0
LWDD Canals	50654	11223	39431	77.2	15.7
C-51	163	1859	-1696	0.3	2.6
Hillsboro Canal	563	1124	-561	0.9	1.6
Rain Infiltration	0	0	0	0.0	0.0
Wells	0	28986	-28986	0.0	40.4
Drainage Canals	0	0	0	0.0	0.0
Evapotranspiration	0	28291	-28291	0.0	39.5
Storage	3323	0	3323	5.1	0.0
Total	65615	71704	-6089	100	100

* Numbers rounded to nearest thousand.
**WPBWCS = West Palm Beach Water Catchment System

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GROUND WATER DEVELOPMENT POTENTIAL

INTRODUCTION

The development potential of the aquifer systems in the study area is determined by numerous factors including aquifer productivity, ambient water quality, potential for water quality degradation, potential for adverse impacts on existing users, and potential for adverse impacts on the environment. To compare the relative development potential in the Surficial and Floridan Aquifer Systems in the study area, four levels of development potential - good, moderate, fair, and poor - have been defined based on aspects of all the above factors except one, the potential for adverse impacts on existing users. The definitions of potential development are arbitrary since they are intended primarily to provide a basis of comparison of relative development potential.

Adverse impacts on existing users were not considered since they are dependent on knowledge of pumping rates and exact well locations which was beyond the scope of this study. These impacts are best addressed through the SFWMD water use permitting process. Aspects of ambient water quality and water quality degradation related to landfills were also not addressed since the definition of existing contaminant plumes and their possible fate with or without remedial action is also beyond the scope of this study. However, the locations of landfills in the study area are shown with the potential development areas on Plates 22 and 23. Landfill impacts should be addressed on an individual basis through the water use permitting process.

The criteria for determining the development potential for the aquifers is summarized in Table 26. Areas with good development potential are defined as having high productivity (at least 40 ft. of Biscayne aquifer present) and ambient ground water which may be treated to potable standards with methods conventionally used by public water suppliers. Additionally, the potential for adverse environmental impacts or degradation of water quality as a result of withdrawals in these areas is considered minimal. The criteria for areas with moderate development potential differs from those for areas with good potential only in terms of aquifer productivity which must be moderate (at least 20 ft. of Biscayne aquifer or more than 100 ft. of production zone present) rather than high. Areas with fair development potential encompass all areas excluded from the good and moderate potential categories because of low productivity. They also include areas where the ambient ground water has a total dissolved solids (TDS) content of less than 10,000 mg/l and is treatable to potable standards using reverse osmosis. Areas where the potential for adverse environmental or water quality impacts as a result of withdrawals is questionable at this time (i.e. areas adjacent to wetlands where impacts depend heavily on withdrawal quantities) are also included in the fair potential category. All areas not meeting the criteria for good, moderate or fair development potential because of likely adverse environmental impacts or water quality degradation as a result of withdrawals are grouped into the poor development potential category.

SURFICIAL AQUIFER SYSTEM

The ground water development potential of the Surficial Aquifer System as defined by the criteria described above is shown on Plate 23. The area of good

TABLE 26. AQUIFER GROUND WATER DEVELOPMENT POTENTIAL CRITERIA

Development Potential	Aquifer Productivity	Biscayne Aquifer	Production Zone	Ambient Ground Water Quality	Potential for Adverse Environmental Impacts	Potential for Degradation of Water Quality
Good	High (T generally >60,000 ft^2/day)	Present >40 ft. thick	No Criteria	Treatable to potable standards with conventional water treatment methods*	Minimal	Minimal
Moderate	Moderate (T generally > 30,000 ft^2/day)	Present >20 ft. thick (or meets production zone criteria)	Present >100 ft. thick if <20 ft. of Biscayne aquifer present	Treatable to potable standards with conventional water treatment methods*	Minimal	Minimal
Fair	No Criteria	No Criteria	No Criteria	Treatable to potable standards with reverse osmosis and TDS <10,000 mg/l.	Minimal or Undetermined	Minimal or Undetermined
Poor	Does not meet criteria for good, moderate, or fair.					

*As employed by public water supplies.

development potential extends north from the Palm Beach-Broward County line to approximately Okeechobee Boulevard and covers much of the south study area.

The extent of the good development area north of SR 802 is limited primarily by the extent of the thick portion of the Biscayne aquifer. South of SR 802 it is generally limited by the potential for withdrawals resulting in adverse impacts on the wetlands near and in WCA-1 to the west and in increased potential for coastal saltwater intrusion to the east.

Most of the moderate development potential area in the Surficial Aquifer System lies along the fringes of the good potential areas where the Biscayne aquifer is less than 40 but greater than 20 feet thick. Other areas of moderate development potential in the study area are quite limited since most of the areas of the Surficial Aquifer System with greater than 100 ft. of production zone are under the West Palm Beach Water Catchment Area where water table drawdowns as a result of ground water development are environmentally undesirable.

Areas of fair development potential are spread throughout the study area. One mile strips adjacent to WCA-1 and the WPBWCA were classified in the fair category because adverse environmental impacts resulting from development in these areas are dependent on the quantity and configuration of ground water withdrawals and are therefore uncertain. Areas east of the Turnpike in the north area and adjacent to the eastern edge of the moderate development potential areas are in the fair category due to their low productivity. Most remaining fair development potential areas have both low productivity and ambient water quality which is not conventionally treatable to potable standards. Reverse osmosis is required to produce potable water in these areas. However, water quality degradation as a result of upconing will need to be addressed in development of these sections since water quality typically degrades with depth. Production wells in these areas are often shallow to take advantage of the better water quality near the surface. However, the upconing of the deeper poorer quality water as a result of the shallow withdrawals ultimately degrades the shallow water quality. This could probably be prevented by using the deeper ground water with appropriate treatment methods.

The entire coastal margin of the Surficial Aquifer System is in the poor development category because additional withdrawals there are expected to significantly increase the potential for saltwater intrusion. The other areas of the Surficial aquifer with poor development potential are under wetlands (the Corbett Wildlife Refuge, the Loxahatchee Slough, the West Palm Beach Water Catchment Area, the wetlands adjacent to WCA-1) where the water table drawdowns likely to result from ground water development are undesirable.

THE FLORIDAN AQUIFER SYSTEM

The upper Floridan aquifer underlying the study area has fair development potential. Its productivity is low compared to much of the Surficial Aquifer System and its water is not conventionally treatable to potable standards. There are two primary concerns in developing the upper Floridan Aquifer System. First, ground water quality is generally better in the upper zones of the system than in the lower ones. Thus, the potential for water quality degradation in the upper zones as a result of withdrawal induced upconing of poorer quality water from the lower zones will have to be considered if the Floridan is developed. The second concern, is the potential for adverse impacts on existing Floridan users in Martin County. Since these users are not permitted to install pumps on their wells, the impacts of drawdowns from withdrawals in the study area would be difficult to mitigate if they extend under the Palm Beach-Martin County line and reduce the flow rate of Martin County Floridan wells.

The lower Floridan aquifer underlying the study area has poor development potential since its ambient ground water has a total dissolved solids content of greater than 10,000 mg/l.

RESULTS AND CONCLUSIONS

1. The most productive zone of the Surficial Aquifer System in eastern Palm Beach County is the northern extension of the Biscayne aquifer. It is composed primarily of highly solutioned limestone with an average hydraulic conductivity of approximately 1600 ft./day. The extent of the Biscayne aquifer in the study area is irregular (Plate 6). It extends from the Palm Beach - Broward county line north to approximately Hood Road where it pinches out. It also generally pinches out before reaching the coast to the east and WCA-1 to the west. The Biscayne aquifer is thickest along its central portion between the turnpike and Military Trail where it is 40 to 100 ft. thick. The aquifer thins to typically less than 40 ft. thick north of the M canal.

2. The Biscayne aquifer is surrounded in most of the study area by a moderately productive interval of sandy shell, moderately solutioned limestone, and moderately to well solutioned sandstone with an average hydraulic conductivity of approximately 150 ft./day. Most withdrawals in the study area north of C-51 are from either this moderately productive interval or the Biscayne aquifer, hence, the two are referred to collectively as the production zone. The production zone underlies most of the northern study area; it is known to be absent only in a small area east of Military Trail between 45th St. and Northlake Blvd. (Plate 9). The production zone in the northern area is thickest, 100 ft. or more, near the turnpike and Okeechobee Blvd. just north of C-51 (Plate 9). In the rest of the northern area, it is generally thickest (100 ft. or more) along a north - south strip extending west 3 to 6 miles from the turnpike. It is also greater than 100 ft. thick east of the turnpike in the area between Donald Ross Road and PGA Blvd.

3. The most important source of recharge to the Surficial Aquifer System is rainfall. Under average conditions, with presently allocated water use, rainfall provides approximately 85% of the total annual aquifer recharge in the study area. About an additional 13% is provided by leakage from the West Palm Beach Water Catchment Area (3%) and canal systems with maintained water levels (10%). Over half of the total recharge from maintained canal systems comes from the LWDD system which covers close to half the study area. The remaining annual recharge comes primarily from inflow to the study area from WCA-1.

4. The largest ground water losses from the Surficial Aquifer System in the study area result from evapotranspiration which accounts for approximately 60 percent of total annual losses under average annual conditions with allocated water use. Leakage to canals, the next most important discharge from the aquifer, accounts for an additional 20 percent of the losses. Close to half (40 percent) of the ground water discharge to canals occurs in the LWDD system. Allocated withdrawals by ground water users make up another 15 percent of the estimated average annual aquifer losses. Remaining losses come primarily from leakage in the C-51 and Hillsboro canals. Ground water underflow out of the study area to the Intracoastal Waterway is small, less than 1 percent of the total aquifer losses.

5. Simulated flow and ground water levels indicate potential for saltwater intrusion in several areas along the coast under typical conditions. The greatest potential in the study area exists along the southernmost 5 miles of

coast where simulated ground water levels at the end of the dry season range from 0.8 to 3.8 ft. Permitted users likely to be impacted by intrusion in this area are the City of Boca Raton, the Boca Raton Hotel and Club, and the Royal Palm Yacht and Country Club. Potential for saltwater intrusion during the dry season also exists east of the Seacoast North Palm Beach, Gulfstream Golf Club, and the Boynton Beach East wellfields where simulated water levels at the end of the dry season are less than 4 ft.

6. Severe droughts, when there is no rainfall recharge reaching the aquifer, cause decreased ground water flow toward the coast and declines in coastal ground water levels. This makes saltwater intrusion likely in portions of the study area during extended droughts if ground water withdrawals are not reduced or shifted inland. Model simulations show high potential for intrusion occurring along the southernmost mile and a half of coast in the vicinity of the Boca Raton Hotel and Country Club and the Royal Palm Yacht and Country Club during a 90 day drought with allocated water use. Intrusion potential increases during a simulated 180 day drought and extends one mile further north to include the area east of the Boca Raton wellfield. Intrusion is also likely east of the Gulfstream Golf Course wellfield during a 180 day drought.

7. Recharge from surface water systems with maintained water levels keeps ground water levels in much of the study area significantly higher than they would be otherwise. This recharge has the greatest influence on ground water levels in the vicinity of large wellfields. Simulated ground water levels near the Boca Raton, Boynton Beach, and Acme Improvement District wellfields are increased 3 to 4 ft. by surface water recharge under typical conditions. Surface water recharge effects are also significant in the vicinity of the West Palm Beach Water Catchment Area where the recharge raises simulated ground water levels 2 to 3 ft. under the water catchment area and 1 to 2 ft. near Clear Lake and Lake Mangonia under typical conditions.

   Surface water recharge to the aquifer is even more significant under drought conditions when little or no rainfall reaches the water table. Under these conditions, leakage from surface water systems with maintained water levels becomes the main source of recharge to the aquifer when the surface water levels can be maintained. If the levels cannot be maintained (i.e. water from Lake Okeechobee or the Water Conservation Areas is not available), there is little aquifer recharge and ground water levels will decline accordingly as water is removed from aquifer storage.

   Aquifer recharge from LWDD canals reduces the potential for coastal saltwater intrusion south of C-16 during dry season and drought conditions when the canal design levels can be maintained. Model simulations show that recharge from the canals under these conditions raises coastal ground water levels in that area from 0.2 to 2.6 ft. with an average of about 0.9 ft. during the dry season and from 0.4 to 3.7 ft. with an average of 1.5 ft. during a 90 day drought.

8. Total permitted ground water withdrawals in the study area as of February 1989 were approximately 97 billion gallons per year. Two thirds of this is for public water supply use and the remainder is primarily for agricultural, landscape and golf course irrigation. The allocated withdrawals result in ground water level drawdowns in the study area which are greatest in areas where the aquifer transmissivity is lowest and where there is little recharge

from surface water systems. The largest projected drawdowns in the study area, greater than 10 ft., occur at the Lake Worth wellfield. Substantial drawdowns are also expected at the Boynton Beach, Delray Beach, Jupiter, and Seacoast wellfields where projected drawdowns are approximately 8, 4, 4, and 4 ft. respectively.

Ground water withdrawals appear to be increasing the potential for salt water intrusion along the coast in much of the study area south of C-51. Simulated coastal drawdowns as a result of withdrawals are 1 to 2 ft. south of Highland Beach and east of the Delray Beach wellfields and 2 to 6 ft. near the Boynton Beach and Gulfstream wellfields. North of C-51, presently allocated withdrawals appear to significantly affect saltwater intrusion potential in the areas east of the Seacoast North Palm Beach, Seacoast Burma, and Riviera Beach Eastern wellfields where simulated coastal drawdowns are 1 to 2 ft.

It is likely that allocated withdrawals are causing adverse impacts in the eastern portion of the Loxahatchee Slough where simulated cumulative drawdowns from allocated withdrawals at the Seacoast Hood Rd. wellfield and the Jupiter wellfield are 2 to 3 ft. under average conditions and 3 to 4 ft. under drought conditions.

9. Public water suppliers in the study area south of C-51 should be able to meet their buildout demands with ground water from the Surficial Aquifer System, provided water conservation techniques are practiced, wellfields are properly located, and ground water quality is protected. There is a large area with good ground water development potential within the Biscayne aquifer in the south. Because the Biscayne aquifer is so prolific, utilities with existing wellfields in the good development area should be able to meet their buildout demand. Further, utilities with wellfields threatened by saltwater intrusion should be able to move their wellfields inland to the good area, if necessary, with minimal impacts on the ground water system.

   In the study area north of C-51, Jupiter and Seacoast are unlikely to be able to meet their future demands from the Surficial Aquifer System alone. Increasing withdrawals to buildout levels at their existing wellfields is expected to cause undesirable drawdowns under wetlands and increased potential for coastal saltwater intrusion. Withdrawals from alternative locations in the Surficial Aquifer System east of the West Palm Beach Water Catchment Area and Loxahatchee Slough are limited by the same factors. The upper Floridan aquifer is one possible alternative source for these utilities at this time.

10. The best potential ground water development area in eastern Palm Beach County occurs entirely within the Biscayne aquifer and extends north from the Palm Beach - Broward county line to approximately Okeechobee Blvd. with an irregular east - west extent that generally includes the area between the turnpike and Military Trail (Plate 23). This area is limited to where the Biscayne aquifer is greater than 40 ft. thick and ground water withdrawals are unlikely to induce saltwater intrusion or cause adverse environmental impacts.

Potential for ground water development of the Surficial Aquifer System is poor in several parts of the study area. Additional development of the aquifer along the coastal margin is undesirable due to the likelihood of increasing the potential for saltwater intrusion there. Development adjacent to WCA-1, the West Palm Beach Water Catchment Area, or the Loxahatchee Slough is undesirable due to the threat of adverse impacts on the wetlands. Development west of C-18 in the Corbett Wildlife Management Area is also undesirable for this reason.

RECOMMENDATIONS

1. Additional Surficial Aquifer System withdrawals should be denied if they are likely to decrease ground water levels or seaward ground water flow along those portions of the coast where the potential for saltwater intrusion under dry season and drought conditions is already significant. Existing permits for ground water use in these areas should continue to be re-evaluated through the SFWMD water use permitting process and permitted allocations should be reduced and/or withdrawals shifted further inland where possible. Stringent salt water intrusion monitoring programs including concurrent water level and chloride measurements from at least two sets of multi-level observation wells installed in a line between the withdrawal facilities and the coast should be required of all ground water permittees in the coastal areas threatened by intrusion. This will provide warning of intrusion before it reaches the wellfields and provide better data on the saltwater intrusion process.

2. Water levels in the LWDD coastal basins should continue to be maintained. If feasible, the control elevation in the 4.5 ft NGVD basin should be raised to increase the surrounding ground water levels and help prevent saltwater intrusion. When surface water deliveries to the LWDD system are limited, priority should be given to maintaining canals levels in the coastal basins because of their importance in preventing saltwater intrusion.

3. If the Loxahatchee Slough is to be protected, no further withdrawals which cause drawdowns underneath it should be permitted. Drawdowns from presently allocated withdrawals are already expected to extend under the slough and even small additional withdrawals will be adding to the cumulative impact potential.

4. Seacoast Utilities should either seek new Surficial aquifer wellfield locations or an alternative source to provide for any demands exceeding their present allocation because increasing withdrawals at their existing wellfields will adversely impact wetlands and increase the potential for coastal saltwater intrusion. Options for new Surficial aquifer wellfield sites in the northern study area are quite limited since most of the area has poor ground water development potential due to probable wetland impact and saltwater intrusion problems. The Floridan aquifer may be the best alternative source if the Floridan withdrawals can be located such that drawdown impacts on other permitted Floridan users are minimal.

5. Jupiter should continue with their plans to use the Floridan aquifer for their additional withdrawals since this study confirms that these demands cannot be met from the Surficial Aquifer System without adverse impacts.

6. The development potential of the Floridan aquifer in the study area should be explored further. Studies should emphasize determination of the transmissivity of the upper Floridan aquifer, the water quality variation with depth within the Floridan aquifer, and the degree of connection between the different water quality zones. This information should be used to evaluate likely water quality deterioration and adjacent user impacts if the Floridan is developed as a ground water source.

7. Stormwater retention for infiltration to the aquifer should be required or encouraged to the greatest degree possible since rainfall is the major source of recharge to the Surficial Aquifer System. Similarly, reduction of pervious area during land development should be minimized to the extent possible since rainfall cannot infiltrate impervious areas to recharge the aquifer.

8. The ground water development potential map of the Surficial Aquifer System (Plate 23) should be used as a guide in locating new wells/wellfields. Preference should be given to the good zone over the moderate zone and to the moderate zone over the fair zone when possible. Withdrawals should not be made from the poor development potential zone unless they are small enough to preclude the adverse impacts anticipated in the zone.

9. The models developed in this study should continue to be used in the water use permitting and planning process for regional problems. Where a finer scale is needed, the models should be used to provide boundary conditions. The models should be refined and updated as additional data become available. In doing this, emphasis should be placed on improving confidence in the parameters to which the models are most sensitive including canal conductance, rainfall recharge and evapotranspiration.

10. All ground water level monitoring wells in the study area, including wells monitored as part of water use permit requirements, should be surveyed to NGVD. This will allow accurate comparison of water levels throughout the county. Ground water monitoring programs should include measurements of key canal water levels since the ground water and surface water systems are so closely related. Additionally, regional sampling should be coordinated with water level and salt water intrusion monitoring sampling performed by water use permittees. This is particularly important since sensitivity runs show that the models are most sensitive to calibration parameters in the vicinity of wellfields.

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APPENDIX A

REFERENCES USED IN DETERMINING SURFICIAL AQUIFER SYSTEM HYDROGEOLOGY, PALM BEACH COUNTY, FLORIDA

APPENDIX A

References Used in Determining Surficial Aquifer System Hydrogeology, Palm Beach County, Florida

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APPENDIX B

HYDROGEOLOGIC WELL DATA TABLES

TABLE B-1: WELL DATA USED TO DETERMINE THE PRESENCE AND EXTENT OF THE SURFICIAL AQUIFER SYSTEM IN EASTERN PALM BEACH COUNTY, FLORIDA

SOUTHEASTERN PALM BEACH COUNTY

WELL NAME	ELEVATION (NGVD) Surface	ELEVATION (NGVD) T.D.	LATITUDE Deg	LATITUDE Min	LATITUDE Sec	LONGITUDE Deg	LONGITUDE Min	LONGITUDE Sec	FL State Plane X	FL State Plane Y	DATA QUALITY 1 to 5 (Low to High)	SURFICIAL AQUIFER SYSTEM Top (NGVD)	Bottom (NGVD)	Thickness (Ft)
B.B.comp	25	-139	26	31	42	80	7	47	784564	798654	3	25	b.TD	>164
B.R.comp	15	-308	26	23	12	80	7	43	785276	747162	3	15	-300	315
LL TW	16	-324	26	40	29	80	6	9	793029	851927	4	16	-249	265
MP TW	19	-181	26	25	42	80	9	15	776810	762252	4	19	b.TD	>200
SFWMD TW	16	-184	26	40	34	80	5	43	795447	852449	5	16	b.TD	>200
SS TW	16	-286	26	38	56	80	14	32	747518	842241	5	16	-106	122
SWA TWX2	12	-208	26	21	16	80	16	7	739508	735165	4	12	-174	186
SYS3comp	20	>-1000	26	29	2	80	8	32	780585	782471	5	20	-230	250
ACME 13	18	-112	26	36	22	80	12	25	759138	826762	3	18	-102	120
ACME 14	17	-113	26	36	50	80	13	14	754673	829562	4	17	-103	120
ACME 15	17	-115	26	37	14	80	13	13	754749	831985	4	17	-98	115
VPSFH 5	15	-245	26	38	47	80	7	48	784182	841566	3	15	-219	234
PB 1605	15	-415	26	26	36	80	6	21	792591	767811	4	15	-355	370
PB 1603	15	-375	26	32	47	80	6	18	792602	805273	3	15	-312	327
PB 1598	19	-251	26	28	5	80	10	16	771171	776654	4	19	-231	250
PB 1586	18	-402	26	34	43	80	3	30	807774	817095	4	18	-396	414
PB 1581	17	-303	26	21	47	80	10	16	771417	738488	4	17	-283	300
PB 1578	10	-260	26	37	2	80	5	19	797777	831058	4	10	-244	254
PB 1576	17	-173	26	32	55	80	13	36	752819	805822	4	17	-143	160
PB 1574	19	-221	26	25	53	80	12	15	760439	763258	4	19	-198	217
PB 1571	19	-241	26	35	9	80	10	22	770350	819462	4	19	-218	237
PB 1544	18	-242	26	38	57	80	10	16	770746	842487	4	18	-225	243
PB 1108	14	-187	26	24	3	80	14	13	749778	752087	3	14	-167	181
PB 1107	15	-186	26	28	8	80	13	17	754721	776854	1	15	-166	181
PB 1106	22	-199	26	22	27	80	21	50	708271	742168	3	22	-139	161
PB 1105	16	-205	26	19	38	80	10	10	772047	726467	3	16	-185	201
PB 1104	20	-320	26	26	45	80	7	18	787403	768684	3	20	-300	320
PB 1103	21	-219	26	24	3	80	10	16	771329	752220	3	21	-199	220
PB 1102	18	-222	26	27	11	80	11	14	765935	771168	3	18	-197	215
PB 1101	19	-201	26	24	5	80	7	18	787513	752529	3	19	b.TD	>220
PB 1100	15	-185	26	20	7	80	13	45	752467	728274	2	15	-160	175

TABLE B-1: WELL DATA USED TO DETERMINE THE PRESENCE AND EXTENT OF THE SURFICIAL AQUIFER SYSTEM IN EASTERN PALM BEACH COUNTY, FLORIDA (CONTINUED)

SOUTHEASTERN PALM BEACH COUNTY

WELL NAME	ELEVATION (NGVD) Surface	ELEVATION (NGVD) T.D.	LATITUDE Deg	LATITUDE Min	LATITUDE Sec	LONGITUDE Deg	LONGITUDE Min	LONGITUDE Sec	FL State Plane X	FL State Plane Y	DATA QUALITY 1 to 5 (Low to High)	SURFICIAL AQUIFER SYSTEM Top (NGVD)	Bottom (NGVD)	Thickness (Ft)
PB 1097	16	-144	26	31	44	80	13	40	752499	798651	3	16	-137	153
PB 1096	20	-200	26	31	38	80	9	52	773213	798175	2	20	-180	200
PB 1095	17	-283	26	31	38	80	6	47	790017	798287	3	17	b.TD	>300
PB 1094	18	-162	26	36	29	80	17	14	732902	827314	3	18	-137	155
PB 1093	18	-182	26	36	26	80	15	15	743705	827073	2	18	-132	150
PB 1092	18	-182	26	36	22	80	13	26	753601	826728	2	18	-150	168
PB 1091	17	-143	26	37	28	80	10	25	769987	833495	5	17	b.TD	>160
PB 1090	16	-184	26	37	45	80	6	40	790395	835348	1	16	b.TD	>200
PB 834-B	8	-192	26	34	55	80	3	8	809762	818321	2	8	b.TD	>200
PB 695	6	-243	26	37	46	80	2	56	810723	835596	1	6	b.TD	>249
PB 694	8	-241	26	36	27	80	3	4	810057	827613	2	8	b.TD	>249
PB 690	11	-264	26	27	12	80	4	7	804745	771532	3	11	b.TD	>275
PB 675	14	-373	26	28	18	80	5	18	798244	778150	2	14	-301	315
PB 674	17	-285	26	29	2	80	6	54	789489	782532	1	17	IC	IC
PB 673	19	-230	26	28	59	80	9	48	773681	782123	2	19	-178	197
PB 672	17	-217	26	35	27	80	12	17	759898	821213	4	17	-168	185
PB 671	18	-101	26	35	23	80	8	52	778512	820929	4	18	b.TD	>119
PB 670	15	-310	26	35	17	80	6	18	792496	820418	1	15	-265	280
PB 668	10	-348	26	36	34	80	5	12	798433	828236	4	10	-260	270
PB 666	13	-402	26	22	13	80	6	52	789955	741237	1	13	IC	IC
PB 665	18	-237	26	21	47	80	12	13	760775	738421	1	18	-232	250
PB 659	15	-230	26	21	13	80	17	50	730140	734810	3	15	-165	180
PB 658	15	-325	26	22	1	80	9	13	777138	739939	2	15	-265	280
PB 657	18	-263	26	37	58	80	9	25	775412	836559	2	18	-227	245
PB 634	10	-178	26	30	50	80	3	35	807492	793565	4	10	b.TD	>188

TABLE B-1: WELL DATA USED TO DETERMINE THE PRESENCE AND EXTENT OF THE SURFICIAL AQUIFER SYSTEM IN EASTERN PALM BEACH COUNTY, FLORIDA (CONTINUED)

SOUTHEASTERN PALM BEACH COUNTY

ABBREVIATIONS

EST = estimated
T.D. = Total Depth
u.z. = upper zone only
b.TD = below Total Depth
IC = Inconclusive
NP = Not Present
DL = Disseminated Layers

WELL NAME ABBREVIATIONS

B.B.comp = Boynton Beach composite well
B.R.comp = Boca Raton composite well
LL TW = SFWMD Lake Lytal Park Test Well
MP TW = SFWMD Morikami Park Test Well
SFWMD TW = SFWMD Geophysical Test Well
SS TW = SFWMD South Shores Test Well
SWA TWX2 = Palm Beach County Solid Waste Autority Test Well X2
SYS3comp = Palm Beach County System 3 composite well
ACME 13 = ACME Improvement District Test Well 13
VPSFH 5 = Village of Palm Springs Forrest Hill Production Well 5
PB 1605 = USGS Palm Beach County well 1605

TABLE B-2: WELL DATA USED TO DETERMINE THE PRESENCE AND EXTENT OF THE SURFICIAL AQUIFER SYSTEM IN EASTERN PALM BEACH COUNTY, FLORIDA

NORTHEASTERN PALM BEACH COUNTY

WELL NAME	ELEVATION (NGVD)		LOCATION								DATA QUALITY	SURFICIAL AQUIFER SYSTEM		
			LATITUDE			LONGITUDE			FL State Plane		1 to 5	Top	Bottom	Thickness
	Surface	T.D.	Deg	Min	Sec	Deg	Min	Sec	X	Y	(Low to High)	(NGVD)	(NGVD)	(Ft)
HD RD #3	18	-182	26	51	42	80	7	44	784009	919823	3	18	-182	200
I-95 TW	13	-347	26	48	10	80	5	54	794123	898486	5	13	-257	270
JUP PW13	13	-225	26	55	33	80	7	46	783667	943147	3	13	-237 EST	250 EST
LTC comp	15	-185	26	50	48	80	3	44	805786	914525	3	15	b.TD	>200
MT TW	12	-368	26	53	47	80	6	13	792161	932502	5	12	-258	270
RB TW	16	-184	26	46	11	80	6	26	791308	886449	3	16	b.TD	>200
WPB LKMA	15	-185	26	44	7	80	4	2	804452	874022	3	15	b.TD	>200
WPB WWTP	18	-162	26	44	50	80	7	23	786198	878235	3	18	-232 EST	250 EST
PB 1613	26	-136	26	54	26	80	24	15	694180	935863	4	26	-124	150
PB 1614	27	-128	26	56	34	80	20	43	713305	948882	4	27	-122	149
PB 1607	18	-202	26	52	48	80	10	38	768207	926382	4	18	-162	180
PB 1583	20	-170	26	42	0	80	15	10	743961	860799	5	20	-144	164
PB 1567	17	-173	26	41	1	80	16	30	736739	854800	5	17	-157	174
PB 1564	20	-200	26	45	55	80	15	17	743187	884524	5	20	-154	174
PB 1562	19	-231	26	48	56	80	20	37	714087	902640	5	19	-135	154
PB 1558	20	-180	26	48	34	80	19	34	719807	900448	5	20	-134	154
PB 1555	19	-171	26	48	43	80	12	50	756407	901568	4	19	-131	150
PB 1552	21	-149	26	54	43	80	15	20	742603	937836	5	21	-136	157
PB 1550	23	-157	26	51	34	80	17	27	731213	918686	5	23	-130	153
PB 1546	20	-150	26	56	6	80	13	55	750247	946263	3	20	-146	166
PB 1098	20	-160	26	48	35	80	13	2	755325	900753	2	20	-140	160
PB 1089	17	-223	26	42	25	80	8	47	778681	863542	4	17	-183	200
PB 1088	19	-181	26	45	55	80	13	44	751617	884574	4	19	-154	173
PB 1087	18	-162	26	45	55	80	11	52	761789	884637	3	18	-152	170
PB 1086	18	-182	26	50	18	80	7	58	782799	911332	3	18	b.TD	>200
PB 1085	18	-182	26	50	27	80	11	57	761143	912099	4	18	-147	165
PB 1084	17	-183	26	50	27	80	10	2	771560	912166	4	17	-164	181

TABLE B-2: WELL DATA USED TO DETERMINE THE PRESENCE AND EXTENT OF THE SURFICIAL AQUIFER SYSTEM IN EASTERN PALM BEACH COUNTY, FLORIDA (CONTINUED)

NORTHEASTERN PALM BEACH COUNTY

WELL NAME	ELEVATION (NGVD) Surface	ELEVATION (NGVD) T.D.	LATITUDE Deg	LATITUDE Min	LATITUDE Sec	LONGITUDE Deg	LONGITUDE Min	LONGITUDE Sec	FL State Plane X	FL State Plane Y	DATA QUALITY 1 to 5 (Low to High)	SURFICIAL AQUIFER SYSTEM Top (NGVD)	Bottom (NGVD)	Thickness (Ft)
PB 1083	12	-188	26	50	27	80	6	0	793482	912316	2	12	b.TD	>200
PB 1082	12	-168	26	50	34	80	5	0	798912	913061	3	12	b.TD	>180
PB 1065	16	-99	26	46	10	80	7	25	785961	886311	4	16	b.TD	>115
PB 1062	17	-95	26	46	43	80	7	0	788204	889659	4	17	b.TD	>112
PB 1038	17	-106	26	48	17	80	6	23	791491	899174	3	17	b.TD	>123
PB 1032	15	-124	26	46	22	80	7	8	787493	887534	4	15	b.TD	>139
PB 1031	16	-113	26	46	19	80	6	43	789762	887246	3	16	b.TD	>129
PB 1026	17	-97	26	47	15	80	8	23	780659	892839	3	17	b.TD	>114
PB 845	17	-72	26	46	53	80	6	37	790281	890683	4	17	b.TD	>89
PB 844	14	-173	26	46	41	80	6	18	792012	889484	4	14	b.TD	>187
PB 835-B	4	-116	26	41	3	80	2	59	810303	855485	3	4	b.TD	>120
PB 833	10	-510	26	52	58	80	5	40	795185	927576	3	10	-300	310
PB 830	22	-198	26	51	6	80	24	14	694365	915669	3	22	-129	151
PB 800	15	-325	26	46	12	80	4	46	800372	886615	4	15	-253	268
PB 799	13	-267	26	46	19	80	5	46	794928	887283	4	13	IC	IC
PB 798	18	-102	26	45	37	80	8	56	777735	882923	2	18	b.TD	>120
PB 712	14	-266	26	55	10	80	8	7	781782	940811	3	14	IC	IC
PB 708	18	-122	26	52	0	80	3	20	807905	921812	3	18	b.TD	>140
PB 700	19	-241	26	41	42	80	11	8	765921	859116	3	19	-181	200
PB 699	20	-337	26	40	43	80	9	27	775121	853219	3	20	-205	225
PB 681	12	-234	26	58	2	80	5	38	795146	958274	4	12	-215	227
PB 679	22	-152	26	48	42	80	17	22	731763	901321	3	22	-128	150
PB 678	20	-169	26	40	58	80	17	52	729303	854456	4	20	-165	185
PB 677	16	-174	26	41	3	80	20	7	717055	854895	4	16	-164	180
PB 667	15	-342	26	41	22	80	5	46	795141	857294	3	15	-223	238
PB 655	20	-247	26	48	38	80	9	20	775438	901185	2	20	-172	192
PB 654	18	-264	26	47	8	80	6	58	788368	892185	3	18	-257	275
PB 653	12	-300	26	46	56	80	5	29	796442	891030	2	12	-300 EST	312 EST
PB 652	20	-293	26	56	42	80	7	23	785701	950129	4	20	-245	265
PB 650	7	-186	26	57	28	80	29	0	668304	954126	4	7	-155	162

TABLE B-2: WELL DATA USED TO DETERMINE THE PRESENCE AND EXTENT OF THE SURFICIAL AQUIFER SYSTEM IN EASTERN PALM BEACH COUNTY, FLORIDA (CONTINUED)

NORTHEASTERN PALM BEACH COUNTY

WELL NAME	ELEVATION (NGVD)		LOCATION								DATA QUALITY 1 to 5	SURFICIAL AQUIFER SYSTEM		
			LATITUDE			LONGITUDE			FL State Plane			Top	Bottom	Thickness
	Surface	T.D.	Deg	Min	Sec	Deg	Min	Sec	X	Y	(Low to High)	(NGVD)	(NGVD)	(Ft)
PB 649	26	-174	26	56	33	80	20	52	712491	948777	4	26	-123	149
PB 641	20	-292	26	46	58	80	4	11	803510	891283	4	20	-292 EST	312 EST
PB 640	19	-211	26	56	32	80	13	56	750140	948888	4	19	-156	175
PB 639	16	-314	26	56	4	80	9	11	775952	946225	3	16	-244	260
PB 632	9	-263	26	46	46	80	3	14	808685	890109	4	9	b.TD	>272
M 1231	24	-158	26	57	26	80	16	41	740606	954284	4	24	-131	155

ABBREVIATIONS

EST = estimated
T.D. = Total Depth
u.z. = upper zone only
b.TD = below Total Depth
IC = Inconclusive
NP = Not Present
DL = Disseminated Layers

WELL NAME ABBREVIATIONS

HD RD #3 = Hood Road Production Well 3
I-95 TW = SFWMD I-95 Test Well
JUP PW13 = Jupiter Production Well 13
LTC comp = Lost Tree Club composite well
MT TW = SFWMD Military Trail Test Well
RB TW = Riviera Beach Test Well
WPB LKMA = City of West Palm Beach, Lake Mangonia composite well
WPB WWTP = City of West Palm Beach, Waste Water Treatment Plant composite well
PB 1607 = USGS Palm Beach County well 1607
M 1231 = USGS Martin County well 1231

TABLE B-3: WELL DATA USED TO DETERMINE THE PRESENCE AND EXTENT OF THE BISCAYNE AQUIFER WITHIN THE SURFICIAL AQUIFER SYSTEM IN EASTERN PALM BEACH COUNTY, FLORIDA

SOUTHEASTERN PALM BEACH COUNTY

WELL NAME	ELEVATION (NGVD)		LOCATION								DATA QUALITY 1 to 5 (Low to High)	BISCAYNE AQUIFER				
			LATITUDE			LONGITUDE			FL State Plane			Main Zone		Stringers		Thickness
	Surface	T.D.	Deg	Min	Sec	Deg	Min	Sec	X	Y		Top (NGVD)	Bottom (NGVD)	Top (NGVD)	Bottom (NGVD)	(Ft)
B.B.comp	25	-139	26	31	42	80	7	47	784564	798654	3	-56	-116			60
B.R.comp	15	-308	26	23	12	80	7	43	785276	747162	3	-88	-135			47
LL TW	16	-324	26	40	29	80	6	9	793029	851927	4	-83	-165	-175	IC	82 u.z.
MP TW	19	-181	26	25	42	80	9	15	776810	762252	4	-76	-181	EST		106 EST
SFWMD TW	16	-184	26	40	34	80	5	43	795447	852449	5	NP	NP			0
SS TW	16	-286	26	38	56	80	14	32	747518	842241	5	-91	-106			15
SWA TWX2	12	-208	26	21	16	80	16	7	739508	735165	4	NP	NP			0
SYS3comp	20	>-1000	26	29	2	80	8	32	780585	782471	5	-115	IC			>17
ACME 13	18	-112	26	36	22	80	12	25	759138	826762	3	-50	-61			11
ACME 14	17	-113	26	36	50	80	13	14	754673	829562	4	-58	-68			10
ACME 15	17	-115	26	37	14	80	13	13	754749	831985	4	NP	NP			0
VPSFH 5	15	-245	26	38	47	80	7	48	784182	841566	3	-93	-151			58
PB 1605	15	-415	26	26	36	80	6	21	792591	767811	4	-32	-69	-79	-105	63
PB 1603	15	-375	26	32	47	80	6	18	792602	805273	3	-49	-95	-115	-135	66
PB 1598	19	-251	26	28	5	80	10	16	771171	776654	4	-81	-165			84
PB 1586	18	-402	26	34	43	80	3	30	807774	817095	4	-22	-86			64
PB 1581	17	-303	26	21	47	80	10	16	771417	738488	4	-70	-163			93
PB 1578	10	-260	26	37	2	80	5	19	797777	831058	4	NP	NP			0
PB 1576	17	-173	26	32	55	80	13	36	752819	805822	4	-53	-80			27
PB 1574	19	-221	26	25	53	80	12	15	760439	763258	4	-71	-131			60
PB 1571	19	-241	26	35	9	80	10	22	770350	819462	4	-51	-95			44
PB 1544	18	-242	26	38	57	80	10	16	770746	842487	4	-52	-128			76
PB 1108	14	-187	26	24	3	80	14	13	749778	752087	3	-67	-97			30
PB 1107	15	-186	26	28	8	80	13	17	754721	776854	1	-54	-102			48
PB 1106	22	-199	26	22	27	80	21	50	708271	742168	3	NP	NP			0
PB 1105	16	-205	26	19	38	80	10	10	772047	725467	3	-88	-165			77
PB 1104	20	-320	26	26	45	80	7	18	787403	768684	3	-49	-160			111
PB 1103	21	-219	26	24	3	80	10	16	771329	752220	3	-65	-139			74
PB 1102	18	-222	26	27	11	80	11	14	765935	771168	3	-82	-161			79
PB 1101	19	-201	26	24	5	80	7	18	787513	752529	3	-41	-121			80
PB 1100	15	-185	26	20	7	80	13	45	752467	728274	2	-42	-100			58

TABLE B-3: WELL DATA USED TO DETERMINE THE PRESENCE AND EXTENT OF THE BISCAYNE AQUIFER WITHIN THE SURFICIAL AQUIFER SYSTEM IN EASTERN PALM BEACH COUNTY, FLORIDA (CONTINUED)

SOUTHEASTERN PALM BEACH COUNTY

WELL NAME	ELEVATION (NGVD) Surface	ELEVATION (NGVD) T.D.	LOCATION LATITUDE Deg	LATITUDE Min	LATITUDE Sec	LONGITUDE Deg	LONGITUDE Min	LONGITUDE Sec	FL State Plane X	FL State Plane Y	DATA QUALITY 1 to 5 (Low to High)	BISCAYNE AQUIFER Main Zone Top (NGVD)	Main Zone Bottom (NGVD)	Stringers Top (NGVD)	Stringers Bottom (NGVD)	Thickness (Ft)
PB 1097	16	-144	26	31	44	80	13	40	752499	798651	3	-49	-71			22
PB 1096	20	-200	26	31	38	80	9	52	773213	798175	2	-65	-160			96
PB 1095	17	-283	26	31	38	80	6	47	790017	798287	3	-97	-121			24
PB 1094	18	-162	26	36	29	80	17	14	732902	827314	3	-97	-102			5
PB 1093	18	-182	26	36	26	80	15	15	743705	827073	2	-31	-62			31
PB 1092	18	-182	26	36	22	80	13	26	753601	826728	2	-45	-62			17
PB 1091	17	-143	26	37	28	80	10	25	769987	833495	5	-47	-123			76
PB 1090	16	-184	26	37	45	80	6	40	790395	835348	1	IC	IC			IC
PB 834-B	8	-192	26	34	55	80	3	8	809762	818321	2	-13	-42			29
PB 695	6	-243	26	37	46	80	2	56	810723	835596	1	NP	NP			0
PB 694	8	-241	26	36	27	80	3	4	810057	827613	2	-45	-54			9
PB 690	11	-264	26	27	12	80	4	7	804745	771532	3	-54	-66			12
PB 675	14	-373	26	28	18	80	5	18	798244	778150	2	-86	-131			45
PB 674	17	-285	26	29	2	80	6	54	789489	782532	1	-53	-68			15
PB 673	19	-230	26	28	59	80	9	48	773681	782123	2	-71	-121			50
PB 672	17	-217	26	35	27	80	12	17	759898	821213	4	-52	-108			56
PB 671	18	-101	26	35	23	80	8	52	778512	820929	4	-67	b.TD			>34
PB 670	15	-310	26	35	17	80	6	18	792496	820418	1	-55	-101			46
PB 668	10	-348	26	36	34	80	5	12	798433	828236	4	NP	NP			0
PB 666	13	-402	26	22	13	80	6	52	789955	741237	1	NP	NP			0
PB 665	18	-237	26	21	47	80	12	13	760775	738421	1	NP	NP			0
PB 659	15	-230	26	21	13	80	17	50	730140	734810	3	NP	NP			0
PB 658	15	-325	26	22	1	80	9	13	777138	739939	2	-105	-210			105
PB 657	18	-263	26	37	58	80	9	25	775412	836559	2	-52	-97			45
PB 634	10	-178	26	30	50	80	3	35	807492	793565	4	NP	NP			0

TABLE B-3: WELL DATA USED TO DETERMINE THE PRESENCE AND EXTENT OF THE BISCAYNE AQUIFER WITHIN THE SURFICIAL AQUIFER SYSTEM IN EASTERN PALM BEACH COUNTY, FLORIDA (CONTINUED)

SOUTHEASTERN PALM BEACH COUNTY

ABBREVIATIONS

EST	= estimated
T.D.	= Total Depth
u.z.	= upper zone only
b.TD	= below Total Depth
IC	= Inconclusive
NP	= Not Present
DL	= Disseminated Layers

WELL NAME ABBREVIATIONS

B.B.comp	= Boynton Beach composite well
B.R.comp	= Boca Raton composite well
LL TW	= SFWMD Lake Lytal Park Test Well
MP TW	= SFWMD Morikami Park Test Well
SFWMD TW	= SFWMD Geophysical Test Well
SS TW	= SFWMD South Shores Test Well
SWA TWX2	= Palm Beach County Solid Waste Authority Test Well X2
SYS3comp	= Palm Beach County System 3 composite well
ACME 13	= ACME Improvement District Test Well 13
VPSFH 5	= Village of Palm Springs Forrest Hill Production Well 5
PB 1605	= USGS Palm Beach County well 1605

TABLE B-4: WELL DATA USED TO DETERMINE THE PRESENCE AND EXTENT OF THE BISCAYNE AQUIFER WITHIN THE SURFICIAL AQUIFER SYSTEM IN EASTERN PALM BEACH COUNTY, FLORIDA

NORTHEASTERN PALM BEACH COUNTY

WELL NAME	ELEVATION (NGVD)		LOCATION								DATA QUALITY	BISCAYNE AQUIFER				
			LATITUDE			LONGITUDE			FL State Plane		1 to 5	Main Zone		Stringers		Thickness
	Surface	T.D.	Deg	Min	Sec	Deg	Min	Sec	X	Y	(Low to High)	Top (NGVD)	Bottom (NGVD)	Top (NGVD)	Bottom (NGVD)	(Ft)
HD RD #3	18	-182	26	51	42	80	7	44	784009	919823	3	-67	-82			15
I-95 TW	13	-347	26	48	10	80	5	54	794123	898486	5	NP	NP			0
JUP PW13	13	-226	26	55	33	80	7	46	783667	943147	3	NP	NP			0
LTC comp	15	-185	26	50	48	80	3	44	805786	914525	3	NP	NP			0
MT TW	12	-388	26	53	47	80	6	13	792161	932502	5	NP	NP			0
RB TW	16	-184	26	46	11	80	6	26	791308	886449	3	NP	NP			0
WPB LKMA	15	-185	26	44	7	80	4	2	804452	874022	3	NP	NP			0
WPB WWTP	18	-162	26	44	50	80	7	23	786198	878235	3	IC	IC			IC
PB 1613	26	-136	26	54	26	80	24	15	694180	935863	4	NP	NP			0
PB 1614	27	-128	26	56	34	80	20	43	713305	948882	4	NP	NP			0
PB 1607	18	-202	26	52	48	80	10	38	768207	926382	4	-16	-32			16
PB 1583	20	-170	26	42	0	80	15	10	743961	860799	5	NP	NP			0
PB 1567	17	-173	26	41	1	80	16	30	736739	854800	5	NP	NP			0
PB 1564	20	-200	26	45	55	80	15	17	743187	884524	5	NP	NP			0
PB 1562	19	-231	26	48	56	80	20	37	714087	902640	5	NP	NP			0
PB 1558	20	-180	26	48	34	80	19	34	719807	900448	5	NP	NP			0
PB 1555	19	-171	26	48	43	80	12	50	756407	901568	4	-28	-48			20
PB 1552	21	-149	26	54	43	80	15	20	742603	937836	5	NP	NP			0
PB 1550	23	-157	26	51	34	80	17	27	731213	918686	5	NP	NP			0
PB 1546	20	-150	26	56	6	80	13	55	750247	946263	3	NP	NP			0
PB 1098	20	-160	26	48	35	80	13	2	755325	900753	2	-25	-50			25
PB 1089	17	-223	26	42	25	80	8	47	778681	863542	4	-27	-128			101
PB 1088	19	-181	26	45	56	80	13	44	751617	884574	4	NP	NP			0
PB 1087	18	-162	26	45	55	80	11	52	761769	884637	3	-30	-42			12
PB 1086	18	-182	26	50	18	80	7	58	782799	911332	3	-47	-70			23
PB 1085	18	-182	26	50	27	80	11	57	761143	912099	4	-22	-62			40
PB 1084	17	-183	26	50	27	80	10	2	771560	912166	4	-49	-83			34
PB 1083	12	-188	26	50	27	80	6	0	793482	912316	2	NP	NP			0
PB 1082	12	-168	26	50	34	80	5	0	798912	913061	3	-126	-127			1
PB 1065	16	-99	26	46	10	80	7	25	785961	886311	4	-41	-70			29

TABLE B-4: WELL DATA USED TO DETERMINE THE PRESENCE AND EXTENT OF THE BISCAYNE AQUIFER WITHIN THE SURFICIAL AQUIFER SYSTEM IN EASTERN PALM BEACH COUNTY, FLORIDA (CONTINUED)

NORTHEASTERN PALM BEACH COUNTY

WELL NAME	ELEVATION (NGVD)		LOCATION								DATA QUALITY	BISCAYNE AQUIFER				
			LATITUDE			LONGITUDE			FL State Plane		1 to 5	Main Zone		Stringers		Thickness
	Surface	T.D.	Deg	Min	Sec	Deg	Min	Sec	X	Y	(Low to High)	Top (NGVD)	Bottom (NGVD)	Top (NGVD)	Bottom (NGVD)	(Ft)
PB 1062	17	-95	26	46	43	80	7	0	788204	889659	4	-44	-82			38
PB 1038	17	-106	26	48	17	80	6	23	791491	899174	3	-79	-82			3
PB 1032	15	-124	26	46	22	80	7	8	787493	887534	4	-47	-85			38
PB 1031	16	-113	26	46	19	80	6	43	789762	887246	3	-58	-88			30
PB 1026	17	-97	26	47	15	80	8	23	780659	892839	3	-45	-65			20
PB 845	17	-72	26	46	53	80	6	37	790281	890683	4	-68	B.TD			>4
PB 844	14	-173	26	46	41	80	6	18	792012	889484	4	NP	NP			0
PB 835-B	4	-116	26	41	3	80	2	59	810303	855485	3	NP	NP			0
PB 833	10	-510	26	52	58	80	5	40	795185	927576	3	NP	NP			0
PB 830	22	-198	26	51	6	80	24	14	694366	915669	3	NP	NP			0
PB 800	15	-325	26	46	12	80	4	46	800372	886615	4	NP	NP			0
PB 799	13	-267	26	46	19	80	5	46	794928	887283	4	NP	NP			0
PB 798	18	-102	26	45	37	80	8	56	777735	882923	2	-52	-53			1
PB 712	14	-266	26	55	10	80	8	7	781782	940811	3	NP	NP			0
PB 708	18	-122	26	52	0	80	3	20	807905	921812	3	NP	NP			0
PB 700	19	-241	26	41	42	80	11	8	765921	859116	3	NP	NP			0
PB 699	20	-337	26	40	43	80	9	27	775121	853219	3	-70	-105			35
PB 681	12	-234	26	58	2	80	5	38	795146	958274	4	NP	NP			0
PB 679	22	-152	26	48	42	80	17	22	731763	901321	3	-58	-68			10
PB 678	20	-169	26	40	58	80	17	52	729303	854456	4	NP	NP			0
PB 677	16	-174	26	41	3	80	20	7	717055	854895	4	NP	NP			0
PB 667	15	-342	26	41	22	80	5	46	795141	857294	3	NP	NP			0
PB 655	20	-247	26	48	38	80	9	20	775438	901185	2	-75	-85			10
PB 654	18	-264	26	47	8	80	6	58	788368	892185	3	-62	-89			27
PB 653	12	-300	26	46	56	80	5	29	796442	891030	2	NP	NP			0
PB 652	20	-293	26	56	42	80	7	23	785701	950129	4	NP	NP			0
PB 650	7	-186	26	57	28	80	29	0	668304	954126	4	NP	NP			0
PB 649	26	-174	26	56	33	80	20	52	712491	948777	4	NP	NP			0
PB 641	20	-292	26	46	58	80	4	11	803510	891283	4	NP	NP			0

TABLE B-4: WELL DATA USED TO DETERMINE THE PRESENCE AND EXTENT OF THE BISCAYNE AQUIFER WITHIN THE SURFICIAL AQUIFER SYSTEM IN EASTERN PALM BEACH COUNTY, FLORIDA (CONTINUED)

NORTHEASTERN PALM BEACH COUNTY

WELL NAME	ELEVATION (NGVD)		LOCATION								DATA QUALITY 1 to 5	BISCAYNE AQUIFER				
			LATITUDE			LONGITUDE			FL State Plane			Main Zone		Stringers		Thickness
	Surface	T.D.	Deg	Min	Sec	Deg	Min	Sec	X	Y	(Low to High)	Top (NGVD)	Bottom (NGVD)	Top (NGVD)	Bottom (NGVD)	(Ft)
PB 640	19	-211	26	56	32	80	13	56	750140	948888	4	NP	NP			0
PB 639	16	-314	26	56	4	80	9	11	775952	946225	3	NP	NP			0
PB 632	9	-263	26	46	46	80	3	14	808685	890109	4	NP	NP			0
M 1231	24	-158	26	57	26	80	15	41	740606	954284	4	NP	NP			0

ABBREVIATIONS

EST = estimated
T.D. = Total Depth
u.z. = upper zone only
b.TD = below Total Depth
IC = Inconclusive
NP = Not Present
DL = Disseminated Layers

WELL NAME ABBREVIATIONS

HD RD #3 = Hood Road Production Well 3
I-95 TW = SFWMD I-95 Test Well
JUP PW13 = Jupiter Production Well 13
LTC comp = Lost Tree Club composite well
MT TW = SFWMD Military Trail Test Well
RB TW = Riviera Beach Test Well
WPB LKMA = City of West Palm Beach, Lake Mangonia composite well
WPB WWTP = City of West Palm Beach, Waste Water Treatment Plant composite well
PB 1607 = USGS Palm Beach County well 1607
M 1231 = USGS Martin County well 1231

TABLE B-5: WELL DATA USED TO DETERMINE THE PRESENCE AND EXTENT OF THE PRODUCTION ZONE WITHIN THE SURFICIAL AQUIFER SYSTEM IN EASTERN PALM BEACH COUNTY, FLORIDA

NORTHEASTERN PALM BEACH COUNTY

WELL NAME	ELEVATION (NGVD)		LOCATION								DATA QUALITY	PRODUCTION ZONE (Biscayne incl.)				
			LATITUDE			LONGITUDE			FL State Plane		1 to 5	Upper		Lower		Thickness
	Surface	T.D.	Deg	Min	Sec	Deg	Min	Sec	X	Y	(Low to High)	Top (NGVD)	Bottom (NGVD)	Top (NGVD)	Bottom (NGVD)	(FT)
HD RD #3	18	-182	26	51	42	80	7	44	784009	919823	3	-22	IC			IC
I-95 TW	13	-347	26	48	10	80	5	54	794123	898486	5	NP	NP			0
JUP PW13	13	-225	26	55	33	80	7	46	783667	943147	3	-77	-187			110
LTC comp	15	-185	26	50	48	80	3	44	805786	914525	3	-84	b.TD			>101
MT TW	12	-368	26	53	47	80	6	13	792161	932502	5	-78	-148			70
RB TW	16	-184	26	46	11	80	6	26	791308	886449	3	IC	-144			IC
WPB LKMA	15	-185	26	44	7	80	4	2	804452	874022	3	-67	-140			73
WPB WWTP	18	-162	26	44	50	80	7	23	786198	878235	3	-57	-162			105
PB 1613	26	-136	26	54	26	80	24	15	694180	935863	4	-16	-86			70
PB 1614	27	-128	26	56	34	80	20	43	713305	948882	4	0	-20	-43	-86	63
PB 1607	18	-202	26	52	48	80	10	38	768207	926382	4	-16	-126			110
PB 1583	20	-170	26	42	0	80	15	10	743961	860799	5	-34	-100			66
PB 1567	17	-173	26	41	1	80	16	30	736739	854800	5	-43	-153			110
PB 1564	20	-200	26	45	55	80	15	17	743187	884524	5	-27	-100			73
PB 1562	19	-231	26	48	56	80	20	37	714087	902640	5	-58	-108			50
PB 1558	20	-180	26	48	34	80	19	34	719807	900448	5	-67	-107			40
PB 1555	19	-171	26	48	43	80	12	50	756407	901568	4	-11	-111			100
PB 1552	21	-149	26	54	43	80	15	20	742603	937836	5	-53	-106			53
PB 1550	23	-157	26	51	34	80	17	27	731213	918686	5	-27	-113			86
PB 1546	20	-150	26	56	6	80	13	56	750247	946263	3	-40	-116			76
PB 1098	20	-160	26	48	35	80	13	2	755325	900753	2	-8	-100			92
PB 1089	17	-223	26	42	25	80	8	47	778681	863542	4	-27	-167			140
PB 1088	19	-181	26	45	55	80	13	44	751617	884574	4	-35	-112			77
PB 1087	18	-162	26	45	55	80	11	52	761769	884637	3	-30	-122			92
PB 1086	18	-182	26	50	18	80	7	58	782799	911332	3	-29	-136			107
PB 1085	18	-182	26	50	27	80	11	57	761143	912099	4	-12	-122			110
PB 1084	17	-183	26	50	27	80	10	2	771560	912166	4	-28	-133			105
PB 1083	12	-188	26	50	27	80	6	0	793482	912316	2 *	-95	-180			85
PB 1082	12	-168	26	50	34	80	5	0	798912	913061	3	-28	-138			110

TABLE B-5: WELL DATA USED TO DETERMINE THE PRESENCE AND EXTENT OF THE PRODUCTION ZONE WITHIN THE SURFICIAL AQUIFER SYSTEM IN EASTERN PALM BEACH COUNTY, FLORIDA (CONTINUED)

NORTHEASTERN PALM BEACH COUNTY

WELL NAME	ELEVATION (NGVD)		LOCATION								DATA QUALITY	PRODUCTION ZONE (Biscayne incl.)				
			LATITUDE			LONGITUDE			FL State Plane		1 to 5	Upper		Lower		Thickness
	Surface	T.D.	Deg	Min	Sec	Deg	Min	Sec	X	Y	(Low to High)	Top (NGVD)	Bottom (NGVD)	Top (NGVD)	Bottom (NGVD)	(FT)
PB 1065	16	-99	26	46	10	80	7	25	785961	886311	4	-38	b.TD			>61
PB 1062	17	-95	26	46	43	80	7	0	788204	889659	4	-34	b.TD			>61
PB 1038	17	-106	26	48	17	80	6	23	791491	899174	3	-32	-47	-79	b.TD	>42
PB 1032	15	-124	26	46	22	80	7	8	787493	887534	4	-27	b.TD			>97
PB 1031	16	-113	26	46	19	80	6	43	789762	887246	3	-48	b.TD			>65
PB 1026	17	-97	26	47	15	80	8	23	780659	892839	3	-38	b.TD			>59
PB 845	17	-72	26	46	53	80	6	37	790281	890683	4	-43	b.TD			>29
PB 844	14	-173	26	46	41	80	6	18	792012	889484	4	NP	NP			0
PB 835-B	4	-116	26	41	3	80	2	59	810303	855485	3	IC	IC			IC
PB 833	10	-510	26	52	58	80	5	40	795185	927576	3	IC	IC			IC
PB 830	22	-198	26	51	6	80	24	14	694365	915869	3	IC	IC			IC
PB 800	15	-325	26	46	12	80	4	46	800372	886615	4	NP	NP			0
PB 799	13	-267	26	46	19	80	5	46	794928	887283	4	NP	NP			0
PB 798	18	-102	26	45	37	80	8	56	777735	882923	2	IC	IC			IC
PB 712	14	-266	26	55	10	80	8	7	781782	940811	3	IC	IC			IC
PB 708	18	-122	26	52	0	80	3	20	807905	921812	3	-87	b.TD			>35
PB 700	19	-241	26	41	42	80	11	8	765921	859116	3	IC	IC			IC
PB 699	20	-337	26	40	43	80	9	27	776121	853219	3	IC	IC			IC
PB 681	12	-234	26	58	2	80	5	38	795146	958274	4	IC	IC			IC
PB 679	22	-152	26	48	42	80	17	22	731763	901321	3	IC	IC			IC
PB 678	20	-169	26	40	58	80	17	52	729303	854456	4	IC	IC			IC
PB 677	16	-174	26	41	3	80	20	7	717055	854895	4	IC	IC			IC
PB 667	15	-342	26	41	22	80	5	46	795141	857294	3	IC	IC			IC
PB 655	20	-247	26	48	38	80	9	20	775438	901185	2	IC	IC			IC
PB 654	18	-264	26	47	8	80	6	58	788368	892185	3	IC	IC			IC
PB 653	12	-300	26	46	56	80	5	29	796442	891030	2	IC	IC			IC
PB 652	20	-293	26	56	42	80	7	23	785701	950129	4	IC	IC			IC
PB 650	7	-186	26	57	28	80	29	0	668304	954126	4	-51	-115			64

TABLE B-5: WELL DATA USED TO DETERMINE THE PRESENCE AND EXTENT OF THE PRODUCTION ZONE WITHIN THE SURFICIAL AQUIFER SYSTEM IN EASTERN PALM BEACH COUNTY, FLORIDA (CONTINUED)

NORTHEASTERN PALM BEACH COUNTY

WELL NAME	ELEVATION (NGVD)		LOCATION								DATA QUALITY	PRODUCTION ZONE (Biscayne incl.)				
			LATITUDE			LONGITUDE			FL State Plane		1 to 5	Upper		Lower		Thickness
	Surface	T.D.	Deg	Min	Sec	Deg	Min	Sec	X	Y	(Low to High)	Top (NGVD)	Bottom (NGVD)	Top (NGVD)	Bottom (NGVD)	(FT)
PB 649	26	-174	26	56	33	80	20	52	712491	948777	4	IC	IC			IC
PB 641	20	-292	26	46	58	80	4	11	803510	891283	4	IC	IC			IC
PB 640	19	-211	26	56	32	80	13	56	750140	948888	4	IC	IC			IC
PB 639	16	-314	26	56	4	80	9	11	775952	946225	3	-66	-158			92
PB 632	9	-263	26	46	46	80	3	14	808685	890109	4	IC	IC			IC
M 1231	24	-158	26	57	26	80	15	41	740606	954284	4	-10	-106			96

ABBREVIATIONS

EST = estimated
T.D. = Total Depth
u.z. = upper zone only
b.TD = below Total Depth
IC = Inconclusive
NP = Not Present
DL = Disseminated Layers

* ANOMOLOUS

WELL NAME ABBREVIATIONS

HD RD #3 = Hood Road Production Well 3
I-95 TW = SFWMD I-95 Test Well
JUP PW13 = Jupiter Production Well 13
LTC comp = Lost Tree Club composite well
MT TW = SFWMD Military Trail Test Well
RB TW = Riviera Beach Test Well
WPB LKMA = City of West Palm Beach, Lake Mangonia composite well
WPB WWTP = City of West Palm Beach, Waste Water Treatment Plant composite well
PB 1607 = USGS Palm Beach County well 1607
M 1231 = USGS Martin County well 1231

TABLE B-6: WELL DATA USED TO DETERMINE THE PRESENCE AND EXTENT OF THE LOW PERMEABILITY ZONES WITHIN THE SURFICIAL AQUIFER SYSTEM IN EASTERN PALM BEACH COUNTY, FLORIDA

SOUTHEASTERN PALM BEACH COUNTY

WELL NAME	ELEVATION (NGVD)		LOCATION								DATA QUALITY	LOW PERMEABILITY ZONES				
			LATITUDE			LONGITUDE			FL State Plane		1 to 5	Upper		Lower		Thickness
	Surface	T.D.	Deg	Min	Sec	Deg	Min	Sec	X	Y	(Low to High)	Top (NGVD)	Bottom (NGVD)	Top (NGVD)	Bottom (NGVD)	(Ft)
B.B.comp	25	-139	26	31	42	80	7	47	784564	798654	3	DL	DL			DL
B.R.comp	15	-308	26	23	12	80	7	43	785276	747162	3	NP	NP			0
LL TW	16	-324	26	40	29	80	6	9	793029	851927	4	-165	-174			9
MP TW	19	-181	26	25	42	80	9	15	776810	762252	4	-40	-41			1
SFWMD TW	16	-184	26	40	34	80	5	43	796447	852449	5	NP	NP			0
SS TW	16	-286	26	38	56	80	14	32	747518	842241	5	NP	NP			0
SWA TWX2	12	-208	26	21	16	80	16	7	739508	735165	4	NP	NP			0
SYS3comp	20	>-1000	26	29	2	80	8	32	780585	782471	5	-26	-32			7
ACME 13	18	-112	26	36	22	80	12	25	759138	826762	3	NP	NP			0
ACME 14	17	-113	26	36	50	80	13	14	754673	829562	4	NP	NP			0
ACME 15	17	-115	26	37	14	80	13	13	754749	831985	4	NP	NP			0
VPSFH 5	15	-245	26	38	47	80	7	48	784182	841566	3	-18	-31			13
PB 1605	15	-415	26	26	36	80	6	21	792591	767811	4	NP	NP			0
PB 1603	15	-375	26	32	47	80	6	18	792602	805273	3	-2	-5			3
PB 1598	19	-251	26	28	5	80	10	16	771171	776654	4	-15	-21			6
PB 1586	18	-402	26	34	43	80	3	30	807774	817095	4	NP	NP			0
PB 1581	17	-303	26	21	47	80	10	16	771417	738488	4	NP	NP			0
PB 1578	10	-260	26	37	2	80	5	19	797777	831058	4	-109	-114	-127	-130	8
PB 1576	17	-173	26	32	55	80	13	36	752819	805822	4	NP	NP			0
PB 1574	19	-221	26	25	53	80	12	15	760439	763258	4	-1	-5	-55	-61	10
PB 1571	19	-241	26	35	9	80	10	22	770350	819462	4	5	-1	-38	-41	9
PB 1544	18	-242	26	38	57	80	10	16	770746	842487	4	NP	NP			0
PB 1108	14	-187	26	24	3	80	14	13	749778	752087	3	1	0	-10	-29	20
PB 1107	15	-186	26	28	8	80	13	17	754721	776854	1	3	-1			4
PB 1106	22	-199	26	22	27	80	21	50	708271	742168	3	10	7	-71	-73	5
PB 1105	16	-205	26	19	38	80	10	10	772047	725467	3	-57	-65			8
PB 1104	20	-320	26	26	45	80	7	18	787403	768684	3	NP	NP			0
PB 1103	21	-219	26	24	3	80	10	16	771329	752220	3	-63	-65	-34	-42	10
PB 1102	18	-222	26	27	11	80	11	14	765935	771168	3	NP	NP			0
PB 1101	19	-201	26	24	5	80	7	18	787513	752529	3	NP	NP			0
PB 1100	15	-185	26	20	7	80	13	45	752467	728274	2	-20	-23			3

TABLE B-6: WELL DATA USED TO DETERMINE THE PRESENCE AND EXTENT OF THE LOW PERMEABILITY ZONES WITHIN THE SURFICIAL AQUIFER SYSTEM IN EASTERN PALM BEACH COUNTY, FLORIDA (CONTINUED)

SOUTHEASTERN PALM BEACH COUNTY

WELL NAME	ELEVATION (NGVD)		LOCATION						FL State Plane		DATA QUALITY 1 to 5 (Low to High)	LOW PERMEABILITY ZONES				
			LATITUDE			LONGITUDE						Upper		Lower		Thickness
	Surface	T.D.	Deg	Min	Sec	Deg	Min	Sec	X	Y		Top (NGVD)	Bottom (NGVD)	Top (NGVD)	Bottom (NGVD)	(Ft)
PB 1097	16	-144	26	31	44	80	13	40	752499	798651	3	4	5	-38	-44	7
PB 1096	20	-200	26	31	38	80	9	52	773213	798175	2	-24	-65			41
PB 1095	17	-283	26	31	38	80	6	47	790017	798287	3	-19	-23	-28	-29	5
PB 1094	18	-182	26	36	29	80	17	14	732902	827314	3	13	10			3
PB 1093	18	-182	26	36	26	80	15	15	743705	827073	2	DL	DL			DL
PB 1092	18	-182	26	36	22	80	13	26	753601	826728	2	DL	DL			DL
PB 1091	17	-143	26	37	28	80	10	25	769987	833495	5	7	2	D	D	5
PB 1090	16	-184	26	37	45	80	6	40	790395	836348	1	DL	DL			DL
PB 834-B	8	-192	26	34	55	80	3	8	809762	818321	2	NP	NP			0
PB 695	6	-243	26	37	46	80	2	56	810723	835596	1	DL	DL			DL
PB 694	8	-241	26	36	27	80	3	4	810057	827613	2	DL	DL			DL
PB 690	11	-264	26	27	12	80	4	7	804745	771532	3	6	8			2
PB 675	14	-373	26	28	18	80	5	18	798244	778150	2	NP	NP			0
PB 674	17	-285	26	29	2	80	6	54	789489	782532	1	DL	DL			DL
PB 673	19	-230	26	28	59	80	9	48	773681	782123	2	DL	DL			DL
PB 672	17	-217	26	35	27	80	12	17	759898	821213	4	-4	-8			4
PB 671	18	-101	26	35	23	80	8	52	778512	820929	4	-8	-20			12
PB 670	15	-310	26	35	17	80	6	18	792496	820418	1	15	-35			50
PB 668	10	-348	26	36	34	80	5	12	798433	828236	4	-25	-27	-135	-140	7
PB 666	13	-402	26	22	13	80	6	52	789955	741237	1	7	5			2
PB 665	18	-237	26	21	47	80	12	13	760775	738421	1	NP	NP			0
PB 659	15	-230	26	21	13	80	17	50	730140	734810	3	NP	NP			0
PB 658	15	-325	26	22	1	80	9	13	777138	739939	2	-50	-51	-60	-61	2
PB 657	18	-263	26	37	58	80	9	25	775412	836559	2	-42	-43	-52	-53	2
PB 634	10	-178	26	30	50	80	3	35	807492	793565	4	NP	NP			0

TABLE B-6: WELL DATA USED TO DETERMINE THE PRESENCE AND EXTENT OF THE LOW PERMEABILITY ZONES WITHIN THE SURFICIAL AQUIFER SYSTEM IN EASTERN PALM BEACH COUNTY, FLORIDA (CONTINUED)

SOUTHEASTERN PALM BEACH COUNTY

ABBREVIATIONS

EST = estimated
T.D. = Total Depth
u.z. = upper zone only
b.TD = below Total Depth
IC = Inconclusive
NP = Not Present
DL = Disseminated Layers

WELL NAME ABBREVIATIONS

B.B.comp = Boynton Beach composite well
B.R.comp = Boca Raton composite well
LL TW = SFWMD Lake Lytal Park Test Well
MP TW = SFWMD Morikami Park Test Well
SFWMD TW = SFWMD Geophysical Test Well
SS TW = SFWMD South Shores Test Well
SWA TWX2 = Palm Beach County Solid Waste Authority Test Well X2
SYS3comp = Palm Beach County System 3 composite well
ACME 13 = ACME Improvement District Test Well 13
VPSFH 5 = Village of Palm Springs Forrest Hill Production Well 5
PB 1605 = USGS Palm Beach County well 1605

TABLE B-7: WELL DATA USED TO DETERMINE THE PRESENCE AND EXTENT OF LOW PERMEABILITY ZONES WITHIN THE SURFICIAL AQUIFER SYSTEM IN EASTERN PALM BEACH COUNTY, FLORIDA

NORTHEASTERN PALM BEACH COUNTY

WELL NAME	ELEVATION (NGVD)		LOCATION								DATA QUALITY	LOW PERMEABILITY ZONES				
			LATITUDE			LONGITUDE			FL State Plane		1 to 5	Upper		Lower		Thickness
	Surface	T.D.	Deg	Min	Sec	Deg	Min	Sec	X	Y	(Low to High)	Top (NGVD)	Bottom (NGVD)	Top (NGVD)	Bottom (NGVD)	(Ft)
HD RD #3	18	-182	26	51	42	80	7	44	784009	919823	3	DL	DL			DL
I-95 TW	13	-347	26	48	10	80	5	54	794123	898486	5	-42	-102			60
JUP PW13	13	-225	26	55	33	80	7	46	783667	943147	3	NP	NP			0
LTC comp	15	-185	26	50	48	80	3	44	805786	914525	3	NP	NP			0
MT TW	12	-368	26	53	47	80	6	13	792161	932502	5	-43	-48			5
RB TW	16	-184	26	46	11	80	6	26	791308	886449	3	8	4			4
WPB LKMA	15	-185	26	44	7	80	4	2	804452	874022	3	7	6	-42	-43	2
WPB WWTP	18	-162	26	44	50	80	7	23	786198	878235	3	DL	DL			DL
PB 1613	26	-136	26	54	26	80	24	15	694180	935863	4	DL	DL			DL
PB 1614	27	-128	26	56	34	80	20	43	713305	948882	4	DL	DL			DL
PB 1607	18	-202	26	52	48	80	10	38	768207	926382	4	-9	-16			7
PB 1583	20	-170	26	42	0	80	15	10	743961	860799	5	NP	NP			0
PB 1567	17	-173	26	41	1	80	16	30	736739	854800	5	7	3			4
PB 1564	20	-200	26	45	55	80	15	17	743187	884524	5	-14	-20			6
PB 1562	19	-231	26	48	56	80	20	37	714087	902640	5	9	5			4
PB 1558	20	-180	26	48	34	80	19	34	719807	900448	5	-4	-10			6
PB 1555	19	-171	26	48	43	80	12	50	756407	901568	4	15	12	5	-11	19
PB 1552	21	-149	26	54	43	80	15	20	742603	937836	5	-56	-59	-93	-99	9
PB 1550	23	-157	26	51	34	80	17	27	731213	918686	5	NP	NP			0
PB 1546	20	-150	26	56	6	80	13	55	750247	946263	3	15	7			8
PB 1098	20	-160	26	48	35	80	13	2	755325	900753	2	18	-8			26
PB 1089	17	-223	26	42	25	80	8	47	778681	863542	4	5	1	-21	-27	10
PB 1088	19	-181	26	45	55	80	13	44	751617	884574	4	11	2	-32	-35	12
PB 1087	18	-162	26	45	55	80	11	52	761769	884637	3	8	-2	-29	-30	11
PB 1086	18	-182	26	50	18	80	7	58	782799	911332	3	1	-15	-20	-29	25
PB 1085	18	-182	26	50	27	80	11	57	761143	912099	4	16	13			3
PB 1084	17	-183	26	50	27	80	10	2	771560	912166	4	4	2	-23	-28	7
PB 1083	12	-188	26	50	27	80	6	0	793482	912316	2	-43	-61	-67	-85	36
PB 1082	12	-168	26	50	34	80	5	0	798912	913061	3	-20	-26			6

TABLE B-7: WELL DATA USED TO DETERMINE THE PRESENCE AND EXTENT OF LOW PERMEABILITY ZONES WITHIN THE SURFICIAL AQUIFER SYSTEM IN EASTERN PALM BEACH COUNTY, FLORIDA (CONTINUED)

NORTHEASTERN PALM BEACH COUNTY

WELL NAME	ELEVATION (NGVD)		LOCATION								DATA QUALITY	LOW PERMEABILITY ZONES				
			LATITUDE			LONGITUDE			FL State Plane		1 to 5	Upper		Lower		Thickness
	Surface	T.D.	Deg	Min	Sec	Deg	Min	Sec	X	Y	(Low to High)	Top (NGVD)	Bottom (NGVD)	Top (NGVD)	Bottom (NGVD)	(Ft)
PB 1065	16	-99	26	46	10	80	7	25	785961	886311	4	-33	-38			5
PB 1062	17	-95	26	46	43	80	7	0	788204	889659	4	NP	NP			0
PB 1038	17	-106	26	48	17	80	6	23	791491	899174	3	NP	NP			0
PB 1032	15	-124	26	46	22	80	7	8	787493	887534	4	0	-1			1
PB 1031	16	-113	26	46	19	80	6	43	789762	887246	3	NP	NP			0
PB 1026	17	-97	26	47	15	80	8	23	780659	892839	3	4	2	-29	-30	3
PB 845	17	-72	26	46	53	80	6	37	790281	890683	4	14	9			5
PB 844	14	-173	26	46	41	80	6	18	792012	889484	4	-11	-12	-96	-106	11
PB 835-B	4	-116	26	41	3	80	2	59	810303	855485	3	NP	NP			0
PB 833	10	-510	26	52	58	80	5	40	795185	927576	3	NP	NP			0
PB 830	22	-198	26	51	6	80	24	14	694365	915669	3	22	19			3
PB 800	15	-325	26	46	12	80	4	46	800372	886615	4	-70	-71	-140	-141	2
PB 799	13	-267	26	46	19	80	5	46	794928	887283	4	3	2			1
PB 798	18	-102	26	45	37	80	8	56	777735	882923	2	9	8			1
PB 712	14	-266	26	55	10	80	8	7	781782	940811	3	-26	-66			40
PB 708	18	-122	26	52	0	80	3	20	807905	921812	3	NP	NP			0
PB 700	19	-241	26	41	42	80	11	8	765921	859116	3	NP	NP			0
PB 699	20	-337	26	40	43	80	9	27	775121	853219	3	NP	NP			0
PB 681	12	-234	26	58	2	80	5	38	795146	958274	4	0	-3			3
PB 679	22	-152	26	48	42	80	17	22	731763	901321	3	-38	-53			15
PB 678	20	-169	26	40	58	80	17	52	729303	854456	4	15	11			4
PB 677	16	-174	26	41	3	80	20	7	717055	854895	4	15	14			1
PB 667	15	-342	26	41	22	80	5	46	795141	857294	3	15	14	-139	-140	2
PB 655	20	-247	26	48	38	80	9	20	775438	901185	2	-23	-24			1
PB 654	18	-264	26	47	8	80	6	58	788368	892185	3	-10	-12			2
PB 653	12	-300	26	46	56	80	5	29	796442	891030	2	DL	DL			DL
PB 652	20	-293	26	56	42	80	7	23	785701	950129	4	-123	-124	-128	-129	2
PB 650	7	-186	26	57	28	80	29	0	668304	954126	4	DL	DL			DL
PB 649	26	-174	26	56	33	80	20	52	712491	948777	4	5	2			3

TABLE B-7: WELL DATA USED TO DETERMINE THE PRESENCE AND EXTENT OF LOW PERMEABILITY ZONES WITHIN THE SURFICIAL AQUIFER SYSTEM IN EASTERN PALM BEACH COUNTY, FLORIDA (CONTINUED)

NORTHEASTERN PALM BEACH COUNTY

WELL NAME	ELEVATION (NGVD)		LOCATION								DATA QUALITY	LOW PERMEABILITY ZONES				
			LATITUDE			LONGITUDE			FL State Plane		1 to 5	Upper		Lower		Thickness
	Surface	T.D.	Deg	Min	Sec	Deg	Min	Sec	X	Y	(Low to High)	Top (NGVD)	Bottom (NGVD)	Top (NGVD)	Bottom (NGVD)	(Ft)
PB 641	20	-292	26	46	58	80	4	11	803510	891283	4	NP	NP			0
PB 640	19	-211	26	56	32	80	13	56	750140	948888	4	DL	DL			DL
PB 639	16	-314	26	56	4	80	9	11	775952	946225	3	DL	DL			DL
PB 632	9	-263	26	46	46	80	3	14	808685	890109	4	NP	NP			0
M 1231	24	-158	26	57	26	80	15	41	740606	954284	4	DL	DL			DL

ABBREVIATIONS

EST = estimated
T.D. = Total Depth
u.z. = upper zone only
b.TD = below Total Depth
IC = Inconclusive
NP = Not Present
DL = Disseminated Layers

WELL NAME ABBREVIATIONS

HD RD #3 = Hood Road Production Well 3
I-95 TW = SFWMD I-95 Test Well
JUP PW13 = Jupiter Production Well 13
LTC comp = Lost Tree Club composite well
MT TW = SFWMD Military Trail Test Well
RB TW = Riviera Beach Test Well
WPB LKMA = City of West Palm Beach, Lake Mangonia composite well
WPB WWTP = City of West Palm Beach, Waste Water Treatment Plant composite well
PB 1607 = USGS Palm Beach County well 1607
M 1231 = USGS Martin County well 1231

APPENDIX C

SELECTED WATER QUALITY DATA TABLES

TABLE C-1. Selected Water Quality Data, Eastern Palm Beach County - Dry and Wet Season Values, 1987

DATA SOURCE	WELL NUMBER	LATITUDE	LONGITUDE	FLORIDA STATE PLANAR COORDS. X	Y	SAMPLE DEPTH (ft.)	CHLORIDE CONCENTRATION (mg./l.) DRY	WET	AVERAGE	CONDUCTIVITY (uMHOS) DRY	WET
AMB.NET	BOY-001	263202	800539	796176	800754	18	11.1	--	11	493	--
AMB.NET	GW-002	263612	800841	779477	825883	10	12.6	--	13	214	--
AMB.NET	GW-005	263605	800846	779028	825173	11	35.7	--	36	616	--
AMB.NET	LP-12P	264819	800442	800641	899441	100	23.2	--	23	420	--
AMB.NET	PB95-1D	264810	800554	794123	898486	160	73.6	--	74	906	--
AMB.NET	PB95-1S	264810	800554	794123	898486	46	18.9	--	19	538	--
AMB.NET	PB-715	265114	801731	730862	916665	81	--	87.5	88	--	--
AMB.NET	PB-716	265114	801731	730862	916665	15	--	17.2	17	--	--
AMB.NET	PB-1097	263144	801340	752499	798651	90	73.1	--	73	84	--
AMB.NET	PB-1098	264835	801302	755325	900753	80	58.5	79.8	69	--	--
AMB.NET	PB-1105	261938	801010	772047	725467	140	36.2	--	36	691	--
AMB.NET	PB-1107	262808	801317	754721	776854	105	165.3	--	165	1242	--
AMB.NET	PB-1108	262403	801413	749778	752087	90	123.9	--	124	958	--
AMB.NET	PB-SSM-4	263856	801432	747518	842241	75	72	--	72	521	--
AMB.NET	PB-SSS-4	263856	801432	747518	842241	33	67	--	67	706	--
SALT	BY01	263050	800346	806493	793558	54	78	96	87	--	--
SALT	BY02	263047	800346	806495	793255	60	110	141	125	--	--
SALT	BY03	263048	800347	806404	793356	62	32	38	35	--	--
SALT	BY04	263202	800341	806894	800831	81	33	--	33	--	--
SALT	BY05	263202	800341	806894	800831	81	33	--	33	--	--
SALT	BYDM1	263050	800338	807220	793563	188	12801	12597	12700	--	--
SALT	BYSM1	263048	800336	807403	793362	80	37	36	36	--	--
SALT	DBM01	262712	800418	803745	771525	220	532	--	532	--	--
SALT	DBM02	262740	800419	803634	774352	138	14	25	20	--	--
SALT	JP001	265558	800758	782564	945664	160	32	56	44	--	--
SALT	JP002	265559	800802	782201	945762	147	107	125	116	--	--
SALT	JP003	265556	800758	782565	945462	156	146	60	103	--	--
SALT	JP004	265556	800802	782203	945459	165	72	75	74	--	--
SALT	JPB	265610	800758	782556	946876	132	30	34	32	560	570
SALT	JPQ	265555	800800	782385	945360	198	229	240	235	1450	1520
SALT	JPS	265602	800737	784462	946081	282	480	500	490	2000	2300
SALT	JPT	255602	800736	787019	582593	23	29	33	31	260	290
SALT	JPU	265618	800757	782641	947684	189	94	102	98	930	970

TABLE C-1. Selected Water Quality Data, Eastern Palm Beach County - Dry and Wet Season Values, 1987 (Continued)

DATA SOURCE	WELL NUMBER	LATITUDE	LONGITUDE	FLORIDA STATE PLANAR COORDS. X	Y	SAMPLE DEPTH (ft.)	CHLORIDE CONCENTRATION (mg./l.) DRY	WET	AVERAGE	CONDUCTIVITY (uMHOS) DRY	WET
SALT	JPV	265618	800756	782731	947685	23	29	27	28	450	530
SALT	JPW	265548	800707	787187	944686	252	32	33	33	480	600
SALT	JPX	265548	800706	787278	944687	23	10	12	11	65	86
SALT	JPY	265608	800759	782466	946673	210	380	360	370	2000	2000
SALT	LW0694	263627	800303	810147	827614	249	1000	1130	1065	--	--
SALT	LW0888	263627	800304	810057	827613	26	250	101	176	--	--
SALT	LW0889	263628	800305	809965	827714	210	2250	2080	4330	--	--
SALT	PB690S	262712	800407	804745	771532	64	121	200	156	--	--
SALT	PB692D	262753	800400	805351	775677	187	7630	12000	9815	--	--
SALT	PB692S	262753	800400	805351	775677	72	174	140	157	--	--
SALT	RBP002	264658	800400	804507	891290	64	20	318	169	--	--
SALT	RBP015	264644	800353	805152	889881	227	19	--	19	--	--
SALT	SCUM15	264831	800427	801992	900663	110	1155	--	1155	--	--
USGS-WAT	PB-467	262138	800546	795983	737744	98	44	48	46	532	565
USGS-WAT	PB-490	262117	800550	795634	735622	127	300	280	290	1290	1330
USGS-WAT	PB-491	262114	800540	796546	735325	207	12000	5100	8550	32500	17900
USGS-WAT	PB-492	262120	800532	797270	735936	163	30	22	26	430	337
USGS-WAT	PB-555	262118	800515	798817	735745	200	26	26	26	436	461
USGS-WAT	PB-567	262130	800554	795261	736932	93	26	28	27	375	405
USGS-WAT	PB-595	265759	800524	796415	957980	114	10000	9800	9900	30100	30000
USGS-WESM	PB-685	264208	801922	721102	861480	17	16	10	13	--	--
USGS-WESM	PB-719	265018	800741	784339	911343	26	10	6	8	--	--
USGS-WAT	PB-746	265803	800525	796321	958383	82	110	96	103	590	579
USGS-WAT	PB-832	265611	800812	781288	946968	141	70	24	47	785	770
USGS-WESM	PB-875	265439	801029	768949	937595	24	38	30	34	--	--
USGS-WESM	PB-876	265439	801029	768949	937595	43	28	30	29	--	--
USGS-WAT	PB-895	262435	800429	802859	755666	19	32	36	34	478	540
USGS-WAT	PB-896	262435	800429	802859	755666	85	30	40	35	430	492
USGS-WAT	PB-947	262435	800429	802859	755666	87	30	32	31	435	472
USGS-WAT	PB-948	262435	800429	802859	755666	175	6000	16500	11250	5800	17200
USGS-WAT	PB-1006	262436	800428	802949	755767	17	60	420	240	--	--
USGS-WAT	PB-1063	261950	800743	785414	726767	134	58	60	59	580	610
USGS-WESM	PB-1084	265027	801002	771560	912166	138	175	220	198	--	--
USGS-WESM	PB-1089	264226	800847	778681	863542	135	95	84	90	--	--

TABLE C-1. Selected Water Quality Data, Eastern Palm Beach County - Dry and Wet Season Values, 1987 (Continued)

DATA SOURCE	WELL NUMBER	LATITUDE	LONGITUDE	FLORIDA STATE PLANAR COORDS. X	Y	SAMPLE DEPTH (ft.)	CHLORIDE CONCENTRATION (mg./l.) DRY	WET	AVERAGE	CONDUCTIVITY (uMHOS) DRY	WET
USGS-WESM	PB-1109A	265115	801731	730861	916766	128	880	880	870	--	--
USGS-WESM	PB-1109B	265115	801731	730861	916766	40	20	34	27	--	--
USGS-WAT	PB-1151	262435	800430	802768	755665	138	--	22	22	--	430
USGS-WAT	PB-1160	262453	800440	801846	757476	16	10	--	10	98	--
USGS-WAT	PB-1455	262114	800645	790633	735284	157	24	22	23	490	495
USGS-WAT	PB-1456	262253	800511	799113	745340	181	18	16	17	307	160
USGS-WAT	PB-1457	262313	800444	801555	747376	193	22	22	22	440	474
USGS-WESM	PB-1460	264553	801827	725966	884225	30	78	110	94	--	--
USGS-WAT	PB-1496	262435	800436	802223	755661	200	30	32	31	476	530
USGS-WESM	PB-1520	265412	800927	774580	934906	22	28	28	28	--	--
USGS-WESM	PB-1521	265255	800839	778978	927160	22	34	34	34	--	--
USGS-WESM	PB-1522	265417	801303	755021	935285	22	42	40	41	--	--
USGS-WESM	PB-1525	265256	801232	757879	927124	22	14	16	15	--	--
USGS-WESM	PB-1527	264856	802037	714087	902640	20	1050	1100	1075	--	--
USGS-WESM	PB-1528	264834	801934	719807	900448	20	44	38	41	--	--
USGS-WESM	PB-1529	264832	801733	730772	900306	22	10	12	11	--	--
USGS-WESM	PB-1530	264841	801611	738196	901257	23	18	20	19	--	--
USGS-WESM	PB-1531	264841	801441	746351	901305	20	10	11	10	--	--
USGS-WESM	PB-1532	264833	801734	730681	900407	22	10	13	12	--	--
USGS-WESM	PB-1533	264555	802034	714454	884366	22	92	90	91	--	--
USGS-WESM	PB-1534	264553	801617	737750	884291	22	112	90	101	--	--
USGS-WESM	PB-1535	264554	801448	745817	884439	22	50	50	50	--	--
USGS-WESM	PB-1536	264550	801322	753615	884082	22	10	18	14	--	--
USGS-WESM	PB-1537	264647	801253	756208	889853	22	16	--	16	--	--
USGS-WESM	PB-1538	264420	801943	719127	874798	22	6	6	6	--	--
USGS-WESM	PB-1539	264224	801655	734425	863168	22	180	185	183	--	--
USGS-WESM	PB-1540	264220	801524	742680	862811	22	110	260	185	--	--
USGS-WESM	PB-1541	265145	801527	742074	919859	20	18	58	38	--	--
USGS-WESM	PB-1546	265606	801355	750247	946263	140	85	--	85	--	--
USGS-WESM	PB-1554	264843	801250	756407	901568	40	33	26	30	--	--
USGS-WESM	PB-1555	264843	801250	756407	901568	130	360	--	360	--	--

AMB. NET -- SFWMD Ambient Ground Water Monitoring Network
SALT -- SFWMD Salt Water Tracking Network
USGS-WAT -- USGS National Water Data Storage and Retrieval System
USGS-WESM - USGS Data (Wes Miller)

APPENDIX D

MONTHLY KRIGED RAINFALL DISTRIBUTION IN EASTERN PALM BEACH COUNTY NOVEMBER 1983 TO MAY 1985

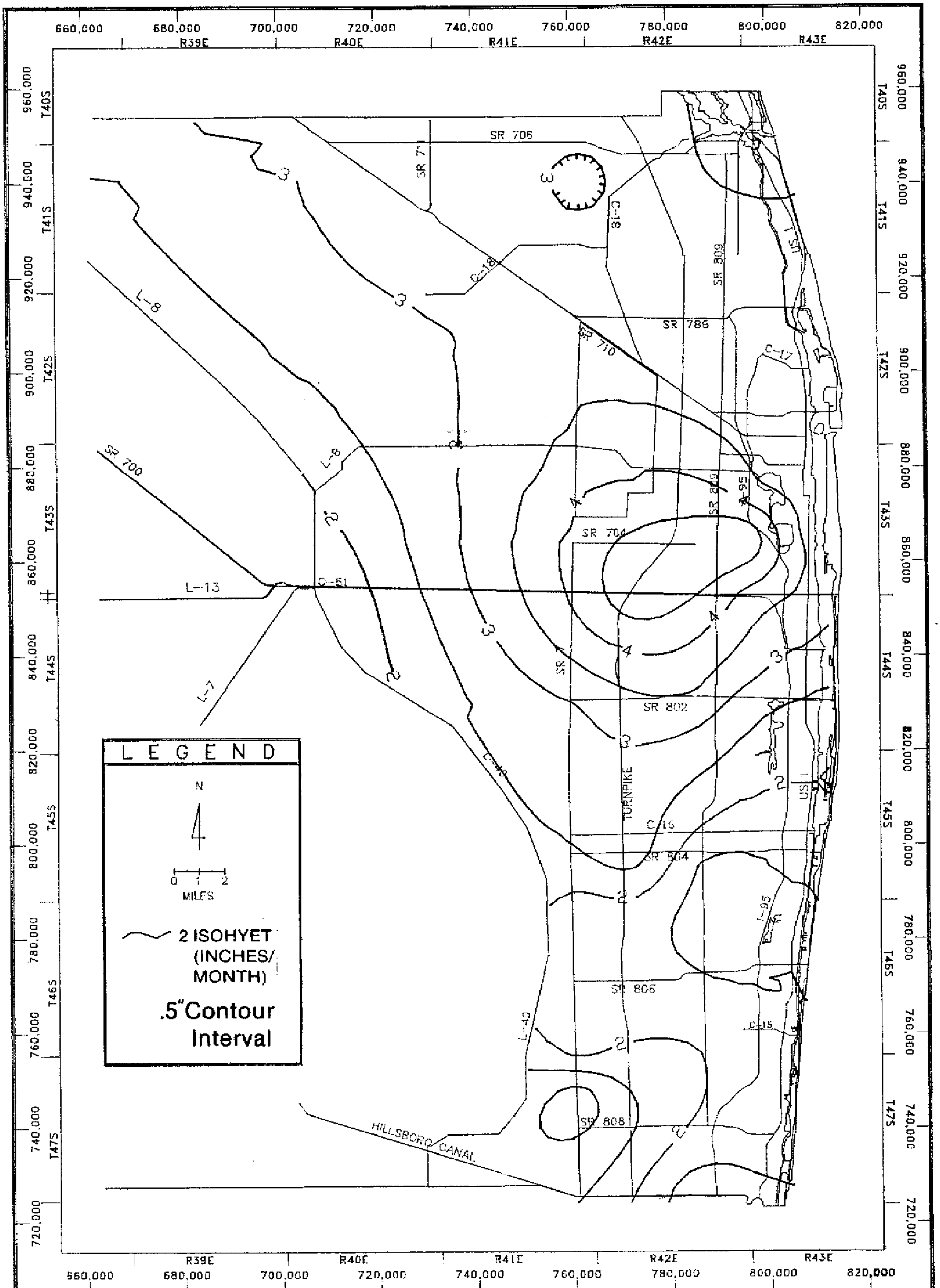

Figure D-1 KRIGED RAINFALL DISTRIBUTION IN EASTERN PALM BEACH COUNTY FOR NOVEMBER 1983

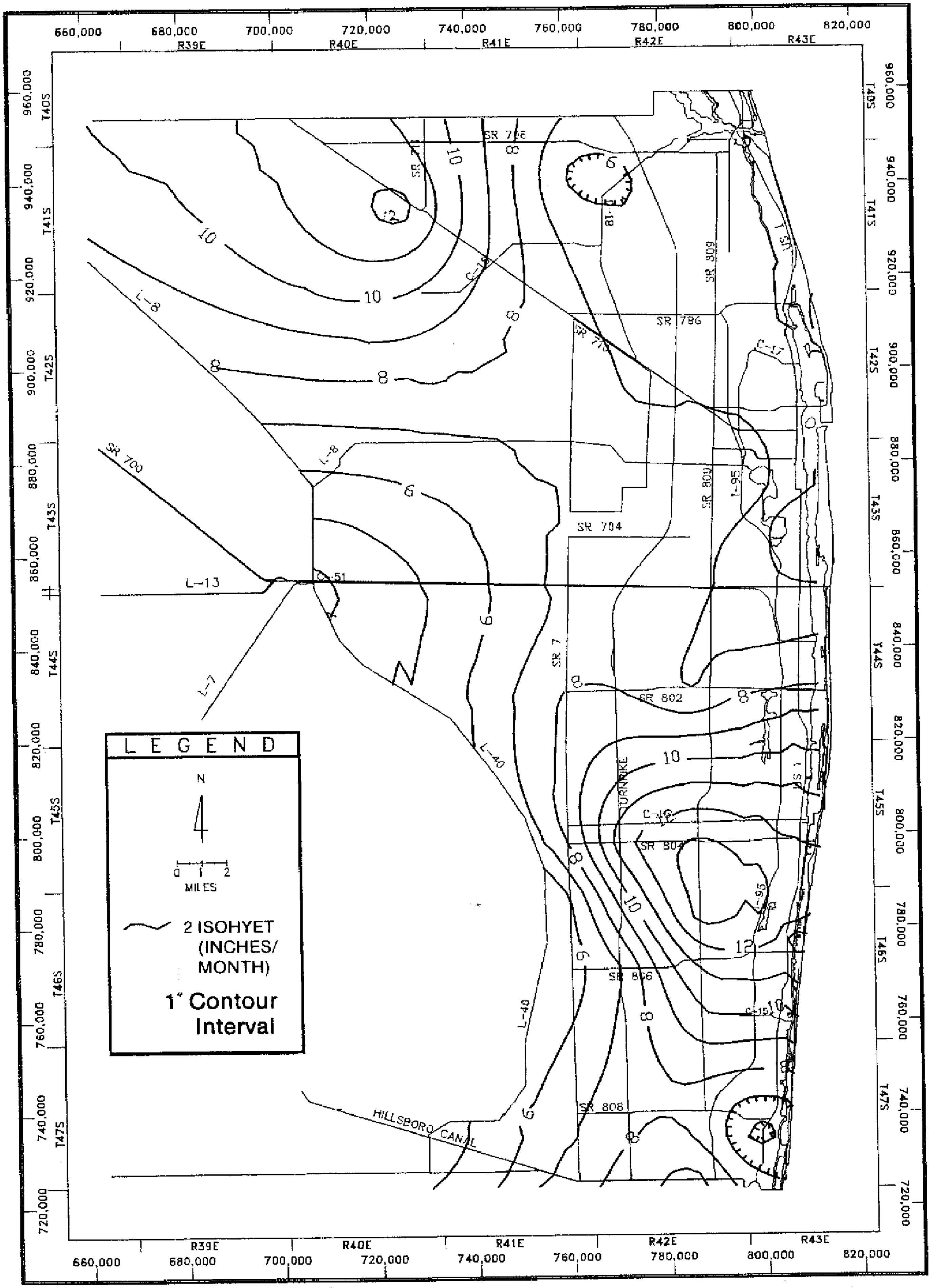

Figure D-2 KRIGED RAINFALL DISTRIBUTION IN EASTERN PALM BEACH COUNTY FOR DECEMBER 1983

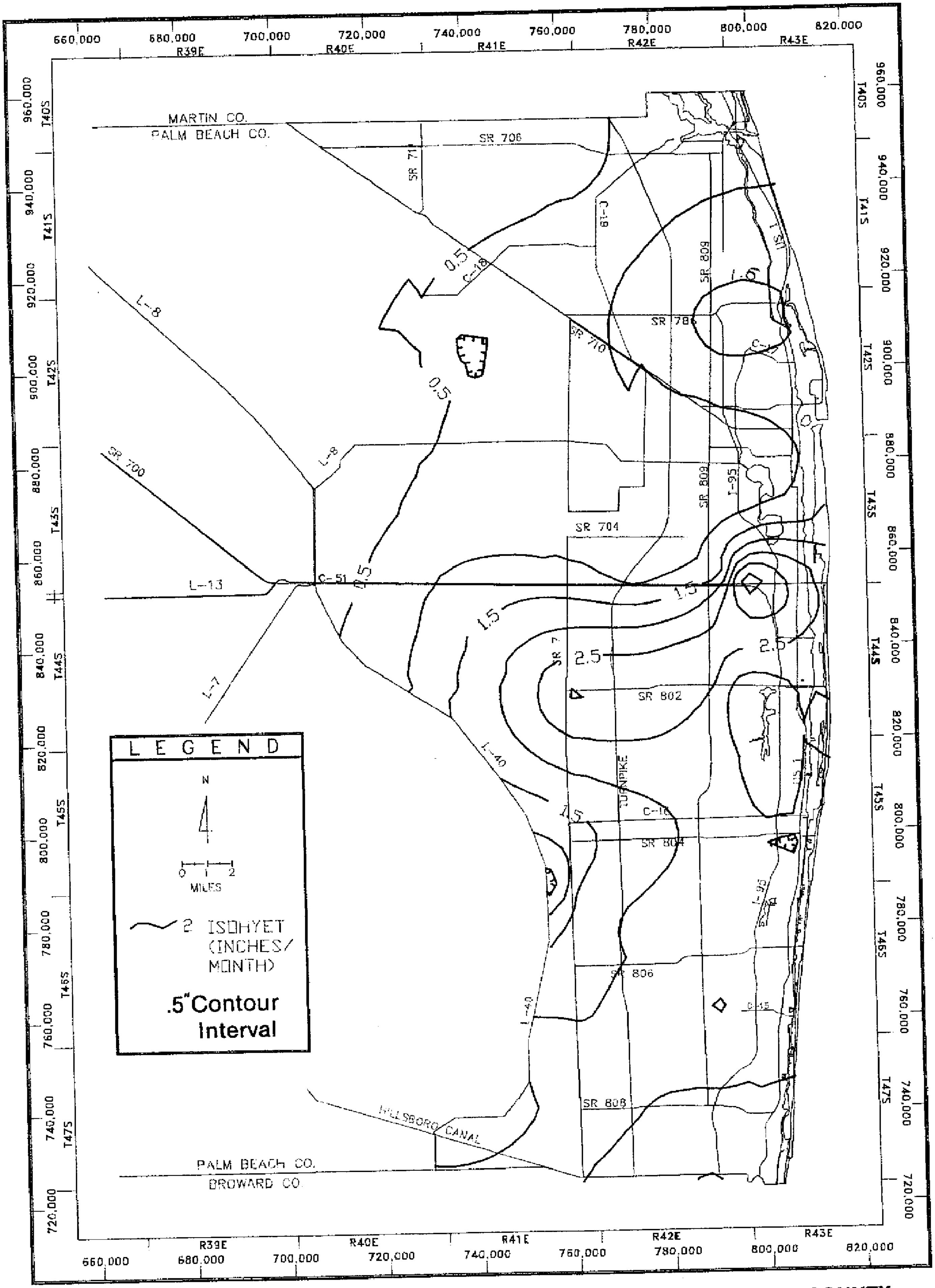

Figure D-3 KRIGED RAINFALL DISTRIBUTION IN EASTERN PALM BEACH COUNTY FOR JANUARY 1984

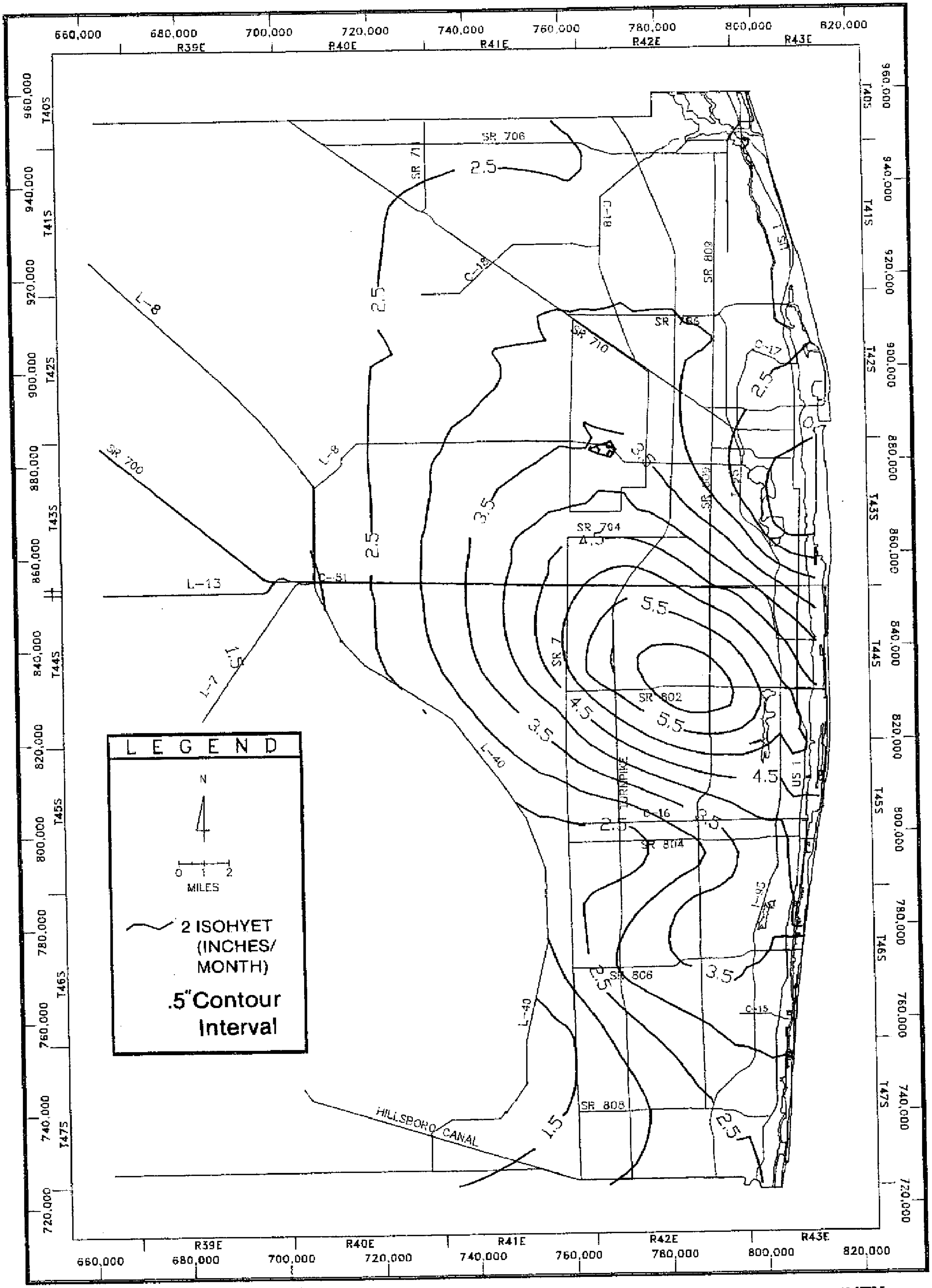

Figure D-4 KRIGED RAINFALL DISTRIBUTION IN EASTERN PALM BEACH COUNTY FOR FEBRUARY 1984

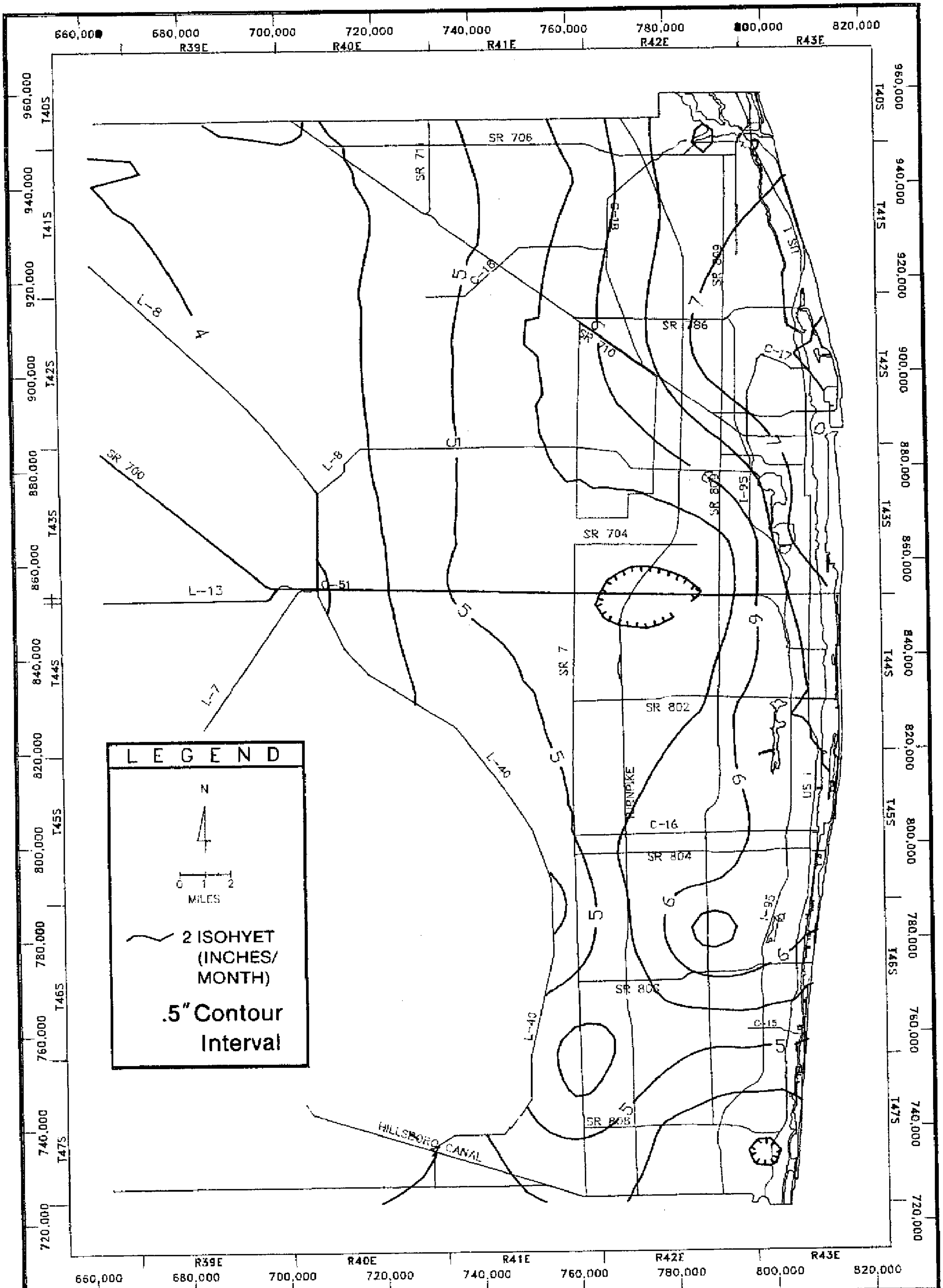

Figure D-5 KRIGED RAINFALL DISTRIBUTION IN EASTERN PALM BEACH COUNTY FOR MARCH 1984

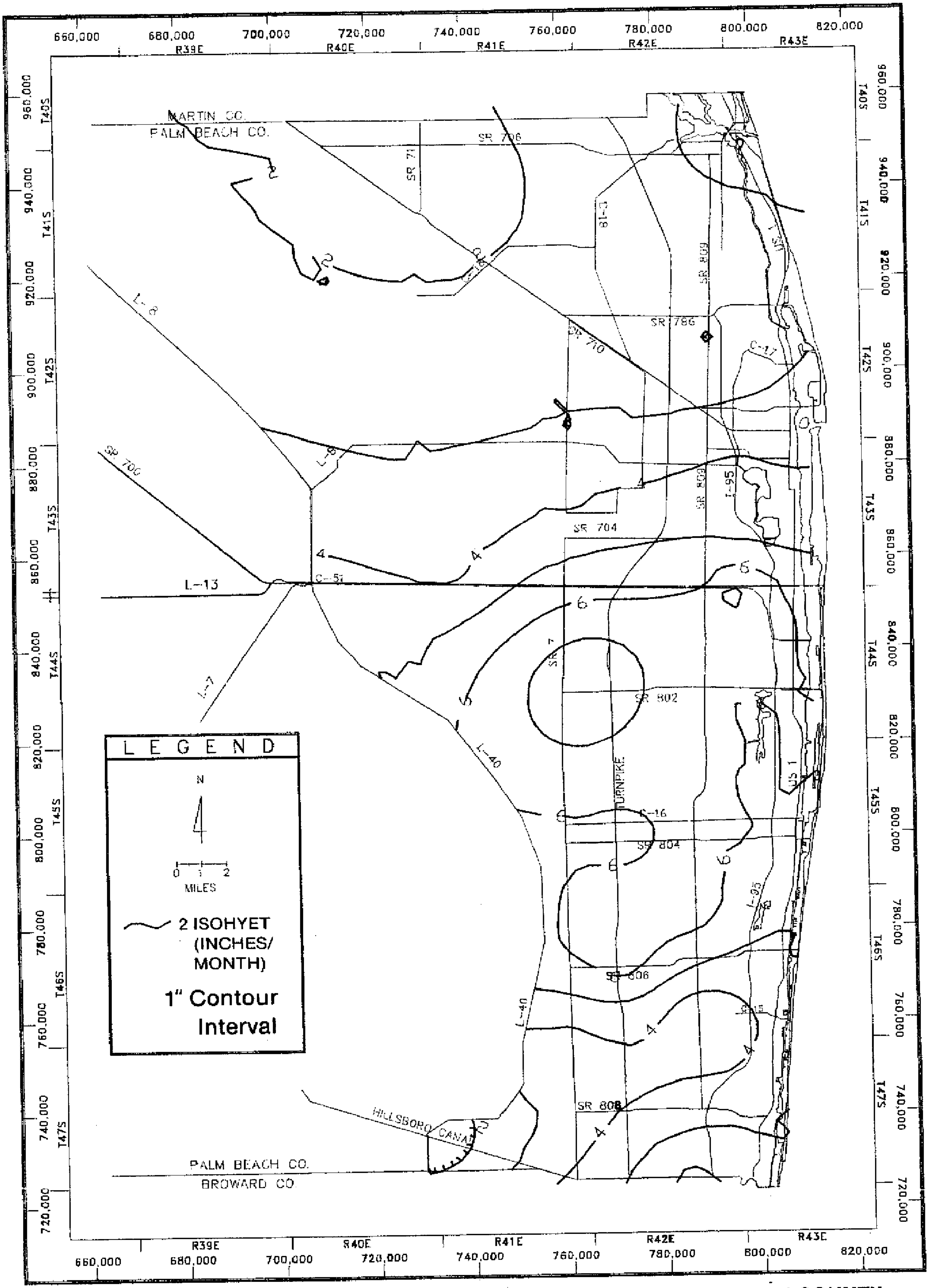

Figure D-6 KRIGED RAINFALL DISTRIBUTION IN EASTERN PALM BEACH COUNTY FOR APRIL 1984

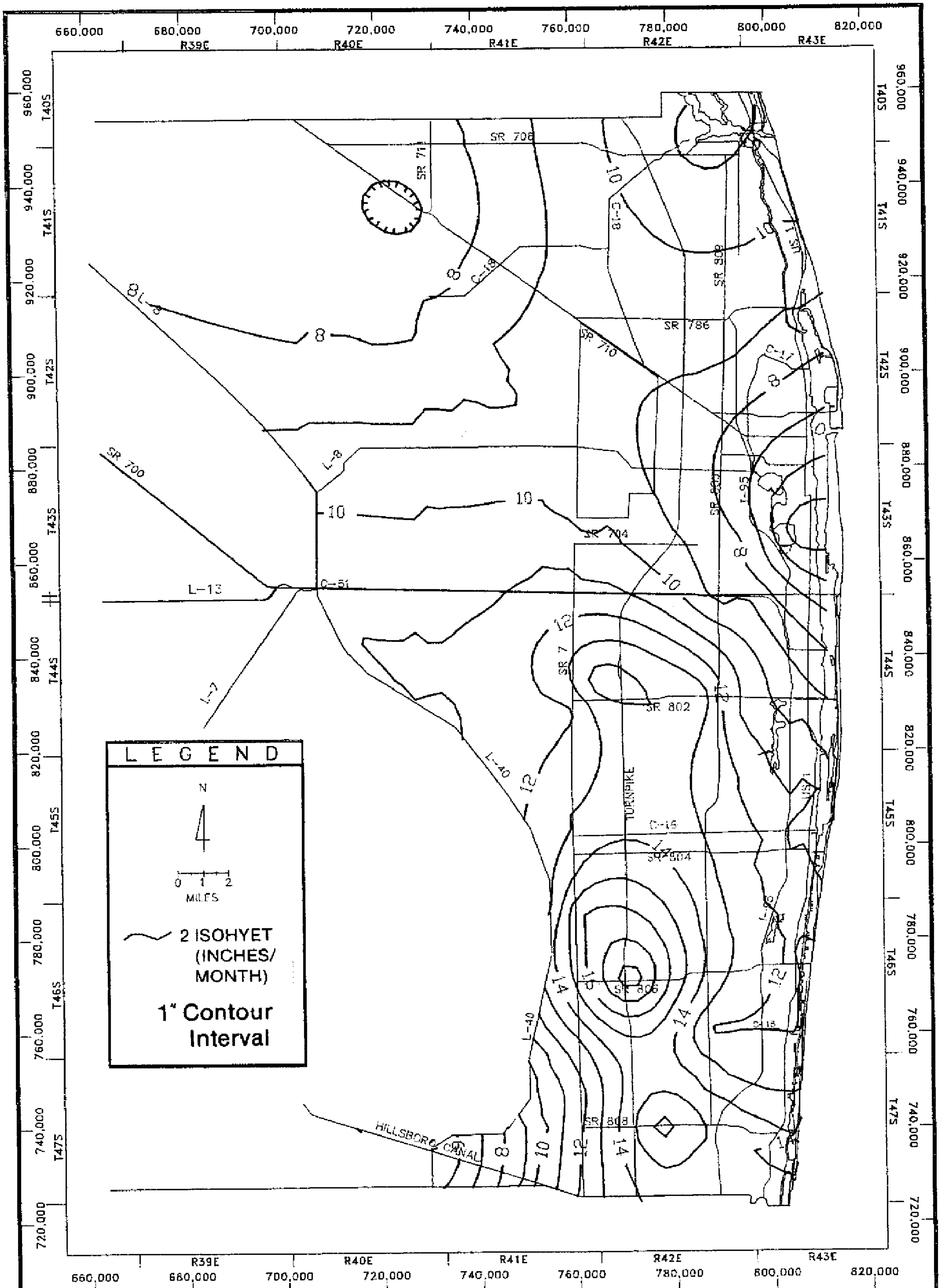

Figure D-7 KRIGED RAINFALL DISTRIBUTION IN EASTERN PALM BEACH COUNTY FOR MAY 1984

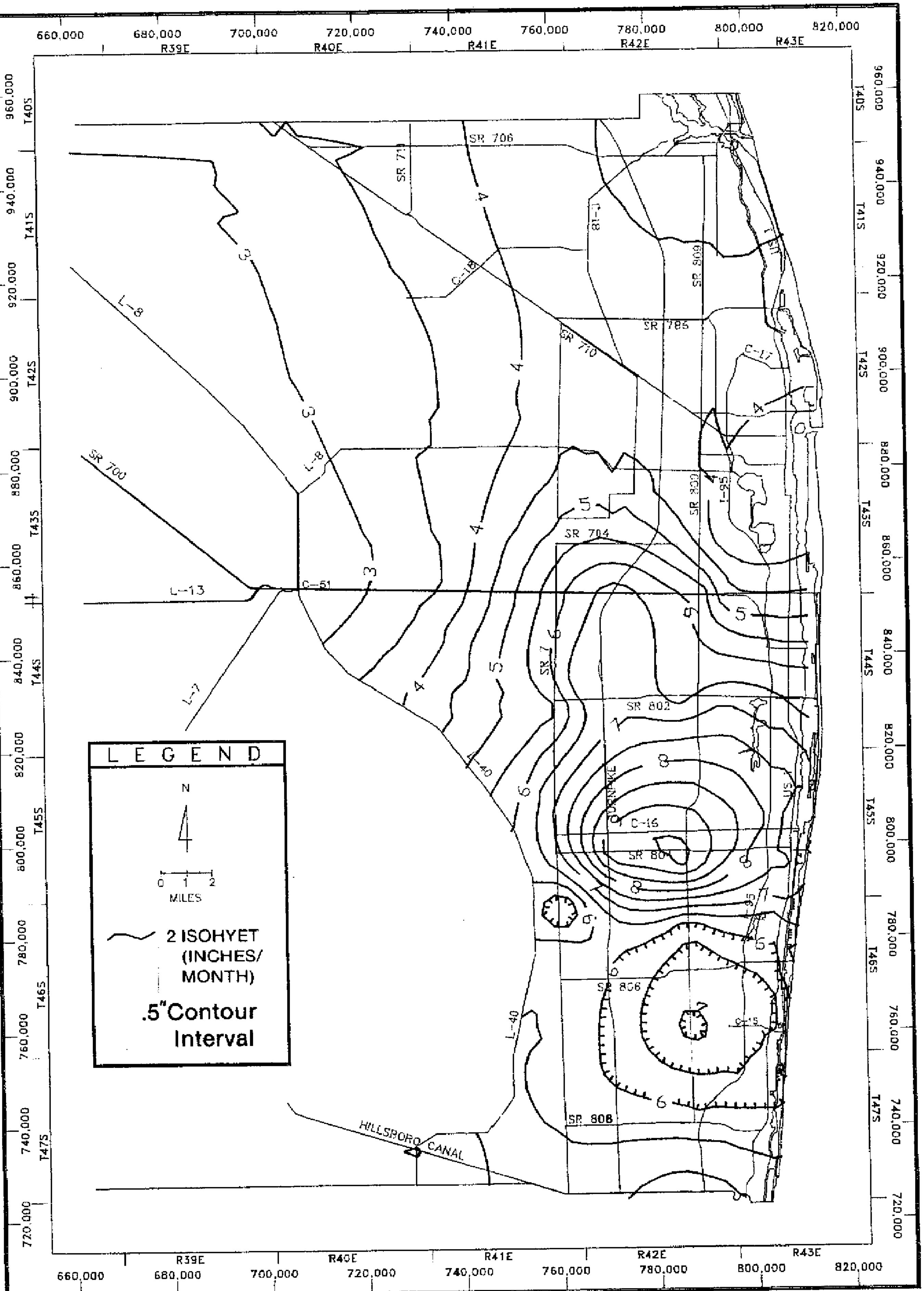

Figure D-8 KRIGED RAINFALL DISTRIBUTION IN EASTERN PALM BEACH COUNTY FOR JUNE 1984

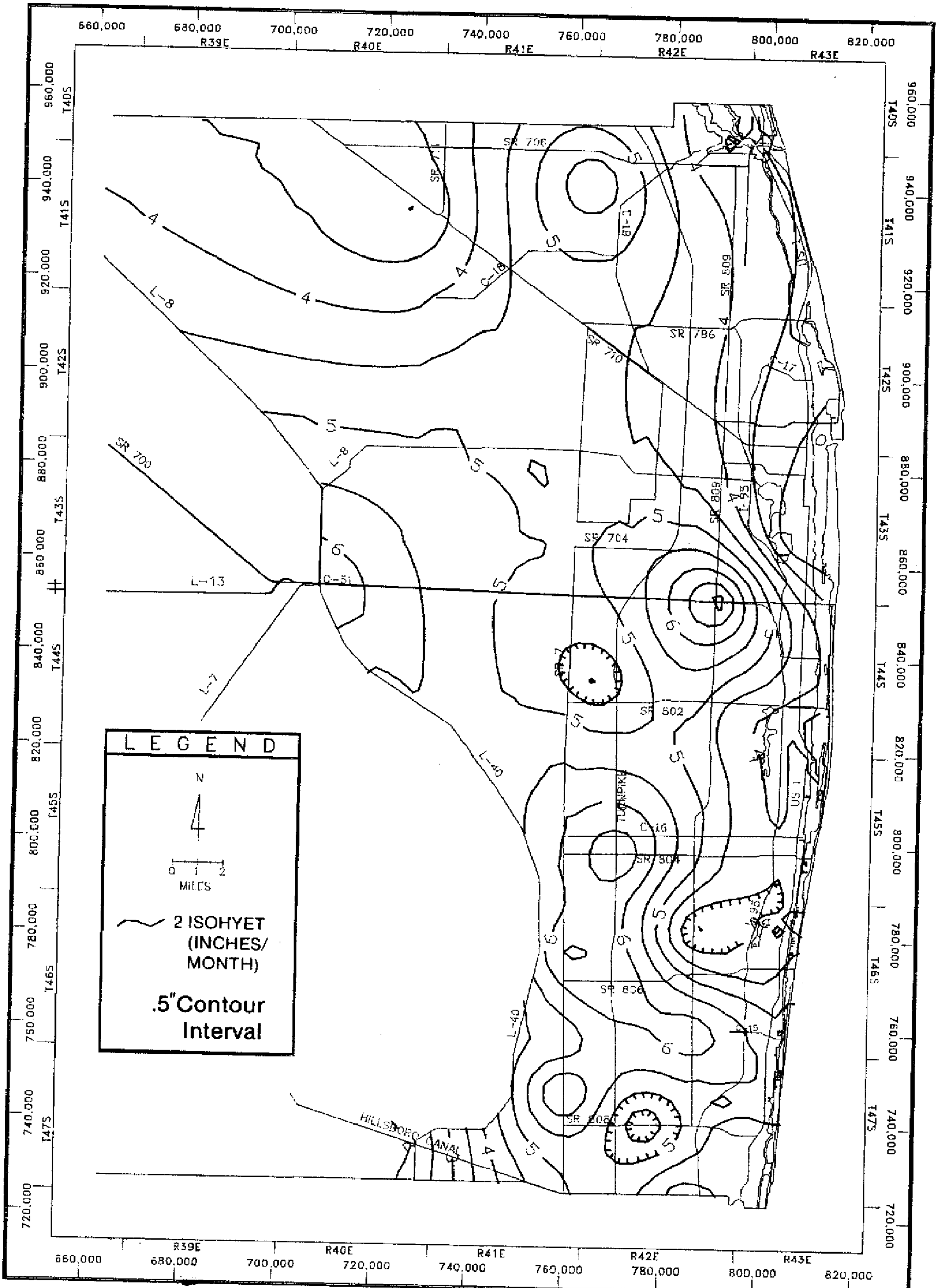

Figure D-9 KRIGED RAINFALL DISTRIBUTION IN EASTERN PALM BEACH COUNTY FOR JULY 1984

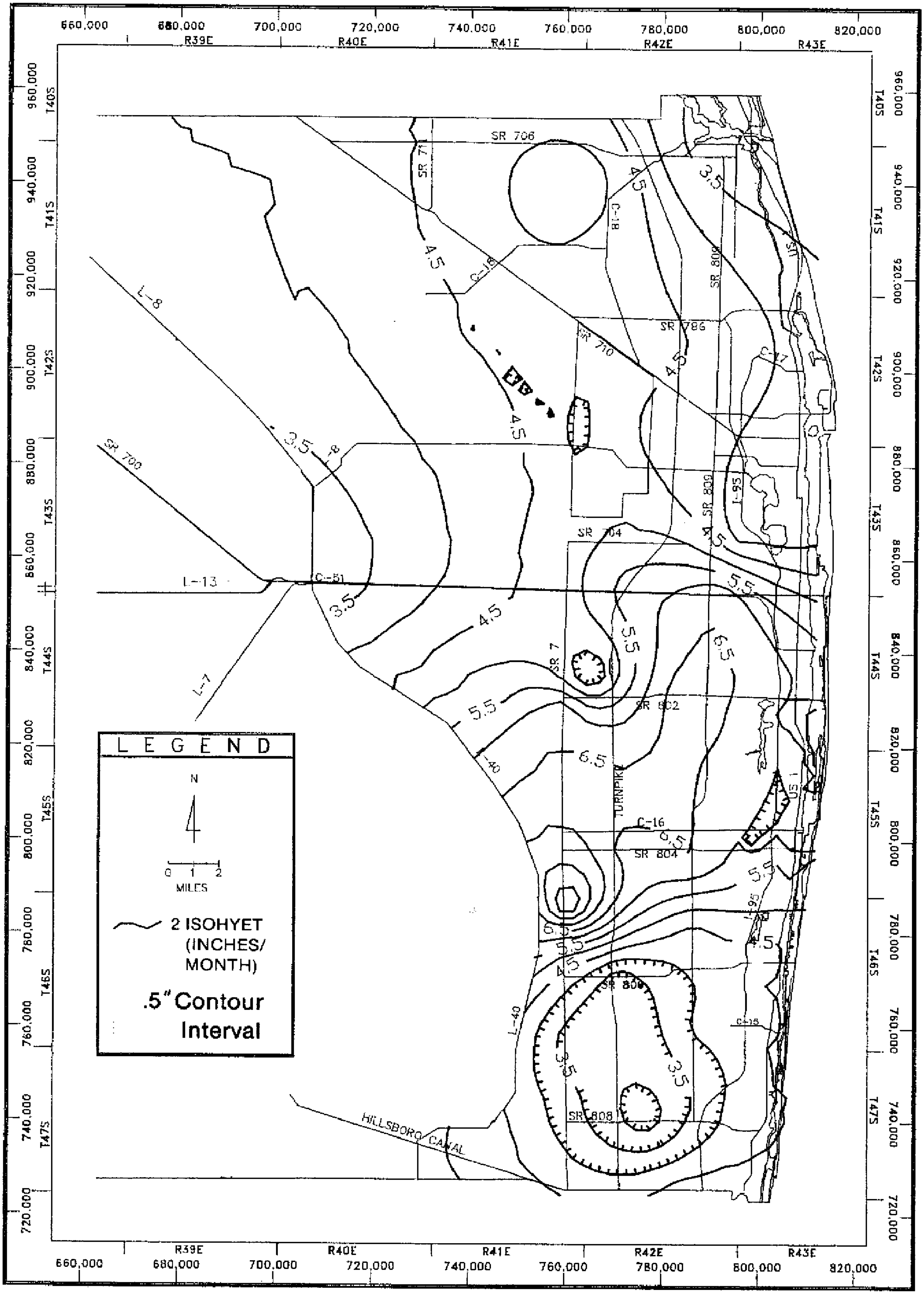

Figure D-10 KRIGED RAINFALL DISTRIBUTION IN EASTERN PALM BEACH COUNTY FOR AUGUST 1984

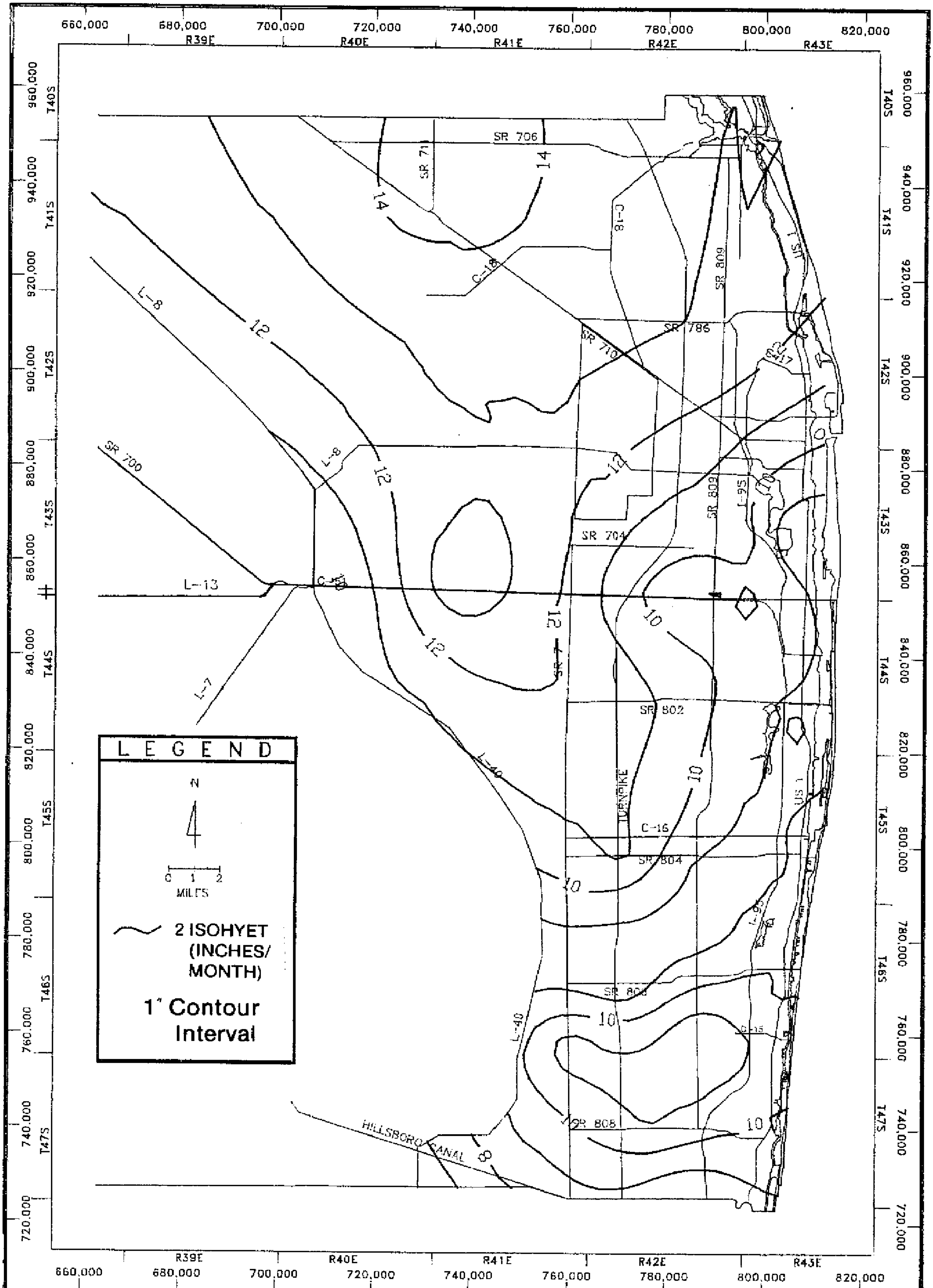

Figure D-11 KRIGED RAINFALL DISTRIBUTION IN EASTERN PALM BEACH COUNTY FOR SEPTEMBER 1984

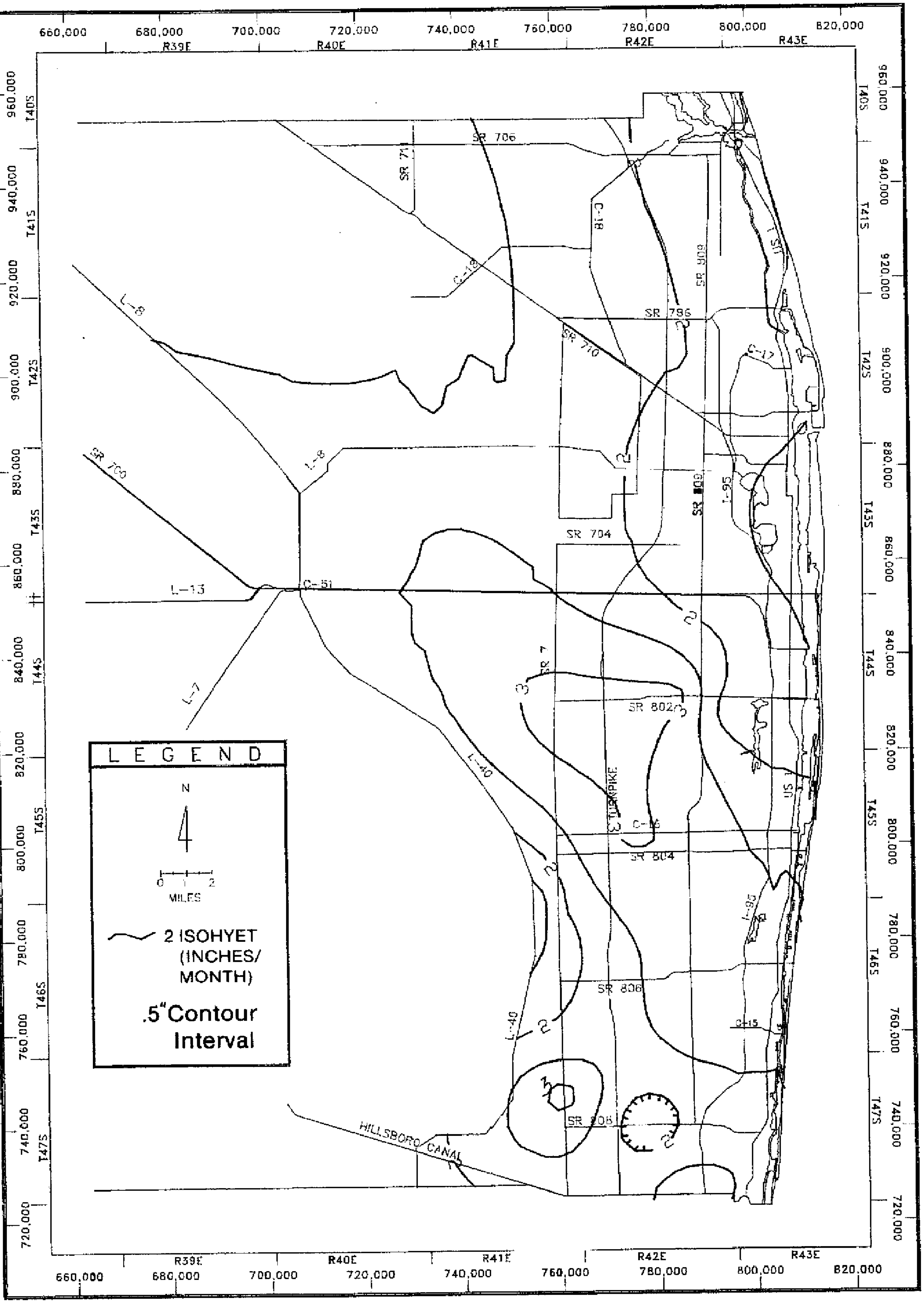

Figure D-12 KRIGED RAINFALL DISTRIBUTION IN EASTERN PALM BEACH COUNTY FOR OCTOBER 1984

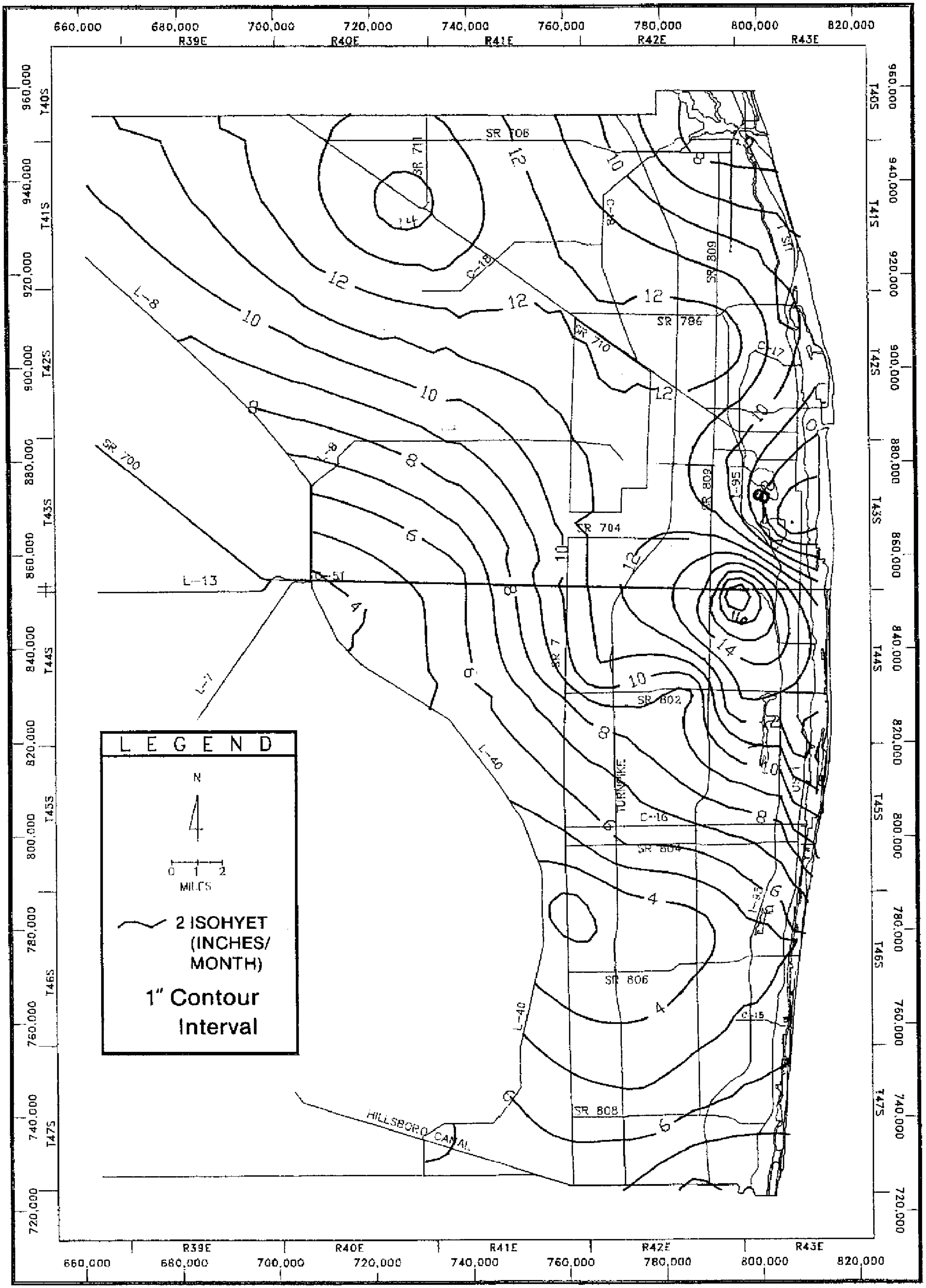

Figure D-13 KRIGED RAINFALL DISTRIBUTION IN EASTERN PALM BEACH COUNTY FOR NOVEMBER 1984

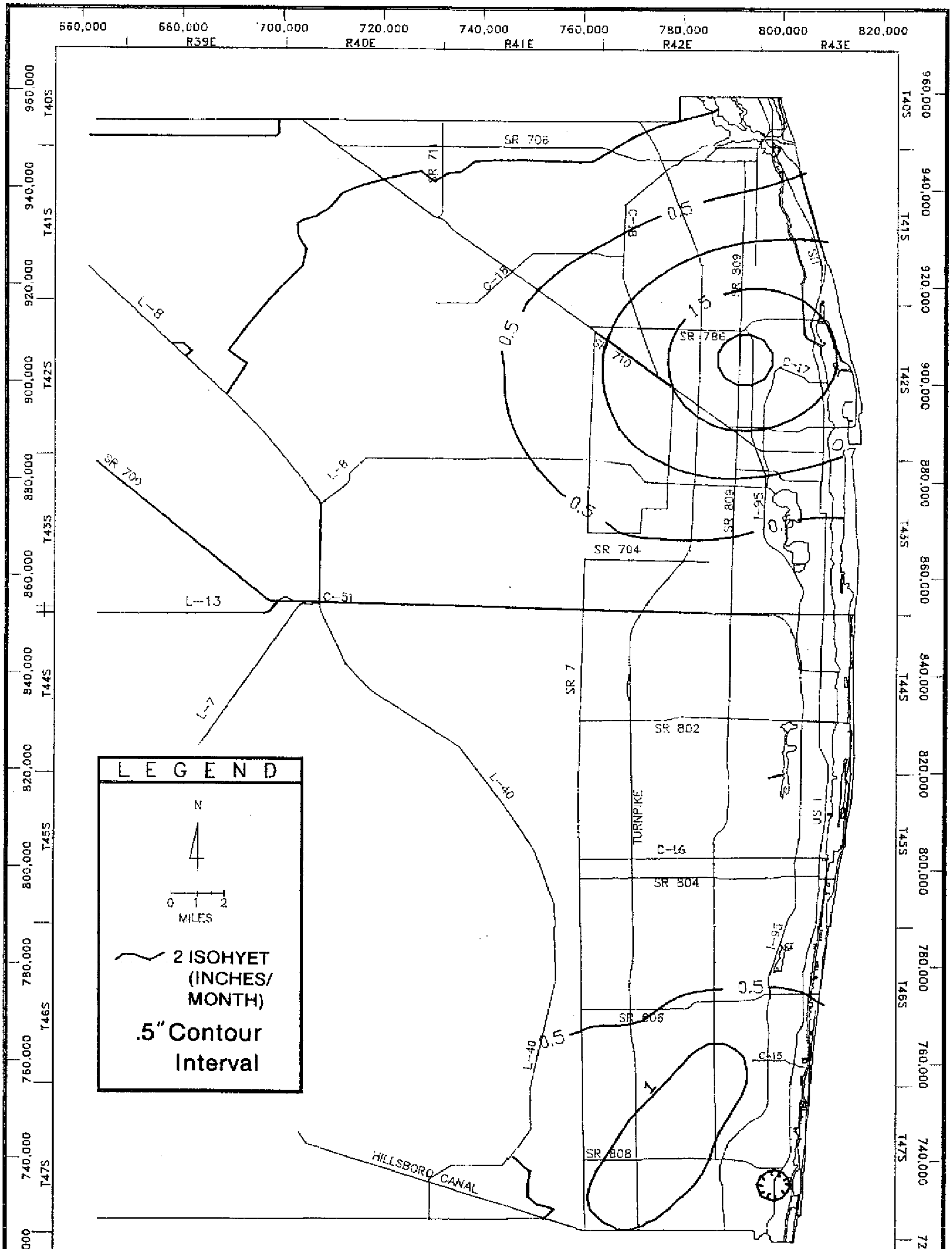

Figure D-14 KRIGED RAINFALL DISTRIBUTION IN EASTERN PALM BEACH COUNTY FOR DECEMBER 1984

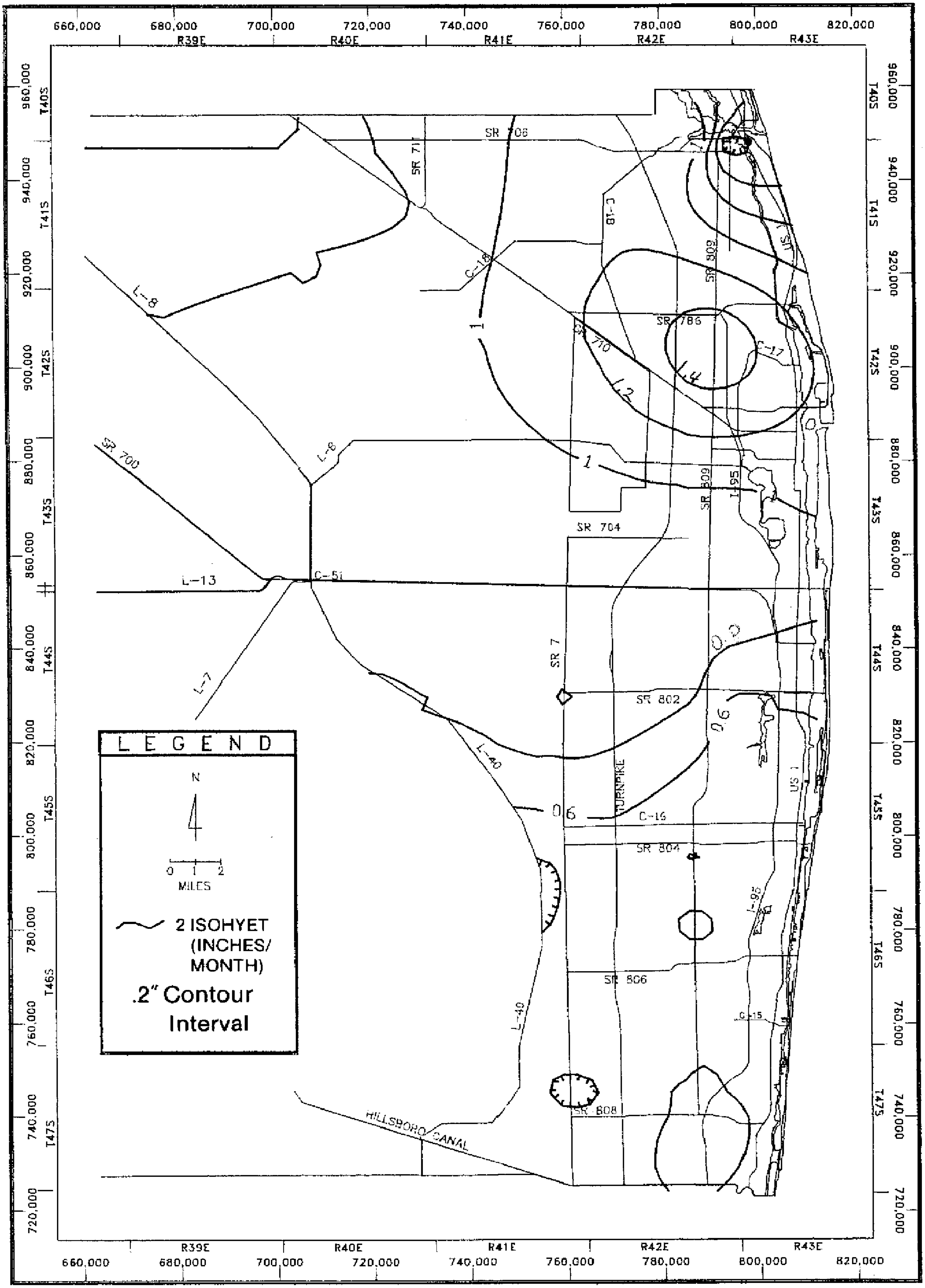

Figure D-15 KRIGED RAINFALL DISTRIBUTION IN EASTERN PALM BEACH COUNTY FOR JANUARY 1985

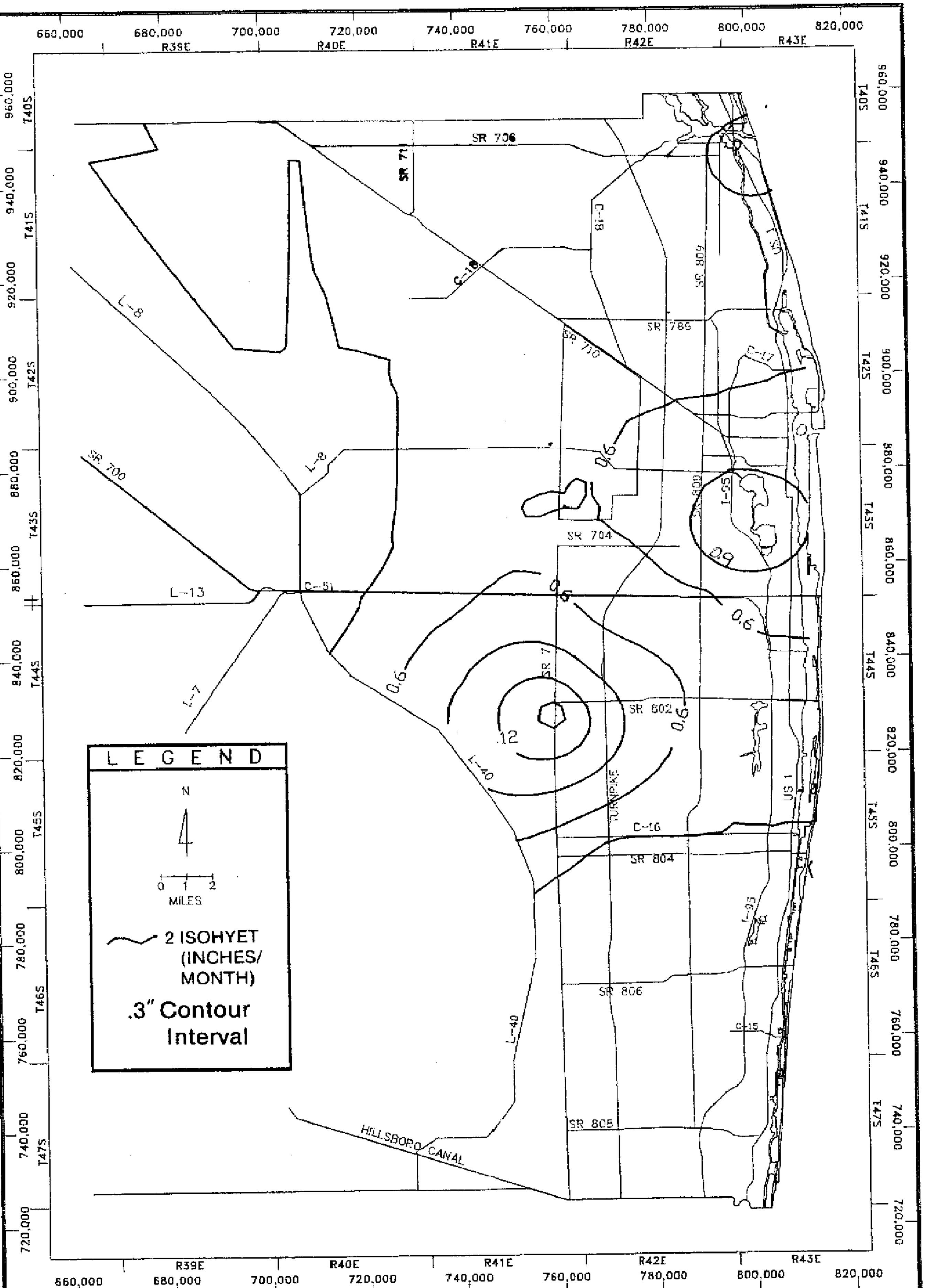

Figure D-16 KRIGED RAINFALL DISTRIBUTION IN EASTERN PALM BEACH COUNTY FOR FEBRUARY 1985

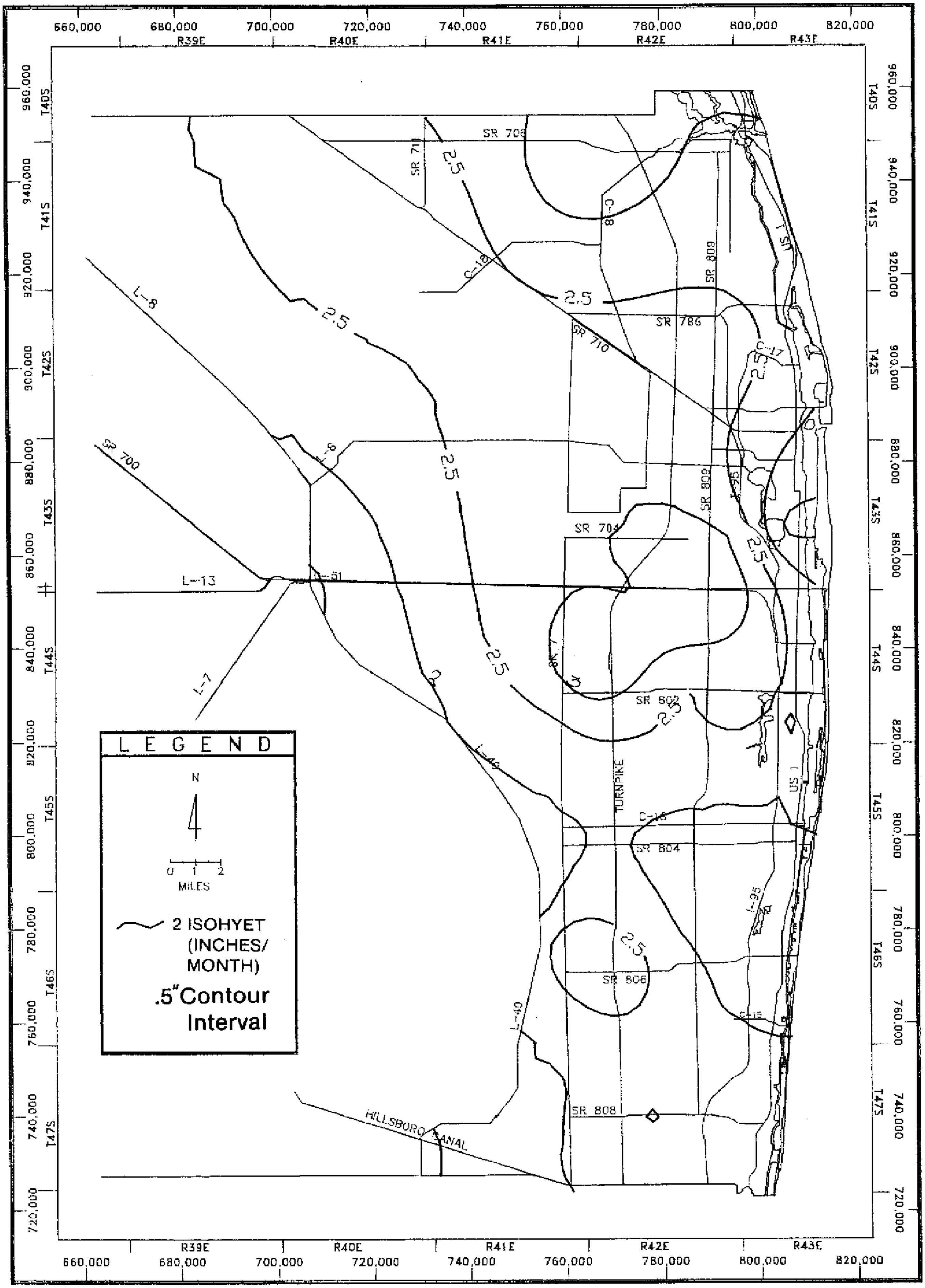

Figure D-17 KRIGED RAINFALL DISTRIBUTION IN EASTERN PALM BEACH COUNTY FOR MARCH 1985

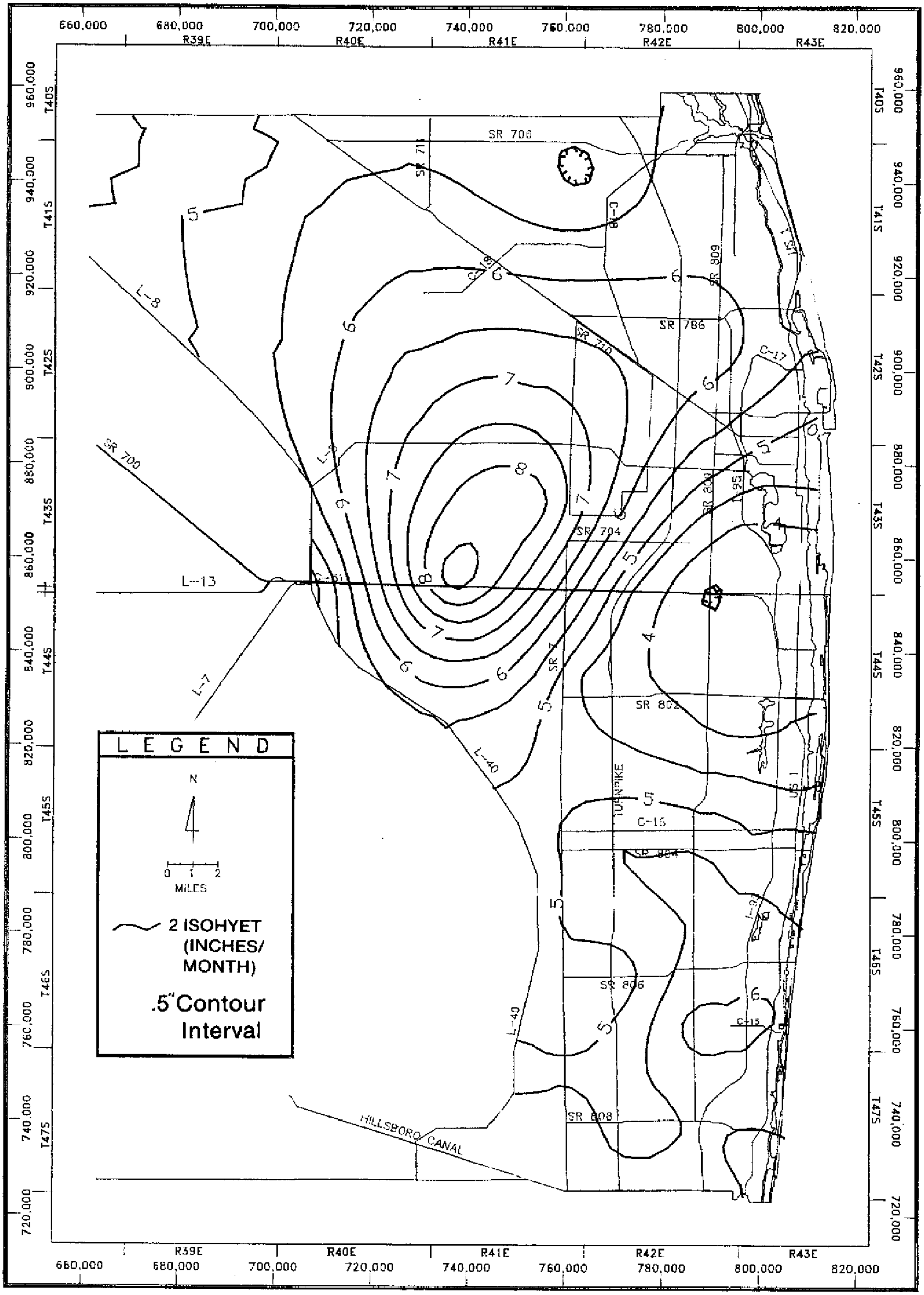

Figure D-18 KRIGED RAINFALL DISTRIBUTION IN EASTERN PALM BEACH COUNTY FOR APRIL 1985

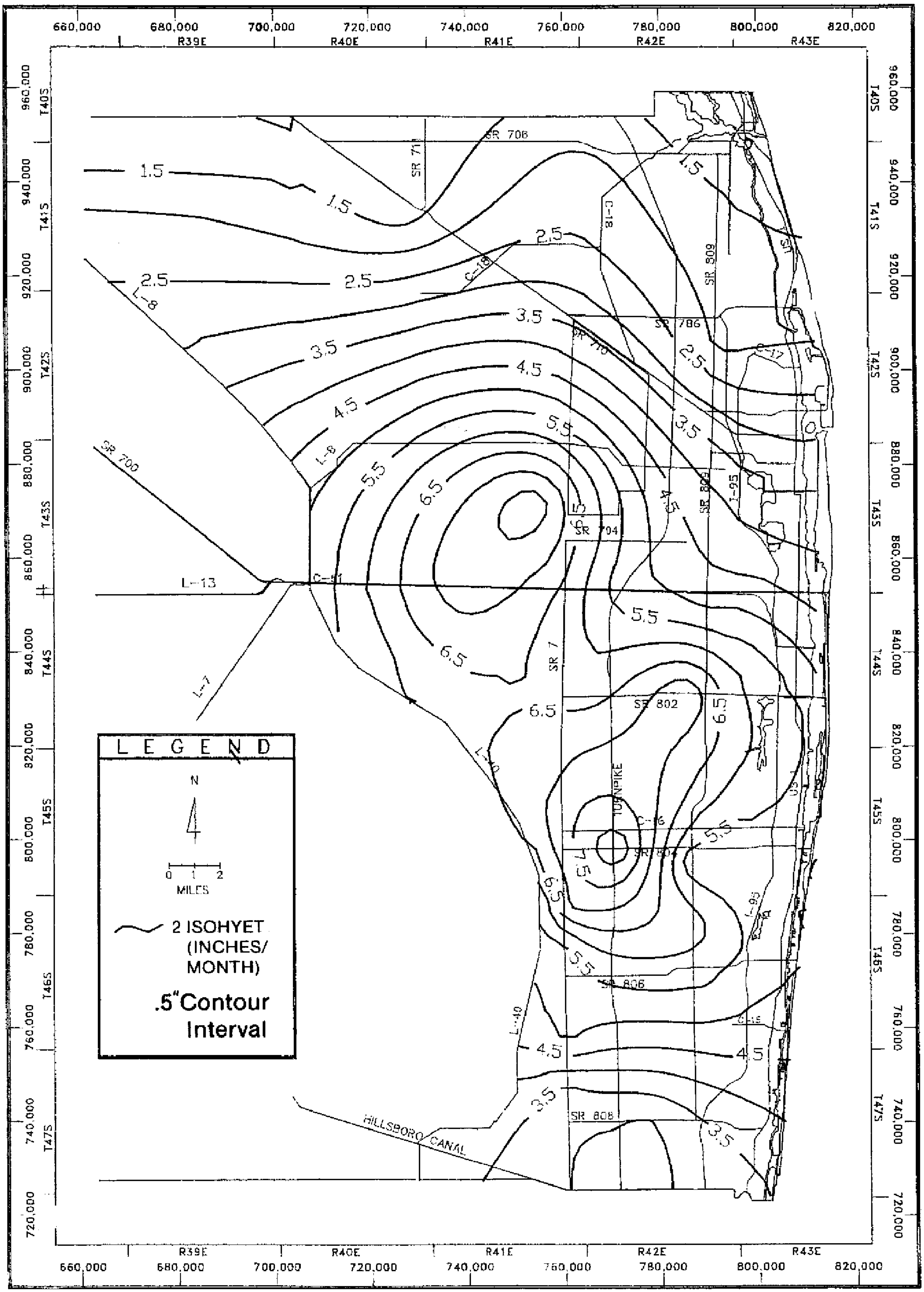

Figure D-19 KRIGED RAINFALL DISTRIBUTION IN EASTERN PALM BEACH COUNTY FOR MAY 1985

APPENDIX F

BASIC PROGRAM FOR VERTICAL DISCRETIZATION OF THE SOUTH PALM BEACH COUNTY MODEL

BASIC PROGRAM USED FOR VERTICAL DISCRETIZATION OF THE SOUTH PALM BEACH COUNTY MODEL (page 1)

```
50 '* This program determines thickness and aquifer material type by cell
51 '* for layers 2 through 6 of the South Palm Beach County ground water
52 '* flow model.
53 '*
54 '* Input required to the program is:
55 '*   1) top of the Biscayne aquifer by cell (file BAT.GFL)
56 '*   2) thickness of the Biscayne aquifer by cell (file BATH.GFL)
57 '*   3) bottom of the Surficial aquifer by cell (file SAB.GFL)
58 '*
59 '* Output from the program layer thicknesses and type codes (Biscayne or
60 '* non-Biscayne aquifer material) by cell for layers 2 through 6 of the
61 '* model.
62 '* Output is to files STHICK#.CAL or STYPE#.CAL where # refers to the
63 '* layer number.  The THICK files contain the layer thickness by cell
64 '* in feet.  The TYPE files contain an aquifer material type code,
65 '* which is the layer number for non-Biscayne material, 9 for Biscayne
66 '* material, and 10 for inactive cells.
67 '*
68 '*
90 '* Open the input and output files
91 '*
100 OPEN "a:BAT.GFL" FOR INPUT AS #1
110 OPEN "A:BATH.GFL" FOR INPUT AS #2
120 OPEN "A:SAB.GFL" FOR INPUT AS #3
130 OPEN "A:STHICK2.CAL" FOR OUTPUT AS #4
140 OPEN "A:STYPE2.CAL" FOR OUTPUT AS #5
150 OPEN "A:STHICK3.CAL" FOR OUTPUT AS #6
160 OPEN "A:STYPE3.CAL" FOR OUTPUT AS #7
170 OPEN "A:STHICK4.CAL" FOR OUTPUT AS #8
180 OPEN "A:STYPE4.CAL" FOR OUTPUT AS #9
190 OPEN "A:STHICK5.CAL" FOR OUTPUT AS #10
200 OPEN "A:STYPE5.CAL" FOR OUTPUT AS #11
210 OPEN "A:STHICK6.CAL" FOR OUTPUT AS #12
220 OPEN "A:STYPE6.CAL" FOR OUTPUT AS #13
250 '*
255 '* Define the initial layer limits
260 '*
300 B1 = -20    'bottom of layer 1
310 B2 = -60    'bottom of layer 2
320 L3M = -75    'midpoint of layer 3
330 B3 = -90    'bottom of layer 3
340 L4M = -115    'midpoint of layer 4
345 B4=-140    'bottom of layer 4
350 B5 = -250    'bottom of layer 5
359 '*
360 '* Loop through the model cells
361 '*
400 FOR ROW = 1 TO 50
410 FOR COL = 1 TO 40
417 '*
```

BASIC PROGRAM USED FOR VERTICAL DISCRETIZATION OF THE SOUTH PALM BEACH COUNTY MODEL (page 2)

```
418 '* Enter the aquifer data
419 '*
420 INPUT #1,TPT   'top of Biscayne
430 INPUT #2,TPTH   'thickness of Biscayne
440 TPB = TPT - TPTH   'bottom of Biscayne
450 INPUT #3,SAB   'bottom of Surficial Aquifer System
454 '*
455 '** Branch to different sections based on Biscayne thickness
456 '** Note: the Biscayne is not used where it is less than 20 ft. thick
457 '*
460 IF TPTH => 20 GOTO 700
470 '**
480 '** Set thicknesses and type where Biscayne is less than 20 ft thick
481 '**
500 THICK2 = B1 -B2 : TYPE2 = 2
510 THICK3 = B2 -B3 : TYPE3 = 3
520 IF SAB < B4 GOTO 570
530 THICK4 = B3 -SAB :TYPE4 = 4   'aquifer bottom occurs in layer 4
540 THICK5 = 1 : TYPE5 = 10   'layer 5 is inactive
550 THICK6 = 1 : TYPE6 = 10   'layer 6 is inactive
560 GOTO 1200   'branch to output
570 THICK4 = B3 - B4 : TYPE4 = 4
580 IF SAB < B5 GOTO 620
590 THICK5 = B4 - SAB : TYPE5 = 5   'aquifer bottom occurs in layer 5
600 THICK6 = 1 : TYPE6 = 10   'layer 6 is inactive
610 GOTO 1200   'branch to output
620 THICK5 = B4-B5 : TYPE5 = 5
630 THICK6 = B5 - SAB :TYPE6 = 6   'aquifer bottom occurs in layer 6
640 GOTO 1200   'branch to output
650 '**
660 '**  Determine thickness and type where Biscayne is => 20 ft thick
661 '**
662 '**
663 '*** Branch based on elevation of Biscayne aquifer top
664 '**
700 IF TPT > L3M GOTO 730
701 '***
702 '*** Top of Bicayne occurs below the layer 3 midpoint
703 '***
710 THICK2 = B1 - B2 : TYPE2 = 2
720 GOTO 740
721 '***
722 '*** Top of Biscayne occurs above the layer 3 midpoint
723 '***
730 THICK2 = B1 -TPT : TYPE2 = 2
731 '**
732 '*** Branch again based on elevation of Biscayne top
733 '**
740 IF TPT > L3M GOTO 770
741 '***
```

BASIC PROGRAM USED FOR VERTICAL DISCRETIZATION OF THE SOUTH PALM BEACH COUNTY MODEL (page 3)

```
742 '*** Top of Biscayne occurs below the layer 3 midpoint
743 '***
750 THICK3 = B2 - TPT : TYPE3 = 3
760 GOTO 810
761 '***
762 '*** Top of the Biscayne occurs above the layer 3 midpoint
763 '***
764 '**** Branch based on elevation of Biscayne bottom
765 '***
770 IF L4M > TPB GOTO 800
771 '****
772 '**** Bottom of Biscayne occurs above layer 4 midpoint
773 '****
780 THICK3 = TPT - TPB : TYPE3 = 9
790 GOTO 810
791 '****
792 '**** Bottom of Biscayne occurs below the layer 4 midpoint
793 '****
800 THICK3 = TPT - B3 : TYPE3 = 9
801 '**
802 '*** Branch based on Biscayne top
803 '**
810 IF TPT < L3M GOTO 980
811 '***
812 '*** Biscayne top above layer 3 midpoint
813 '***
814 '**** Branch based on Biscayne bottom
815 '***
820 IF TPB < L4M GOTO 930
821 '****
822 '**** Biscayne bottom above layer 4 midpoint
823 '****
830 IF SAB < B4 GOTO 880
840 THICK4 = TPB - SAB : TYPE4 = 4   'aquifer bottom occurs in layer 4
850 THICK5 = 1 :TYPE5 = 10   'layer 5 is inactive
860 THICK6 = 1 : TYPE6 = 10   'layer 6 is inactive
870 GOTO 1200   'branch to output
880 THICK4 = TPB -B4 : TYPE4 = 4
890 IF SAB < B5 GOTO 1070
900 THICK5 = B4 -SAB : TYPE5 = 5   'aquifer bottom occurs in layer 5
910 THICK6 = 1 : TYPE6 = 10   'layer 6 is inactive
920 GOTO 1200   'branch to output
921 '****
922 '**** Biscayne bottom below layer 4 midpoint
923 '****
930 THICK4 = B3 - TPB : TYPE4 = 9
940 IF SAB < B5 GOTO 1100
950 THICK5 = TPB - SAB : TYPE5 = 5   'aquifer bottom occurs in layer 5
960 THICK6 = 1 : TYPE6 = 10   'layer 6 is inactive
970 GOTO 1200   'branch to output
```

BASIC PROGRAM USED FOR VERTICAL DISCRETIZATION OF THE SOUTH PALM BEACH COUNTY MODEL (page 4)

```
971 '***
972 '*** Biscayne top below layer 3 midpoint
973 '***
980 THICK4 = TPT - TPB : TYPE4 = 9
990 IF SAB < TPB GOTO 1030
1000 THICK5 = 1 : TYPE5 = 10   'layer 5 is inactive
1010 THICK6 = 1 : TYPE6 = 10   'layer 6 is inactive
1020 GOTO 1200   'branch to output
1030 IF SAB < B5 GOTO 1100
1040 THICK5 = TPB - SAB : TYPE5 = 5   'aquifer bottom occurs in layer 5
1050 THICK6 = 1 : TYPE6 = 10   'layer 6 is inactive
1060 GOTO 1200   'branch to output
1070 THICK5 = B4 - B5 : TYPE5 = 5
1080 THICK6 = B5 - SAB : TYPE6 = 6   'aquifer bottom occurs in layer 6
1090 GOTO 1200   'branch to output
1100 THICK5 = TPB - B5 : TYPE5 = 5
1110 THICK6 = B5 - SAB : TYPE6 = 6   'aquifer bottom occurs in layer 6
1120 GOTO 1200
1190 '*
1191 '* Output thicknesses and cell type codes
1192 '*
1200 PRINT #4,USING "####.#";THICK2;
1210 PRINT #5,USING "####";TYPE2;
1220 PRINT #6,USING "####.#";THICK3;
1230 PRINT #7,USING "####";TYPE3;
1240 PRINT #8,USING "####.#";THICK4;
1250 PRINT #9,USING "####";TYPE4;
1260 PRINT #10,USING "####.#";THICK5;
1270 PRINT #11,USING "####";TYPE5;
1280 PRINT #12,USING "####.#";THICK6;
1290 PRINT #13,USING "####";TYPE6;
1300 IF COL/10<>INT(COL/10) GOTO 1500
1310 PRINT #4,""
1320 PRINT #5,""
1330 PRINT #6,""
1340 PRINT #7,""
1350 PRINT #8,""
1360 PRINT #9,""
1370 PRINT #10,""
1380 PRINT #11,""
1390 PRINT #12,""
1400 PRINT #13,""
1500 NEXT COL
1600 NEXT ROW
2000 END
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APPENDIX I

GENERAL HEAD BOUNDARY, RIVER AND DRAIN INPUT DATA FOR THE SOUTH PALM BEACH COUNTY MODEL

TABLE I-1 GENERAL HEAD BOUNDARY DATA FOR THE SOUTH PALM BEACH MODEL (page 1)

CANAL	MODEL LAYER	MODEL ROW	MODEL COLUMN	REACH LENGTH (FT)	REACH WIDTH (FT)	REACH * CONDUCTANCE (FT2/DAY)	CANAL STAGE (NGVD)
C-51	1	1	1	2640	90	118800	10
C-51	1	1	2	2640	90	118800	10
C-51	1	1	3	2640	90	118800	10
C-51	1	1	4	2640	90	118800	10
C-51	1	1	5	2640	90	118800	10
C-51	1	1	6	2640	90	118800	10
C-51	1	1	7	2640	90	118800	10
C-51	1	1	8	2640	90	118800	10
C-51	1	1	9	2640	90	118800	10
C-51	1	1	10	2640	90	118800	10
C-51	1	1	11	2640	90	118800	10
C-51	1	1	12	2640	90	118800	10
C-51	1	1	13	2640	90	118800	10
C-51	1	1	14	2640	90	118800	8
C-51	1	1	15	2640	90	118800	8
C-51	1	1	16	2640	90	118800	8
C-51	1	1	17	2640	90	118800	8
C-51	1	1	18	2640	90	118800	8
C-51	1	1	19	2640	105	138600	8
C-51	1	1	20	2640	100	132000	8
C-51	1	1	21	2640	100	132000	8
C-51	1	1	22	2640	100	132000	8
C-51	1	1	23	2640	100	132000	8
C-51	1	1	24	2640	100	132000	8
C-51	1	1	25	2640	120	158400	8
C-51	1	1	26	2640	120	158400	8
C-51	1	1	27	2640	120	158400	8
C-51	1	1	28	2640	120	158400	8
C-51	1	1	29	2640	120	158400	8
C-51	1	1	30	2640	120	158400	8
C-51	1	1	31	2640	140	184800	8
C-51	1	1	32	2640	140	184800	8
C-51	1	1	33	2640	170	224400	8
C-51	1	1	34	2640	170	224400	8
C-51	1	1	35	2800	150	210000	8
C-51	1	2	36	2640	150	198000	8
C-51	1	3	36	2800	200	280000	8
C-51	1	4	36	2640	200	264000	8
C-51	1	5	37	2700	200	270000	8
C-51	1	6	37	3500	180	315000	8
C-51	1	6	38	2640	160	211200	0.6
C-51	1	6	39	2640	160	211200	0.6
C-51	1	6	40	800	160	64000	0.6
HILLSBORO	1	46	9	1500	80	60000	8
HILLSBORO	1	46	10	2750	80	110000	8
HILLSBORO	1	47	11	2750	80	110000	8

* based on 1 ft of sediment with a hydraulic conductivity of 0.5 ft/day

TABLE I-1 GENERAL HEAD BOUNDARY DATA FOR THE SOUTH PALM BEACH MODEL (page 2)

CANAL	MODEL LAYER	MODEL ROW	MODEL COLUMN	REACH LENGTH (FT)	REACH WIDTH (FT)	REACH * CONDUCTANCE (FT2/DAY)	CANAL STAGE (NGVD)
HILLSBORO	1	47	12	2800	80	112000	8
HILLSBORO	1	47	13	2750	80	110000	8
HILLSBORO	1	48	14	2750	80	110000	8
HILLSBORO	1	48	15	2750	80	110000	8
HILLSBORO	1	48	16	2750	80	110000	8
HILLSBORO	1	49	17	2750	80	110000	8
HILLSBORO	1	49	18	2750	80	110000	8
HILLSBORO	1	49	19	2700	80	108000	8
HILLSBORO	1	50	20	2750	80	110000	8
HILLSBORO	1	50	21	2640	80	105600	8
HILLSBORO	1	50	22	2640	80	105600	8
HILLSBORO	1	50	23	2640	80	105600	8
HILLSBORO	1	50	24	2640	80	105600	8
HILLSBORO	1	50	25	2640	95	125400	8
HILLSBORO	1	50	26	2640	95	125400	8
HILLSBORO	1	50	27	2640	120	158400	8
HILLSBORO	1	50	28	2640	120	158400	8
HILLSBORO	1	50	29	2640	120	158400	8
HILLSBORO	1	50	30	2640	135	178200	8
HILLSBORO	1	50	31	2640	135	178200	8
HILLSBORO	1	50	32	2640	135	178200	0.6
HILLSBORO	1	50	33	2640	130	171600	0.6
HILLSBORO	1	50	34	4300	135	290250	0.6
HILLSBORO	1	50	35	3750	200	375000	0.6
HILLSBORO	1	50	36	800	120	48000	0.6

* based on 1 ft of sediment with a hydraulic conductivity of 0.5 ft/day

TABLE I-2 RIVER PACKAGE DATA FOR THE SOUTH PALM BEACH MODEL (page 1)
LAKE WORTH DRAINAGE DISTRICT CANALS

CANAL	MODEL LAYER	MODEL ROW	MODEL COLUMN	REACH LENGTH (FT)	REACH WIDTH (FT)	REACH * CONDUCTANCE (FT2/DAY)	CANAL STAGE (NGVD)
S-4	1	1	20	450	30	6750	12.5
S-4	1	2	20	1660	30	24900	12.5
S-4	1	2	19	1970	30	29550	12.5
S-4	1	3	19	1970	30	29550	12.5
S-5	1	3	19	1060	30	15900	15.5
S-5	1	3	20	2262	30	33930	15.5
S-5	1	4	19	2640	30	39600	15.5
S-5	1	5	19	2870	30	43050	15.5
S-5	1	5	20	2260	30	33900	15.5
S-6	1	7	19	605	30	9075	15.5
S-6	1	7	20	2110	30	31650	15.5
11-W	1	8	19	605	30	9075	15.5
11-W	1	8	20	2110	30	31650	15.5
S-6	1	9	19	605	30	9075	15.5
S-6	1	9	20	2110	30	31650	15.5
S-7	1	11	19	1210	30	18150	15.5
S-7	1	11	20	1810	30	27150	15.5
S-7	1	12	19	2640	30	39600	15.5
S-7	1	13	19	3400	30	51000	15.5
S-7	1	13	20	1660	30	24900	15.5
15-W	1	12	19	1060	30	15900	15.5
15-W	1	12	20	1810	30	27150	15.5
HOMELAND	1	14	18	1060	30	15900	15.5
HOMELAND	1	14	19	2640	30	39600	15.5
HOMELAND	1	14	20	1660	30	24900	15.5
HERITAGE	1	14	18	1200	30	18000	15.5
HERITAGE	1	15	18	2640	30	39600	15.5
HERITAGE	1	16	18	2640	30	39600	15.5
HERITAGE	1	17	18	2640	30	39600	15.5
S-8	1	16	19	2110	30	31650	15.5
S-8	1	16	20	1660	30	24900	15.5
S-8	1	17	19	2640	30	39600	15.5
S-8	1	18	19	1510	30	22650	15.5
19-W	1	17	19	1130	30	16950	15.5
19-W	1	17	20	1660	30	24900	15.5
23-W	1	21	17	900	30	13500	15.5
23-W	1	21	18	2640	30	39600	15.5
23-W	1	21	19	2640	30	39600	15.5
23-W	1	21	20	1810	30	27150	15.5
S-9	1	20	19	905	30	13575	15.5
S-9	1	21	19	2640	30	39600	15.5
S-9	1	22	19	1580	30	23700	15.5
S-10	1	24	19	830	30	12450	15.5
S-10	1	24	20	1810	30	27150	15.5

* based on 1 ft of sediment with a hydraulic conductivity of 0.5 ft/day

TABLE I-2 RIVER PACKAGE DATA FOR THE SOUTH PALM BEACH MODEL (page 2)
LAKE WORTH DRAINAGE DISTRICT CANALS

CANAL	MODEL LAYER	MODEL ROW	MODEL COLUMN	REACH LENGTH (FT)	REACH WIDTH (FT)	REACH * CONDUCTANCE (FT2/DAY)	CANAL STAGE (NGVD)
30-W	1	28	18	605	30	9075	11
30-W	1	28	19	2640	30	39600	11
30-W	1	28	20	1960	30	29400	15.5
31-W	1	29	18	605	30	9075	11
31-W	1	29	19	2640	30	39600	11
31-W	1	29	20	1960	30	29400	15.5
32-W	1	30	18	605	30	9075	11
32-W	1	30	19	2640	30	39600	11
32-W	1	30	20	1960	30	29400	15.5
E-1W-N	1	28	18	300	50	7500	11
E-1W-N	1	29	18	2640	50	66000	11
E-1W-N	1	30	18	2640	50	66000	11
E-1W-N	1	31	18	3245	50	81125	11
E-1W-N	1	32	18	2640	50	66000	11
E-1W-N	1	33	18	2640	50	66000	11
E-1W-N	1	34	18	2640	50	66000	11
E-1W-N	1	35	18	1510	50	37750	11
E-1W-S	1	35	17	905	50	22625	11.5
E-1W-S	1	36	17	2640	50	66000	11.5
E-1W-S	1	37	17	2640	50	66000	11.5
E-1W-S	1	38	17	2640	50	66000	11.5
E-1W-S	1	39	17	2640	50	66000	11.5
E-1W-S	1	40	17	2640	50	66000	11.5
E-1W-S	1	41	17	2640	50	66000	11.5
E-1W-S	1	42	17	1960	50	49000	11.5
E-1W-S	1	42	16	905	50	22625	7.5
E-1W-S	1	43	16	2870	50	71750	7.5
E-1W-S	1	44	15	1960	50	49000	7.5
E-1W-S	1	44	16	980	50	24500	7.5
E-1W-S	1	45	15	2700	50	67500	7.5
E-1W-S	1	46	15	2640	50	66000	7.5
E-1W-S	1	47	15	2640	50	66000	7.5
E-1W-S	1	48	15	1060	50	26500	7.5
L-36.5	1	35	17	605	30	9075	11
L-36.5	1	35	18	2640	30	39600	11
L-36.5	1	35	19	1320	30	19800	11
L-36.5	1	35	19	1320	30	19800	15.5
L-36.5	1	35	20	2260	30	33900	15.5
L-37-W	1	36	18	2640	30	39600	12.5
L-37-W	1	36	19	2640	30	39600	12.5
L-37-W	1	36	20	2260	30	33900	15.5
S-11	1	36	18	2260	30	33900	12.5
S-11	1	37	18	2640	30	39600	12.5
S-11	1	38	18	305	30	4575	12.5

* based on 1 ft of sediment with a hydraulic conductivity of 0.5 ft/day

TABLE I-2 RIVER PACKAGE DATA FOR THE SOUTH PALM BEACH MODEL (page 3)
LAKE WORTH DRAINAGE DISTRICT CANALS

CANAL	MODEL LAYER	MODEL ROW	MODEL COLUMN	REACH LENGTH (FT)	REACH WIDTH (FT)	REACH * CONDUCTANCE (FT2/DAY)	CANAL STAGE (NGVD)
L-39-W	1	38	18	140	30	2100	12.5
L-39-W	1	38	19	2640	30	39600	12.5
L-39-W	1	38	20	2500	30	37500	12.5
L-40-W	1	39	19	460	30	6900	15.5
L-40-W	1	39	20	2640	30	39600	15.5
L-42-W	1	41	19	2640	30	39600	7.5
L-42-W	1	41	20	2600	30	39000	7.5
L-43-W	1	41	19	1360	30	20400	7.5
L-43-W	1	42	19	1660	30	24900	7.5
L-43-W	1	42	18	2640	30	39600	7.5
L-43-W	1	42	17	2640	30	39600	7.5
E-1	1	2	20	2415	50	60375	15.5
E-1	1	3	20	2640	50	66000	15.5
E-1	1	4	20	2640	50	66000	15.5
E-1	1	5	20	2640	50	66000	15.5
E-1	1	6	20	2640	50	66000	15.5
E-1	1	7	20	2640	50	66000	15.5
E-1	1	8	20	2640	50	66000	15.5
E-1	1	9	20	2640	50	66000	15.5
E-1	1	10	20	2640	50	66000	15.5
E-1	1	11	20	2640	50	66000	15.5
E-1	1	12	20	2640	50	66000	15.5
E-1	1	13	20	2640	50	66000	15.5
E-1	1	14	20	2640	50	66000	15.5
E-1	1	15	20	2640	50	66000	15.5
E-1	1	16	20	2640	50	66000	15.5
E-1	1	17	20	2640	50	66000	15.5
E-1	1	18	20	2640	50	66000	15.5
E-1	1	19	20	2640	50	66000	15.5
E-1	1	20	20	2640	50	66000	15.5
E-1	1	21	20	2640	50	66000	15.5
E-1	1	22	20	2640	50	66000	15.5
E-1	1	23	20	2640	50	66000	15.5
E-1	1	24	20	2640	50	66000	15.5
E-1	1	25	20	2640	50	66000	15.5
E-1	1	26	20	2640	50	66000	15.5
E-1	1	27	20	2640	50	66000	15.5
E-1	1	28	20	2640	50	66000	15.5
E-1	1	29	20	2640	50	66000	15.5
E-1	1	30	20	2640	50	66000	15.5
E-1	1	31	20	2640	50	66000	15.5
E-1	1	32	20	2640	50	66000	15.5
E-1	1	33	20	2640	50	66000	15.5
E-1	1	34	20	2640	50	66000	15.5

* based on 1 ft of sediment with a hydraulic conductivity of 0.5 ft/day

TABLE I-2 RIVER PACKAGE DATA FOR THE SOUTH PALM BEACH MODEL (page 4)
LAKE WORTH DRAINAGE DISTRICT CANALS

CANAL	MODEL LAYER	MODEL ROW	MODEL COLUMN	REACH LENGTH (FT)	REACH WIDTH (FT)	REACH * CONDUCTANCE (FT2/DAY)	CANAL STAGE (NGVD)
E-1	1	35	20	2640	50	66000	15.5
E-1	1	36	20	2640	50	66000	15.5
E-1	1	37	20	2640	50	66000	15.5
E-1	1	38	20	2640	50	66000	15.5
E-1	1	39	20	2110	50	52750	15.5
E-1	1	39	21	1360	50	34000	15.5
E-1	1	40	20	2270	50	56750	15.5
E-1	1	41	21	2200	50	55000	15.5
E-1	1	42	21	3620	50	90500	15.5
E-1	1	43	21	2640	50	66000	15.5
E-1	1	44	21	760	50	19000	15.5
E-1	1	44	21	1880	50	47000	12.5
E-1	1	45	21	2640	50	66000	12.5
E-1	1	46	21	2640	50	66000	12.5
E-1	1	47	21	2640	50	66000	12.5
E-1	1	48	21	2640	50	66000	12.5
E-1	1	49	21	2640	50	66000	12.5
E-1	1	50	21	905	50	22625	12.5
E-1-E	1	47	21	530	50	13250	9.3
E-1-E	1	48	21	2640	50	66000	9.3
E-1-E	1	49	21	2640	50	66000	9.3
E-1-E	1	50	21	905	50	22625	9.3
E-1.5	1	50	23	760	50	19000	9.3
E-1.5	1	49	23	2700	50	67500	9.3
E-1.5	1	48	22	2340	50	58500	9.3
E-2W	1	2	24	2640	50	66000	12.5
E-2W	1	3	24	2640	50	66000	12.5
E-2W	1	4	24	2640	50	66000	12.5
E-2W	1	5	24	2640	50	66000	12.5
E-2W	1	6	24	2640	50	66000	12.5
E-2W	1	7	24	2640	50	66000	12.5
E-2W	1	8	24	2640	50	66000	12.5
E-2W	1	9	24	2640	50	66000	12.5
E-2W	1	10	24	1040	50	26000	12.5
E-2W	1	10	24	1600	50	40000	15.5
E-2W	1	11	24	2640	50	66000	15.5
E-2W	1	12	24	2640	50	66000	15.5
E-2W	1	13	24	2640	50	66000	15.5
E-2W	1	14	24	2640	50	66000	15.5
E-2W	1	15	24	2640	50	66000	15.5
E-2W	1	16	24	2640	50	66000	15.5
E-2W	1	17	24	2640	50	66000	15.5
E-2W	1	18	24	2640	50	66000	15.5
E-2W	1	19	24	2640	50	66000	15.5

* based on 1 ft of sediment with a hydraulic conductivity of 0.5 ft/day

TABLE I-2 RIVER PACKAGE DATA FOR THE SOUTH PALM BEACH MODEL (page 5)
LAKE WORTH DRAINAGE DISTRICT CANALS

CANAL	MODEL LAYER	MODEL ROW	MODEL COLUMN	REACH LENGTH (FT)	REACH WIDTH (FT)	REACH * CONDUCTANCE (FT2/DAY)	CANAL STAGE (NGVD)
E-2W	1	20	24	2640	50	66000	15.5
E-2W	1	21	24	2640	50	66000	15.5
E-2W	1	22	24	2640	50	66000	15.5
E-2W	1	23	24	2640	50	66000	15.5
E-2W	1	24	24	2640	50	66000	15.5
E-2W	1	25	24	2640	50	66000	15.5
E-2W	1	26	24	2640	50	66000	15.5
E-2W	1	27	24	2640	50	66000	15.5
E-2W	1	28	24	2640	50	66000	15.5
E-2W	1	29	24	2640	50	66000	15.5
E-2W	1	30	24	2640	50	66000	15.5
E-2W	1	31	24	2640	50	66000	15.5
E-2W	1	32	24	2800	50	70000	15.5
E-2W	1	33	24	2640	50	66000	15.5
E-2W	1	34	24	2640	50	66000	15.5
E-2W	1	35	24	2640	50	66000	15.5
E-2W	1	36	24	2640	50	66000	15.5
E-2W	1	37	24	2640	50	66000	15.5
E-2W	1	38	24	2640	50	66000	15.5
E-2W	1	39	24	2640	50	66000	15.5
E-2W	1	40	24	2640	50	66000	15.5
E-2W	1	41	24	2640	50	66000	15.5
E-2W	1	42	24	2640	50	66000	15.5
E-2W	1	43	24	2800	50	70000	15.5
E-2W	1	44	24	2640	50	66000	15.5
E-2W	1	45	24	2640	50	66000	15.5
E-2W	1	46	25	2640	50	66000	15.5
E-2W	1	47	25	2640	50	66000	15.5
E-2W	1	48	25	2640	50	66000	15.5
E-2W	1	49	25	2640	50	66000	15.5
E-2W	1	50	25	755	50	18875	15.5
E-2E	1	3	24	2265	50	56625	12.5
E-2E	1	4	24	2640	50	66000	12.5
E-2E	1	5	24	2640	50	66000	12.5
E-2E	1	6	24	2640	50	66000	12.5
E-2E	1	7	24	2640	50	66000	12.5
E-2E	1	8	24	2640	50	66000	12.5
E-2E	1	9	24	2640	50	66000	12.5
E-2E	1	10	24	2640	50	66000	12.5
E-2E	1	11	24	2640	50	66000	12.5
E-2E	1	12	24	2640	50	66000	12.5
E-2E	1	13	24	2640	50	66000	12.5
E-2E	1	14	24	1320	50	33000	12.5
E-2E	1	14	24	1320	50	33000	15.5

* based on 1 ft of sediment with a hydraulic conductivity of 0.5 ft/day

TABLE I-2 RIVER PACKAGE DATA FOR THE SOUTH PALM BEACH MODEL (page 6)
LAKE WORTH DRAINAGE DISTRICT CANALS

CANAL	MODEL LAYER	MODEL ROW	MODEL COLUMN	REACH LENGTH (FT)	REACH WIDTH (FT)	REACH * CONDUCTANCE (FT2/DAY)	CANAL STAGE (NGVD)
E-2E	1	15	24	2640	50	66000	15.5
E-2E	1	16	24	2640	50	66000	15.5
E-2E	1	17	24	2640	50	66000	15.5
E-2E	1	18	24	2640	50	66000	15.5
E-2E	1	19	24	2640	50	66000	15.5
E-2E	1	20	24	2640	50	66000	15.5
E-2E	1	21	24	2640	50	66000	15.5
E-2E	1	22	24	2640	50	66000	15.5
E-2E	1	23	24	2640	50	66000	15.5
E-2E	1	24	24	2640	50	66000	15.5
E-2E	1	25	24	2640	50	66000	15.5
E-2E	1	26	24	2640	50	66000	15.5
E-2E	1	27	24	2640	50	66000	15.5
E-2E	1	28	24	2640	50	66000	15.5
E-2E	1	29	24	2640	50	66000	15.5
E-2E	1	30	24	2640	50	66000	15.5
E-2E	1	31	24	2640	50	66000	15.5
E-2E	1	32	24	2640	50	66000	15.5
E-2E	1	33	24	2640	50	66000	15.5
E-2E	1	34	24	2640	50	66000	15.5
E-2E	1	35	24	2640	50	66000	15.5
E-2E	1	36	24	2640	50	66000	15.5
E-2E	1	37	24	2640	50	66000	15.5
E-2E	1	38	24	2640	50	66000	15.5
E-2E	1	39	25	2640	50	66000	15.5
E-2E	1	40	25	2640	50	66000	15.5
E-2E	1	41	25	2640	50	66000	15.5
E-2E	1	42	25	2640	50	66000	15.5
E-2E	1	43	25	2640	50	66000	15.5
E-2E	1	44	25	2640	50	66000	15.5
E-2E	1	45	25	450	50	11250	15.5
E-2E	1	45	25	2190	50	54750	9.3
E-2E	1	46	25	2640	50	66000	9.3
E-2E	1	47	25	2640	50	66000	9.3
E-2E	1	48	25	2640	50	66000	9.3
E-2E	1	49	25	2640	50	66000	9.3
E-2E	1	50	25	605	50	15125	9.3
E-2.5E	1	36	27	2415	50	60375	15.5
E-2.5E	1	35	27	2640	50	66000	15.5
E-2.5E	1	34	27	2640	50	66000	15.5
E-2.5E	1	33	27	300	50	7500	15.5
E-2.5	1	12	26	905	50	22625	12.5
E-2.5	1	11	26	1660	50	41500	12.5
E-2.5	1	10	26	905	50	22625	12.5

* based on 1 ft of sediment with a hydraulic conductivity of 0.5 ft/day

TABLE I-2 RIVER PACKAGE DATA FOR THE SOUTH PALM BEACH MODEL (page 7)
LAKE WORTH DRAINAGE DISTRICT CANALS

CANAL	MODEL LAYER	MODEL ROW	MODEL COLUMN	REACH LENGTH (FT)	REACH WIDTH (FT)	REACH * CONDUCTANCE (FT2/DAY)	CANAL STAGE (NGVD)
E-2.5	1	9	26	1660	50	41500	12.5
E-2.5	1	8	26	1210	50	30250	12.5
E-3	1	2	30	2265	50	56625	12.5
E-3	1	3	30	2640	50	66000	12.5
E-3	1	4	30	2640	50	66000	12.5
E-3	1	5	30	2640	50	66000	12.5
E-3	1	6	30	2640	50	66000	12.5
E-3	1	7	30	2640	50	66000	12.5
E-3	1	8	30	2640	50	66000	12.5
E-3	1	9	29	2640	50	66000	12.5
E-3	1	10	29	2640	50	66000	12.5
E-3	1	11	29	2640	50	66000	12.5
E-3	1	12	29	2640	50	66000	12.5
E-3	1	13	29	2640	50	66000	12.5
E-3	1	14	29	1280	50	32000	12.5
E-3	1	14	29	1360	50	34000	15.5
E-3	1	15	29	2640	50	66000	15.5
E-3	1	16	29	2640	50	66000	15.5
E-3	1	17	29	2640	50	66000	15.5
E-3	1	18	29	2640	50	66000	15.5
E-3	1	19	29	2640	50	66000	15.5
E-3	1	20	29	2640	50	66000	15.5
E-3	1	21	29	2640	50	66000	15.5
E-3	1	22	29	2640	50	66000	15.5
E-3	1	23	29	2640	50	66000	15.5
E-3	1	24	29	2640	50	66000	15.5
E-3	1	25	29	2640	50	66000	15.5
E-3	1	26	29	2640	50	66000	15.5
E-3	1	27	29	2640	50	66000	15.5
E-3	1	28	29	2640	50	66000	15.5
E-3	1	29	29	2640	50	66000	15.5
E-3	1	30	29	2640	50	66000	15.5
E-3	1	31	29	2640	50	66000	15.5
E-3	1	32	29	2640	50	66000	15.5
E-3	1	33	29	2640	50	66000	15.5
E-3	1	34	30	2640	50	66000	15.5
E-3	1	35	30	2640	50	66000	15.5
E-3	1	36	30	2640	50	66000	15.5
E-3	1	37	30	2640	50	66000	15.5
E-3	1	38	30	2640	50	66000	15.5
E-3	1	39	30	2440	50	61000	15.5
E-3	1	39	30	200	50	5000	9.3
E-3	1	40	30	2640	50	66000	9.3
E-3	1	41	30	2640	50	66000	9.3

* based on 1 ft of sediment with a hydraulic conductivity of 0.5 ft/day

TABLE I-2 RIVER PACKAGE DATA FOR THE SOUTH PALM BEACH MODEL (page 8)
LAKE WORTH DRAINAGE DISTRICT CANALS

CANAL	MODEL LAYER	MODEL ROW	MODEL COLUMN	REACH LENGTH (FT)	REACH WIDTH (FT)	REACH * CONDUCTANCE (FT2/DAY)	CANAL STAGE (NGVD)
E-3	1	42	30	2640	50	66000	9.3
E-3	1	43	30	2640	50	66000	9.3
E-3	1	44	30	2640	50	66000	9.3
E-3	1	45	30	2640	50	66000	9.3
E-3	1	46	30	2640	50	66000	9.3
E-3	1	47	30	2640	50	66000	9.3
E-3	1	48	30	2640	50	66000	9.3
E-3	1	49	30	2640	50	66000	9.3
E-3	1	50	30	300	50	7500	9.3
E-3.5-1	1	45	31	2640	50	66000	0.6
E-3.5-3	1	34	33	1885	50	47125	8.5
E-3.5-3	1	33	33	2640	50	66000	8.5
E-3.5-3	1	32	33	605	50	15125	8.5
E-3.5-4	1	30	33	1735	50	43375	8.5
E-3.5-4	1	29	33	905	50	22625	8.5
E-3.5-E	1	28	35	1510	50	37750	8.5
E-3.5-E	1	27	35	1510	50	37750	8.5
E-4	1	5	36	2036	455	463190	8.5
E-4	1	6	36	2640	530	699600	8.5
E-4	1	7	36	2640	380	501600	8.5
E-4	1	8	36	3800	50	95000	8.5
E-4	1	9	36	755	50	18875	8.5
E-4	1	9	35	1960	50	49000	8.5
E-4	1	10	35	3320	50	83000	8.5
LAKE OSBO	1	10	36	2640	1210	1597200	8.5
E-4	1	11	36	2640	150	198000	8.5
E-4	1	12	36	2640	1360	1795200	8.5
E-4	1	13	36	2640	980	1293600	8.5
E-4	1	14	36	2640	1132	1494240	8.5
E-4	1	15	35	1885	75	70687.5	8.5
E-4	1	15	36	1735	1360	1179800	8.5
E-4	1	16	35	2640	80	105600	8.5
E-4	1	17	35	2640	95	125400	8.5
E-4	1	18	35	2640	85	112200	8.5
E-4	1	19	35	2640	85	112200	8.5
E-4	1	20	35	2640	100	132000	8.5
E-4	1	21	35	2640	85	112200	8.5
E-4	1	22	35	2640	90	118800	8.5
E-4	1	23	35	2415	85	102637.5	8.5
E-4	1	23	36	905	85	38462.5	8.5
E-4	1	24	36	2640	85	112200	8.5
E-4	1	25	36	2640	90	118800	8.5
E-4	1	26	36	2640	80	105600	8.5
E-4	1	27	36	2640	980	1293600	8.5

* based on 1 ft of sediment with a hydraulic conductivity of 0.5 ft/day

TABLE I-2 RIVER PACKAGE DATA FOR THE SOUTH PALM BEACH MODEL (page 9)
LAKE WORTH DRAINAGE DISTRICT CANALS

CANAL	MODEL LAYER	MODEL ROW	MODEL COLUMN	REACH LENGTH (FT)	REACH WIDTH (FT)	REACH * CONDUCTANCE (FT2/DAY)	CANAL STAGE (NGVD)
E-4	1	28	36	2640	605	798600	8.5
E-4	1	28	35	1960	605	592900	8.5
E-4	1	29	35	2640	1285	1696200	8.5
E-4	1	30	35	1510	300	226500	8.5
E-4	1	30	34	1660	300	249000	8.5
E-4	1	31	34	2640	50	66000	8.5
E-4	1	32	34	2640	50	66000	8.5
E-4	1	33	34	2640	50	66000	8.5
E-4	1	34	34	2640	50	66000	8.5
E-4	1	35	33	2640	50	66000	8.5
E-4	1	36	33	2640	50	66000	8.5
E-4	1	37	33	2640	50	66000	8.5
E-4	1	38	33	450	50	11250	8.5
E-4	1	38	33	2190	50	54750	4.5
E-4	1	39	34	2640	50	66000	4.5
E-4	1	40	34	2640	50	66000	4.5
E-4	1	41	34	2640	50	66000	4.5
E-4	1	42	34	2640	50	66000	4.5
E-4	1	43	34	2640	50	66000	4.5
E-4	1	44	34	1060	50	26500	4.5
E-4	1	44	34	1600	50	40000	0.6
E-4	1	45	34	2790	50	69750	0.6
E-4	1	46	34	2640	50	66000	0.6
E-4	1	47	34	2715	50	67875	0.6
E-4	1	48	34	2640	50	66000	0.6
E-4	1	49	34	2640	50	66000	0.6
E-4	1	50	34	1210	50	30250	0.6
L-5	1	3	20	380	30	5700	15.5
L-5	1	3	21	2640	30	39600	15.5
L-5	1	3	22	905	30	13575	15.5
L-5	1	3	22	1735	30	26025	12.5
L-5	1	3	23	2640	30	39600	12.5
L-5	1	3	24	2640	30	39600	12.5
L-5	1	3	25	2640	30	39600	12.5
L-5	1	3	26	2640	30	39600	12.5
L-5	1	3	27	2640	30	39600	12.5
L-5	1	3	28	2640	30	39600	12.5
L-5	1	3	29	2640	30	39600	12.5
L-5	1	3	30	2640	30	39600	12.5
L-5	1	3	31	2640	30	39600	12.5
L-5	1	3	32	300	30	4500	12.5
L-5	1	3	32	2340	30	35100	8.5
L-5	1	3	33	2640	30	39600	8.5
L-5	1	3	34	2640	30	39600	8.5

* based on 1 ft of sediment with a hydraulic conductivity of 0.5 ft/day

TABLE I-2 RIVER PACKAGE DATA FOR THE SOUTH PALM BEACH MODEL (page 10)
LAKE WORTH DRAINAGE DISTRICT CANALS

CANAL	MODEL LAYER	MODEL ROW	MODEL COLUMN	REACH LENGTH (FT)	REACH WIDTH (FT)	REACH * CONDUCTANCE (FT2/DAY)	CANAL STAGE (NGVD)
L-5	1	3	35	2640	30	39600	8.5
L-5	1	3	36	1510	30	22650	8.5
L-6	1	4	20	450	30	6750	15.5
L-6	1	4	21	2640	30	39600	15.5
L-6	1	4	22	905	30	13575	15.5
L-6	1	4	22	1735	30	26025	12.5
L-6	1	4	23	2640	30	39600	12.5
L-6	1	4	24	830	30	12450	12.5
L-6	1	4	27	2640	30	39600	12.5
L-6	1	4	28	2640	30	39600	12.5
L-6	1	4	29	2640	30	39600	12.5
L-6	1	4	30	2640	30	39600	12.5
L-6	1	4	31	2640	30	39600	12.5
L-6	1	4	32	200	30	3000	12.5
L-6	1	4	32	2440	30	36600	8.5
L-6	1	4	33	2640	30	39600	8.5
L-6	1	4	34	2640	30	39600	8.5
L-6	1	4	35	2640	30	39600	8.5
L-6	1	4	36	2110	30	31650	8.5
OKEE PK C	1	3	25	1280	30	19200	12.5
OKEE PK C	1	3	26	2110	30	31650	12.5
OKEE PK C	1	4	26	3770	30	56550	12.5
OKEE PK C	1	5	26	1810	30	27150	12.5
L-7	1	5	20	450	30	6750	15.5
L-7	1	5	21	2640	30	39600	15.5
L-7	1	5	22	1060	30	15900	15.5
L-7	1	5	22	1580	30	23700	12.5
L-7	1	5	23	2640	30	39600	12.5
L-7	1	5	24	755	30	11325	12.5
L-7	1	5	28	2640	30	39600	12.5
L-7	1	5	29	2640	30	39600	12.5
L-7	1	5	30	2640	30	39600	12.5
L-7	1	5	31	2640	30	39600	12.5
L-7	1	5	32	225	30	3375	12.5
L-7	1	5	32	2415	30	36225	8.5
L-7	1	5	33	2640	30	39600	8.5
L-7	1	5	34	2640	30	39600	8.5
L-7	1	5	35	2640	30	39600	8.5
L-7	1	5	36	2110	30	31650	8.5
L-8	1	6	20	450	30	6750	15.5
L-8	1	6	21	2640	30	39600	15.5
L-8	1	6	22	1060	30	15900	15.5
L-8	1	6	22	1580	30	23700	12.5
L-8	1	6	23	2640	30	39600	12.5

* based on 1 ft of sediment with a hydraulic conductivity of 0.5 ft/day

TABLE I-2 RIVER PACKAGE DATA FOR THE SOUTH PALM BEACH MODEL (page 11)
LAKE WORTH DRAINAGE DISTRICT CANALS

CANAL	MODEL LAYER	MODEL ROW	MODEL COLUMN	REACH LENGTH (FT)	REACH WIDTH (FT)	REACH * CONDUCTANCE (FT2/DAY)	CANAL STAGE (NGVD)
L-8	1	6	24	905	30	13575	12.5
L-8	1	6	28	2640	30	39600	12.5
L-8	1	6	29	2640	30	39600	12.5
L-8	1	6	30	2640	30	39600	12.5
L-8	1	6	31	2640	30	39600	12.5
L-8	1	6	32	330	30	4950	12.5
L-8	1	6	32	2310	30	34650	8.5
L-8	1	6	33	2640	30	39600	8.5
L-8	1	6	34	2640	30	39600	8.5
L-8	1	6	35	2640	30	39600	8.5
L-8	1	6	36	1800	30	27000	8.5
PINE ST.	1	7	24	1225	30	18375	12.5
PINE ST.	1	7	25	2640	30	39600	12.5
PINE ST.	1	7	26	4680	30	70200	12.5
PINE ST.	1	6	26	2640	30	39600	12.5
L-9	1	7	20	560	30	8400	15.5
L-9	1	7	21	2640	30	39600	15.5
L-9	1	7	22	1040	30	15600	15.5
L-9	1	7	22	1600	30	24000	12.5
L-9	1	7	23	2640	30	39600	12.5
L-9	1	7	24	565	30	8475	12.5
L-9	1	7	26	300	30	4500	12.5
L-9	1	7	27	2460	30	36900	12.5
L-9	1	7	28	2640	30	39600	12.5
L-9	1	7	29	2640	30	39600	12.5
L-9	1	7	30	2640	30	39600	12.5
L-9	1	7	31	2640	30	39600	12.5
L-9	1	7	32	300	30	4500	12.5
L-9	1	7	32	2340	30	35100	8.5
L-9	1	7	33	2640	30	39600	8.5
L-9	1	7	34	2640	30	39600	8.5
L-9	1	7	35	2640	30	39600	8.5
L-9	1	7	36	2265	30	33975	8.5
L-10	1	8	20	660	30	9900	15.5
L-10	1	8	21	2640	30	39600	15.5
L-10	1	8	22	1040	30	15600	15.5
L-10	1	8	22	1700	30	25500	12.5
L-10	1	8	23	2640	30	39600	12.5
L-10	1	8	24	1225	30	18375	12.5
L-10	1	8	25	2640	30	39600	12.5
L-10	1	8	26	2640	30	39600	12.5
L-10	1	8	27	2640	30	39600	12.5
L-10	1	8	28	2640	30	39600	12.5
L-10	1	8	29	2640	30	39600	12.5

* based on 1 ft of sediment with a hydraulic conductivity of 0.5 ft/day

TABLE I-2 RIVER PACKAGE DATA FOR THE SOUTH PALM BEACH MODEL (page 12)
LAKE WORTH DRAINAGE DISTRICT CANALS

CANAL	MODEL LAYER	MODEL ROW	MODEL COLUMN	REACH LENGTH (FT)	REACH WIDTH (FT)	REACH * CONDUCTANCE (FT2/DAY)	CANAL STAGE (NGVD)
L-10	1	8	30	2640	30	39600	12.5
L-10	1	8	31	2640	30	39600	12.5
L-10	1	8	32	2640	30	39600	8.5
L-10	1	8	33	2640	30	39600	8.5
L-10	1	8	34	2640	30	39600	8.5
L-10	1	8	35	2640	30	39600	8.5
L-10	1	8	36	2265	30	33975	8.5
L-11	1	9	20	755	30	11325	15.5
L-11	1	9	21	2640	30	39600	15.5
L-11	1	9	22	1320	30	19800	15.5
L-11	1	9	22	1320	30	19800	12.5
L-11	1	9	23	2640	30	39600	12.5
L-11	1	9	24	860	30	12900	12.5
L-11	1	9	24	1040	30	15600	12.5
L-11	1	9	25	2640	30	39600	12.5
L-11	1	9	26	2640	30	39600	12.5
L-11	1	9	27	2640	30	39600	12.5
L-11	1	9	28	2640	30	39600	12.5
L-11	1	9	29	2640	30	39600	12.5
L-11	1	9	30	2640	30	39600	12.5
L-11	1	9	31	2640	30	39600	12.5
L-11	1	9	32	2640	30	39600	8.5
L-11	1	9	33	2640	30	39600	8.5
L-11	1	9	34	2640	30	39600	8.5
L-11	1	9	35	2640	30	39600	8.5
L-12	1	10	20	790	30	11850	15.5
L-12	1	10	21	2640	30	39600	15.5
L-12	1	10	22	2640	30	39600	15.5
L-12	1	10	23	2640	30	39600	15.5
L-12	1	10	24	1040	30	15600	15.5
L-12	1	10	31	3200	30	48000	12.5
L-12	1	10	32	2640	30	39600	8.5
L-12	1	10	33	2640	30	39600	8.5
L-12	1	10	34	2640	30	39600	8.5
L-12	1	10	35	1510	30	22650	8.5
L-13	1	11	20	755	30	11325	15.5
L-13	1	11	21	2640	30	39600	15.5
L-13	1	11	22	2640	30	39600	15.5
L-13	1	11	23	2640	30	39600	15.5
L-13	1	11	24	1130	30	16950	15.5
L-13	1	11	24	980	30	14700	12.5
L-13	1	11	25	2640	30	39600	12.5
L-13	1	11	26	1700	30	25500	12.5
L-13	1	11	27	370	30	5550	12.5

* based on 1 ft of sediment with a hydraulic conductivity of 0.5 ft/day

TABLE I-2 RIVER PACKAGE DATA FOR THE SOUTH PALM BEACH MODEL (page 13)
LAKE WORTH DRAINAGE DISTRICT CANALS

CANAL	MODEL LAYER	MODEL ROW	MODEL COLUMN	REACH LENGTH (FT)	REACH WIDTH (FT)	REACH * CONDUCTANCE (FT2/DAY)	CANAL STAGE (NGVD)
L-13	1	11	28	3200	30	48000	12.5
L-13	1	11	29	2640	30	39600	12.5
L-13	1	11	30	2640	30	39600	12.5
L-13	1	11	31	2540	30	38100	12.5
L-13	1	11	31	100	30	1500	8.5
L-13	1	11	32	2640	30	39600	8.5
L-13	1	11	33	2640	30	39600	8.5
L-13	1	11	34	2640	30	39600	8.5
L-13	1	11	35	2640	30	39600	8.5
L-13	1	11	36	380	30	5700	8.5
L-14	1	12	20	850	30	12750	15.5
L-14	1	12	21	2640	30	39600	15.5
L-14	1	12	22	2640	30	39600	15.5
L-14	1	12	23	2640	30	39600	15.5
L-14	1	12	24	1130	30	16950	15.5
L-14	1	12	24	945	30	14175	12.5
L-14	1	12	25	2640	30	39600	12.5
L-14	1	12	26	2640	30	39600	12.5
L-14	1	12	27	2640	30	39600	12.5
L-14	1	12	28	2640	30	39600	12.5
L-14	1	12	29	2640	30	39600	12.5
L-14	1	12	30	2640	30	39600	12.5
L-14	1	12	31	2640	30	39600	12.5
L-14	1	12	32	1700	30	25500	12.5
L-14	1	12	32	940	30	14100	8.5
L-14	1	12	33	2640	30	39600	8.5
L-14	1	12	34	2640	30	39600	8.5
L-14	1	12	35	2640	30	39600	8.5
L-15	1	13	24	850	30	12750	12.5
L-15	1	13	25	2640	30	39600	12.5
L-15	1	13	26	2640	30	39600	12.5
L-15	1	13	27	2640	30	39600	12.5
L-15	1	13	28	100	30	1500	12.5
L-15	1	12	28	2450	30	36750	12.5
L-15	1	13	29	470	30	7050	12.5
L-15	1	13	30	2640	30	39600	12.5
L-15	1	13	31	2640	30	39600	12.5
L-15	1	13	32	2640	30	39600	12.5
L-15	1	13	33	2640	30	39600	12.5
L-15	1	13	34	1320	30	19800	8.5
L-15	1	12	34	2100	30	31500	8.5
L-16	1	14	20	850	30	12750	15.5
L-16	1	14	21	2640	30	39600	15.5
L-16	1	14	22	2640	30	39600	15.5

* based on 1 ft of sediment with a hydraulic conductivity of 0.5 ft/day

TABLE I-2 RIVER PACKAGE DATA FOR THE SOUTH PALM BEACH MODEL (page 14)
LAKE WORTH DRAINAGE DISTRICT CANALS

CANAL	MODEL LAYER	MODEL ROW	MODEL COLUMN	REACH LENGTH (FT)	REACH WIDTH (FT)	REACH * CONDUCTANCE (FT2/DAY)	CANAL STAGE (NGVD)
L-16	1	14	23	2640	30	39600	15.5
L-16	1	14	24	1225	30	18375	15.5
L-16	1	14	24	850	30	12750	15.5
L-16	1	14	25	2640	30	39600	15.5
L-16	1	14	26	2640	30	39600	15.5
L-16	1	14	27	2100	30	31500	15.5
L-16	1	14	27	540	30	8100	12.5
L-16	1	14	28	2640	30	39600	12.5
L-16	1	14	29	2100	30	31500	12.5
L-16	1	14	29	470	30	7050	15.5
L-16	1	14	30	2640	30	39600	15.5
L-16	1	14	31	940	30	14100	15.5
L-16	1	14	31	1700	30	25500	8.5
L-16	1	14	32	2830	30	42450	8.5
L-16	1	14	33	2830	30	42450	8.5
L-16	1	14	34	2640	30	39600	8.5
L-16	1	14	35	2830	30	42450	8.5
L-17	1	15	27	285	30	4275	15.5
L-17	1	15	28	2640	30	39600	15.5
L-17	1	15	29	2640	30	39600	15.5
L-17	1	15	30	2640	30	39600	15.5
L-17	1	15	31	940	30	14100	15.5
L-17	1	15	31	1700	30	25500	8.5
L-17	1	15	32	2640	30	39600	8.5
L-17	1	15	33	2640	30	39600	8.5
L-17	1	15	34	2640	30	39600	8.5
L-17	1	15	35	2450	30	36750	8.5
L-18	1	16	20	850	30	12750	15.5
L-18	1	16	21	2640	30	39600	15.5
L-18	1	16	22	2640	30	39600	15.5
L-18	1	16	23	2640	30	39600	15.5
L-18	1	16	24	2110	30	31650	15.5
L-18	1	16	25	2640	30	39600	15.5
L-18	1	16	26	2640	30	39600	15.5
L-18	1	16	27	2640	30	39600	15.5
L-18	1	16	28	2640	30	39600	15.5
L-18	1	16	29	2640	30	39600	15.5
L-18	1	16	30	2640	30	39600	15.5
L-18	1	16	31	2640	30	39600	15.5
L-18	1	16	32	2640	30	39600	8.5
L-18	1	16	33	2640	30	39600	8.5
L-18	1	16	34	2640	30	39600	8.5
L-18	1	16	35	2450	30	36750	8.5
L-19	1	17	20	850	30	12750	15.5

* based on 1 ft of sediment with a hydraulic conductivity of 0.5 ft/day

TABLE I-2 RIVER PACKAGE DATA FOR THE SOUTH PALM BEACH MODEL (page 15)
LAKE WORTH DRAINAGE DISTRICT CANALS

CANAL	MODEL LAYER	MODEL ROW	MODEL COLUMN	REACH LENGTH (FT)	REACH WIDTH (FT)	REACH * CONDUCTANCE (FT2/DAY)	CANAL STAGE (NGVD)
L-19	1	17	21	2640	30	39600	15.5
L-19	1	17	22	2640	30	39600	15.5
L-19	1	17	23	2640	30	39600	15.5
L-19	1	17	24	1415	30	21225	15.5
L-19	1	17	28	2640	30	39600	15.5
L-19	1	17	29	2640	30	39600	15.5
L-19	1	17	30	2340	30	35100	15.5
L-19	1	17	30	300	30	4500	14.5
L-19	1	17	31	2640	30	39600	14.5
L-19	1	17	32	2640	30	39600	14.5
L-19	1	17	33	1700	30	25500	14.5
L-19	1	17	33	940	30	14100	8.5
L-19	1	17	34	2640	30	39600	8.5
L-19	1	17	35	1130	30	16950	8.5
L-20	1	18	20	850	30	12750	15.5
L-20	1	18	21	2640	30	39600	15.5
L-20	1	18	22	2640	30	39600	15.5
L-20	1	18	23	2640	30	39600	15.5
L-20	1	18	24	2110	30	31650	15.5
L-20	1	18	25	2640	30	39600	15.5
L-20	1	18	26	2640	30	39600	15.5
L-20	1	18	27	2640	30	39600	15.5
L-20	1	18	28	2640	30	39600	15.5
L-20	1	18	29	2640	30	39600	15.5
L-20	1	18	30	2640	30	39600	15.5
L-20	1	18	31	2075	30	31125	15.5
L-20	1	18	31	565	30	8475	14.5
L-20	1	18	32	2640	30	39600	14.5
L-20	1	18	33	1700	30	25500	14.5
L-20	1	18	33	940	30	14100	8.5
L-20	1	18	34	2640	30	39600	8.5
L-20	1	18	35	1040	30	15600	8.5
L-21	1	19	20	850	30	12750	15.5
L-21	1	19	21	2640	30	39600	15.5
L-21	1	19	22	2640	30	39600	15.5
L-21	1	19	23	2640	30	39600	15.5
L-21	1	19	24	1415	30	21225	15.5
L-21	1	19	27	380	30	5700	15.5
L-21	1	19	28	2640	30	39600	15.5
L-21	1	19	29	2640	30	39600	15.5
L-21	1	19	30	2450	30	36750	15.5
L-21	1	19	30	190	30	2850	14.5
L-21	1	19	31	2640	30	39600	14.5
L-21	1	19	32	2640	30	39600	14.5

* based on 1 ft of sediment with a hydraulic conductivity of 0.5 ft/day

TABLE I-2 RIVER PACKAGE DATA FOR THE SOUTH PALM BEACH MODEL (page 16)
LAKE WORTH DRAINAGE DISTRICT CANALS

CANAL	MODEL LAYER	MODEL ROW	MODEL COLUMN	REACH LENGTH (FT)	REACH WIDTH (FT)	REACH * CONDUCTANCE (FT2/DAY)	CANAL STAGE (NGVD)
L-21	1	19	33	1700	30	25500	14.5
L-21	1	19	33	940	30	14100	8.5
L-21	1	19	34	2640	30	39600	8.5
L-21	1	19	35	1000	30	15000	8.5
L-22	1	20	24	755	30	11325	15.5
L-22	1	20	25	2640	30	39600	15.5
L-22	1	20	26	2640	30	39600	15.5
L-22	1	20	27	2260	30	33900	15.5
L-22	1	20	30	280	30	4200	8.5
L-22	1	20	31	2640	30	39600	8.5
L-22	1	20	32	2640	30	39600	8.5
L-22	1	20	33	940	30	14100	8.5
C-16	1	20	21	905	60	27150	15.5
C-16	1	21	21	2640	60	79200	15.5
C-16	1	21	22	2640	60	79200	15.5
C-16	1	21	23	2640	60	79200	15.5
C-16	1	21	24	2640	60	79200	15.5
C-16	1	21	25	2640	60	79200	15.5
C-16	1	21	26	2640	70	92400	15.5
C-16	1	21	27	2640	75	99000	15.5
C-16	1	21	28	2640	75	99000	15.5
C-16	1	21	29	2640	85	112200	15.5
C-16	1	20	30	2640	100	132000	15.5
C-16	1	20	31	2640	100	132000	15.5
C-16	1	20	32	2640	100	132000	15.5
C-16	1	20	33	2640	100	132000	8.5
C-16	1	20	34	2640	110	145200	8.5
C-16	1	20	35	2260	110	124300	8.5
C-16	1	20	36	2640	140	184800	8.5
C-16	1	20	37	2640	150	198000	8.5
C-16	1	20	38	2640	170	224400	8.5
C-16	1	20	39	660	170	56100	8.5
C-16	1	20	39	660	170	56100	0.6
L-23	1	21	20	850	30	12750	15.5
L-23	1	21	21	2640	30	39600	15.5
L-23	1	21	22	2640	30	39600	15.5
L-23	1	21	23	2640	30	39600	15.5
L-23	1	21	24	2100	30	31500	15.5
L-23	1	21	25	2640	30	39600	15.5
L-23	1	21	26	2075	30	31125	15.5
L-23	1	21	29	570	30	8550	15.5
L-23	1	21	30	2450	30	36750	15.5
L-23	1	21	30	190	30	2850	14.5
L-23	1	21	31	2640	30	39600	14.5

* based on 1 ft of sediment with a hydraulic conductivity of 0.5 ft/day

TABLE I-2 RIVER PACKAGE DATA FOR THE SOUTH PALM BEACH MODEL (page 17)
LAKE WORTH DRAINAGE DISTRICT CANALS

CANAL	MODEL LAYER	MODEL ROW	MODEL COLUMN	REACH LENGTH (FT)	REACH WIDTH (FT)	REACH * CONDUCTANCE (FT2/DAY)	CANAL STAGE (NGVD)
L-23	1	21	32	2640	30	39600	14.5
L-23	1	21	33	2000	30	30000	12.5
L-23	1	21	33	640	30	9600	8.5
L-23	1	21	34	1700	30	25500	8.5
L-24	1	22	20	850	30	12750	15.5
L-24	1	22	21	2640	30	39600	15.5
L-24	1	22	22	2640	30	39600	15.5
L-24	1	22	23	2640	30	39600	15.5
L-24	1	22	24	2100	30	31500	15.5
L-24	1	22	25	2640	30	39600	15.5
L-24	1	22	26	2640	30	39600	15.5
L-24	1	22	27	2640	30	39600	15.5
L-24	1	22	28	2640	30	39600	15.5
L-24	1	22	29	2170	30	32550	15.5
L-24	1	23	29	470	30	7050	15.5
L-24	1	23	30	2450	30	36750	15.5
L-24	1	22	30	1130	30	16950	8.5
L-24	1	22	31	2830	30	42450	8.5
L-24	1	22	32	2640	30	39600	8.5
L-24	1	22	33	2640	30	39600	8.5
L-24	1	22	34	2640	30	39600	8.5
L-24	1	22	35	1510	30	22650	8.5
L-25	1	23	20	850	30	12750	15.5
L-25	1	23	21	2640	30	39600	15.5
L-25	1	23	22	2640	30	39600	15.5
L-25	1	23	23	2640	30	39600	15.5
L-25	1	23	24	2100	30	31500	15.5
L-25	1	23	25	2640	30	39600	15.5
L-25	1	23	26	2640	30	39600	15.5
L-25	1	23	27	2640	30	39600	15.5
L-25	1	23	28	2640	30	39600	15.5
L-25	1	23	29	2640	30	39600	15.5
L-25	1	23	30	2450	30	36750	15.5
L-25	1	23	30	190	30	2850	12.5
L-25	1	23	31	2075	30	31125	12.5
L-25	1	23	31	565	30	8475	9.3
L-25	1	23	32	2640	30	39600	9.3
L-25	1	23	33	1320	30	19800	9.3
L-25	1	23	33	1320	30	19800	8.5
L-25	1	23	34	2640	30	39600	8.5
L-25	1	23	35	1510	30	22650	8.5
L-26	1	24	20	850	30	12750	15.5
L-26	1	24	21	2640	30	39600	15.5
L-26	1	24	22	2640	30	39600	15.5

* based on 1 ft of sediment with a hydraulic conductivity of 0.5 ft/day

TABLE I-2 RIVER PACKAGE DATA FOR THE SOUTH PALM BEACH MODEL (page 18)
LAKE WORTH DRAINAGE DISTRICT CANALS

CANAL	MODEL LAYER	MODEL ROW	MODEL COLUMN	REACH LENGTH (FT)	REACH WIDTH (FT)	REACH * CONDUCTANCE (FT2/DAY)	CANAL STAGE (NGVD)
L-26	1	24	23	2640	30	39600	15.5
L-26	1	24	24	2100	30	31500	15.5
L-26	1	24	25	2640	30	39600	15.5
L-26	1	24	26	2640	30	39600	15.5
L-26	1	24	27	2640	30	39600	15.5
L-26	1	24	28	2640	30	39600	15.5
L-26	1	24	29	2640	30	39600	15.5
L-26	1	24	30	2450	30	36750	15.5
L-26	1	24	30	190	30	2850	8.5
L-26	1	24	31	2640	30	39600	8.5
L-26	1	24	32	2640	30	39600	8.5
L-26	1	24	33	2640	30	39600	8.5
L-26	1	24	34	2640	30	39600	8.5
L-26	1	24	35	2640	30	39600	8.5
L-26	1	24	36	570	30	8550	8.5
L-27	1	25	20	850	30	12750	15.5
L-27	1	25	21	2640	30	39600	15.5
L-27	1	25	22	2640	30	39600	15.5
L-27	1	25	23	2640	30	39600	15.5
L-27	1	25	24	2100	30	31500	15.5
L-27	1	25	25	2640	30	39600	15.5
L-27	1	25	26	2640	30	39600	15.5
L-27	1	25	27	3110	30	46650	15.5
L-27	1	26	27	1600	30	24000	15.5
L-27	1	25	29	470	30	7050	15.5
L-27	1	25	30	2450	30	36750	15.5
L-27	1	25	30	190	30	2850	8.5
L-27	1	25	31	2640	30	39600	8.5
L-27	1	25	32	2640	30	39600	8.5
L-27	1	25	33	2640	30	39600	8.5
L-27	1	25	34	3200	30	48000	8.5
L-27	1	25	35	2640	30	39600	8.5
L-27	1	25	36	300	30	4500	8.5
L-28	1	26	20	850	30	12750	15.5
L-28	1	26	21	2640	30	39600	15.5
L-28	1	26	22	2640	30	39600	15.5
L-28	1	26	23	2640	30	39600	15.5
L-28	1	26	24	2110	30	31650	15.5
L-28	1	26	25	2640	30	39600	15.5
L-28	1	26	26	2640	30	39600	15.5
L-28	1	26	27	2640	30	39600	15.5
L-28	1	26	28	2640	30	39600	15.5
L-28	1	26	29	2640	30	39600	15.5
L-28	1	26	30	2450	30	36750	15.5

* based on 1 ft of sediment with a hydraulic conductivity of 0.5 ft/day

TABLE I-2 RIVER PACKAGE DATA FOR THE SOUTH PALM BEACH MODEL (page 19)
LAKE WORTH DRAINAGE DISTRICT CANALS

CANAL	MODEL LAYER	MODEL ROW	MODEL COLUMN	REACH LENGTH (FT)	REACH WIDTH (FT)	REACH * CONDUCTANCE (FT2/DAY)	CANAL STAGE (NGVD)
L-28	1	26	30	850	30	12750	12.5
L-28	1	26	31	2735	30	41025	12.5
L-28	1	27	31	1130	30	16950	12.5
L-28	1	26	32	2640	30	39600	8.5
L-28	1	26	33	2640	30	39600	8.5
L-28	1	26	34	2640	30	39600	8.5
L-28	1	26	35	2640	30	39600	8.5
L-28	1	26	36	380	30	5700	8.5
L-29	1	27	20	755	30	11325	15.5
L-29	1	27	21	2640	30	39600	15.5
L-29	1	27	22	2640	30	39600	15.5
L-29	1	27	23	2640	30	39600	15.5
L-29	1	27	24	2240	30	33600	15.5
L-29	1	27	25	2640	30	39600	15.5
L-29	1	27	26	2640	30	39600	15.5
L-29	1	27	27	2640	30	39600	15.5
L-29	1	27	28	2640	30	39600	15.5
L-29	1	27	29	2640	30	39600	15.5
L-29	1	27	30	2640	30	39600	15.5
L-29	1	27	31	1320	30	19800	15.5
L-29	1	27	31	1320	30	19800	11.5
L-29	1	27	32	1885	30	28275	11.5
L-29	1	28	32	1885	30	28275	11.5
L-29	1	27	35	1960	30	29400	8.5
L-30	1	28	20	755	30	11325	15.5
L-30	1	28	21	2640	30	39600	15.5
L-30	1	28	22	2640	30	39600	15.5
L-30	1	28	23	2640	30	39600	15.5
L-30	1	28	24	1980	30	29700	15.5
L-30	1	28	25	2640	30	39600	15.5
L-30	1	28	26	2640	30	39600	15.5
L-30	1	28	27	2640	30	39600	15.5
L-30	1	28	28	2640	30	39600	15.5
L-30	1	28	29	2640	30	39600	15.5
L-30	1	28	30	2640	30	39600	15.5
L-30	1	28	31	2640	30	39600	8.5
L-30	1	28	32	2640	30	39600	8.5
L-30	1	28	33	2640	30	39600	8.5
L-30	1	28	34	2640	30	39600	8.5
L-30	1	28	35	1510	30	22650	8.5
L-31	1	29	20	700	30	10500	15.5
L-31	1	29	21	2640	30	39600	15.5
L-31	1	29	22	2640	30	39600	15.5
L-31	1	29	23	2640	30	39600	15.5

* based on 1 ft of sediment with a hydraulic conductivity of 0.5 ft/day

TABLE I-2 RIVER PACKAGE DATA FOR THE SOUTH PALM BEACH MODEL (page 20)
LAKE WORTH DRAINAGE DISTRICT CANALS

CANAL	MODEL LAYER	MODEL ROW	MODEL COLUMN	REACH LENGTH (FT)	REACH WIDTH (FT)	REACH * CONDUCTANCE (FT2/DAY)	CANAL STAGE (NGVD)
L-31	1	29	24	1980	30	29700	15.5
L-31	1	29	25	2640	30	39600	15.5
L-31	1	29	26	2640	30	39600	15.5
L-31	1	29	27	2640	30	39600	15.5
L-31	1	29	28	3170	30	47550	15.5
L-31	1	29	29	2800	30	42000	15.5
L-31	1	29	30	2640	30	39600	15.5
L-31	1	29	31	2640	30	39600	8.5
L-31	1	29	32	2640	30	39600	8.5
L-32	1	30	20	600	30	9000	15.5
L-32	1	30	21	2640	30	39600	15.5
L-32	1	30	22	2640	30	39600	15.5
L-32	1	30	23	2640	30	39600	15.5
L-32	1	30	24	1980	30	29700	15.5
L-32	1	30	25	2640	30	39600	15.5
L-32	1	30	26	2640	30	39600	15.5
L-32	1	30	27	2640	30	39600	15.5
L-32	1	30	28	2640	30	39600	15.5
L-32	1	30	29	2640	30	39600	15.5
L-32	1	30	30	2640	30	39600	15.5
L-32	1	30	31	2640	30	39600	14.5
L-32	1	30	32	2640	30	39600	8.5
L-32	1	30	33	2640	30	39600	8.5
L-32	1	30	34	950	30	14250	8.5
L-33	1	31	20	565	30	8475	15.5
L-33	1	31	21	2640	30	39600	15.5
L-33	1	31	22	2640	30	39600	15.5
L-33	1	31	23	2640	30	39600	15.5
L-33	1	31	24	1800	30	27000	15.5
L-33	1	31	25	2640	30	39600	15.5
L-33	1	31	26	2640	30	39600	15.5
L-33	1	31	27	2640	30	39600	15.5
L-33	1	31	28	2640	30	39600	15.5
L-33	1	31	29	2640	30	39600	15.5
L-33	1	31	30	2640	30	39600	15.5
L-33	1	31	31	2640	30	39600	8.5
L-33	1	31	32	2640	30	39600	8.5
L-33	1	31	33	2640	30	39600	8.5
L-33	1	31	34	660	30	9900	8.5
L-34	1	33	20	470	30	7050	15.5
L-34	1	33	21	2640	30	39600	15.5
L-34	1	32	22	2640	30	39600	15.5
L-34	1	32	23	2640	30	39600	15.5
L-34	1	32	24	1900	30	28500	15.5

* based on 1 ft of sediment with a hydraulic conductivity of 0.5 ft/day

TABLE I-2 RIVER PACKAGE DATA FOR THE SOUTH PALM BEACH MODEL (page 21)
LAKE WORTH DRAINAGE DISTRICT CANALS

CANAL	MODEL LAYER	MODEL ROW	MODEL COLUMN	REACH LENGTH (FT)	REACH WIDTH (FT)	REACH * CONDUCTANCE (FT2/DAY)	CANAL STAGE (NGVD)
L-34	1	32	25	2640	30	39600	15.5
L-34	1	32	26	2640	30	39600	15.5
L-34	1	32	27	1060	30	15900	15.5
L-34	1	32	28	1510	30	22650	15.5
L-34	1	32	29	2640	30	39600	15.5
L-34	1	32	30	2640	30	39600	15.5
L-34	1	32	31	150	30	2250	15.5
L-34	1	32	31	1060	30	15900	12.5
L-34	1	32	31	1430	30	21450	9.3
L-34	1	32	32	1320	30	19800	9.3
L-34	1	32	32	1320	30	19800	8.5
L-34	1	32	33	300	30	4500	8.5
L-35	1	33	20	380	30	5700	15.5
L-35	1	33	21	2640	30	39600	15.5
L-35	1	33	22	2640	30	39600	15.5
L-35	1	33	23	2640	30	39600	15.5
L-35	1	33	24	1660	30	24900	15.5
L-35	1	33	27	1660	30	24900	15.5
L-35	1	33	28	2640	30	39600	15.5
L-35	1	33	29	2640	30	39600	15.5
L-35	1	33	30	2640	30	39600	15.5
L-35	1	33	31	150	30	2250	15.5
L-35	1	33	31	1060	30	15900	12.5
L-35	1	33	31	1430	30	21450	9.3
L-35	1	33	32	1320	30	19800	9.3
L-35	1	33	32	1320	30	19800	8.5
L-35	1	33	33	225	30	3375	8.5
L-36	1	34	20	350	30	5250	15.5
L-36	1	34	21	2640	30	39600	15.5
L-36	1	34	22	2640	30	39600	15.5
L-36	1	34	23	2640	30	39600	15.5
L-36	1	34	24	1730	30	25950	15.5
L-36	1	34	27	1360	30	20400	15.5
L-36	1	34	28	2640	30	39600	15.5
L-36	1	34	29	2640	30	39600	15.5
L-36	1	34	30	2640	30	39600	15.5
L-36	1	34	31	225	30	3375	15.5
L-36	1	34	31	2415	30	36225	14.5
L-36	1	34	32	840	30	12600	14.5
L-36	1	34	32	1800	30	27000	8.5
L-36	1	34	33	2640	30	39600	8.5
L-36	1	34	34	450	30	6750	8.5
L-37	1	36	20	300	30	4500	15.5
L-37	1	36	21	2640	30	39600	15.5

* based on 1 ft of sediment with a hydraulic conductivity of 0.5 ft/day

TABLE I-2 RIVER PACKAGE DATA FOR THE SOUTH PALM BEACH MODEL (page 22)
LAKE WORTH DRAINAGE DISTRICT CANALS

CANAL	MODEL LAYER	MODEL ROW	MODEL COLUMN	REACH LENGTH (FT)	REACH WIDTH (FT)	REACH * CONDUCTANCE (FT2/DAY)	CANAL STAGE (NGVD)
L-37	1	36	22	2640	30	39600	15.5
L-37	1	35	23	2640	30	39600	15.5
L-37	1	35	24	1660	30	24900	15.5
L-37	1	35	27	1360	30	20400	15.5
L-37	1	35	28	2640	30	39600	15.5
L-37	1	35	29	2640	30	39600	15.5
L-37	1	35	30	2640	30	39600	15.5
L-37	1	35	31	1360	30	20400	15.5
L-37	1	35	31	1660	30	24900	8.5
L-37	1	35	32	2640	30	39600	8.5
L-37	1	35	33	2500	30	37500	8.5
L-38	1	37	20	250	30	3750	15.5
L-38	1	37	21	2640	30	39600	15.5
L-38	1	37	22	2640	30	39600	15.5
L-38	1	37	23	2640	30	39600	15.5
L-38	1	36	24	1960	30	29400	15.5
L-38	1	36	25	2640	100	132000	15.5
L-38	1	36	26	2640	100	132000	15.5
L-38	1	36	27	2640	100	132000	15.5
L-38	1	36	28	2640	100	132000	15.5
L-38	1	36	29	2640	100	132000	15.5
L-38	1	36	30	1040	100	52000	15.5
L-38	1	36	30	1600	100	80000	8.5
L-38	1	36	31	2640	100	132000	8.5
L-38	1	36	32	2640	100	132000	8.5
L-38	1	36	33	2500	100	125000	8.5
C-15	1	36	34	2640	175	231000	8.5
C-15	1	36	35	2640	175	231000	8.5
C-15	1	36	36	2640	175	231000	8.5
C-15	1	36	37	1320	175	115500	8.5
C-15	1	36	37	1320	175	115500	0.6
L-39	1	38	20	200	30	3000	15.5
L-39	1	38	21	2640	30	39600	15.5
L-39	1	38	22	2640	30	39600	15.5
L-39	1	38	23	2640	30	39600	15.5
L-39	1	38	24	2110	30	31650	15.5
L-39	1	37	28	1885	30	28275	15.5
L-39	1	37	29	2640	30	39600	15.5
L-39	1	37	30	225	30	3375	15.5
L-40	1	39	20	150	30	2250	15.5
L-40	1	39	21	2640	30	39600	15.5
L-40	1	39	22	2640	30	39600	15.5
L-40	1	39	23	150	30	2250	15.5
L-40	1	38	25	2640	30	39600	15.5

* based on 1 ft of sediment with a hydraulic conductivity of 0.5 ft/day

TABLE I-2 RIVER PACKAGE DATA FOR THE SOUTH PALM BEACH MODEL (page 23)
LAKE WORTH DRAINAGE DISTRICT CANALS

CANAL	MODEL LAYER	MODEL ROW	MODEL COLUMN	REACH LENGTH (FT)	REACH WIDTH (FT)	REACH * CONDUCTANCE (FT2/DAY)	CANAL STAGE (NGVD)
L-40	1	38	26	2640	30	39600	15.5
L-40	1	38	27	2640	30	39600	15.5
L-40	1	38	28	2640	30	39600	15.5
L-40	1	38	29	2640	30	39600	15.5
L-40	1	38	30	1040	30	15600	15.5
L-40	1	38	30	1600	30	24000	4.5
L-40	1	38	31	2640	30	39600	4.5
L-40	1	38	32	2640	30	39600	4.5
L-40	1	38	33	2640	30	39600	4.5
L-40	1	38	34	2640	30	39600	4.5
L-40	1	38	35	2640	30	39600	4.5
L-40	1	38	36	150	30	2250	4.5
L-41	1	40	21	1510	30	22650	15.5
L-41	1	40	22	2640	30	39600	15.5
L-41	1	40	23	2640	30	39600	15.5
L-41	1	40	24	2265	30	33975	15.5
L-41	1	39	27	605	30	9075	15.5
L-41	1	39	28	2640	30	39600	15.5
L-41	1	39	29	2640	30	39600	15.5
L-41	1	39	30	1810	30	27150	15.5
L-41	1	39	30	830	30	12450	4.5
L-41	1	39	31	2640	30	39600	4.5
L-41	1	39	32	2640	30	39600	4.5
L-41	1	39	33	2640	30	39600	4.5
L-42	1	41	21	1660	30	24900	15.5
L-42	1	41	22	2640	30	39600	15.5
L-42	1	41	23	2640	30	39600	15.5
L-42	1	41	24	2415	30	36225	15.5
L-42	1	41	25	2440	30	36600	15.5
L-42	1	41	26	2640	30	39600	15.5
L-42	1	40	27	2640	30	39600	15.5
L-42	1	40	28	1320	30	19800	15.5
L-42	1	40	28	1320	30	19800	9.3
L-42	1	40	29	2640	30	39600	9.3
L-42	1	40	30	500	30	7500	9.3
L-42	1	40	30	2140	30	32100	4.5
L-42	1	40	31	2640	30	39600	4.5
L-42	1	40	32	2640	30	39600	4.5
L-42	1	40	33	2640	30	39600	4.5
L-42	1	40	34	150	30	2250	4.5
L-43	1	42	25	2340	30	35100	15.5
L-43	1	42	26	2640	30	39600	15.5
L-43	1	42	27	2640	30	39600	15.5
L-43	1	42	28	1320	30	19800	15.5

* based on 1 ft of sediment with a hydraulic conductivity of 0.5 ft/day

TABLE I-2 RIVER PACKAGE DATA FOR THE SOUTH PALM BEACH MODEL (page 24)
LAKE WORTH DRAINAGE DISTRICT CANALS

CANAL	MODEL LAYER	MODEL ROW	MODEL COLUMN	REACH LENGTH (FT)	REACH WIDTH (FT)	REACH * CONDUCTANCE (FT2/DAY)	CANAL STAGE (NGVD)
L-43	1	42	28	1320	30	19800	9.3
L-43	1	41	29	2640	30	39600	9.3
L-43	1	41	30	2640	30	39600	9.3
L-43	1	41	31	640	30	9600	9.3
L-43	1	41	31	2000	30	30000	4.5
L-43	1	42	32	2265	30	33975	4.5
L-44	1	43	21	2600	30	39000	15.5
L-44	1	43	22	2640	30	39600	15.5
L-44	1	43	23	2640	30	39600	15.5
L-44	1	43	24	2415	30	36225	15.5
L-44	1	43	25	2265	30	33975	15.5
L-44	1	43	26	2640	30	39600	15.5
L-44	1	43	27	2640	30	39600	15.5
L-44	1	43	28	1320	30	19800	15.5
L-44	1	43	28	1320	30	19800	9.3
L-44	1	43	29	2640	30	39600	9.3
L-44	1	43	30	605	30	9075	9.3
L-45	1	44	21	2600	30	39000	15.5
L-45	1	44	22	2640	30	39600	15.5
L-45	1	44	23	2640	30	39600	15.5
L-45	1	44	24	2600	30	39000	15.5
L-45	1	44	25	3000	30	45000	15.5
L-45	1	44	26	2740	30	41100	15.5
L-45	1	44	27	3600	30	54000	15.5
L-45	1	44	28	1320	30	19800	15.5
L-45	1	44	28	1320	30	19800	9.3
L-45	1	44	29	2640	30	39600	9.3
L-45	1	44	30	2640	30	39600	9.3
L-45	1	44	31	680	30	10200	9.3
L-46	1	45	21	2500	30	37500	14.5
L-46	1	45	22	2110	30	31650	14.5
L-46	1	45	22	530	30	7950	15.5
L-46	1	45	23	2640	30	39600	15.5
L-46	1	45	24	2640	30	39600	15.5
L-46	1	45	25	2187	30	32805	9.3
L-46	1	45	26	2640	30	39600	9.3
L-46	1	45	27	2640	30	39600	9.3
L-46	1	45	28	2640	30	39600	9.3
L-46	1	45	29	4000	30	60000	9.3
L-46	1	45	30	760	30	11400	9.3
L-46	1	44	30	1885	30	28275	0.6
L-46	1	44	31	2640	30	39600	0.6
L-46	1	44	32	2640	30	39600	0.6
L-46	1	44	33	2870	30	43050	0.6

* based on 1 ft of sediment with a hydraulic conductivity of 0.5 ft/day

TABLE I-2 RIVER PACKAGE DATA FOR THE SOUTH PALM BEACH MODEL (page 25)
LAKE WORTH DRAINAGE DISTRICT CANALS

CANAL	MODEL LAYER	MODEL ROW	MODEL COLUMN	REACH LENGTH (FT)	REACH WIDTH (FT)	REACH * CONDUCTANCE (FT2/DAY)	CANAL STAGE (NGVD)
L-46	1	44	34	1360	30	20400	0.6
L-47	1	46	21	2415	30	36225	12.5
L-47	1	46	22	2640	30	39600	12.5
L-47	1	46	23	2640	30	39600	15.5
L-47	1	46	24	2640	30	39600	15.5
L-47	1	46	25	2110	30	31650	9.3
L-47	1	46	26	2640	30	39600	9.3
L-47	1	46	27	2640	30	39600	9.3
L-47	1	46	28	2640	30	39600	9.3
L-47	1	46	29	905	30	13575	9.3
L-47	1	45	29	1280	30	19200	9.3
L-47	1	45	30	1510	30	22650	9.3
L-47	1	45	31	1510	30	22650	0.6
L-47	1	45	32	2640	30	39600	0.6
L-47	1	45	33	2640	30	39600	0.6
L-47	1	45	34	450	30	6750	0.6
L-48	1	47	21	2415	30	36225	12.5
L-48	1	47	22	2640	30	39600	12.5
L-48	1	47	23	2640	30	39600	15.5
L-48	1	47	24	2640	30	39600	15.5
L-48	1	47	25	2040	30	30600	9.3
L-48	1	47	26	2640	30	39600	9.3
L-48	1	47	27	2640	30	39600	9.3
L-48	1	47	28	2640	30	39600	9.3
L-48	1	47	29	2640	30	39600	9.3
L-48	1	47	30	905	30	13575	9.3
L-48	1	46	31	905	30	13575	0.6
L-48	1	46	32	2415	30	36225	0.6
L-48	1	47	32	1360	30	20400	0.6
L-48	1	47	33	3020	30	45300	0.6
L-48	1	47	34	600	30	9000	0.6
L-49	1	48	23	2265	30	33975	15.5
L-49	1	48	24	2640	30	39600	15.5
L-49	1	48	25	150	30	2250	15.5
L-49	1	48	25	1960	30	29400	9.3
L-49	1	48	26	2640	30	39600	9.3
L-49	1	48	27	2640	30	39600	9.3
L-49	1	48	28	2640	30	39600	9.3
L-49	1	48	29	2640	30	39600	9.3
L-49	1	48	30	980	30	14700	9.3
L-49	1	48	31	830	30	12450	0.6
L-49	1	48	32	2640	30	39600	0.6
L-49	1	48	33	2800	30	42000	0.6
L-49	1	48	34	1500	30	22500	0.6

* based on 1 ft of sediment with a hydraulic conductivity of 0.5 ft/day

TABLE I-2 RIVER PACKAGE DATA FOR THE SOUTH PALM BEACH MODEL (page 26)
LAKE WORTH DRAINAGE DISTRICT CANALS

CANAL	MODEL LAYER	MODEL ROW	MODEL COLUMN	REACH LENGTH (FT)	REACH WIDTH (FT)	REACH * CONDUCTANCE (FT2/DAY)	CANAL STAGE (NGVD)
L-50	1	49	23	2265	30	33975	15.5
L-50	1	49	24	2950	30	44250	15.5
L-50	1	49	25	300	30	4500	15.5
L-50	1	49	25	1885	30	28275	9.3
L-50	1	49	26	2640	30	39600	9.3
L-50	1	49	27	2640	30	39600	9.3
L-50	1	49	28	2640	30	39600	9.3
L-50	1	49	29	2640	30	39600	9.3
L-50	1	49	30	1060	30	15900	9.3
L-50	1	48	30	3900	30	58500	9.3
L-50	1	48	31	900	30	13500	9.3
L-50	1	49	31	600	30	9000	0.6
L-50	1	49	32	2640	30	39600	0.6
L-50	1	49	33	2640	30	39600	0.6
L-50	1	49	34	1130	30	16950	0.6

* based on 1 ft of sediment with a hydraulic conductivity of 0.5 ft/day

TABLE I-3 RIVER PACKAGE DATA FOR THE SOUTH PALM BEACH MODEL (page 1)
ACME IMPROVEMENT DISTRICT CANALS

CANAL	MODEL LAYER	MODEL ROW	MODEL COLUMN	REACH LENGTH (FT)	REACH WIDTH (FT)	REACH * CONDUCTANCE (FT2/DAY)	CANAL STAGE (NGVD)
C-1	1	2	9	1285	30	19275	12.5
C-1	1	3	9	2640	30	39600	12.5
C-1	1	4	9	2640	30	39600	12.5
C-1	1	5	9	2640	30	39600	12.5
C-1	1	6	9	2640	30	39600	12.5
C-1	1	7	9	905	30	13575	12.5
C-1	1	7	9	1735	30	26025	13.5
C-1	1	8	9	2640	30	39600	13.5
C-1	1	9	9	2640	30	39600	13.5
C-1	1	10	9	1285	30	19275	13.5
C-27A	1	10	9	2800	30	42000	13.5
C-27A	1	10	10	1285	30	19275	13.5
C-27A	1	11	10	755	30	11325	13.5
C-27	1	10	9	2415	30	36225	13.5
C-27	1	11	10	455	30	6825	13.5
C-27	1	11	11	2800	30	42000	13.5
C-27	1	12	11	2490	30	37350	13.5
C-27	1	12	12	905	30	13575	13.5
C-27	1	13	12	2565	30	38475	13.5
C-27	1	13	13	2640	30	39600	13.5
C-27	1	13	14	2640	30	39600	13.5
C-27	1	13	15	2640	30	39600	13.5
C-27	1	13	16	2000	30	30000	13.5
C-1EXT(31)	1	1	9	2112	30	31680	12.5
C-1EXT(31)	1	1	10	1660	30	24900	12.5
C-1EXT(6)	1	2	10	3320	30	49800	12.5
C-1EXT(6)	1	2	9	755	30	11325	12.5
C-1EXT(6)	1	3	9	980	30	14700	12.5
C-1EXT(7)	1	3	9	2112	30	31680	12.5
C-1EXT(7)	1	3	10	2640	30	39600	12.5
C-1EXT(7)	1	4	10	1130	30	16950	12.5
C-1EXT(7)	1	5	9	2120	30	31800	12.5
C-1EXT(7)	1	5	9	760	30	11400	12.5
AEROCL LKS	1	4	10	3020	150	226500	12.5
AEROCL LKS	1	5	10	3300	150	247500	12.5
AEROCL LKS	1	6	10	1810	75	67875	12.5
C-2	1	1	10	1210	30	18150	12.5
C-2	1	2	10	2640	30	39600	12.5
C-2	1	3	10	2640	30	39600	12.5
C-2	1	4	10	2640	30	39600	12.5
C-2	1	5	10	2640	30	39600	12.5
C-2	1	6	10	2640	30	39600	12.5
C-2	1	7	10	1060	30	15900	12.5
C-2	1	7	10	1580	30	23700	13.5
C-2	1	8	10	2640	30	39600	13.5

* based on 1 ft of sediment with a hydraulic conductivity of 0.5 ft/day

TABLE I-3 RIVER PACKAGE DATA FOR THE SOUTH PALM BEACH MODEL (page 2)
ACME IMPROVEMENT DISTRICT CANALS

CANAL	MODEL LAYER	MODEL ROW	MODEL COLUMN	REACH LENGTH (FT)	REACH WIDTH (FT)	REACH * CONDUCTANCE (FT2/DAY)	CANAL STAGE (NGVD)
C-2	1	9	10	2640	30	39600	13.5
C-2	1	10	10	2640	30	39600	13.5
C-2	1	11	10	760	30	11400	13.5
C-2	1	9	12	1510	30	22650	13.5
C-2	1	10	12	2640	30	39600	13.5
C-2	1	11	12	1060	30	15900	13.5
C-2A	1	10	11	1735	30	26025	13.5
C-2A	1	11	11	1060	30	15900	13.5
C-2B	1	9	11	380	30	5700	13.5
C-2B	1	10	11	2640	30	39600	13.5
C-2B	1	11	11	1060	30	15900	13.5
C-3	1	2	12	3020	30	45300	12.5
C-3	1	3	12	2800	30	42000	12.5
C-3	1	4	12	2700	30	40500	12.5
C-3	1	5	12	1100	30	16500	12.5
C-4	1	4	13	2265	30	33975	12.5
C-4(LAKE)	1	4	12	1210	125	75625	12.5
C-4(LAKE)	1	5	12	605	125	37812.5	12.5
C-4	1	5	12	2415	30	36225	12.5
C-4	1	6	12	2640	30	39600	12.5
C-4EXT(17)	1	6	12	455	30	6825	12.5
C-4EXT(17)	1	7	12	1130	30	16950	12.5
C-4	1	7	12	1130	30	16950	12.5
C-4	1	7	12	1510	30	22650	13.5
C-4EXT(21A)	1	7	12	380	30	5700	13.5
C-4EXT(21A)	1	7	13	1985	30	29775	13.5
C-4	1	8	12	2640	30	39600	13.5
C-4EXT(21B)	1	8	12	380	30	5700	13.5
C-4EXT(21B)	1	8	13	4700	30	70500	13.5
C-4EXT(21B)	1	8	14	380	30	5700	13.5
C-4EXT(21B)	1	9	13	1060	30	15900	13.5
C-4	1	9	12	2415	30	36225	13.5
C-4	1	10	12	2640	30	39600	13.5
C-4	1	11	12	2600	30	39000	13.5
C-4	1	12	12	2640	30	39600	13.5
C-4	1	13	12	1210	30	18150	13.5
C-5	1	2	11	3625	30	54375	12.5
C-5(LAKE)	1	2	11	300	125	18750	12.5
C-5(LAKE)	1	3	11	600	125	37500	12.5
C-5(LAKE)	1	3	12	300	125	18750	12.5
C-5	1	2	12	1510	30	22650	12.5
C-5	1	3	12	1510	30	22650	12.5
C-5	1	3	13	3170	30	47550	12.5
C-5	1	4	13	905	30	13575	12.5
GREENVIEW SH	1	4	13	1100	300	165000	12.5

* based on 1 ft of sediment with a hydraulic conductivity of 0.5 ft/day

TABLE I-3 RIVER PACKAGE DATA FOR THE SOUTH PALM BEACH MODEL (page 3)
ACME IMPROVEMENT DISTRICT CANALS

CANAL	MODEL LAYER	MODEL ROW	MODEL COLUMN	REACH LENGTH (FT)	REACH WIDTH (FT)	REACH * CONDUCTANCE (FT2/DAY)	CANAL STAGE (NGVD)
GREENVIEW SH	1	4	14	2265	150	169875	12.5
GREENVIEW SH	1	5	14	2110	600	633000	12.5
C-6	1	5	14	1210	30	18150	12.5
C-6(LAKE)	1	5	15	1500	100	75000	12.5
C-6	1	6	14	2265	30	33975	12.5
C-6	1	7	14	1280	30	19200	12.5
C-6	1	7	14	1360	30	20400	13.5
C-6	1	8	14	2640	30	39600	13.5
C-6	1	9	14	2640	30	39600	13.5
C-6	1	10	14	2640	30	39600	13.5
C-6	1	11	14	2640	30	39600	13.5
C-6	1	12	14	2640	30	39600	13.5
C-6	1	13	14	1360	30	20400	13.5
C-7	1	1	15	905	30	13575	12.5
C-7	1	2	15	2715	30	40725	12.5
C-7	1	3	15	605	30	9075	12.5
LAKE WELL.	1	3	15	1960	500	490000	12.5
LAKE WELL.	1	4	15	3200	500	800000	12.5
LAKE WELL.	1	5	16	1660	500	415000	12.5
LAKE WELL.EXT	1	4	14	350	30	5250	12.5
LAKE WELL.EXT	1	4	16	750	30	11250	12.5
LAKE WELL.EXT	1	6	15	1510	30	22650	12.5
LAKE WELL.EXT	1	5	16	1060	30	15900	12.5
LAKE WELL.EXT	1	5	15	1400	30	21000	12.5
C-7	1	7	16	1320	30	19800	13.5
C-7	1	8	16	2640	30	39600	13.5
C-7	1	9	16	2640	30	39600	13.5
C-7	1	10	16	2640	30	39600	13.5
C-7	1	11	16	2640	30	39600	13.5
C-7	1	12	16	2640	30	39600	13.5
C-7	1	13	16	1510	30	22650	13.5
C-8	1	1	18	530	30	7950	12.5
C-8	1	2	18	2640	30	39600	12.5
C-8	1	3	18	2640	30	39600	12.5
C-8	1	4	18	2640	30	39600	12.5
C-8	1	5	18	2640	30	39600	12.5
C-8	1	6	18	2640	30	39600	12.5
C-8	1	7	18	2640	30	39600	12.5
C-8	1	8	18	2640	30	39600	12.5
C-8	1	9	18	2640	30	39600	12.5
C-8	1	10	18	2640	30	39600	12.5
C-8	1	11	18	1660	30	24900	12.5
C-8EXT(11)	1	3	18	3620	30	54300	12.5
C-8EXT(11)	1	4	18	700	30	10500	12.5
C-8EXT(11)	1	4	17	2640	30	39600	12.5

* based on 1 ft of sediment with a hydraulic conductivity of 0.5 ft/day

TABLE I-3 RIVER PACKAGE DATA FOR THE SOUTH PALM BEACH MODEL (page 4)
ACME IMPROVEMENT DISTRICT CANALS

CANAL	MODEL LAYER	MODEL ROW	MODEL COLUMN	REACH LENGTH (FT)	REACH WIDTH (FT)	REACH * CONDUCTANCE (FT2/DAY)	CANAL STAGE (NGVD)
C-9	1	2	10	150	30	2250	12.5
C-9	1	2	11	2640	30	39600	12.5
C-9	1	2	12	2640	30	39600	12.5
C-9	1	2	13	2640	30	39600	12.5
C-9	1	2	14	2640	30	39600	12.5
C-9	1	2	15	2640	30	39600	12.5
C-9	1	2	16	1960	30	29400	12.5
C-9EXT(3)	1	2	16	3770	30	56550	12.5
C-9EXT(3)	1	3	15	2565	30	38475	12.5
C-9EXT(3)	1	3	16	5580	30	83700	12.5
C-9EXT(3)	1	4	16	4000	30	60000	12.5
C-9EXT(3)	1	4	17	500	30	7500	12.5
C-10	1	3	10	225	30	3375	12.5
C-10	1	3	11	2640	30	39600	12.5
C-10	1	3	12	605	30	9075	12.5
C-11	1	4	12	905	30	13575	12.5
C-11	1	4	11	1660	30	24900	12.5
C-11	1	5	11	1060	30	15900	12.5
C-12	1	3	12	300	30	4500	12.5
C-12	1	3	13	3170	30	47550	12.5
C-12	1	3	14	3000	30	45000	12.5
C-14	1	1	17	605	30	9075	12.5
C-14	1	2	17	2640	30	39600	12.5
C-14	1	3	17	1510	30	22650	12.5
C-15	1	5	10	350	30	5250	12.5
C-15	1	5	11	2640	30	39600	12.5
C-15	1	5	12	2640	30	39600	12.5
C-15	1	5	13	2565	30	38475	12.5
C-15EXT(16)	1	5	13	500	30	7500	12.5
C-15EXT(16)	1	5	14	1210	30	18150	12.5
C-15EXT(16)	1	5	15	905	30	13575	12.5
C-16	1	3	18	760	30	11400	12.5
C-16	1	3	17	1510	30	22650	12.5
C-17(LAKE)	1	4	17	600	250	75000	12.5
C-17	1	4	17	380	30	5700	12.5
C-17	1	4	18	1360	30	20400	12.5
C-17A	1	4	17	605	30	9075	12.5
C-17A	1	5	17	1400	30	21000	12.5
C-17B	1	4	18	150	30	2250	12.5
C-17B	1	5	17	760	30	11400	12.5
C-17B	1	6	18	800	30	12000	12.5
C-17B LAKE	1	5	18	400	200	40000	12.5
C-18	1	5	10	400	30	6000	12.5
C-18	1	6	11	2700	30	40500	12.5
C-18	1	6	12	2700	30	40500	12.5

* based on 1 ft of sediment with a hydraulic conductivity of 0.5 ft/day

TABLE I-3 RIVER PACKAGE DATA FOR THE SOUTH PALM BEACH MODEL (page 5)
ACME IMPROVEMENT DISTRICT CANALS

CANAL	MODEL LAYER	MODEL ROW	MODEL COLUMN	REACH LENGTH (FT)	REACH WIDTH (FT)	REACH * CONDUCTANCE (FT2/DAY)	CANAL STAGE (NGVD)
C-18	1	6	13	1660	30	24900	12.5
C-23	1	7	9	2265	30	33975	12.5
C-23	1	7	10	2640	30	39600	12.5
C-23	1	7	11	2640	30	39600	12.5
C-23	1	7	12	2640	30	39600	12.5
C-23	1	7	13	2640	30	39600	12.5
C-23	1	7	14	2640	30	39600	12.5
C-23	1	7	15	2640	30	39600	12.5
C-23	1	7	16	2640	30	39600	12.5
C-23	1	7	17	2640	30	39600	12.5
C-23	1	7	18	2265	30	33975	12.5
C-23A	1	7	9	2265	30	33975	13.5
C-23A	1	7	10	2115	30	31725	13.5
C-23B	1	8	9	2265	30	33975	13.5
C-23B	1	8	10	2115	30	31725	13.5
C-24	1	9	9	2265	30	33975	13.5
C-24	1	9	10	2640	30	39600	13.5
C-24	1	9	11	2640	30	39600	13.5
C-24	1	9	12	2640	30	39600	13.5
C-24	1	9	13	2640	30	39600	13.5
C-24	1	9	14	2640	30	39600	13.5
C-24	1	9	15	2640	30	39600	13.5
C-24	1	9	16	2640	30	39600	13.5
C-24	1	9	17	2640	30	39600	13.5
C-24	1	9	18	2115	30	31725	13.5
C-24B	1	9	10	605	30	9075	13.5
C-24B	1	9	11	2640	30	39600	13.5
C-24B	1	9	12	1960	30	29400	13.5
C-24C	1	10	10	760	30	11400	13.5
C-24C	1	10	11	2640	30	39600	13.5
C-24C	1	10	12	1885	30	28275	13.5
C-24D	1	10	10	760	30	11400	13.5
C-24D	1	10	11	2640	30	39600	13.5
C-24D	1	10	12	1810	30	27150	13.5
C-25	1	11	10	905	30	13575	13.5
C-25	1	11	11	2640	30	39600	13.5
C-25	1	11	12	2640	30	39600	13.5
C-25	1	11	13	3760	30	56400	13.5
C-25EXT (33)	1	12	13	2600	30	39000	13.5
C-25	1	11	14	2640	30	39600	13.5
C-25	1	11	15	2640	30	39600	13.5
C-25	1	11	16	2640	30	39600	13.5
C-25	1	11	17	2640	30	39600	13.5
C-25	1	11	18	1960	30	29400	13.5
POLO FIELDS	1	6	13	230	30	3450	12.5

* based on 1 ft of sediment with a hydraulic conductivity of 0.5 ft/day

TABLE I-3 RIVER PACKAGE DATA FOR THE SOUTH PALM BEACH MODEL (page 6)
ACME IMPROVEMENT DISTRICT CANALS

CANAL	MODEL LAYER	MODEL ROW	MODEL COLUMN	REACH LENGTH (FT)	REACH WIDTH (FT)	REACH * CONDUCTANCE (FT2/DAY)	CANAL STAGE (NGVD)
POLO FIELDS	1	6	14	2715	30	40725	12.5
POLO FIELDS	1	7	14	2190	30	32850	12.5
POLO FIELDS	1	7	14	2870	30	43050	13.5
POLO FIELDS	1	7	15	1360	30	20400	13.5
POLO & C.C. L	1	6	14	1000	30	15000	12.5
POLO & C.C. L	1	7	14	450	30	6750	12.5
POLO & C.C. L	1	6	15	4900	30	73500	12.5
POLO & C.C. L	1	7	15	3100	30	46500	12.5
POLO & C.C. L	1	5	16	1800	30	27000	12.5
POLO & C.C. L	1	6	16	6300	30	94500	12.5
POLO & C.C. L	1	7	16	3500	30	52500	12.5
POLO & C.C. L	1	5	17	1500	30	22500	12.5
POLO & C.C. L	1	6	17	7200	30	108000	12.5
POLO & C.C. L	1	7	17	2900	30	43500	12.5
POLO & C.C. L	1	5	18	1730	30	25950	12.5
POLO & C.C. L	1	6	18	7200	30	108000	12.5
POLO & C.C. L	1	7	18	3700	30	55500	12.5

* based on 1 ft of sediment with a hydraulic conductivity of 0.5 ft/day

TABLE I-4 DRAIN PACKAGE DATA FOR THE SOUTH PALM BEACH MODEL (page 1)
PINE TREE CONTROL DISTRICT CANALS

MODEL LAYER	MODEL ROW	MODEL COLUMN	CANAL DENSITY (per cell)	REACH LENGTH (FT)	REACH WIDTH (FT)	REACH * CONDUCTANCE (FT2/DAY)	DRAIN ELEVATION (NGVD)
1	2	7	2	2640	10	26400	13.5
1	3	7	2	2640	10	26400	13.5
1	4	7	2	2640	10	26400	13.5
1	5	7	2	2640	10	26400	13.5
1	2	6	1	2640	10	13200	13.5
1	3	6	2	2640	10	26400	13.5
1	4	6	3	2640	10	39600	13.5
1	5	6	2	2640	10	26400	13.5
1	6	8	2	2640	10	26400	13.5
1	7	8	1	2640	10	13200	13.5
1	8	8	2	2640	10	26400	13.5
1	6	7	3	2640	10	39600	13.5
1	7	7	2	2640	10	26400	13.5
1	8	7	2	2640	10	26400	13.5
1	6	6	2	2640	10	26400	13.5
1	7	6	1	2640	10	13200	13.5
1	8	6	2	2640	10	26400	13.5
1	1	7	1	2640	10	13200	13.5
1	1	5	1	2640	10	13200	13.5
1	1	4	2	2640	10	26400	13.5
1	1	3	1.5	2640	10	19800	13.5
1	2	5	2	2640	10	26400	13.5
1	3	5	3	2640	10	39600	13.5
1	4	5	3	2640	10	39600	13.5
1	5	5	2	2640	10	26400	13.5
1	2	4	1	2640	10	13200	13.5
1	3	4	2	2640	10	26400	13.5
1	4	4	2	2640	10	26400	13.5
1	5	4	2	2640	10	26400	13.5
1	2	3	1	2640	10	13200	13.5
1	3	3	2	2640	10	26400	13.5
1	4	3	3	2640	10	39600	13.5
1	5	3	2	2640	10	26400	13.5
1	6	5	3	2640	10	39600	13.5
1	7	5	2	2640	10	26400	13.5
1	8	5	3	2640	10	39600	13.5
1	6	4	1	2640	10	13200	13.5
1	7	4	2	2640	10	26400	13.5
1	6	3	2	2640	10	26400	13.5

* based on 1 ft of sediment with a hydraulic conductivity of 0.5 ft/day

TABLE I-4 DRAIN PACKAGE DATA FOR THE SOUTH PALM BEACH MODEL (page 2)
PINE TREE CONTROL DISTRICT CANALS

MODEL LAYER	MODEL ROW	MODEL COLUMN	CANAL DENSITY (per cell)	REACH LENGTH (FT)	REACH WIDTH (FT)	REACH * CONDUCTANCE (FT2/DAY)	DRAIN ELEVATION (NGVD)
1	1	2	0.5	2640	10	6600	13.5
1	1	1	0.5	2640	10	6600	13.5
1	2	2	1	2640	10	13200	13.5
1	3	2	1	2640	10	13200	13.5
1	4	2	2	2640	10	26400	13.5
1	2	2	1	2640	10	13200	13.5
1	9	8	1	2640	10	13200	13.5

* based on 1 ft of sediment with a hydraulic conductivity of 0.5 ft/day

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APPENDIX J

BASIC PROGRAM FOR VERTICAL DISCRETIZATION OF THE NORTH PALM BEACH COUNTY MODEL

BASIC PROGRAM USED FOR VERTICAL DISCRETIZATION OF THE NORTH PALM BEACH COUNTY MODEL (page 1)

```
10 '* This program determines the thickness and aquifer material type by
11 '* cell for a given layer of the North Palm Beach County ground
12 '* water flow model.
13 '*
14 '* Input required to the program is
15 '*   1) land surface elevation by cell (file NELE.GFL)
16 '*   2) top of the production zone by cell (file PZT.GFL)
17 '*   3) thickness of the production zone by cell (file PZTH.GFL)
18 '*   4) top of the Biscayne aquifer by cell (file BT.GFL)
19 '*   5) thickness of the Biscayne aquifer by cell (file BTH.GFL)
20 '*   6) bottom of the Surficial aquifer by cell (file SAB.GFL)
30 '*
31 '* Output from the program is layer thicknesses, type codes
32 '* (Biscyne, non-Biscayne production zone, or non-production zone),
33 '* type percentages by cell for a given layer of the model.
34 '* Statements 1030-1050 and 5060-5100 must be adjusted for each run
35 '* so that the proper variables for the given layer are output.
36 '* Output is to file NTHICK#.CAL, NTYPE#.CAL, NPER#SD.CAL, NPER#PZ.CAL,
37 '* and NPER#B.CAL where # refers to the layer number.  The NTHICK files
38 '* contain the layer thickness in feet by cell.  The NTYPE files contain
39 '* an aquifer material type code which is the layer number for non-
40 '* production zone material, 7 for non-Biscayne production zone material,
41 '* 9 for Biscayne material, 10 for inactive cells
42 '* and a combination of these numbers for a combination of
42 '* materials.  The NPER# files give the percent of each cell made up by
43 '* each material.  NPER#SD, NPER#PZ, and NPER#B give the percentages
44 '* of non-production zone, non-Biscayne production zone, and Biscayne
45 '* material respectively.
50 '*
51 '* open the input and output files
52 '*
500 OPEN "A:NELE.GFL" FOR INPUT AS #1
510 OPEN "A:PZT.GFL" FOR INPUT AS #2
520 OPEN "A:PZTH.GFL" FOR INPUT AS #3
530 OPEN "A:BT.GFL" FOR INPUT AS #4
540 OPEN "A:BTH.GFL" FOR INPUT AS #5
550 OPEN "A:SAB.GFL" FOR INPUT AS #6
555 INPUT "ENTER LAYER - ";DLAY$
560 OPEN "A:NTHICK"+DLAY$+".CAL" FOR OUTPUT AS #7
570 OPEN "A:NTYPE"+DLAY$+".CAL" FOR OUTPUT AS #8
580 OPEN "A:NPER"+DLAY$+"SD.CAL" FOR OUTPUT AS #9
590 OPEN "A:NPER"+DLAY$+"PZ.CAL" FOR OUTPUT AS #10
600 OPEN "A:NPER"+DLAY$+"B.CAL" FOR OUTPUT AS #11
610 '*
620 '* Define layer bottoms and midpoints
630 '*
640 B1=-20
650 L2M=-40
660 B2=-60
670 L3M=-75
```

BASIC PROGRAM USED FOR VERTICAL DISCRETIZATION OF THE NORTH PALM
BEACH COUNTY MODEL (page 2)

```
680 B3=-90
690 L4M=-115
700 B4=-140
710 B5=-250
720 '*********************************************************************
730 '*********************************************************************
740 '*********************************************************************
750 '*
760 '* Loop thru grid rows and columns processing 1 grid cell at a time
770 '*
780 FOR ROW=1 TO 40
790 FOR COL=1 TO 58
800 PRINT ROW,COL
810 '*
820 '* Input aquifer data for cell
830 '*
840 INPUT #1,SFC
850 INPUT #2,TPZ
860 INPUT #3,THPZ
870 INPUT #4,TTP
880 INPUT #5,THTP
890 INPUT #6,SAB
900 '*
910 '* Define production zone bottom, correct kriging anomolies,
915 '* define Biscayne bottom
920 '*
930 BPZ=TPZ-THPZ
940 IF BPZ<SAB THEN BPZ=SAB
970 IF THTP>THPZ THEN THTP=THPZ
980 IF TTP>TPZ THEN TTP=TPZ
990 BTP=TTP-THTP
1000 '*
1010 '* Initialize percentages to 0 for all aquifer zones
1020 '* Note: The next three lines must have the variables changed
1021 '* to reflect the proper layer number (i.e. to run the program
1022 '* for layer 3 the variables should be PER3SD, PER3PZ, and PER3B)
1023 '* before the program is run.
1024 '*
1030 PER4SD=0
1040 PER4PZ=0
1050 PER4TP=0
1060 '*
1070 '* Calculate thickness of layer 1 (same method for all cases)
1080 '*
1090 IF TPZ<L2M THEN TH1=SFC-B1 ELSE TH1=SFC-TPZ
1100 TYPE1=1
1110 PER1SD=1
1120 '*
1130 '* Branch here for cells with > 10' and with < 10' of turnpike
1140 '*
1150 '* Note that the turnpike is not considered further when it is less than
```

BASIC PROGRAM USED FOR VERTICAL DISCRETIZATION OF THE NORTH PALM BEACH COUNTY MODEL (page 3)

```
1160 '* 10 feet thick.
1170 '*
1180 IF THTP>10 GOTO 2320
1190 '*
1200 '*****************************************************************
1210 '*****************************************************************
1220 '*
1230 '* Determine layers 2 to 5 thicknesses and types for cells
1240 '* with less than 10' of turnpike.
1250 '*
1260 '* Branch here for cells with >30' and <30' of production zone
1270 '*
1280 '* Note that the production zone is not considered further when
1290 '* it is less than 20 feet thick
1300 '*
1310 IF THPZ>30 GOTO 1610
1320 '*
1330 '*****************************************************************
1340 '*****************************************************************
1350 '*
1360 '* Production zone < 30' thick
1370 '*
1380 TH1=SFC-B1 : TYPE1=1 : PER1SD=1
1390 TH2=B1-B2 : TYPE2=2 : PER2SD=1
1400 TH3=B2-B3 : TYPE3=3 : PER3SD=1
1410 IF SAB<B4 GOTO 1470
1420 TH4=B3-SAB : TYPE4=4 :PER4SD=1
1430 TH5=1 : TYPE5=10
1440 TH6=1 : TYPE6=10
1450 GOTO 5060   'Output
1460 '*
1470 TH4=B3-B4 : TYPE4=4 : PER4SD=1
1480 IF SAB<B5 GOTO 1530
1490 TH5=B4-SAB : TYPE5=5 : PER5SD=1
1500 TH6=1 : TYPE6=10
1510 GOTO 5060   'Output
1520 '*
1530 TH5=B4-B5 : TYPE5=5 : PER5SD=1
1540 TH6=B5-SAB : TYPE6=6 : PER6SD=1
1550 GOTO 5060   'output
1560 '*
1570 '*****************************************************************
1580 '*
1590 '* Layer 2 no turnpike
1600 '*
1610 IF TPZ<L3M THEN TH2=B1-B2 : TYPE2=2 : PER2SD=1 : GOTO 1710     'layer 3
1620 '*
1630 IF TPZ<L2M THEN TH2=B1-TPZ : TYPE2=2 : PER2SD=1 : GOTO 1710    'layer 3
1640 '*
1650 TH2=TPZ-B2 : TYPE2=7 : PER2PZ=1
```

BASIC PROGRAM USED FOR VERTICAL DISCRETIZATION OF THE NORTH PALM BEACH COUNTY MODEL (page 4)

```
1660 '*
1670 '********************************************************************
1680 '*
1690 '* Layer 3 no turnpike
1700 '*
1710 IF TPZ<L3M THEN TH3=B2-TPZ : TYPE3=3 : PER3SD=1 : GOTO 1870    'layer 4
1720 '*
1730 PER3PZ=1
1740 IF TPZ<L2M GOTO 1790
1750 IF BPZ<L4M THEN TH3=B2-B3 : TYPE3=7: GOTO 1870                 'layer 4
1760 '*
1770 TH3=B2-BPZ : TYPE3=7 : GOTO 2100     'no production zone layer 4
1780 '*
1790 IF BPZ<L4M THEN TH3=TPZ-B3 : TYPE3=7 : GOTO 1870     'layer 4
1800 '*
1810 TH3=TPZ-BPZ : TYPE3=7 : GOTO 2100     'no production zone layer 4
1820 '*
1830 '********************************************************************
1840 '*
1850 '* Layer 4 production zone present in layer 4; no turnpike
1860 '*
1870 PER4PZ=1
1880 IF TPZ<L3M THEN TH4=TPZ-BPZ : TYPE4=7 : GOTO 1950     'layer 5
1890 TH4=B3-BPZ : TYPE4=7 : GOTO 1950     'layer 5
1900 '*
1910 '********************************************************************
1920 '*
1930 '* Layers 5 and 6 production zone present in layer 4; no turnpike
1940 '*
1950 IF SAB<B5 GOTO 2020
1960 TH5=BPZ-SAB
1970 IF TH5=0 THEN TYPE5=10 : GOTO 1990
1980 TYPE5=5 : PER5SD=1
1990 TH6=1 : TYPE6=10
2000 GOTO 5060   'output
2010 '*
2020 TH5=BPZ-B5 : TYPE5=5 : PER5SD=1
2030 TH6=B5-SAB : TYPE6=6 : PER6SD=1
2040 GOTO 5060   'output
2050 '*
2060 '********************************************************************
2070 '*
2080 '* Layers 4, 5, and 6 no production zone in layer 4; no turnpike
2090 '*
2100 PER4SD=1
2110 IF SAB<B4 GOTO 2170
2120 TH4=BPZ-SAB : TYPE4=4
2130 TH5=1 : TYPE5=10
2140 TH6=1 : TYPE6=10
2150 GOTO 5060   'output
2160 '*
```

BASIC PROGRAM USED FOR VERTICAL DISCRETIZATION OF THE NORTH PALM BEACH COUNTY MODEL (page 5)

```
2170 TH4=BPZ-B4 : TYPE4=4
2180 IF SAB<B5 GOTO 2230
2190 TH5=B4-SAB : TYPE5=5 : PER5SD=1
2200 TH6=1 : TYPE6=10
2210 GOTO 5060   'output
2220 '*
2230 TH5=B4-B5 : TYPE5=5 : PER5SD=1
2240 TH6=B5-SAB : TYPE6=6 : PER6SD=1
2250 GOTO 5060   'output
2260 '*
2270 '*********************************************************************
2280 '*********************************************************************
2290 '*
2300 '* Branch here for cells with >= 20' and < 20' of turnpike
2310 '*
2320 IF THTP>20 GOTO 3490
2330 '*
2340 '*********************************************************************
2350 '*
2360 '* Turnpike < 20' thick
2370 '*
2380 '*********************************************************************
2390 '* Layer 2 < 20' of turnpike
2400 '*
2410 IF TPZ<L3M THEN TH2=B1-B2 : TYPE2=2 : PER2SD=1 : GOTO 2610 'layer 3
2420 '*
2430 IF TPZ<L2M THEN TH2=B1-TPZ : TYPE2=2 : PER2SD=1 : GOTO 2610 'layer 3
2440 '*
2450 TH2=TPZ-B2
2460 IF TTP<=B2 THEN TYPE2=7 : PER2PZ=1 : GOTO 2610            'layer 3
2470 '*
2480 TYPE2=79
2490 '*********************************************************************
2500 IF B2<=BTP GOTO 2540
2510 PER2TP=(TTP-B2)/TH2
2520 PER2PZ=1-PER2TP : GOTO 2610     'layer 3
2530 '*
2540 PER2TP=(TTP-BTP)/TH2
2550 PER2PZ=1-PER2TP : GOTO 1710     'layer 3 no turnpike
2560 '*
2570 '*********************************************************************
2580 '*
2590 '* Layer 3 < 20' of turnpike
2600 '*
2610 IF TPZ<L3M THEN TH3=B2-TPZ : TYPE3=3 : PER3SD=1 : GOTO 3260 'layer 4
2620 '*
2630 IF TPZ<L2M GOTO 2910
2640 IF BPZ<L4M GOTO 2760
2650 TH3=B2-BPZ
2660 IF TTP<=B3 THEN TYPE3=7 : PER3PZ=1 : GOTO 3260   'layer 4
2670 '*
```

BASIC PROGRAM USED FOR VERTICAL DISCRETIZATION OF THE NORTH PALM BEACH COUNTY MODEL (page 6)

```
2680 TYPE3=79
2690 IF TTP<B2 GOTO 2730
2700 PER3TP=(B2-BTP)/TH3
2710 PER3PZ=1-PER3TP : GOTO 2100     'layer 4 no production zone
2720 '*
2730 PER3TP=(TTP-BTP)/TH3
2740 PER3PZ=1-PER3TP : GOTO 2100     'layer 4 no production zone
2750 '*
2760 TH3=B2-B3
2770 IF TTP<=B3 THEN TYPE3=7 : PER3PZ=1 : GOTO 3260     'layer 4
2780 '*
2790 TYPE3=79
2800 IF TTP<B2 GOTO 2840
2810 PER3TP=(B2-BTP)/TH3
2820 PER3PZ=1-PER3TP : GOTO 1870     'layer 4 no turnpike
2830 '*
2840 IF BTP<B4 GOTO 2880
2850 PER3TP=(TTP-BTP)/TH3
2860 PER3PZ=1-PER3TP : GOTO 1870     'layer 4 no turnpike
2870 '*
2880 PER3TP=(TTP-B3)/TH3
2890 PER3PZ=1-PER3TP : GOTO 3260     'layer 4
2900 '*
2910 IF BPZ<L4M GOTO 3050
2920 TH3=TPZ-BPZ
2930 IF TTP<=B3 THEN TYPE3=7 : PER3PZ=1 : GOTO 2100 'layer 4 no prod zone
2940 '*
2950 IF B2<=BTP THEN TYPE3=7 : PER3PZ=1 : GOTO 2100 'layer 4 no prod zone
2960 '*
2970 TYPE3=79
2980 IF TTP<B2 GOTO 3020
2990 PER3TP=(B2-BTP)/TH3
3000 PER3PZ=1-PER3TP : GOTO 2100    'layer 4 no production zone
3010 '*
3020 PER3TP=(TTP-BTP)/TH3
3030 PER3PZ=1-PER3TP : GOTO 2100    'layer 4 no production zone
3040 '*
3050 TH3=TPZ-B3
3060 IF TTP<=B3 THEN TYPE3=7 : PER3PZ=1 : GOTO 3260     'layer 4
3070 '*
3080 IF B2<=BTP THEN TYPE3=7 : PER3PZ=1 : GOTO 3260     'layer 4
3090 '*
3100 TYPE3=79
3110 IF TTP<B2 GOTO 3150
3120 PER3TP=(B2-BTP)/TH3
3130 PER3PZ=1-PER3TP : GOTO 1870     'layer 4 no turnpike
3140 '*
3150 IF BTP<B3 GOTO 3190
3160 PER3TP=(TTP-BTP)/TH3
3170 PER3PZ=1-PER3TP : GOTO 1870     'layer 4 no turnpike
3180 '*
```

BASIC PROGRAM USED FOR VERTICAL DISCRETIZATION OF THE NORTH PALM BEACH COUNTY MODEL (page 7)

```
3190 PER3TP=(TTP-B3)/TH3
3200 PER3PZ=1-PER3TP : GOTO 3260     'layer 4
3210 '*
3220 '********************************************************************
3230 '*
3240 '* Layer 4 < 20' of turnpike
3250 '*
3260 TYPE4=79
3270 IF TPZ<L3M GOTO 3360
3280 TH4=B3-BPZ
3290 IF TTP<B3 GOTO 3330
3300 PER4TP=(B3-BTP)/TH4
3310 PER4PZ=1-PER4TP : GOTO 1950     'layers 5 and 6 no turnpike
3320 '*
3330 PER4TP=(TTP-BTP)/TH4
3340 PER4PZ=1-PER4TP : GOTO 1950     'layers 5 and 6 no turnpike
3350 '*
3360 TH4=TPZ-BPZ
3370 PER4TP=(TTP-BTP)/TH4
3380 PER4PZ=1-PER4TP : GOTO 1950     'layers 5 and 6 no turnpike
3390 '*
3400 '********************************************************************
3410 '********************************************************************
3420 '*
3430 '* Cells with > 20' of turnpike
3440 '*
3450 '********************************************************************
3460 '*
3470 '* Layer 2 > 20' of turnpike and all turnpike between layer midpoints
3480 '*
3490 IF TPZ<L2M GOTO 3940
3500 IF TTP<L2M GOTO 3630
3510 TYPE2=79
3520 IF BTP<L3M GOTO 3590
3530 TH2=TPZ-BTP
3540 PER2TP=(TTP-BTP)/TH2
3550 PER2PZ=1-PER2TP
3560 TPZ=BTP
3570 GOTO 1710     'layer 3 no turnpike
3580 '*
3590 TH2=TPZ-B2
3600 PER2TP=(TTP-B2)/TH2
3610 PER2PZ=1-PER2TP : GOTO 4430     'layer 3
3620 '*
3630 IF TTP<L3M GOTO 3790
3640 IF L3M<BTP GOTO 3680
3650 TH2=TPZ-TTP : TYPE2=7 : PER2PZ=1
3660 GOTO 4430     'layer 3
3670 '*
3680 IF (TTP-B2)<(B2-BTP) GOTO 3740
3690 TH2=TPZ-BTP : TYPE2=79
```

BASIC PROGRAM USED FOR VERTICAL DISCRETIZATION OF THE NORTH PALM BEACH COUNTY MODEL (page 8)

```
3700 PER2TP=(TTP-BTP)/TH2
3710 PER2PZ=1-PER2TP
3720 TPZ=BTP : GOTO 1710     'layer 3 no turnpike
3730 '*
3740 TH2=TPZ-TTP : TYPE2=7 : PER2PZ=1
3750 TH3=TTP-BTP : TYPE3=9 : PER3TP=1
3760 TH4=BTP-BPZ : TYPE4=7 : PER4PZ=1
3770 GOTO 1950     'layer 5 no turnpike
3780 '*
3790 IF L4M<BTP GOTO 3830
3800 TH2=TPZ-B2 : TYPE2=7 : PER2PZ=1
3810 GOTO 4430     'layer 3
3820 '*
3830 IF (TTP-B3)<(B3-BTP) GOTO 3890
3840 TH2=TPZ-TTP : TYPE2=7 : PER2PZ=1
3850 TH3=TTP-BTM : TYPE3=9 : PER3TP=1
3860 TPZ=BTP
3870 GOTO 1870     'layer 4 no turnpike
3880 '*
3890 TH2=TPZ-B2 : TYPE2=7 : PER2PZ=1
3900 TH3=B2-TTP : TYPE3=7 : PER3PZ=1
3910 TH4=TTP-BTP : TYPE4=9 : PER4TP=1
3920 GOTO 4900     'layer 5 turnpike
3930 '*
3940 IF TTP<L3M GOTO 4140
3950 IF L3M<BTP GOTO 4000
3960 TH2=B1-TTP : TYPE2=27
3970 PER2PZ=(TPZ-TTP)/TH2
3980 PER2SD=1-PER2PZ : GOTO 4430     'layer 3
3990 '*
4000 IF(TTP-B2)<(B2-BTP) GOTO 4070
4010 TH2=B1-BTP : TYPE2=279
4020 PER2TP=(TTP-BTP)/TH2
4030 PER2PZ=(TPZ-TTP)/TH2
4040 PER2SD=1-PER2TP-PER2PZ
4050 TPZ=BTP : GOTO 1710     'layer 3 no turnpike
4060 '*
4070 TH2=B1-TTP : TYPE2=27
4080 PER2PZ=(TPZ-TTP)/TH2
4090 PER2SD=1-PER2PZ
4100 TH3=TTP-BTP : TYPE3=9 : PER3TP=1
4110 TH4=BTP-BPZ : TYPE4=7 : PER4PZ=1
4120 GOTO 1950     'layer 5 no turnpike
4130 '*
4140 IF L4M<BTP GOTO 4210
4150 IF (TPZ-TTP)<15 GOTO 4180
4160 TH2=B1-TPZ : TYPE2=2 : PER2SD=1
4170 GOTO 4430     'layer 3
4180 TH2=B1-B2 : TYPE2=2 : PER2SD=1
4190 GOTO 4430    'layer 3
4200 '*
```

BASIC PROGRAM USED FOR VERTICAL DISCRETIZATION OF THE NORTH PALM BEACH COUNTY MODEL (page 9)

```
4210 IF(TTP-B3)<(B3-BTP) GOTO 4290
4220 TH2=B1-TTP : TYPE2=27
4230 PER2PZ=(TPZ-TTP)/TH2
4240 PER2SD=1-PER2PZ
4250 TH3=TTP-BTP : TYPE3=9 : PER3TP=1
4260 TPZ=BTP
4270 GOTO 1870     'layer 4 no turnpike
4280 '*
4290 IF (TPZ-TTP)<20 GOTO 4350
4300 TH2=B1-TPZ : TYPE2=2 : PER2SD=1
4310 TH3=TPZ-TTP : TYPE3=7 : PER3PZ=1
4320 TH4=TTP-BTP : TYPE4=9 : PER4TP=1
4330 GOTO 4900     'layer 5 below turnpike layer 4
4340 '*
4350 TH2=B1-B2 : TYPE2=2 : PER2SD=1
4360 TH3=B2-TTP : TYPE3=37
4370 PER3PZ=(TPZ-TTP)/TH3
4380 PER3SD=1-PER3PZ
4390 TH4=TTP-BTP : TYPE4=9
4400 GOTO 4900     'layer 5 below turnpike layer 4
4410 '*
4420 '* Layer 3 with > 20' of turnpike
4430 IF TTP<L2M GOTO 4520
4440 IF BTP<L4M GOTO 4490
4450 TH3=B2-BTP : TYPE3=9 : PER3TP=1
4460 TPZ=BTP
4470 GOTO 1870     'layer 4 no turnpike
4480 '*
4490 TH3=B2-B3 : TYPE3=9 : PER3TP=1
4500 GOTO 4780     'layer 4 turnpike
4510 '*
4520 IF TTP<L3M GOTO 4610
4530 IF BTP<L4M GOTO 4580
4540 TH3=TTP-BTP : TYPE3=9 : PER3TP=1
4550 TPZ=BTP
4560 GOTO 1870     'layer 4 no turnpike
4570 '*
4580 TH3=TTP-B3 : TYPE3=9 : PER3TP=1
4590 GOTO 4780     'layer 4 turnpike
4600 '*
4610 IF TPZ<L2M GOTO 4650
4620 TH3=B2-TTP : TYPE3=7 : PER3PZ=1
4630 GOTO 4780     'layer 4 turnpike
4640 '*
4650 IF (TPZ-TTP)<15 GOTO 4690
4660 TH3=TPZ-TTP : TYPE3=7 : PER3PZ=1
4670 GOTO 4780     'layer 4 turnpike
4680 '*
4690 TH3=B2-TTP : TYPE3=37
4700 PER3PZ=(TPZ-TTP)/TH3
4710 PER3SD=1-PER3PZ
```

BASIC PROGRAM USED FOR VERTICAL DISCRETIZATION OF THE NORTH PALM BEACH COUNTY MODEL (page 10)

```
4720 GOTO 4780          'layer 4 turnpike
4730 '*
4740 '*******************************************************************
4750 '*
4760 '* Layer 4 with > 20' of turnpike
4770 '*
4780 IF TTP<L3M GOTO 4820
4790 TH4=B3-BTP : TYPE4=9 : PER4TP=1
4800 GOTO 4900       'layer 5 turnpike in layer 4
4810 '*
4820 TH4=TTP-BTP : TYPE4=9 : PER4TP=1
4830 GOTO 4900       'layer 5 turnpike in layer 4
4840 '*
4850 '*******************************************************************
4860 '*
4870 '* Layers 5 and 6 with > 20' of turnpike
4880 '*
4890 '*
4900 IF SAB<B5 GOTO 5060
4910 TH5=BTP-SAB : TYPE5=57
4920 PER5PZ=(BTP-BPZ)/TH5
4930 PER5SD=1-PER5PZ
4940 TH6=1 : TYPE6=10
4950 GOTO 5060    'output
4960 '*
4970 TH5=BTP-B5 : TYPE5=57
4980 PER5PZ=(BTP-BPZ)/TH5
4990 PER5SD=1-PER5PZ
5000 TH6=SAB-B5 : TYPE6=6 : PER6SD=1
5010 '*
5020 '*******************************************************************
5030 '*******************************************************************
5040 '*
5050 '* Output
5051 '*
5052 '* Note: the next five statements must be changed as necessary so that
5053 '* the variable number is the same as the layer number.  Changes are
5054 '* made by hand prior to running the program.
5055 '*
5060 PRINT #7, USING "####.#";TH4;
5070 PRINT #8, USING "####";TYPE4;
5080 PRINT #9, USING "#.## ";PER4SD;
5090 PRINT #10, USING "#.## ";PER4PZ;
5100 PRINT #11, USING "#.## ";PER4TP;
5110 IF TH4 => 0 GOTO 5230
5120 PRINT "ERROR NEGATIVE THICKNESS"
5130 PRINT "SFC= ";SFC
5140 PRINT "TPZ= ";TPZ
5150 PRINT "THPZ= ";THPZ
5160 PRINT "TTP= ";TTP
5170 PRINT "THTP= ";THTP
```

BASIC PROGRAM USED FOR VERTICAL DISCRETIZATION OF THE NORTH PALM BEACH COUNTY MODEL (page 11)

```
5180 PRINT "SAB= ";SAB
5190 PRINT "BPZ= ";BPZ
5200 PRINT "TPB= ";BTP
5210 PRINT "TH2= ";TH2
5220 STOP
5230 IF COL/10<>INT(COL/10) AND COL<>58 THEN GOTO 5330
5240 PRINT #7,""
5250 PRINT #8,""
5260 PRINT #9,""
5270 PRINT #10,""
5280 PRINT #11,""
5290 '*
5300 '*************************************************************************
5310 '*************************************************************************
5320 '*
5330 NEXT COL
5340 NEXT ROW
5350 '*************************************************************************
5360 '*************************************************************************
5370 '*************************************************************************
5380 '*
5390 END
```

APPENDIX N

GENERAL HEAD BOUNDARY, RIVER AND DRAIN INPUT DATA FOR THE NORTH PALM BEACH COUNTY MODEL

TABLE N-1 NORTH COUNTY MODEL GENERAL HEAD BOUNDARY DATA (page 1)

CANAL	MODEL LAYER	MODEL ROW	MODEL COLUMN	REACH LENGTH (FT)	REACH WIDTH (FT)	REACH AREA (FT2)	REACH * CONDUCTANCE (FT2/DAY)	CANAL ELEVATION (NGVD)
M-CANAL	1	31	19	1500	75	112500	56250	12.9
M-CANAL	1	31	20	2640	75	198000	99000	12.9
M-CANAL	1	30	21	2300	60	138000	69000	18.5
M-CANAL	1	29	21	2640	60	158400	79200	18.5
M-CANAL	1	29	22	1100	60	66000	33000	18.5
M-CANAL	1	28	22	1800	50	90000	45000	18.5
M-CANAL	1	28	23	2640	50	132000	66000	18.5
M-CANAL	1	28	24	2640	50	132000	66000	18.5
M-CANAL	1	28	25	2640	50	132000	66000	18.5
M-CANAL	1	28	26	2640	50	132000	66000	18.5
M-CANAL	1	28	27	2640	50	132000	66000	18.5
M-CANAL	1	28	28	2640	50	132000	66000	18.5
M-CANAL	1	28	29	2640	50	132000	66000	18.5
M-CANAL	1	28	30	2640	50	132000	66000	18.5
M-CANAL	1	28	31	2800	50	140000	70000	18.5
M-CANAL	1	28	32	2640	50	132000	66000	18.5
M-CANAL	1	28	33	2640	50	132000	66000	18.5
M-CANAL	1	28	34	2640	50	132000	66000	18.5
M-CANAL	1	28	35	2640	50	132000	66000	18.5
M-CANAL	1	28	36	2640	50	132000	66000	18.5
M-CANAL	1	28	37	2640	50	132000	66000	18.5
M-CANAL	1	28	38	2640	50	132000	66000	18.5
M-CANAL	1	28	39	2640	50	132000	66000	18.2
M-CANAL	1	29	40	2640	50	132000	66000	18.2
M-CANAL	1	29	41	2640	50	132000	66000	18.2
M-CANAL	1	29	42	3200	50	160000	80000	18.2
M-CANAL	1	30	43	3200	50	160000	80000	18.2
M-CANAL	1	30	44	2640	50	132000	66000	18.2
M-CANAL	1	30	45	2640	50	132000	66000	18.2
M-CANAL	1	30	46	2640	50	132000	66000	18.2
M-CANAL	1	30	47	2640	75	198000	99000	18.2
M-CANAL	1	30	48	2640	75	198000	99000	18.2
M-CANAL	1	30	49	2640	75	198000	99000	13.8
M-CANAL	1	30	50	2640	90	237600	118800	13.8
M-CANAL	1	30	51	2640	140	369600	184800	13.8
M-CANAL	1	30	52	2640	150	396000	198000	13.8
M-CANAL	1	31	53	1800	150	270000	135000	13.8
LAKES	1	31	53			3067000	1533500	13.8
LAKES	1	31	54			6133000	3066500	13.8
LAKES	1	32	53			1951000	975500	13.8
LAKES	1	32	54			5436000	2718000	13.8
LAKES	1	33	54			1951000	975500	13.8
LAKES	1	33	55			3345000	1672500	13.8
LAKES	1	34	54			558000	279000	13.8
LAKES	1	35	54			2788000	1394000	13.8

* based on 1 ft of sediment with a hydraulic conductivity of 0.5 ft/day

TABLE N-1 NORTH COUNTY MODEL GENERAL HEAD BOUNDARY DATA (page 2)

CANAL	MODEL LAYER	MODEL ROW	MODEL COLUMN	REACH LENGTH (FT)	REACH WIDTH (FT)	REACH AREA (FT2)	REACH * CONDUCTANCE (FT2/DAY)	CANAL ELEVATION (NGVD)
LAKES	1	35	55			4739000	2369500	13.8
LAKES	1	36	55			8642000	4321000	13.8
LAKES	1	37	55			2788000	1394000	13.8
WPBWCA	1	19	39			2788000	1394000	17.9
WPBWCA	1	19	40			3903000	1951500	17.9
WPBWCA	1	20	39			2788000	1394000	17.9
WPBWCA	1	20	40			6970000	3485000	17.9
WPBWCA	1	20	41			5018000	2509000	17.9
WPBWCA	1	21	39			2788000	1394000	17.9
WPBWCA	1	21	40			6970000	3485000	17.9
WPBWCA	1	21	41			6970000	3485000	17.9
WPBWCA	1	21	42			6133000	3066500	17.9
WPBWCA	1	21	43			1673000	836500	17.9
WPBWCA	1	22	39			3345000	1672500	17.9
WPBWCA	1	22	40			6970000	3485000	17.9
WPBWCA	1	22	41			6970000	3485000	17.9
WPBWCA	1	22	42			6970000	3485000	17.9
WPBWCA	1	22	43			6970000	3485000	17.9
WPBWCA	1	22	44			3624000	1812000	17.9
WPBWCA	1	23	39			3345000	1672500	17.9
WPBWCA	1	23	40			6970000	3485000	17.9
WPBWCA	1	23	41			6970000	3485000	17.9
WPBWCA	1	23	42			6970000	3485000	17.9
WPBWCA	1	23	43			6970000	3485000	17.9
WPBWCA	1	23	44			6970000	3485000	17.9
WPBWCA	1	23	45			3624000	1812000	17.9
WPBWCA	1	24	39			4182000	2091000	17.9
WPBWCA	1	24	40			6970000	3485000	17.9
WPBWCA	1	24	41			6970000	3485000	17.9
WPBWCA	1	24	42			6970000	3485000	17.9
WPBWCA	1	24	43			6970000	3485000	17.9
WPBWCA	1	24	44			6970000	3485000	17.9
WPBWCA	1	24	45			4182000	2091000	17.9
WPBWCA	1	25	39			4182000	2091000	17.9
WPBWCA	1	25	40			6970000	3485000	17.9
WPBWCA	1	25	41			6970000	3485000	17.9
WPBWCA	1	25	42			6970000	3485000	17.9
WPBWCA	1	25	43			6970000	3485000	17.9
WPBWCA	1	25	44			6970000	3485000	17.9
WPBWCA	1	25	45			4182000	2091000	17.9
WPBWCA	1	26	39			4182000	2091000	17.9
WPBWCA	1	26	40			6970000	3485000	17.9
WPBWCA	1	26	41			6970000	3485000	17.9
WPBWCA	1	26	42			6970000	3485000	17.9
WPBWCA	1	26	43			6970000	3485000	17.9
WPBWCA	1	26	44			6970000	3485000	17.9

* based on 1 ft of sediment with a hydraulic conductivity of 0.5 ft/day

TABLE N-1 NORTH COUNTY MODEL GENERAL HEAD BOUNDARY DATA (page 3)

CANAL	MODEL LAYER	MODEL ROW	MODEL COLUMN	REACH LENGTH (FT)	REACH WIDTH (FT)	REACH AREA (FT2)	REACH * CONDUCTANCE (FT2/DAY)	CANAL ELEVATION (NGVD)
WPBWCA	1	26	45			3903000	1951500	17.9
WPBWCA	1	27	39			4461000	2230500	17.9
WPBWCA	1	27	40			6970000	3485000	17.9
WPBWCA	1	27	41			6970000	3485000	17.9
WPBWCA	1	27	42			6970000	3485000	17.9
WPBWCA	1	27	43			6970000	3485000	17.9
WPBWCA	1	27	44			6970000	3485000	17.9
WPBWCA	1	27	45			3624000	1812000	17.9
WPBWCA	1	28	39			4739000	2369500	17.9
WPBWCA	1	28	40			6970000	3485000	17.9
WPBWCA	1	28	41			6970000	3485000	17.9
WPBWCA	1	28	42			6970000	3485000	17.9
WPBWCA	1	28	43			6970000	3485000	17.9
WPBWCA	1	28	44			6970000	3485000	17.9
WPBWCA	1	28	45			3345000	1672500	17.9
WPBWCA	1	29	39			5018000	2509000	17.9
WPBWCA	1	29	40			6970000	3485000	17.9
WPBWCA	1	29	41			6970000	3485000	17.9
WPBWCA	1	29	42			6970000	3485000	17.9
WPBWCA	1	29	43			6970000	3485000	17.9
WPBWCA	1	29	44			6970000	3485000	17.9
WPBWCA	1	29	45			2230000	1115000	17.9
WPBWCA	1	30	39			5018000	2509000	17.9
WPBWCA	1	30	40			6970000	3485000	17.9
WPBWCA	1	30	41			6970000	3485000	17.9
WPBWCA	1	30	42			6970000	3485000	17.9
WPBWCA	1	30	43			6970000	3485000	17.9
WPBWCA	1	30	44			6970000	3485000	17.9
WPBWCA	1	30	45			1951000	975500	17.9
WPBWCA	1	31	39			5018000	2509000	17.9
WPBWCA	1	31	40			6970000	3485000	17.9
WPBWCA	1	31	41			6970000	3485000	17.9
WPBWCA	1	31	42			6970000	3485000	17.9
WPBWCA	1	31	43			6970000	3485000	17.9
WPBWCA	1	31	44			6970000	3485000	17.9
WPBWCA	1	31	45			1673000	836500	17.9
WPBWCA	1	32	39			5576000	2788000	17.9
WPBWCA	1	32	40			6970000	3485000	17.9
WPBWCA	1	32	41			6970000	3485000	17.9
WPBWCA	1	32	42			6970000	3485000	17.9
WPBWCA	1	32	43			6970000	3485000	17.9
WPBWCA	1	32	44			6970000	3485000	17.9
WPBWCA	1	32	45			1115000	557500	17.9
WPBWCA	1	33	39			5576000	2788000	17.9
WPBWCA	1	33	40			6970000	3485000	17.9
WPBWCA	1	33	41			6970000	3485000	17.9

* based on 1 ft of sediment with a hydraulic conductivity of 0.5 ft/day

TABLE N-1 NORTH COUNTY MODEL GENERAL HEAD BOUNDARY DATA (page 4)

CANAL	MODEL LAYER	MODEL ROW	MODEL COLUMN	REACH LENGTH (FT)	REACH WIDTH (FT)	REACH AREA (FT2)	REACH * CONDUCTANCE (FT2/DAY)	CANAL ELEVATION (NGVD)
WPBWCA	1	33	42			6970000	3485000	17.9
WPBWCA	1	33	43			1115000	557500	17.9
WPBWCA	1	34	39			3903000	1951500	17.9
WPBWCA	1	34	40			5018000	2509000	17.9
WPBWCA	1	34	41			5297000	2648500	17.9
WPBWCA	1	34	42			5576000	2788000	17.9
WPBWCA	1	34	43			1115000	557500	17.9
C-51	1	40	19	2640	90	237600	118800	10
C-51	1	40	20	2640	90	237600	118800	10
C-51	1	40	21	2640	90	237600	118800	10
C-51	1	40	22	2640	90	237600	118800	10
C-51	1	40	23	2640	90	237600	118800	10
C-51	1	40	24	2640	90	237600	118800	10
C-51	1	40	25	2640	90	237600	118800	10
C-51	1	40	26	2640	90	237600	118800	10
C-51	1	40	27	2640	90	237600	118800	10
C-51	1	40	28	2640	90	237600	118800	10
C-51	1	40	29	2640	90	237600	118800	10
C-51	1	40	30	2640	90	237600	118800	10
C-51	1	40	31	2640	90	237600	118800	10
C-51	1	40	32	2640	90	237600	118800	8
C-51	1	40	33	2640	90	237600	118800	8
C-51	1	40	34	2640	90	237600	118800	8
C-51	1	40	35	2640	90	237600	118800	8
C-51	1	40	36	2640	90	237600	118800	8
C-51	1	40	37	2640	105	277200	138600	8
C-51	1	40	38	2640	100	264000	132000	8
C-51	1	40	39	2640	100	264000	132000	8
C-51	1	40	40	2640	100	264000	132000	8
C-51	1	40	41	2640	100	264000	132000	8
C-51	1	40	42	2640	100	264000	132000	8
C-51	1	40	43	2640	120	316800	158400	8
C-51	1	40	44	2640	120	316800	158400	8
C-51	1	40	45	2640	120	316800	158400	8
C-51	1	40	46	2640	120	316800	158400	8
C-51	1	40	47	2640	120	316800	158400	8
C-51	1	40	48	2640	120	316800	158400	8
C-51	1	40	49	2640	140	369600	184800	8
C-51	1	40	50	2640	140	369600	184800	8
C-51	1	40	51	2640	170	448800	224400	8
C-51	1	40	52	2640	170	448800	224400	8
C-51	1	40	53	2800	150	420000	210000	8

* based on 1 ft of sediment with a hydraulic conductivity of 0.5 ft/day

TABLE N-2 NORTH COUNTY MODEL RIVER PACKAGE INPUT (page 1)

UNIT	MODEL LAYER	MODEL ROW	MODEL COLUMN	REACH DENSITY (/CELL)	REACH WIDTH (FT)	REACH * CONDUCTANCE (FT2/DAY)	CONTROL ELEVATION (NGVD)
LOXAHAT. GROVES	1	33	27	1.5	15	29700	16
LOXAHAT. GROVES	1	34	27	1	15	19800	16
LOXAHAT. GROVES	1	35	27	1.25	15	24750	16
LOXAHAT. GROVES	1	36	27	2	15	39600	16
LOXAHAT. GROVES	1	37	27	1	55	72600	16
LOXAHAT. GROVES	1	38	27	1	15	19800	16
LOXAHAT. GROVES	1	39	27	1	55	72600	16
LOXAHAT. GROVES	1	32	28	2	15	39600	16
LOXAHAT. GROVES	1	33	28	2	15	39600	16
LOXAHAT. GROVES	1	34	28	1	15	19800	16
LOXAHAT. GROVES	1	35	28	1	15	19800	16
LOXAHAT. GROVES	1	36	28	1	15	19800	16
LOXAHAT. GROVES	1	37	28	1	55	72600	16
LOXAHAT. GROVES	1	38	28	1	15	19800	16
LOXAHAT. GROVES	1	39	28	1	40	52800	16
LOXAHAT. GROVES	1	32	29	1	15	19800	16
LOXAHAT. GROVES	1	33	29	1	15	19800	16
LOXAHAT. GROVES	1	37	29	1	40	52800	16
LOXAHAT. GROVES	1	39	29	1.5	40	79200	16
LOXAHAT. GROVES	1	33	30	1	55	72600	16
LOXAHAT. GROVES	1	34	30	1	40	52800	16
LOXAHAT. GROVES	1	35	30	1	40	52800	16
LOXAHAT. GROVES	1	36	30	1	40	52800	16
LOXAHAT. GROVES	1	37	30	1	40	52800	16
LOXAHAT. GROVES	1	38	30	1	40	52800	16
LOXAHAT. GROVES	1	39	30	1.5	40	79200	16
LOXAHAT. GROVES	1	35	31	1	15	19800	16
LOXAHAT. GROVES	1	36	31	1	15	19800	16
LOXAHAT. GROVES	1	37	31	1	55	72600	16
LOXAHAT. GROVES	1	38	31	1	15	19800	16
LOXAHAT. GROVES	1	39	31	1	40	52800	16
LOXAHAT. GROVES	1	35	32	1	15	19800	16
LOXAHAT. GROVES	1	36	32	1	15	19800	16
LOXAHAT. GROVES	1	37	32	1	55	72600	16
LOXAHAT. GROVES	1	38	32	1	15	19800	16
LOXAHAT. GROVES	1	39	32	1	40	52800	16
LOXAHAT. GROVES	1	35	33	1	20	26400	16
LOXAHAT. GROVES	1	36	33	0.75	20	19800	16
LOXAHAT. GROVES	1	37	33	0.5	20	13200	16
LOXAHAT. GROVES	1	38	33	0.5	20	13200	16
LOXAHAT. GROVES	1	39	33	0.5	60	39600	16
LOXAHAT. GROVES	1	35	26	0.5	15	9900	16
LOXAHAT. GROVES	1	36	26	0.5	15	9900	16
LOXAHAT. GROVES	1	37	26	0.5	15	9900	16
LOXAHAT. GROVES	1	38	26	0.5	15	9900	16

* based on 1 ft of sediment with a hydraulic conductivity of 0.5 ft/day and a reach length of 2640

TABLE N-3 DRAIN PACKAGE DATA FOR THE NORTH COUNTY MODEL (page 1)
DRAINAGE AND WATER CONTROL DISTRICTS

UNIT	MODEL LAYER	MODEL ROW	MODEL COLUMN	REACH DENSITY (/CELL)	REACH WIDTH (FT)	REACH CONDUCTANCE (FT2/DAY)	WEIR ELEVATION (NGVD)
PRATT WHITNEY	1	9	21	1	20	26400	23.5
PRATT WHITNEY	1	9	22	1	20	264000	23.5
PRATT WHITNEY	1	9	23	1	20	264000	23.5
PRATT WHITNEY	1	9	24	1	20	264000	23.5
PRATT WHITNEY	1	8	25	1	20	264000	20
PRATT WHITNEY	1	9	25	2	20	528000	20
PRATT WHITNEY	1	10	25	1	20	264000	20
PRATT WHITNEY	1	9	26	1	20	264000	20
PRATT WHITNEY	1	10	26	1	20	264000	20
PRATT WHITNEY	1	10	27	1	20	264000	20
NPBCWCD UNIT 23	1	2	46	0.5	660	4356000	6
NPBCWCD UNIT 23	1	3	46	0.5	660	4356000	6
NPBCWCD UNIT 23	1	2	47	0.5	660	4356000	6
PRATT WHITNEY	1	9	14	1	20	264000	23.5
PRATT WHITNEY	1	9	15	1	20	264000	23.5
PRATT WHITNEY	1	9	16	1	20	264000	23.5
PRATT WHITNEY	1	9	17	1	20	264000	23.5
PRATT WHITNEY	1	9	18	1	20	264000	23.5
PRATT WHITNEY	1	9	19	1	20	264000	23.5
PRATT WHITNEY	1	9	20	1	20	264000	23.5
NPBCWCD UNIT 16	1	9	28	1	30	396000	16
NPBCWCD UNIT 16	1	10	28	0.5	30	198000	16
NPBCWCD UNIT 16	1	9	29	1	30	396000	16
NPBCWCD UNIT 16	1	8	30	0.5	30	198000	16
NPBCWCD UNIT 16	1	8	31	0.5	30	198000	16
SIRWCD	1	2	32	0.75	30	297000	10.5
SIRWCD	1	3	32	1.5	30	594000	10.5
SIRWCD	1	4	32	0.75	30	297000	10.5
SIRWCD	1	8	32	0.75	30	297000	10.5
SIRWCD	1	9	32	1.5	30	594000	10.5
SIRWCD	1	2	33	0.75	30	297000	10.5
SIRWCD	1	3	33	1.5	30	594000	10.5
SIRWCD	1	4	33	1.5	30	594000	10.5
SIRWCD	1	5	33	1.5	30	594000	10.5
SIRWCD	1	6	33	1.5	30	594000	10.5
SIRWCD	1	7	33	1.5	30	594000	10.5
SIRWCD	1	8	33	1.5	30	594000	10.5
SIRWCD	1	9	33	1.5	30	594000	10.5
SIRWCD	1	2	34	0.75	30	297000	10.5
SIRWCD	1	3	34	1.5	30	594000	10.5
SIRWCD	1	4	34	1.5	30	594000	10.5
SIRWCD	1	5	34	1.5	30	594000	10.5
SIRWCD	1	6	34	1.5	30	594000	10.5
SIRWCD	1	7	34	1.5	30	594000	10.5

* based on 1 ft of sediment with a hydraulic conductivity of 0.5 ft/day and a reach length of 2640 ft

TABLE N-3 DRAIN PACKAGE DATA FOR THE NORTH COUNTY MODEL (page 2)
DRAINAGE AND WATER CONTROL DISTRICTS

UNIT	MODEL LAYER	MODEL ROW	MODEL COLUMN	REACH DENSITY (/CELL)	REACH WIDTH (FT)	REACH CONDUCTANCE (FT2/DAY)	WEIR ELEVATION (NGVD)
SIRWCD	1	8	34	1.5	30	594000	10.5
SIRWCD	1	9	34	1.5	30	594000	10.5
SIRWCD	1	10	34	0.75	30	297000	10.5
SIRWCD	1	2	35	0.75	30	297000	10.5
SIRWCD	1	3	35	1.5	30	594000	10.5
SIRWCD	1	4	35	1.5	30	594000	10.5
SIRWCD	1	5	35	1.5	30	594000	10.5
SIRWCD	1	6	35	1.5	30	594000	10.5
SIRWCD	1	7	35	1.5	30	594000	10.5
SIRWCD	1	8	35	1.5	30	594000	10.5
SIRWCD	1	9	35	1.5	30	594000	10.5
SIRWCD	1	10	35	0.75	30	297000	10.5
SIRWCD	1	4	36	0.75	30	297000	10.5
SIRWCD	1	5	36	1.5	30	594000	10.5
SIRWCD	1	6	36	1.5	30	594000	10.5
SIRWCD	1	7	36	1.5	30	594000	10.5
SIRWCD	1	8	36	1.5	30	594000	10.5
SIRWCD	1	9	36	1.5	30	594000	10.5
SIRWCD	1	10	36	0.75	30	297000	10.5
SIRWCD	1	4	37	0.75	30	297000	10.5
SIRWCD	1	5	37	1.5	30	594000	10.5
SIRWCD	1	6	37	1.5	30	594000	10.5
SIRWCD	1	7	37	1.5	30	594000	10.5
SIRWCD	1	8	37	1.5	30	594000	10.5
SIRWCD	1	9	37	1.5	30	594000	10.5
SIRWCD	1	10	37	0.75	30	297000	10.5
SIRWCD	1	4	38	0.75	30	297000	10.5
SIRWCD	1	5	38	1.5	30	594000	10.5
SIRWCD	1	6	38	1.5	30	594000	10.5
SIRWCD	1	7	38	1.5	30	594000	10.5
SIRWCD	1	8	38	1.5	30	594000	10.5
SIRWCD	1	9	38	1.5	30	594000	10.5
SIRWCD	1	10	38	0.75	30	297000	10.5
SIRWCD	1	4	39	0.75	30	297000	10.5
SIRWCD	1	5	39	1.5	30	594000	10.5
SIRWCD	1	6	39	1.5	30	594000	10.5
SIRWCD	1	7	39	1.5	30	594000	10.5
SIRWCD	1	8	39	1.5	30	594000	10.5
SIRWCD	1	9	39	1.5	30	594000	10.5
SIRWCD	1	10	39	0.75	30	297000	10.5
SIRWCD	1	6	40	0.75	30	297000	10.5
SIRWCD	1	7	40	1.5	30	594000	10.5
SIRWCD	1	8	40	1.5	30	594000	10.5
SIRWCD	1	9	40	1.5	30	594000	10.5

* based on 1 ft of sediment with a hydraulic conductivity of 0.5 ft/day and a reach length of 2640 ft

TABLE N-3 DRAIN PACKAGE DATA FOR THE NORTH COUNTY MODEL (page 3)
DRAINAGE AND WATER CONTROL DISTRICTS

UNIT	MODEL LAYER	MODEL ROW	MODEL COLUMN	REACH DENSITY (/CELL)	REACH WIDTH (FT)	REACH CONDUCTANCE (FT2/DAY)	WEIR ELEVATION (NGVD)
SIRWCD	1	10	40	0.75	30	297000	10.5
SIRWCD	1	6	41	0.75	30	297000	10.5
SIRWCD	1	7	41	1.5	30	594000	10.5
SIRWCD	1	8	41	1.5	30	594000	10.5
SIRWCD	1	9	41	1.5	30	594000	10.5
SIRWCD	1	10	41	0.75	30	297000	10.5
SIRWCD	1	8	42	0.75	30	297000	10.5
SIRWCD	1	9	42	1.5	30	594000	13
SIRWCD	1	10	42	1.5	30	594000	13
SIRWCD	1	8	43	0.75	30	297000	10.5
SIRWCD	1	9	43	1.5	30	594000	13
SIRWCD	1	10	43	1.5	30	594000	13
SIRWCD	1	7	44	1.5	30	594000	13
SIRWCD	1	8	44	1.5	30	594000	13
SIRWCD	1	9	44	1.5	30	594000	13
SIRWCD	1	10	44	1.5	30	594000	13
SIRWCD	1	7	45	1.5	30	594000	13
SIRWCD	1	8	45	1.5	30	594000	13
SIRWCD	1	9	45	1.5	30	594000	13
SIRWCD	1	10	45	1.5	30	594000	13
SIRWCD	1	9	46	1.5	30	594000	13
SIRWCD	1	10	46	1.5	30	594000	13
SIRWCD	1	11	46	1.5	30	594000	13
SIRWCD	1	12	46	1.5	30	594000	13
SIRWCD	1	9	47	1.5	30	594000	13
NPBCWCD UNIT 9	1	9	48	1	20	264000	8
NPBCWCD UNIT 9	1	10	48	1	20	264000	9
NPBCWCD UNIT 9	1	11	48	1	20	264000	11
NPBCWCD UNIT 9	1	12	48	0.5	20	132000	11
NPBCWCD UNIT 9	1	9	49	1	20	264000	8
NPBCWCD UNIT 9	1	10	49	1	20	264000	9
NPBCWCD UNIT 9	1	11	49	1	20	264000	11
NPBCWCD UNIT 9	1	12	50	0.5	20	132000	11
NPBCWCD UNIT 9	1	9	50	1	20	264000	6
NPBCWCD UNIT 9	1	10	50	1	20	264000	6
NPBCWCD UNIT 9	1	11	50	1	20	264000	6
NPBCWCD UNIT 9	1	12	50	0.5	20	132000	6
NPBCWCD UNIT 9	1	9	51	1	20	264000	6
NPBCWCD UNIT 9	1	10	51	1	20	264000	6
NPBCWCD UNIT 9	1	11	51	1	20	264000	6
NPBCWCD UNIT 9	1	12	51	0.5	20	132000	6
NPBCWCD UNIT 10	1	10	30	1.5	25	495000	16
NPBCWCD UNIT 10	1	11	30	3	25	990000	16
NPBCWCD UNIT 10	1	10	31	1.5	25	495000	16

* based on 1 ft of sediment with a hydraulic conductivity of 0.5 ft/day and a reach length of 2640 ft

TABLE N-3 DRAIN PACKAGE DATA FOR THE NORTH COUNTY MODEL (page 4)
DRAINAGE AND WATER CONTROL DISTRICTS

UNIT	MODEL LAYER	MODEL ROW	MODEL COLUMN	REACH DENSITY (/CELL)	REACH WIDTH (FT)	REACH CONDUCTANCE (FT2/DAY)	WEIR ELEVATION (NGVD)
NPBCWCD UNIT 10	1	11	31	3	25	990000	16
NPBCWCD UNIT 10	1	12	31	1.5	25	495000	16
NPBCWCD UNIT 10	1	10	32	1.5	25	495000	16
NPBCWCD UNIT 10	1	11	32	3	25	990000	16
NPBCWCD UNIT 10	1	12	32	3	25	990000	16
NPBCWCD UNIT 10	1	13	32	1.5	25	495000	16
NPBCWCD UNIT 10	1	10	33	1.5	25	495000	16
NPBCWCD UNIT 10	1	11	33	3	25	990000	16
NPBCWCD UNIT 10	1	12	33	3	25	990000	16
NPBCWCD UNIT 10	1	13	33	3	25	990000	16
NPBCWCD UNIT 10	1	12	34	1.5	25	495000	16
NPBCWCD UNIT 10	1	13	34	3	25	990000	16
NPBCWCD UNIT 10	1	14	34	3	25	990000	16
NPBCWCD UNIT 2	1	16	48	1	30	396000	11
NPBCWCD UNIT 2	1	16	49	1	30	396000	11
NPBCWCD UNIT 2	1	18	49	1	30	396000	11
NPBCWCD UNIT 2	1	13	50	1	30	396000	11
NPBCWCD UNIT 2	1	14	50	1	30	396000	11
NPBCWCD UNIT 2	1	15	50	1	30	396000	11
NPBCWCD UNIT 2	1	16	50	1	30	396000	11
NPBCWCD UNIT 2	1	17	50	1	30	396000	11
NPBCWCD UNIT 2	1	18	50	1	30	396000	11
NPBCWCD UNIT 2	1	13	51	1	30	396000	8
NPBCWCD UNIT 2	1	14	51	1	30	396000	8
NPBCWCD UNIT 2	1	15	51	1	30	396000	8
NPBCWCD UNIT 2	1	16	51	1	30	396000	8
NPBCWCD UNIT 2	1	17	51	1	30	396000	8
NPBCWCD UNIT 2	1	18	51	0.5	30	198000	8
NPBCWCD UNIT 2	1	12	52	0.5	188	1240800	4.35
NPBCWCD UNIT 2	1	13	52	1	188	2481600	4.35
NPBCWCD UNIT 2	1	14	52	0.5	188	1240800	4.35
NPBCWCD UNIT 2	1	12	53	0.5	188	1240800	4.35
NPBCWCD UNIT 2	1	13	53	1	188	2481600	4.35
NPBCWCD UNIT 2	1	14	53	0.5	188	1240800	4.35
NPBCWCD UNIT 11	1	18	43	0.75	100	990000	18
NPBCWCD UNIT 11	1	19	43	0.75	100	990000	18
NPBCWCD UNIT 11	1	21	44	0.75	100	990000	18
NPBCWCD UNIT 3	1	23	47	1	30	396000	12
NPBCWCD UNIT 3	1	24	47	1	30	396000	12
NPBCWCD UNIT 3	1	23	48	2	30	792000	12
NPBCWCD UNIT 3	1	24	48	2	30	792000	12
NPBCWCD UNIT 3	1	25	48	1	30	396000	12
NPBCWCD UNIT 3	1	23	49	2	30	792000	9.5
NPBCWCD UNIT 3	1	24	49	2	30	792000	9.5

* based on 1 ft of sediment with a hydraulic conductivity of 0.5 ft/day and a reach length of 2640 ft

TABLE N-3 DRAIN PACKAGE DATA FOR THE NORTH COUNTY MODEL (page 5)
DRAINAGE AND WATER CONTROL DISTRICTS

UNIT	MODEL LAYER	MODEL ROW	MODEL COLUMN	REACH DENSITY (/CELL)	REACH WIDTH (FT)	REACH CONDUCTANCE (FT2/DAY)	WEIR ELEVATION (NGVD)
NPBCWCD UNIT 3	1	25	49	2	30	792000	9.5
NPBCWCD UNIT 3	1	23	50	1	30	396000	9.5
NPBCWCD UNIT 3	1	24	50	1	30	396000	9.5
NPBCWCD UNIT 3	1	25	50	1	30	396000	9.5
NPBCWCD UNIT 7	1	27	48	0.5	60	396000	11
NPBCWCD UNIT 7	1	28	48	0.5	60	396000	11
NPBCWCD UNIT 7	1	27	49	1	60	792000	11
NPBCWCD UNIT 7	1	28	49	1	60	792000	11
NPBCWCD UNIT 7	1	27	50	1	60	792000	7
NPBCWCD UNIT 7	1	28	50	1	60	792000	7
NPBCWCD UNIT 7	1	27	51	0.5	60	396000	7
NPBCWCD UNIT 7	1	28	51	0.5	60	396000	7
NPBCWCD UNIT 7	1	28	52	0.25	60	198000	7
NPBCWCD UNIT 4	1	31	47	0.5	400	2640000	10.5
NPBCWCD UNIT 4	1	32	47	0.5	400	2640000	10.5
NPBCWCD UNIT 4	1	33	47	1	400	5280000	10.5
NPBCWCD UNIT 4	1	34	47	1	400	5280000	10.5
NPBCWCD UNIT 4	1	31	48	1	400	5280000	10.5
NPBCWCD UNIT 4	1	32	48	1	400	5280000	10.5
NPBCWCD UNIT 4	1	33	48	1	400	5280000	10.5
NPBCWCD UNIT 4	1	34	48	0.5	400	2640000	10.5
NPBCWCD UNIT 4	1	31	49	0.5	400	2640000	10.5
NPBCWCD UNIT 4	1	32	49	1	400	5280000	10.5
NPBCWCD UNIT 4	1	33	49	1	400	5280000	10.5
NPBCWCD UNIT 4	1	34	49	1	400	5280000	10.5
NPBCWCD UNIT 4	1	31	50	1	400	5280000	10.5
NPBCWCD UNIT 4	1	32	50	1	400	5280000	10.5
NPBCWCD UNIT 4	1	34	50	1	400	5280000	10.5
NPBCWCD UNIT 4	1	35	50	1	400	5280000	10.5
NPBCWCD UNIT 4	1	36	50	0.5	400	2640000	10.5
NPBCWCD UNIT 4	1	31	51	0.5	400	2640000	10.5
NPBCWCD UNIT 4	1	32	51	0.5	400	2640000	10.5
NPBCWCD UNIT 4	1	34	51	0.5	400	2640000	10.5
NPBCWCD UNIT 4	1	35	51	0.5	400	2640000	10.5
NPBCWCD UNIT 15	1	33	50	0.5	400	2640000	10.5
NPBCWCD UNIT 15	1	31	51	0.5	400	2640000	10.5
NPBCWCD UNIT 15	1	32	51	0.5	400	2640000	10.5
NPBCWCD UNIT 15	1	33	51	1	400	5280000	10.5
NPBCWCD UNIT 15	1	34	51	0.5	400	2640000	10.5
NPBCWCD UNIT 15	1	35	51	0.5	400	2640000	10.5
NPBCWCD UNIT 15	1	36	51	0.5	400	2640000	10.5
NPBCWCD UNIT 15	1	31	52	1	400	5280000	10.5
NPBCWCD UNIT 15	1	32	52	0.5	400	2640000	10.5
NPBCWCD UNIT 15	1	33	52	0.5	400	2640000	10.5

* based on 1 ft of sediment with a hydraulic conductivity of 0.5 ft/day and a reach length of 2640 ft

TABLE N-3 DRAIN PACKAGE DATA FOR THE NORTH COUNTY MODEL (page 6)
DRAINAGE AND WATER CONTROL DISTRICTS

UNIT	MODEL LAYER	MODEL ROW	MODEL COLUMN	REACH DENSITY (/CELL)	REACH WIDTH (FT)	REACH CONDUCTANCE (FT2/DAY)	WEIR ELEVATION (NGVD)
NPBCWCD UNIT 15	1	34	52	0.5	400	2640000	10.5
NPBCWCD UNIT 15	1	35	52	0.5	400	2640000	10.5
NPBCWCD UNIT 6	1	38	37	1	50	660000	13
NPBCWCD UNIT 6	1	37	38	1	50	660000	13
NPBCWCD UNIT 6	1	38	38	1	50	660000	13
M-1 ACREAGE	1	22	21	1	20	264000	17.5
M-1 ACREAGE	1	22	22	2	20	528000	17.5
M-1 ACREAGE	1	22	23	2	20	528000	17.5
M-1 ACREAGE	1	23	23	1	20	264000	17.5
M-1 ACREAGE	1	24	23	1	20	264000	17.5
M-1 ACREAGE	1	25	23	1	20	264000	17.5
M-1 ACREAGE	1	26	23	1	20	264000	17.5
M-1 ACREAGE	1	27	23	1	20	264000	17.5
M-1 ACREAGE	1	28	23	1	20	264000	17.5
M-1 ACREAGE	1	22	24	2	20	528000	17.5
M-1 ACREAGE	1	23	24	2	20	528000	17.5
M-1 ACREAGE	1	24	24	2	20	528000	17.5
M-1 ACREAGE	1	25	24	2	20	528000	17.5
M-1 ACREAGE	1	26	24	2	20	528000	17.5
M-1 ACREAGE	1	28	24	2	20	528000	17.5
M-1 ACREAGE	1	28	25	2	20	528000	17.5
M-1 ACREAGE	1	28	26	2	20	528000	17.5
M-1 ACREAGE	1	27	24	2	20	528000	17.5
M-1 ACREAGE	1	22	25	2	20	528000	17.5
M-1 ACREAGE	1	23	25	2	20	528000	17.5
M-1 ACREAGE	1	24	25	2	20	528000	17.5
M-1 ACREAGE	1	25	25	2	20	528000	17.5
M-1 ACREAGE	1	26	25	2	20	528000	17.5
M-1 ACREAGE	1	27	25	2	20	528000	17.5
M-1 ACREAGE	1	22	26	2	20	528000	17.5
M-1 ACREAGE	1	23	26	2	20	528000	17.5
M-1 ACREAGE	1	24	26	2	20	528000	17.5
M-1 ACREAGE	1	25	26	2	20	528000	17.5
M-1 ACREAGE	1	26	26	2	20	528000	17.5
M-1 ACREAGE	1	27	26	2	20	528000	17.5
M-1 ACREAGE	1	21	27	1	20	264000	17.5
M-1 ACREAGE	1	22	27	2	20	528000	17.5
M-1 ACREAGE	1	23	27	2	20	528000	17.5
M-1 ACREAGE	1	24	27	2	20	528000	17.5
M-1 ACREAGE	1	25	27	2	20	528000	17.5
M-1 ACREAGE	1	26	27	2	20	528000	17.5
M-1 ACREAGE	1	27	27	2	20	528000	17.5
M-1 ACREAGE	1	28	27	2	20	528000	17.5
M-1 ACREAGE	1	21	28	2	20	528000	17.5

* based on 1 ft of sediment with a hydraulic conductivity of 0.5 ft/day and a reach length of 2640 ft

TABLE N-3 DRAIN PACKAGE DATA FOR THE NORTH COUNTY MODEL (page 7)
DRAINAGE AND WATER CONTROL DISTRICTS

UNIT	MODEL LAYER	MODEL ROW	MODEL COLUMN	REACH DENSITY (/CELL)	REACH WIDTH (FT)	REACH CONDUCTANCE (FT2/DAY)	WEIR ELEVATION (NGVD)
M-1 ACREAGE	1	22	28	2	20	528000	17.5
M-1 ACREAGE	1	23	28	2	20	528000	17.5
M-1 ACREAGE	1	24	28	2	20	528000	17.5
M-1 ACREAGE	1	25	28	2	20	528000	17.5
M-1 ACREAGE	1	26	28	2	20	528000	17.5
M-1 ACREAGE	1	27	28	2	20	528000	17.5
M-1 ACREAGE	1	28	28	2	20	528000	17.5
M-1 ACREAGE	1	21	29	2	20	528000	17.5
M-1 ACREAGE	1	22	29	2	20	528000	17.5
M-1 ACREAGE	1	23	29	2	20	528000	17.5
M-1 ACREAGE	1	24	29	2	20	528000	17.5
M-1 ACREAGE	1	25	29	2	20	528000	17.5
M-1 ACREAGE	1	26	29	2	20	528000	17.5
M-1 ACREAGE	1	27	29	2	20	528000	17.5
M-1 ACREAGE	1	28	29	2	20	528000	17.5
M-1 ACREAGE	1	21	30	1	20	264000	17.5
M-1 ACREAGE	1	22	30	1	20	264000	17.5
M-1 ACREAGE	1	23	30	2	20	528000	17.5
M-1 ACREAGE	1	24	30	2	20	528000	17.5
M-1 ACREAGE	1	25	30	2	20	528000	17.5
M-1 ACREAGE	1	26	30	2	20	528000	17.5
M-1 ACREAGE	1	27	30	2	20	528000	17.5
M-1 ACREAGE	1	28	30	2	20	528000	17.5
M-1 ACREAGE	1	23	31	2	20	528000	17.5
M-1 ACREAGE	1	24	31	2	20	528000	17.5
M-1 ACREAGE	1	25	31	2	20	528000	17.5
M-1 ACREAGE	1	26	31	2	20	528000	17.5
M-1 ACREAGE	1	27	31	2	20	528000	17.5
M-1 ACREAGE	1	28	31	2	20	528000	17.5
M-1 ACREAGE	1	29	31	1	20	264000	17.5
M-1 ACREAGE	1	30	31	1	20	264000	17.5
M-1 ACREAGE	1	31	31	1	20	264000	17.5
M-1 ACREAGE	1	32	31	1	20	264000	17.5
M-1 ACREAGE	1	33	31	1	20	264000	17.5
M-1 ACREAGE	1	34	31	2	20	528000	17.5
M-1 ACREAGE	1	23	32	2	20	528000	17.5
M-1 ACREAGE	1	24	32	2	20	528000	17.5
M-1 ACREAGE	1	25	32	2	20	528000	17.5
M-1 ACREAGE	1	26	32	2	20	528000	17.5
M-1 ACREAGE	1	27	32	2	20	528000	17.5
M-1 ACREAGE	1	28	32	2	20	528000	17.5
M-1 ACREAGE	1	29	32	2	20	528000	17.5
M-1 ACREAGE	1	30	32	2	20	528000	17.5
M-1 ACREAGE	1	31	32	2	20	528000	17.5

* based on 1 ft of sediment with a hydraulic conductivity of 0.5 ft/day and a reach length of 2640 ft

TABLE N-3 DRAIN PACKAGE DATA FOR THE NORTH COUNTY MODEL (page 8)
DRAINAGE AND WATER CONTROL DISTRICTS

UNIT	MODEL LAYER	MODEL ROW	MODEL COLUMN	REACH DENSITY (/CELL)	REACH WIDTH (FT)	REACH CONDUCTANCE (FT2/DAY)	WEIR ELEVATION (NGVD)
M-1 ACREAGE	1	32	32	2	20	528000	17.5
M-1 ACREAGE	1	23	33	2	20	528000	17.5
M-1 ACREAGE	1	24	33	2	20	528000	17.5
M-1 ACREAGE	1	25	33	2	20	528000	17.5
M-1 ACREAGE	1	26	33	2	20	528000	17.5
M-1 ACREAGE	1	27	33	2	20	528000	17.5
M-1 ACREAGE	1	28	33	2	20	528000	17.5
M-1 ACREAGE	1	29	33	1	20	264000	17.5
M-1 ACREAGE	1	30	33	1	20	264000	17.5
M-1 ACREAGE	1	31	33	2	20	528000	17.5
M-1 ACREAGE	1	32	33	2	20	528000	17.5
M-1 ACREAGE	1	22	34	1	20	264000	17.5
M-1 ACREAGE	1	23	34	2	20	528000	17.5
M-1 ACREAGE	1	24	34	2	20	528000	17.5
M-1 ACREAGE	1	25	34	2	20	528000	17.5
M-1 ACREAGE	1	26	34	2	20	528000	17.5
M-1 ACREAGE	1	27	34	2	20	528000	17.5
M-1 ACREAGE	1	28	34	2	20	528000	17.5
M-1 ACREAGE	1	31	34	2	20	528000	17.5
M-1 ACREAGE	1	32	34	2	20	528000	17.5
M-1 ACREAGE	1	22	35	1	20	264000	17.5
M-1 ACREAGE	1	23	35	2	20	528000	17.5
M-1 ACREAGE	1	24	35	2	20	528000	17.5
M-1 ACREAGE	1	25	35	2	20	528000	17.5
M-1 ACREAGE	1	26	35	2	20	528000	17.5
M-1 ACREAGE	1	27	35	2	20	528000	17.5
M-1 ACREAGE	1	28	35	2	20	528000	17.5
M-1 ACREAGE	1	31	35	2	20	528000	17.5
M-1 ACREAGE	1	32	35	2	20	528000	17.5
M-1 ACREAGE	1	23	36	1	20	264000	17.5
M-1 ACREAGE	1	24	36	1	20	264000	17.5
M-1 ACREAGE	1	25	36	2	20	528000	17.5
M-1 ACREAGE	1	26	36	2	20	528000	17.5
M-1 ACREAGE	1	27	36	2	20	528000	17.5
M-1 ACREAGE	1	28	36	2	20	528000	17.5
M-1 ACREAGE	1	29	36	2	20	528000	17.5
M-1 ACREAGE	1	30	36	2	20	528000	17.5
M-1 ACREAGE	1	31	36	2	20	528000	17.5
M-1 ACREAGE	1	32	36	2	20	528000	17.5
M-1 ACREAGE	1	25	37	1	20	264000	17.5
M-1 ACREAGE	1	26	37	1	20	264000	17.5
M-1 ACREAGE	1	27	37	1	20	264000	17.5
M-1 ACREAGE	1	28	37	1	20	264000	17.5
M-1 ACREAGE	1	29	37	1	20	264000	17.5

* based on 1 ft of sediment with a hydraulic conductivity of 0.5 ft/day and a reach length of 2640 ft

TABLE N-3 DRAIN PACKAGE DATA FOR THE NORTH COUNTY MODEL (page 9)
DRAINAGE AND WATER CONTROL DISTRICTS

UNIT	MODEL LAYER	MODEL ROW	MODEL COLUMN	REACH DENSITY (/CELL)	REACH WIDTH (FT)	REACH CONDUCTANCE (FT2/DAY)	WEIR ELEVATION (NGVD)
M-1 ACREAGE	1	30	37	1	20	264000	17.5
SEMINOLE WDC	1	30	21	1	8	105600	15
SEMINOLE WDC	1	29	22	2	8	211200	15
SEMINOLE WDC	1	30	22	1	8	105600	15
SEMINOLE WDC	1	29	23	2	8	211200	15
SEMINOLE WDC	1	30	23	2	8	211200	15
SEMINOLE WDC	1	29	24	2	8	211200	15
SEMINOLE WDC	1	30	24	2	8	211200	15
SEMINOLE WDC	1	29	25	2	8	211200	15
SEMINOLE WDC	1	30	25	2	8	211200	15
SEMINOLE WDC	1	29	26	2	8	211200	15
SEMINOLE WDC	1	30	26	2	8	211200	15
SEMINOLE WDC	1	31	26	2	8	211200	15
SEMINOLE WDC	1	29	27	2	8	211200	15
SEMINOLE WDC	1	30	27	2	8	211200	15
SEMINOLE WDC	1	31	27	2	8	211200	15
SEMINOLE WDC	1	29	28	2	8	211200	15
SEMINOLE WDC	1	30	28	2	8	211200	15
SEMINOLE WDC	1	31	28	2	8	211200	15
SEMINOLE WDC	1	29	29	2	8	211200	15
SEMINOLE WDC	1	30	29	2	8	211200	15
SEMINOLE WDC	1	31	29	2	8	211200	15
SEMINOLE WDC	1	29	30	2	8	211200	15
SEMINOLE WDC	1	30	30	2	8	211200	15
SEMINOLE WDC	1	31	30	2	8	211200	15
SEMINOLE WDC	1	29	31	1	8	105600	15
SEMINOLE WDC	1	30	31	1	8	105600	15
SEMINOLE WDC	1	31	31	1	8	105600	15
M-2 ACREAGE	1	31	21	2	20	528000	17.5
M-2 ACREAGE	1	32	21	1	20	264000	17.5
M-2 ACREAGE	1	33	21	1	20	264000	17.5
M-2 ACREAGE	1	34	21	1	20	264000	17.5
M-2 ACREAGE	1	31	22	2	20	528000	17.5
M-2 ACREAGE	1	32	22	2	20	528000	17.5
M-2 ACREAGE	1	33	22	2	20	528000	17.5
M-2 ACREAGE	1	31	23	2	20	528000	17.5
M-2 ACREAGE	1	32	23	2	20	528000	17.5
M-2 ACREAGE	1	33	23	2	20	528000	17.5
M-2 ACREAGE	1	34	23	1	20	264000	17.5
M-2 ACREAGE	1	31	24	2	20	528000	17.5
M-2 ACREAGE	1	32	24	2	20	528000	17.5
M-2 ACREAGE	1	33	24	2	20	528000	17.5
M-2 ACREAGE	1	34	24	2	20	528000	17.5
M-2 ACREAGE	1	32	25	1	20	264000	17.5

* based on 1 ft of sediment with a hydraulic conductivity of 0.5 ft/day and a reach length of 2640 ft

TABLE N-3 DRAIN PACKAGE DATA FOR THE NORTH COUNTY MODEL (page 10)
DRAINAGE AND WATER CONTROL DISTRICTS

UNIT	MODEL LAYER	MODEL ROW	MODEL COLUMN	REACH DENSITY (/CELL)	REACH WIDTH (FT)	REACH CONDUCTANCE (FT2/DAY)	WEIR ELEVATION (NGVD)
M-2 ACREAGE	1	33	25	2	20	528000	17.5
M-2 ACREAGE	1	34	25	2	20	528000	17.5
M-2 ACREAGE	1	35	25	2	20	528000	17.5
M-2 ACREAGE	1	36	25	2	20	528000	17.5
M-2 ACREAGE	1	37	25	2	20	528000	17.5
M-2 ACREAGE	1	38	25	2	20	528000	17.5
M-2 ACREAGE	1	33	26	1	20	264000	17.5
M-2 ACREAGE	1	34	26	1	20	264000	17.5
M-2 ACREAGE	1	35	26	1	20	264000	17.5
M-2 ACREAGE	1	36	26	1	20	264000	17.5
M-2 ACREAGE	1	37	26	1	20	264000	17.5
M-2 ACREAGE	1	38	26	1	20	264000	17.5
LION CO. SAFARI	1	35	23	8	20	2112000	
LION CO. SAFARI	1	36	23	2	20	528000	
LION CO. SAFARI	1	35	24	8	20	2112000	
INDIAN TR.WCD ACT.	1	33	35	1	50	660000	13.5
INDIAN TR.WCD ACT.	1	34	35	1	50	660000	13.5
INDIAN TR.WCD ACT.	1	35	35	1	50	660000	13.5
INDIAN TR.WCD ACT.	1	36	35	1	50	660000	13.5
INDIAN TR.WCD ACT.	1	37	35	1	50	660000	13.5
INDIAN TR.WCD ACT.	1	38	35	1	50	660000	13.5
INDIAN TR.WCD ACT.	1	39	35	1	50	660000	13.5
INDIAN TR.WCD ACT.	1	33	36	1	50	660000	13.5
INDIAN TR.WCD ACT.	1	34	36	1	50	660000	13.5
INDIAN TR.WCD ACT.	1	35	36	1	50	660000	13.5
INDIAN TR.WCD ACT.	1	36	36	1	50	660000	13.5
INDIAN TR.WCD ACT.	1	37	36	1	50	660000	13.5
INDIAN TR.WCD ACT.	1	38	36	1	50	660000	13.5
INDIAN TR.WCD ACT.	1	35	37	0.5	50	330000	13.5
INDIAN TR.WCD ACT.	1	36	37	0.5	50	330000	13.5
INDIAN TR.WCD ACT.	1	37	37	1	50	660000	13.5
MISC/AG	1	22	16	2	8	211200	15
MISC/AG	1	22	17	2	8	211200	15
MISC/AG	1	22	18	2	8	211200	15
MISC/AG	1	22	19	2	8	211200	15
MISC/AG	1	22	20	2	8	211200	15
MISC/AG	1	23	16	2	8	211200	15
MISC/AG	1	23	17	2	8	211200	15
MISC/AG	1	23	18	2	8	211200	15
MISC/AG	1	23	19	2	8	211200	15
MISC/AG	1	23	20	2	8	211200	15
MISC/AG	1	23	21	2	8	211200	15
MISC/AG	1	23	22	2	8	211200	15
MISC/AG	1	24	16	2	8	211200	15

* based on 1 ft of sediment with a hydraulic conductivity of 0.5 ft/day and a reach length of 2640 ft

TABLE N-3 DRAIN PACKAGE DATA FOR THE NORTH COUNTY MODEL (page 11)
DRAINAGE AND WATER CONTROL DISTRICTS

UNIT	MODEL LAYER	MODEL ROW	MODEL COLUMN	REACH DENSITY (/CELL)	REACH WIDTH (FT)	REACH CONDUCTANCE (FT2/DAY)	WEIR ELEVATION (NGVD)
MISC/AG	1	24	17	2	8	211200	15
MISC/AG	1	24	18	2	8	211200	15
MISC/AG	1	24	19	2	8	211200	15
MISC/AG	1	24	20	2	8	211200	15
MISC/AG	1	24	21	2	8	211200	15
MISC/AG	1	24	22	2	8	211200	15
MISC/AG	1	25	16	2	8	211200	15
MISC/AG	1	25	17	2	8	211200	15
MISC/AG	1	25	18	2	8	211200	15
MISC/AG	1	25	19	2	8	211200	15
MISC/AG	1	25	20	2	8	211200	15
MISC/AG	1	25	21	2	8	211200	15
MISC/AG	1	25	22	2	8	211200	15
MISC/AG	1	26	16	2	8	211200	15
MISC/AG	1	26	17	2	8	211200	15
MISC/AG	1	26	18	2	8	211200	15
MISC/AG	1	26	19	2	8	211200	15
MISC/AG	1	26	20	2	8	211200	15
MISC/AG	1	26	21	2	8	211200	15
MISC/AG	1	26	22	2	8	211200	15
MISC/AG	1	27	16	2	8	211200	15
MISC/AG	1	27	17	2	8	211200	15
MISC/AG	1	27	18	2	8	211200	15
MISC/AG	1	27	19	2	8	211200	15
MISC/AG	1	27	20	2	8	211200	15
MISC/AG	1	27	21	2	8	211200	15
MISC/AG	1	27	22	2	8	211200	15
MISC/AG	1	28	16	2	8	211200	15
MISC/AG	1	28	17	2	8	211200	15
MISC/AG	1	28	18	2	8	211200	15
MISC/AG	1	28	19	2	8	211200	15
MISC/AG	1	28	20	2	8	211200	15
MISC/AG	1	28	21	2	8	211200	15
MISC/AG	1	28	22	2	8	211200	15
MISC/AG	1	37	23	2	8	211200	15
MISC/AG	1	37	24	2	8	211200	15
MISC/AG	1	38	23	2	8	211200	15
MISC/AG	1	38	24	2	8	211200	15
MISC/AG	1	39	23	2	8	211200	15
MISC/AG	1	39	24	2	8	211200	15
MISC/AG	1	22	21	1	8	105600	15
MISC/AG	1	23	23	1	8	105600	15
MISC/AG	1	24	23	1	8	105600	15
MISC/AG	1	25	23	1	8	105600	15

* based on 1 ft of sediment with a hydraulic conductivity of 0.5 ft/day and a reach length of 2640 ft

TABLE N-3 DRAIN PACKAGE DATA FOR THE NORTH COUNTY MODEL (page 12)
DRAINAGE AND WATER CONTROL DISTRICTS

UNIT	MODEL LAYER	MODEL ROW	MODEL COLUMN	REACH DENSITY (/CELL)	REACH WIDTH (FT)	REACH CONDUCTANCE (FT2/DAY)	WEIR ELEVATION (NGVD)
MISC/AG	1	26	23	1	8	105600	15
MISC/AG	1	27	23	1	8	105600	15
MISC/AG	1	28	23	1	8	105600	15
NPBHWCD	1	12	47	1	50	660000	8
NPBHWCD	1	11	47	2	50	1320000	7.5
NPBHWCD	1	10	47	3	50	1980000	6
JUPITER VILAGE	1	7	47	1	132	1742400	6.3
MAPLEWOOD	1	7	48	1	100	1320000	6.3
MAPLEWOOD	1	7	49	2	100	2640000	6.3
INDIAN CREEK	1	8	46	1	80	1056000	7.5
INDIAN CREEK	1	8	47	1	80	1056000	7.5
NPBCWCD UNIT 11	1	12	28	0.25	20	6600	19.1
NPBCWCD UNIT 11	1	13	28	1	20	26400	19.1
NPBCWCD UNIT 11	1	14	28	1	20	26400	19.1
NPBCWCD UNIT 11	1	15	28	1	20	26400	19.1
NPBCWCD UNIT 11	1	12	29	1	20	26400	19.1
NPBCWCD UNIT 11	1	13	29	2	20	52800	19.1
NPBCWCD UNIT 11	1	14	29	2	20	52800	19.1
NPBCWCD UNIT 11	1	15	29	2	20	52800	19.1
NPBCWCD UNIT 11	1	12	30	0.5	20	13200	19.1
NPBCWCD UNIT 11	1	13	30	2	20	52800	19.1
NPBCWCD UNIT 11	1	14	30	2	20	52800	19.1
NPBCWCD UNIT 11	1	15	30	2	20	52800	19.1
NPBCWCD UNIT 14	1	13	46	1	188	248160	15
NPBCWCD UNIT 14	1	14	46	1	188	248160	15
NPBCWCD UNIT 14	1	13	47	1	188	248160	15
NPBCWCD UNIT 14	1	14	47	1	188	248160	15
NPBCWCD UNIT 11	1	18	44	0.75	100	99000	15
NPBCWCD UNIT 11	1	18	45	0.75	100	99000	15
NPBCWCD UNIT 11	1	19	45	1.5	100	198000	15
NPBCWCD UNIT 11	1	20	45	1.5	100	198000	15
NPBCWCD UNIT 11	1	21	45	1.5	100	198000	15
NPBCWCD UNIT 11	1	22	45	0.75	100	99000	15
NPBCWCD UNIT 11	1	18	46	0.75	100	99000	15
NPBCWCD UNIT 11	1	19	46	1.5	100	198000	15
NPBCWCD UNIT 11	1	20	46	1.5	100	198000	15
NPBCWCD UNIT 11	1	21	46	1.5	100	198000	15
NPBCWCD UNIT 11	1	22	46	1.5	100	198000	15
NPBCWCD UNIT 11	1	19	47	0.75	100	99000	15
NPBCWCD UNIT 11	1	20	47	0.75	100	99000	15
NPBCWCD UNIT 11	1	21	47	0.75	100	99000	15
NPBCWCD UNIT 11	1	22	47	0.75	100	99000	15

* based on 1 ft of sediment with a hydraulic conductivity of 0.5 ft/day and a reach length of 2640 ft

TABLE N-4 DRAIN PACKAGE DATA FOR THE NORTH COUNTY MODEL (page 1)
C-17 AND C-18 CANALS

CANAL	MODEL LAYER	MODEL ROW	MODEL COLUMN	REACH LENGTH (FT)	REACH WIDTH (FT)	REACH * CONDUCTANCE (FT2/DAY)	WEIR ELEVATION (NGVD)
C-18	1	16	28	3300	45	74250	17.4
C-18	1	16	29	2640	45	59400	17.4
C-18	1	16	30	2900	45	65250	17.4
C-18	1	16	31	2760	45	62100	17.4
C-18	1	15	32	3580	45	80550	17.4
C-18	1	14	33	2500	45	56250	17.4
C-18	1	14	33	1300	45	29250	14.5
C-18	1	13	34	3700	45	83250	14.5
C-18	1	12	35	3900	75	146250	14.5
C-18	1	12	36	2640	75	99000	14.5
C-18	1	12	37	2640	75	99000	14.5
C-18	1	12	38	2640	75	99000	14.5
C-18	1	12	39	2640	75	99000	14.5
C-18	1	12	40	3036	75	113850	14.5
C-18	1	12	41	2640	75	99000	14.5
C-18	1	13	41	2640	125	165000	14.5
C-18	1	14	41	2640	125	165000	14.5
C-18	1	15	42	2640	98	129360	14.5
C-18	1	16	42	2640	98	129360	14.5
C-18	1	17	42	2640	98	129360	14.5
C-18	1	18	43	2640	98	129360	14.5
C-18	1	19	43	2640	65	85800	14.5
C-18	1	20	43	2640	65	85800	14.5
C-18	1	21	44	2640	65	85800	14.5
C-18	1	22	44	1050	65	34125	14.5
C-18	1	12	42	2640	125	165000	14.5
C-18	1	11	42	2640	125	165000	14.5
C-18	1	10	42	2640	125	165000	14.5
C-18	1	9	42	2640	125	165000	14.5
C-18	1	8	42	3170	150	237750	14.5
C-18	1	7	43	3700	150	277500	14.5
C-18	1	6	44	2640	150	198000	14.5
C-18	1	6	45	2640	150	198000	14.5
C-18	1	5	46	1300	150	97500	0.6
C-18	1	5	46	2400	150	180000	0.6
C-18	1	4	47	2900	150	217500	0.6
C-18	1	4	48	2640	290	384500	0.6
C-18	1	4	49	2640	845	1115000	0.6
C-17	1	22	57	1100	150	82500	0.6
C-17	1	22	56	2640	150	198000	0.6
C-17	1	22	55	3200	125	200000	0.6
C-17	1	22	54	1000	125	62500	0.6
C-17	1	21	54	1600	125	100000	6.8
C-17	1	21	53	2000	120	120000	6.8

* based on 1 ft of sediment with a hydraulic conductivity of 0.5 ft/day

TABLE N-4 DRAIN PACKAGE DATA FOR THE NORTH COUNTY MODEL (page 2)
C-17 AND C-18 CANALS

CANAL	MODEL LAYER	MODEL ROW	MODEL COLUMN	REACH LENGTH (FT)	REACH WIDTH (FT)	REACH * CONDUCTANCE (FT2/DAY)	WEIR ELEVATION (NGVD)
C-17	1	22	53	2640	150	198000	6.8
C-17	1	23	53	2000	140	140000	6.8
C-17	1	23	52	750	140	52500	6.8
C-17	1	24	52	2750	140	192500	6.8
C-17	1	25	52	2640	130	171600	6.8
C-17	1	26	52	2640	130	171600	6.8
C-17	1	27	52	2640	150	198000	6.8
C-17	1	28	52	2750	100	137500	6.8
C-17	1	29	52	2800	125	175000	6.8
C-17	1	30	52	3000	125	187500	6.8

* based on 1 ft of sediment with a hydraulic conductivity of 0.5 ft/day

APPENDIX O

CALIBRATION PERIOD WATER USE DATA

TABLE O-1 NORTH MODEL CALIBRATION PERIOD PUMPAGE DISTRIBUTION (page 1)

PERMIT #	PERMITTEE	WELLFIELD	USE* TYPE	LAYER	ROW	COL	NODE % OF WELLFIELD
50-00010	JUPITER	MAIN	PWS	4	5	47	21.0
			PWS	4	6	47	33.3
			PWS	5	6	48	4.2
			PWS	4	7	48	4.2
			PWS	5	8	46	4.2
			PWS	5	8	47	12.5
			PWS	5	8	48	12.5
			PWS	5	9	47	4.2
			PWS	5	10	47	4.2
50-00030	MANGONIA	MAIN	PWS	5	29	54	40.0
			PWS	5	28	54	60.0
50-00135	PB COUNTY #8W	8W	PWS	4	37	45	22.0
			PWS	4	37	46	66.0
			PWS	4	36	46	11.0
50-00135	PB COUNTY #1W	1W	PWS	5	38	50	8.3
			PWS	5	38	51	25.0
			PWS	5	39	50	16.6
			PWS	5	39	51	16.6
			PWS	5	39	52	33.0
50-00178	CENTURY	MAIN	PWS	5	36	48	100.0
50-00365	SEACOAST	LILAC	PWS	5	19	50	14.3
			PWS	5	19	51	14.3
			PWS	5	20	50	14.3
			PWS	5	20	51	57.1
50-00365	SEACOAST	HOOD	PWS	5	15	47	15.4
			PWS	4	15	48	7.7
			PWS	4	16	47	31.0
			PWS	4	16	48	38.5
			PWS	4	17	47	7.7
50-00365	SEACOAST	RICH. RD.	PWS	5	21	53	12.5
			PWS	4	22	53	87.5
50-00365	SEACOAST	OLD DIXIE	PWS	4	23	53	55.5
			PWS	3	23	54	44.5
50-00444	ROYAL PLM BCH	OKEECHOBEE	PWS	3	36	37	42.9
			PWS	3	37	37	57.1
50-00460	RIVERIA BCH	EAST	PWS	5	26	53	5.6
			PWS	5	26	54	16.7
			PWS	5	28	54	5.6
			PWS	5	25	55	22.2
			PWS	5	26	55	50.0
		WEST	PWS	4	29	49	16.7
			PWS	4	29	50	16.7
			PWS	5	28	50	50.0
			PWS	5	28	51	16.7

* PWS=public water supply NONAG=non-agricultural

TABLE O-1 NORTH MODEL CALIBRATION PERIOD PUMPAGE DISTRIBUTION (page 2)

PERMIT #	PERMITTEE	WELLFIELD	USE* TYPE	LAYER	ROW	COL	NODE % OF WELLFIELD
50-00501	PRATT-WHITNEY	MAIN	PWS	2	10	26	75.0
			PWS	2	10	27	25.0
50-00562	MEADOWBROOK	MAIN	PWS	3	38	46	100.0
50-00653	GOOD SAM	MAIN	PWS	2	34	57	100.0
50-00713	CONSOLIDATED	MAIN	PWS	4	28	49	100.0
50-00203	FLAGLER SYSTEM, INC		NONAG	4	38	39	100.0
50-00849	BELVEDERE GOLF CLUB		NONAG	3	39	47	100.0
50-00218	ROYAL PALM MEMORIAL GRDN		NONAG	5	29	56	100.0
50-00224	PRESIDENT COUNTRY CLUB		NONAG	5	32	53	50.0
			NONAG	5	33	53	50.0
50-00233	PB LAKES GOLF CLUB		NONAG	5	34	53	100.0
50-00256	WEST PALM BEACH, CITY OF		NONAG	4	33	55	100.0
50-00257	WEST PALM BEACH, CITY OF		NONAG	5	37	57	100.0
50-01469	WEST PALM BEACH, CITY OF		NONAG	3	37	56	100.0
50-00255	HOLIGOLF, INC		NONAG	5	26	50	100.0
50-00617	PGA NATIONAL VENTURE		NONAG	4	18	44	14.3
			NONAG	4	19	45	28.6
			NONAG	4	20	45	28.6
			NONAG	4	18	46	14.3
			NONAG	4	19	46	14.3
50-00852	J.D.M. COUNTRY CLUB		NONAG	3	18	48	100.0
50-00421	LOST TREE CLUB, INC		NONAG	1	16	55	12.5
			NONAG	1	17	55	12.5
			NONAG	1	17	56	37.5
			NONAG	1	17	57	37.5
50-00063	OUR LADY OF FLA PASSIONIST MON		NONAG	2	18	56	100.0
50-00237	JONATHAN'S LANDING		NONAG	2	5	52	28.6
			NONAG	2	6	52	42.9
			NONAG	2	7	52	28.5
50-00941	EASTPOINTE COUNTRY CLUB		NONAG	3	13	47	100.0
50-01443	OLD MARSH PARTNERS		NONAG	3	14	44	100.0
50-01391	LANDSITES, INC		NONAG	2	5	54	100.0
50-01169	JUPITER 1 HOMEOWNERS		NONAG	2	7	54	100.0
50-01204	OCEANSIDE TERRACE HOMEOWNERS		NONAG	3	8	54	100.0
50-01203	RADNOR CORPORATION		NONAG	2	8	55	25.0
			NONAG	2	9	55	75.0
50-01282	BURG & DIVOSTA CORPORATION		NONAG	1	9	55	25.0
			NONAG	1	10	55	62.5
			NONAG	2	11	55	12.5
50-01373	BURG & DIVOSTA CORPORATION		NONAG	2	9	54	33.3
			NONAG	2	10	54	33.3
			NONAG	2	10	55	33.3
50-01392	L.J. JUPITER VENTURE		NONAG	1	10	55	50.0
			NONAG	1	11	55	50.0
50-01131	SEA OATS OF JUNO BEACH		NONAG	1	12	56	100.0

* PWS=public water supply NONAG=non-agricultural

TABLE O-1 NORTH MODEL CALIBRATION PERIOD PUMPAGE DISTRIBUTION (page 3)

PERMIT #	PERMITTEE	WELLFIELD	USE* TYPE	LAYER	ROW	COL	NODE % OF WELLFIELD
50-01484	CROSSWINDS JUPITER SOUTH		NONAG	1	11	56	100.0
50-01442	ENGLE GROUP, INC		NONAG	5	14	54	100.0
50-00349	SEMINOLE GOLF CLUB		NONAG	5	14	55	57.1
			NONAG	5	14	56	42.9
50-00223	TEQUESTA COUNTRY CLUB		NONAG	3	1	49	100.0

* PWS=public water supply NONAG=non-agricultural

TABLE 0-2 SOUTH MODEL CALIBRATION PERIOD PUMPAGE DISTRIBUTION (page 1)

PERMIT #	PERMITTEE	WELLFIELD	USE* TYPE	LAYER	ROW	COL	NODE% OF WELLFIELD
50-00036	PALM SPRINGS	MAIN	PWS	4	6	33	30
			PWS	4	6	34	20
			PWS	4	7	34	50
50-00083	ATLANTIS	MAIN	PWS	3	12	34	100
50-00177	DELRAY BEACH	MAIN	PWS	3	30	37	17
			PWS	3	30	36	11
			PWS	3	31	36	22
			PWS	3	32	36	5
			PWS	3	32	37	17
			PWS	3	33	37	17
			PWS	4	33	36	11
50-00179	JAMACIA BAY	WEST	PWS	4	33	35	100
50-00234	LAKE WORTH	MAIN	PWS	3	20	31	100
		MAIN	PWS	4	10	37	50
50-00346	HIGHLAND BEACH		PWS	4	11	37	50
50-00367	BOCA RATON	MAIN	PWS	4	38	36	100
		EAST	PWS	4	41	35	4
			PWS	4	41	34	8
			PWS	4	42	34	17
			PWS	4	43	34	21
			PWS	4	44	34	8
			PWS	4	44	35	17
			PWS	4	45	35	17
50-00367	BOCA RATON		PWS	4	46	35	8
		WEST	PWS	4	41	28	8
			PWS	4	41	29	8
			PWS	4	41	30	16
			PWS	4	42	30	8
			PWS	4	42	29	4
			PWS	4	43	29	8
			PWS	4	44	30	4
			PWS	4	45	30	12
			PWS	4	46	30	8
			PWS	4	47	30	12
50-00401	PALM BEACH COUNTY		PWS	4	44	32	12
		SYSTEM 9	PWS	4	47	21	7
			PWS	4	47	22	13
			PWS	4	48	22	40
			PWS	4	48	21	7
			PWS	4	49	21	13
			PWS	4	49	22	20

* PWS=public water supply AG=agricultural NONAG=non-agricultural

TABLE O-2 SOUTH MODEL CALIBRATION PERIOD PUMPAGE DISTRIBUTION (page 2)

PERMIT #	PERMITTEE	WELLFIELD	USE* TYPE	LAYER	ROW	COL	NODE% OF WELLFIELD
50-00464	ACME	MAIN	PWS	2	3	17	44
			PWS	2	3	18	14
			PWS	2	4	18	21
			PWS	2	5	18	14
			PWS	3	11	18	7
50-00499	BOYNTON BEACH	MAIN	PWS	2	23	37	6
			PWS	2	24	37	44
			PWS	2	24	36	25
			PWS	2	25	36	25
50-00506	MANALAPAN	MAIN	PWS	3	16	39	100
50-00506	MANALAPAN	BOOSTER	PWS	3	16	39	33
			PWS	3	16	38	67
50-00511	PALM BEACH COUNTY	SYSTEM 3	PWS	4	28	28	86
			PWS	4	28	29	14
50-00572	NATL MOBILE IND.	MAIN	PWS	3	10	30	100
50-00575	LANTANA	MAIN	PWS	3	15	39	100
50-00584	PALM BEACH COUNTY	SYSTEM 2	PWS	4	7	26	58
			PWS	4	8	26	25
			PWS	4	8	25	17
50-01007	FLA WATER SERVICES	MAIN	PWS	4	15	33	100
50-01092	A.G. HOLLEY	MAIN	PWS	4	13	38	33
			PWS	4	14	38	67
50-01283	ARROWHEAD MHP	MAIN	PWS	3	14	32	100
50-00612	GOLF	MAIN	PWS	3	25	31	100
50-00489	ARVIDA CORPORATION		NONAG	4	39	31	100
50-01511	ARVIDA CORPORATION		NONAG	4	39	28	25
			NONAG	4	39	29	25
			NONAG	4	40	30	50
50-00502	IBM		NONAG	4	41	32	100
50-00992	BOCA WEST CLUB, INC		NONAG	3	42	25	25
			NONAG	3	42	26	25
			NONAG	3	43	25	25
			NONAG	3	44	27	16
			NONAG	3	43	28	9
50-01079	GREATER BOCA RATON BCH TAX D		NONAG	4	41	31	100
50-00411	SANDALFOOT COVE COUNTRY CLUB		NONAG	4	49	22	50
			NONAG	4	48	22	50
50-00088	BOCA TEECA CORP		NONAG	5	39	35	60
			NONAG	5	40	35	20
			NONAG	5	39	36	20
50-00328	BOCA RATON HOTEL & CLUB		NONAG	4	47	35	50
			NONAG	4	47	36	50

* PWS=public water supply AG=agricultural NONAG=non-agricultural

TABLE O-2 SOUTH MODEL CALIBRATION PERIOD PUMPAGE DISTRIBUTION (page 3)

PERMIT #	PERMITTEE	WELLFIELD	USE* TYPE	LAYER	ROW	COL	NODE% OF WELLFIELD
50-00159	ROYAL PALM YACHT & C C		NONAG	2	49	35	50
			NONAG	2	49	36	25
			NONAG	2	48	35	25
50-00150	COUNTRY MANORS CONDO INI		NONAG	4	29	31	100
50-00534	DGC ASSOC BY PAIR, INC		NONAG	3	36	32	100
50-00908	BOCA RAY, INC		NONAG	4	36	29	67
			NONAG	4	36	30	33
50-01068	F.P.A. CORPORATION		NONAG	3	34	32	50
			NONAG	3	38	33	50
50-01523	SUMMIT ASSOCIATES		NONAG	3	26	33	100
50-00434	LITTLE CLUB, INC, THE		NONAG	1	28	39	50
			NONAG	1	27	39	50
50-00814	PB CO PARKS & REC DEP		NONAG	5	26	35	100
50-00331	SUMMIT ASSOCIATES, LTD		NONAG	3	26	32	45
			NONAG	3	27	32	11
			NONAG	3	27	33	11
			NONAG	3	27	34	22
			NONAG	3	28	34	11
50-00377	GULF STREAM GOLF CLUB		NONAG	2	27	38	100
50-00970	HIDDEN VALLEY GOLF		NONAG	2	37	36	100
50-00945	CROUCH/PALERMO FLA		NONAG	3	14	24	100
50-00535	PINE TREE GOLF CLUB INC		NONAG	3	23	32	100
50-01001	CADILLAC FAIRVIEW		NONAG	4	22	30	100
50-00851	DELRAY DUNES G & C CLUB		NONAG	3	25	31	67
			NONAG	3	26	31	33
50-00697	BIERNBAUM, RALPH (HIGH RIDGE)		NONAG	3	17	36	100
50-01194	MOTOROLA, INC		NONAG	3	20	35	100
50-00039	BOYNTON BEACH, CITY OF		NONAG	2	24	37	100
50-00419	QUAIL RIDGE, INC		NONAG	3	24	32	30
			NONAG	3	24	33	20
			NONAG	3	25	33	10
			NONAG	3	24	34	20
			NONAG	3	23	33	10
			NONAG	3	22	33	10
50-00883	GOULD FLORIDA, INC		NONAG	3	5	18	100
50-00865	PALM HILL VILLAS		NONAG	3	5	31	100
50-00855	RETIREMENT BUILDERS		NONAG	3	6	30	100
50-00741	DEP OF NATURAL RESOURCES		NONAG	3	5	23	100
50-00268	P B NATIONAL GOLF & C C		NONAG	3	8	25	100
50-00967	LUCERNE PARK, LTD (PARK POINTE)		NONAG	4	8	27	100
50-00140	JOHN I LEONARD HIGH SCHOOL		NONAG	2	8	31	100
50-00631	WILLOW BEND ASSOCIATES, INC		NONAG	3	9	25	100
50-00452	ATLANTIS COUNTRY CLUB		NONAG	3	12	32	100
50-00866	LAKE WORTH, CITY OF		NONAG	2	9	40	100

* PWS=public water supply AG=agricultural NONAG=non-agricultural

TABLE O-2 SOUTH MODEL CALIBRATION PERIOD PUMPAGE DISTRIBUTION (page 4)

PERMIT #	PERMITTEE	WELLFIELD	USE* TYPE	LAYER	ROW	COL	NODE% OF WELLFIELD
50-00407	J & N FARMS		AG	3	37	19	100
50-00158	MICHAELS NURSERIES		AG	3	26	30	100
50-00390	LOREN MEREDITH FARMS		AG	3	28	30	100
50-00396	EAKER, S		AG	3	27	30	100
50-00455	WHITWORTH FARMS		AG	4	25	25	67
			AG	4	26	25	33
50-00923	TALMO, ROY		AG	3	26	23	100
50-00433	ROSACKER'S PLANTS		AG	4	31	24	100
50-01071	SHOEMAKER, J.D.		AG	4	32	22	50
			AG	4	32	23	50
50-01345	MORNINGSTAR NURSERY		AG	4	31	24	67
			AG	4	32	24	33
50-00577	PALM COAST NURSERY CORP		AG	4	33	21	100
50-00911	TROPICAL TREE FARM		AG	4	32	22	100
50-00288	FLORAL ACRES, INC		AG	4	33	28	90
			AG	4	32	28	10
50-00930	BLOODS HAMMOCK GROVE		AG	4	35	31	33
			AG	4	34	31	67
50-00943	MILLER, E		AG	3	35	31	100
50-00959	GOLD HILL NURSERY		AG	4	35	29	50
			AG	4	34	29	50
50-00904	MCDOUGALD & SONS NURSERY		AG	4	34	29	100
50-00960	UNIV OF FLA - MORIKAMI FARMS		AG	4	36	27	100
50-00872	RAINBOW FARMS, INC		AG	4	38	21	100
50-00103	MURRAY, ALLAN NURSERY, INC.		AG	3	18	31	100
50-00124	RAUTH, LOUIS F		AG	3	24	31	100
50-00144	BOYNTON NURSERIES, I C		AG	4	18	32	100
50-00145	BOYNTON NURSERIES I C		AG	3	19	30	100
50-00206	MAZZONI FARMS INC		AG	4	23	25	100
50-00250	DUBOIS, SR. W A		AG	3	20	20	100
50-00264	DUBOIS, JR, W A		AG	3	19	20	100
50-00343	KNOLLWOOD GROVES, INC		AG	3	16	33	67
			AG	3	17	33	33
50-00364	MOESLY NURSERIES, INC		AG	3	16	32	80
			AG	3	17	32	20
50-00670	COUNTRY JOE'S NURSERY		AG	3	20	32	100
50-00910	LUIS, J		AG	3	22	23	100
50-00919	DUBOIS, W A		AG	3	23	22	50
			AG	3	22	22	50
50-00956	CHAS GREENS NURSERIES		AG	4	22	28	100
50-00957	OSWAYO VALLEY FARMS		AG	3	16	31	100
50-00966	R & A FARMS		AG	3	22	21	50
			AG	3	21	21	50
50-00977	S.O. NURSERY		AG	4	24	29	100

* PWS=public water supply AG=agricultural NONAG=non-agricultural

TABLE O-2 SOUTH MODEL CALIBRATION PERIOD PUMPAGE DISTRIBUTION (page 5)

PERMIT #	PERMITTEE	WELLFIELD	USE* TYPE	LAYER	ROW	COL	NODE% OF WELLFIELD
50-00988	WALLIN NURSERY		AG	3	23	26	100
50-00438	SANDY LOAM FARMS, INC		AG	3	5	30	67
			AG	3	4	30	33
50-00882	OKEAN, H		AG	3	9	14	100
50-00955	QUALITY ORNAMENTALS		AG	3	12	30	100
50-00979	DUBOIS FARMS, INC		AG	3	8	18	100

* PWS=public water supply AG=agricultural NONAG=non-agricultural

TABLE O-3 North Model Calibration Period Pumpage Input Data (thousands of ft3/day) page 1

Permit #	Use Type*	Layer	Row	Col	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr
50-00010	PWS	4	5	47	122	121	135	138	140	149	175	143	139	165	138	162	154	174	173	196	174	157
	PWS	4	6	47	194	192	214	219	222	237	277	227	221	261	218	256	244	275	275	310	276	249
	PWS	5	6	48	24	24	27	28	28	30	35	29	28	33	28	32	31	35	35	39	35	31
	PWS	4	7	48	24	24	27	28	28	30	35	29	28	33	28	32	31	35	35	39	35	31
	PWS	5	8	46	24	24	27	28	28	30	35	29	28	33	28	32	31	35	35	39	35	31
	PWS	5	8	47	73	72	80	82	83	89	104	85	83	98	82	96	92	103	103	116	104	94
	PWS	5	8	48	73	72	80	82	83	89	104	85	83	98	82	96	92	103	103	116	104	94
	PWS	5	9	47	24	24	27	28	28	30	35	29	28	33	28	32	31	35	35	39	35	31
	PWS	5	10	47	24	24	27	28	28	30	35	29	28	33	28	32	31	35	35	39	35	31
50-00030	PWS	5	29	54	17	20	18	42	20	21	26	19	23	19	12	19	15	28	26	31	36	26
	PWS	5	28	54	25	30	26	62	30	31	40	28	35	29	18	29	22	42	40	46	55	39
50-00135	PWS	4	37	45	170	183	179	194	197	185	207	186	168	175	110	185	168	183	189	187	242	230
(8W)	PWS	4	37	46	511	549	537	582	592	556	620	558	503	526	331	555	504	549	568	562	726	690
	PWS	4	36	46	85	91	90	97	99	93	103	93	84	88	55	92	84	91	95	94	121	115
50-00135	PWS	5	38	50	2	2	4	2	2	2	2	1	2	3	16	2	2	2	3	3	2	1
(1W)	PWS	5	38	51	5	5	11	6	5	5	6	4	5	8	48	7	7	6	10	9	5	4
	PWS	5	39	50	4	3	7	4	3	3	4	3	3	5	32	4	5	4	7	6	3	2
	PWS	5	39	51	4	3	7	4	3	3	4	3	3	5	32	4	5	4	7	6	3	2
	PWS	5	39	52	7	6	15	8	6	6	8	6	6	11	63	9	10	8	14	12	7	5
50-00178	PWS	5	36	48	139	157	159	153	150	143	121	114	103	105	104	111	122	133	135	140	136	122
50-00365	PWS	5	19	50	19	15	11	16	15	20	35	20	19	15	17	15	13	16	22	26	24	24
(LILAC)	PWS	5	19	51	19	15	11	16	15	20	35	20	19	15	17	15	13	16	22	26	24	24
	PWS	5	20	50	19	15	11	16	15	20	35	20	19	15	17	15	13	16	22	26	24	24
	PWS	5	20	51	78	59	45	63	59	80	141	79	75	61	69	59	51	63	87	104	97	95
50-00365	PWS	5	15	47	108	114	117	132	151	153	159	147	159	165	155	154	141	149	148	157	165	157
(HOOD)	PWS	4	15	48	54	57	58	66	75	77	79	73	79	82	78	77	71	74	74	79	83	79
	PWS	4	16	47	217	229	235	265	304	308	320	295	319	332	313	310	285	299	298	316	333	316
	PWS	4	16	48	269	284	292	329	377	383	397	367	397	412	389	385	354	372	370	393	413	393
	PWS	4	17	47	54	57	58	66	75	77	79	73	79	82	78	77	71	74	74	79	83	79
50-00365	PWS	5	21	53	25	24	24	19	27	32	42	29	34	34	28	42	39	38	33	39	48	38
(RICH.RD.)	PWS	4	22	53	172	171	168	131	189	222	296	204	239	239	199	296	272	269	234	275	333	264
50-00365	PWS	4	23	53	74	72	72	77	72	74	72	74	72	72	74	72	74	72	72	79	72	74
(OLD DIXIE)	PWS	3	23	54	59	58	58	62	58	59	58	59	58	58	59	58	59	58	58	64	58	59
50-00444	PWS	3	36	37	53	57	64	64	70	74	91	65	57	60	60	63	63	69	78	86	93	77
	PWS	3	37	37	71	76	85	85	94	99	121	86	76	81	80	84	84	92	105	115	124	103

* PWS=public water supply NONAG=non-agricultural

TABLE O-3 North Model Calibration Period Pumpage Input Data (thousands of ft3/day) page 2

Permit #	Use Type*	Layer	Row	Col	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr
50-00460	PWS	5	26	53	26	27	27	30	31	34	33	33	34	34	33	34	30	27	27	29	31	32
	PWS	5	26	54	78	80	83	92	94	102	99	99	101	102	99	101	89	81	80	88	94	95
	PWS	5	28	54	26	27	27	30	31	34	33	33	34	34	33	34	30	27	27	29	31	32
	PWS	5	25	55	104	107	110	122	126	136	132	132	134	137	132	135	119	107	106	118	125	127
	PWS	5	26	55	233	240	248	275	283	306	296	297	303	307	298	303	268	242	239	265	282	286
	PWS	4	29	49	52	53	55	61	63	68	80	66	67	68	66	67	59	54	53	59	63	64
	PWS	4	29	50	52	53	55	61	63	68	80	66	67	68	66	67	59	54	53	59	63	64
	PWS	5	28	50	156	160	165	183	189	204	240	198	202	205	199	202	179	161	159	177	188	191
	PWS	5	28	51	52	53	55	61	63	68	80	66	67	68	66	67	59	54	53	59	63	64
50-00501	PWS	2	10	26	87	84	90	86	79	79	94	101	106	116	100	115	110	95	103	114	107	105
	PWS	2	10	27	29	28	30	29	26	26	31	34	35	39	33	38	37	32	34	38	36	35
50-00562	PWS	3	38	46	114	108	105	104	108	108	115	108	115	114	107	107	111	107	120	150	112	98
50-00653	PWS	2	34	57	34	32	30	33	26	32	37	37	36	37	38	33	35	36	34	37	36	35
50-00713	PWS	4	28	49	23	23	23	24	25	26	32	29	25	26	25	25	24	24	24	27	26	24
50-00203	NONAG	4	38	39	33	0	32	9	36	57	59	102	93	97	53	97	0	54	38	53	51	85
50-00849	NONAG	3	39	47	4	0	4	1	4	7	7	13	12	12	7	12	0	7	5	7	6	11
50-00218	NONAG	5	29	56	16	0	14	6	17	27	29	45	42	43	27	41	0	22	16	22	23	37
50-00224	NONAG	5	32	53	20	0	20	5	22	35	36	63	57	60	33	60	0	34	23	32	31	53
	NONAG	5	33	53	20	0	20	5	22	35	36	63	57	60	33	60	0	34	23	32	31	53
50-00233	NONAG	5	34	53	18	0	16	7	20	31	34	53	50	51	31	48	0	26	19	25	27	43
50-00256	NONAG	4	33	55	9	0	8	3	10	15	16	25	24	24	15	23	0	12	9	12	13	20
50-00257	NONAG	5	37	57	3	0	3	1	4	6	6	10	9	9	6	9	0	5	3	5	5	8
50-01469	NONAG	3	37	56	3	0	3	1	4	6	6	10	9	9	6	9	0	5	3	5	5	8
50-00255	NONAG	5	26	50	6	0	6	2	6	10	10	18	16	17	9	17	0	10	7	9	9	15
50-00617	NONAG	4	18	44	14	0	14	10	6	32	9	41	48	48	5	35	1	21	13	20	24	21
	NONAG	4	19	45	27	0	28	20	12	63	17	81	96	97	9	70	3	42	26	40	48	42
	NONAG	4	20	45	27	0	28	20	12	63	17	81	96	97	9	70	3	42	26	40	48	42
	NONAG	4	18	46	14	0	14	10	6	32	9	41	48	48	5	35	1	21	13	20	24	21
	NONAG	4	19	46	14	0	14	10	6	32	9	41	48	48	5	35	1	21	13	20	24	21
50-00852	NONAG	3	18	48	112	0	116	81	50	257	71	332	393	394	38	287	10	172	107	162	196	172
50-00421	NONAG	1	16	55	3	0	3	3	2	7	3	10	11	11	2	8	1	5	3	5	6	5
	NONAG	1	17	55	3	0	3	3	2	7	3	10	11	11	2	8	1	5	3	5	6	5
	NONAG	1	17	56	10	0	10	8	6	22	10	29	34	34	7	24	3	14	9	14	17	16
	NONAG	1	17	57	10	0	10	8	6	22	10	29	34	34	7	24	3	14	9	14	17	16
50-00063	NONAG	2	18	56	1	0	2	1	1	3	1	4	5	5	1	4	0	2	1	2	3	2
50-00237	NONAG	2	5	52	11	0	12	8	5	26	7	33	39	39	4	29	1	17	11	16	20	17
	NONAG	2	6	52	17	0	17	12	7	38	11	50	59	59	6	43	2	26	16	24	29	26
	NONAG	2	7	52	11	0	11	8	5	26	7	33	39	39	4	29	1	17	11	16	20	17
50-00941	NONAG	3	13	47	23	0	24	17	10	54	15	70	82	83	8	60	2	36	22	34	41	36
50-01443	NONAG	3	14	44	33	0	34	24	15	75	21	97	115	115	11	84	3	50	31	47	57	50
50-01391	NONAG	2	5	54	4	0	4	3	2	8	2	11	13	13	1	9	0	6	3	5	6	6

* PWS=public water supply NONAG=non-agricultural

TABLE O-3 North Model Calibration Period Pumpage Input Data (thousands of ft3/day) page 3

Permit #	Use Type*	Layer	Row	Col	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr
50-01169	NONAG	2	7	54	2	0	2	1	1	4	1	6	7	7	1	5	0	3	2	3	3	3
50-01204	NONAG	3	8	54	1	0	1	1	0	2	1	3	4	4	0	3	0	2	1	2	2	2
50-01203	NONAG	2	8	55	2	0	2	2	1	6	2	7	8	8	1	6	0	4	2	3	4	4
	NONAG	2	9	55	7	0	7	5	3	17	5	21	25	25	2	19	1	11	7	10	13	11
50-01282	NONAG	1	9	55	7	0	8	5	3	17	5	22	26	26	3	19	1	11	7	11	13	11
	NONAG	1	10	55	19	0	19	13	8	43	12	56	66	66	6	48	2	29	18	27	33	29
	NONAG	2	11	55	4	0	4	3	2	9	2	11	13	13	1	10	0	6	4	5	7	6
50-01373	NONAG	2	9	54	1	0	1	1	1	3	1	4	4	4	0	3	0	2	1	2	2	2
	NONAG	2	10	54	1	0	1	1	1	3	1	4	4	4	0	3	0	2	1	2	2	2
	NONAG	2	10	55	1	0	1	1	1	3	1	4	4	4	0	3	0	2	1	2	2	2
50-01392	NONAG	1	10	55	1	0	1	1	1	3	1	4	5	5	0	4	0	2	1	2	3	2
	NONAG	1	11	55	1	0	1	1	1	3	1	4	5	5	0	4	0	2	1	2	3	2
50-01131	NONAG	1	12	56	2	0	2	2	1	6	2	7	8	8	1	6	0	4	2	3	4	4
50-01484	NONAG	1	11	56	1	0	1	1	0	2	0	2	3	3	0	2	0	1	1	1	1	1
50-01442	NONAG	5	14	54	2	0	3	2	1	6	2	7	9	9	1	6	0	4	2	4	4	4
50-00349	NONAG	5	14	55	11	0	12	8	5	26	7	34	40	40	4	29	1	17	11	16	20	17
	NONAG	5	14	56	9	0	9	6	4	20	5	25	30	30	3	22	1	13	8	12	15	13
50-00223	NONAG	3	1	49	19	0	20	14	8	44	12	56	67	67	6	49	2	29	18	27	33	29

* PWS=public water supply NONAG=non-agricultural

TABLE O-4 South Model Calibration Period Pumpage Input Data (thousands of ft3/day) page 1

Permit #	Use Type*	Layer	Row	Col	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May
50-00036	PWS	4	6	33	110	106	112	119	138	138	155	134	128	132	126	130	129	139	147	163	186	164	169
	PWS	4	6	34	73	70	74	80	92	92	103	89	85	88	84	87	86	93	98	109	124	109	113
	PWS	4	7	34	183	176	186	199	231	229	258	223	214	220	210	217	215	232	244	271	310	273	282
50-00083	PWS	3	12	34	76	78	81	82	87	87	76	73	75	74	76	87	87	88	94	99	105	107	98
50-00177	PWS	3	30	37	132	132	132	132	132	132	132	132	132	132	132	132	132	132	132	132	132	132	132
	PWS	3	30	36	85	85	85	85	85	85	85	85	85	85	85	85	85	85	85	85	85	85	85
	PWS	3	31	36	171	171	171	171	171	171	171	171	171	171	171	171	171	171	171	171	171	171	171
	PWS	3	32	36	39	39	39	39	39	39	39	39	39	39	39	39	39	39	39	39	39	39	39
	PWS	3	32	37	132	132	132	132	132	132	132	132	132	132	132	132	132	132	132	132	132	132	132
	PWS	3	33	37	132	132	132	132	132	132	132	132	132	132	132	132	132	132	132	132	132	132	132
	PWS	4	33	36	85	85	85	85	85	85	85	85	85	85	85	85	85	85	85	85	85	85	85
	PWS	4	33	35	539	476	496	531	685	784	975	764	679	764	718	787	727	743	821	923	858	643	576
50-00179	PWS	3	20	31	5	5	5	5	5	6	6	5	4	3	3	5	6	7	7	9	9	7	4
50-00234	PWS	4	10	37	395	368	379	385	429	426	506	459	479	477	420	455	402	435	460	485	476	434	436
	PWS	4	11	37	395	368	379	385	429	426	506	459	479	477	420	455	402	435	460	485	476	434	436
50-00346	PWS	4	38	36	148	146	157	160	159	152	163	154	146	163	147	154	151	160	194	195	193	177	159
50-00367	PWS	4	41	35	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	PWS	4	41	34	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	PWS	4	42	34	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	PWS	4	43	34	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	PWS	4	44	34	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	PWS	4	44	35	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	PWS	4	45	35	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	PWS	4	46	35	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
50-00367	PWS	4	41	28	259	245	257	265	292	306	342	338	289	349	305	341	315	318	363	399	373	342	370
	PWS	4	41	29	259	245	257	265	292	306	342	338	289	349	305	341	315	318	363	399	373	342	370
	PWS	4	41	30	518	491	515	530	585	611	684	676	578	698	610	682	631	637	725	798	747	685	741
	PWS	4	42	30	259	245	257	265	292	306	342	338	289	349	305	341	315	318	363	399	373	342	370
	PWS	4	42	29	129	123	129	132	146	153	171	169	144	174	153	170	158	159	181	199	187	171	185
	PWS	4	43	29	259	245	257	265	292	306	342	338	289	349	305	341	315	318	363	399	373	342	370
	PWS	4	44	30	129	123	129	132	146	153	171	169	144	174	153	170	158	159	181	199	187	171	185
	PWS	4	45	30	388	368	386	397	438	458	513	507	433	523	458	511	473	478	544	598	560	513	555
	PWS	4	46	30	259	245	257	265	292	306	342	338	289	349	305	341	315	318	363	399	373	342	370
	PWS	4	47	30	388	368	386	397	438	458	513	507	433	523	458	511	473	478	544	598	560	513	555
	PWS	4	44	32	388	368	386	397	438	458	513	507	433	523	458	511	473	478	544	598	560	513	555
50-00401	PWS	4	47	21	41	44	47	50	53	55	61	55	52	56	57	61	54	62	66	72	67	67	70
	PWS	4	47	22	76	82	88	93	99	102	114	101	96	104	105	114	101	115	122	133	125	125	130
	PWS	4	48	22	235	253	271	287	303	313	351	312	295	319	323	350	310	354	377	409	385	384	401
	PWS	4	48	21	41	44	47	50	53	55	61	55	52	56	57	61	54	62	66	72	67	67	70
	PWS	4	49	21	76	82	88	93	99	102	114	101	96	104	105	114	101	115	122	133	125	125	130

* PWS=public water supply NONAG=non-agricultural

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Permit #	Use Type*	Layer	Row	Col	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May
	PWS	4	49	22	118	126	136	143	152	157	175	156	147	160	161	175	155	177	188	204	193	192	200
50-00464	PWS	2	3	17	65	69	69	78	79	88	114	100	80	86	79	82	79	88	95	112	119	100	106
	PWS	2	3	18	21	22	22	25	25	28	36	32	25	27	25	26	25	28	30	36	38	32	34
	PWS	2	4	18	31	33	33	37	38	42	54	48	38	41	38	39	38	42	45	53	57	48	50
	PWS	2	5	18	21	22	22	25	25	28	36	32	25	27	25	26	25	28	30	36	38	32	34
	PWS	3	11	18	10	11	11	12	13	14	18	16	13	14	13	13	13	14	15	18	19	16	17
50-00499	PWS	2	23	37	58	58	57	57	63	63	72	62	59	64	63	66	64	69	73	77	79	72	72
	PWS	2	24	37	422	425	415	416	463	459	531	454	434	472	461	485	468	506	533	568	580	527	529
	PWS	2	24	36	240	241	236	236	263	261	302	258	247	268	262	275	266	288	303	323	329	300	301
	PWS	2	25	36	240	241	236	236	263	261	302	258	247	268	262	275	266	288	303	323	329	300	301
50-00506	PWS	3	16	39	94	78	90	92	107	106	125	97	57	97	99	103	94	107	111	107	109	107	105
50-00506	PWS	3	16	39	0	0	23	0	0	0	0	0	13	7	4	3	2	0	2	6	3	4	5
	PWS	3	16	38	0	0	47	0	0	0	0	0	26	13	8	6	3	0	4	13	6	8	10
50-00511	PWS	4	28	28	232	246	258	263	247	221	187	164	150	161	165	173	200	235	247	269	279	271	247
	PWS	4	28	29	38	40	42	43	40	36	30	27	24	26	27	28	33	38	40	44	45	44	40
50-00572	PWS	3	10	30	22	16	22	24	26	28	36	17	15	15	12	15	14	16	21	27	27	20	18
50-00575	PWS	3	15	39	225	216	216	255	261	252	305	254	240	271	229	254	231	245	257	276	292	251	235
50-00584	PWS	4	7	26	17	6	0	0	11	39	27	21	28	33	106	39	79	85	115	210	113	88	198
	PWS	4	8	26	7	3	0	0	5	17	12	9	12	14	46	17	34	37	50	91	49	38	85
	PWS	4	8	25	5	2	0	0	3	11	8	6	8	10	31	11	23	25	34	62	33	26	58
50-01007	PWS	4	15	33	44	40	47	49	60	61	76	59	51	52	49	60	53	61	70	82	82	70	69
50-01092	PWS	4	13	38	6	8	7	7	5	7	6	7	7	7	6	7	6	7	6	7	7	6	6
	PWS	4	14	38	13	16	15	14	11	14	11	15	14	14	13	13	13	14	13	15	15	13	13
50-01283	PWS	3	14	32	17	17	19	18	20	23	19	17	15	18	16	15	19	21	23	26	25	23	19
50-00612	PWS	3	25	31	43	42	46	50	0	47	37	29	28	27	32	37	44	45	45	50	54	48	36
50-00489	NON	4	39	31	29	0	19	21	18	35	0	36	55	57	16	49	10	33	26	36	39	36	34
50-01511	NON	4	39	28	1	0	1	1	1	2	0	2	3	3	1	2	0	2	1	2	2	2	2
	NON	4	39	29	1	0	1	1	1	2	0	2	3	3	1	2	0	2	1	2	2	2	2
	NON	4	40	30	3	0	2	2	2	3	0	3	5	5	2	5	1	3	3	4	4	3	3
50-00502	NON	4	41	32	20	0	12	10	12	19	0	26	41	33	18	36	0	11	12	20	21	22	37
50-00992	NON	3	42	25	47	0	27	23	27	44	0	62	96	77	42	84	0	26	29	46	49	52	86
	NON	3	42	26	47	0	27	23	27	44	0	62	96	77	42	84	0	26	29	46	49	52	86
	NON	3	43	25	47	0	27	23	27	44	0	62	96	77	42	84	0	26	29	46	49	52	86
	NON	3	44	27	30	0	17	15	17	28	0	40	61	49	27	54	0	17	19	30	32	33	55
	NON	3	43	28	17	0	10	8	10	16	0	22	35	28	15	30	0	9	11	17	18	19	31
50-01079	NON	4	41	31	255	0	147	124	148	241	0	336	523	419	226	456	0	142	159	252	269	284	469
50-00411	NON	4	49	22	31	0	18	15	18	29	0	41	64	51	28	56	0	17	19	31	33	35	57
	NON	4	48	22	31	0	18	15	18	29	0	41	64	51	28	56	0	17	19	31	33	35	57
50-00088	NON	5	39	35	21	0	13	15	15	27	8	30	41	42	17	35	10	22	18	24	27	27	27
	NON	5	40	35	7	0	4	5	5	9	3	10	14	14	6	12	3	7	6	8	9	9	9
	NON	5	39	36	7	0	4	5	5	9	3	10	14	14	6	12	3	7	6	8	9	9	9

* PWS=public water supply NONAG=non-agricultural

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Permit #	Use Type*	Layer	Row	Col	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May
50-00328	NON	4	47	35	31	0	15	13	17	29	0	37	52	43	26	44	3	15	16	24	27	30	47
	NON	4	47	36	31	0	15	13	17	29	0	37	52	43	26	44	3	15	16	24	27	30	47
50-00159	NON	2	49	35	34	0	16	14	18	31	0	40	57	47	29	48	4	16	17	26	29	33	51
	NON	2	49	36	17	0	8	7	9	16	0	20	29	24	14	24	2	8	9	13	15	16	25
	NON	2	48	35	17	0	8	7	9	16	0	20	29	24	14	24	2	8	9	13	15	16	25
50-00150	NON	4	29	31	12	0	8	9	7	15	0	15	23	24	7	21	4	14	11	15	16	15	14
50-00534	NON	3	36	32	60	0	39	44	37	75	0	76	117	120	34	104	21	70	55	77	83	76	71
50-00908	NON	4	36	29	14	0	9	10	9	17	0	18	27	28	8	24	5	16	13	18	19	18	16
	NON	4	36	30	7	0	4	5	4	9	0	9	13	14	4	12	2	8	6	9	9	9	8
50-01068	NON	3	34	32	50	0	32	36	31	62	0	62	96	98	28	86	18	58	45	63	68	63	58
	NON	3	38	33	50	0	32	36	31	62	0	62	96	98	28	86	18	58	45	63	68	63	58
50-01523	NON	3	26	33	5	0	3	4	3	7	0	7	10	11	3	9	2	6	5	7	7	7	6
50-00434	NON	1	28	39	6	0	4	4	4	7	2	8	11	11	5	10	3	6	5	7	8	8	7
	NON	1	27	39	6	0	4	4	4	7	2	8	11	11	5	10	3	6	5	7	8	8	7
50-00814	NON	5	26	35	7	0	4	5	4	8	0	9	13	13	4	12	2	8	6	9	9	9	8
50-00331	NON	3	26	32	20	0	13	14	12	24	0	25	38	39	11	34	7	23	18	25	27	25	23
	NON	3	27	32	5	0	3	3	3	6	0	6	9	10	3	8	2	6	4	6	7	6	6
	NON	3	27	33	5	0	3	3	3	6	0	6	9	10	3	8	2	6	4	6	7	6	6
	NON	3	27	34	10	0	6	7	6	12	0	12	19	19	5	17	3	11	9	12	13	12	11
	NON	3	28	34	5	0	3	3	3	6	0	6	9	10	3	8	2	6	4	6	7	6	6
50-00377	NON	2	27	38	55	0	35	40	39	72	20	79	110	111	45	93	27	59	47	65	73	73	73
50-00970	NON	2	37	36	3	0	2	2	2	4	0	4	6	6	2	5	1	4	3	4	4	4	4
50-00945	NON	3	14	24	19	0	12	14	12	24	0	24	37	38	11	33	7	22	17	24	26	24	22
50-00535	NON	3	23	32	51	0	33	37	31	63	0	64	98	101	28	88	18	59	46	65	70	64	60
50-01001	NON	4	22	30	28	0	18	20	17	35	0	35	54	56	16	48	10	33	26	36	38	35	33
50-00851	NON	3	25	31	26	0	17	19	16	32	0	32	49	51	14	44	9	30	23	33	35	32	30
	NON	3	26	31	13	0	8	9	8	16	0	16	24	25	7	22	4	15	11	16	17	16	15
50-00697	NON	3	17	36	21	0	13	15	15	27	8	30	42	42	17	35	10	22	18	25	28	28	27
50-01194	NON	3	20	35	3	0	2	2	2	4	1	4	6	6	2	5	1	3	3	3	4	4	4
50-00039	NON	2	24	37	6	0	4	5	4	8	0	8	12	13	4	11	2	7	6	8	9	8	7
50-00419	NON	3	24	32	19	0	12	14	12	23	0	24	36	37	10	32	7	22	17	24	26	24	22
	NON	3	24	33	13	0	8	9	8	16	0	16	24	25	7	22	4	15	11	16	17	16	15
	NON	3	25	33	6	0	4	5	4	8	0	8	12	12	3	11	2	7	6	8	9	8	7
	NON	3	24	34	13	0	8	9	8	16	0	16	24	25	7	22	4	15	11	16	17	16	15
	NON	3	23	33	6	0	4	5	4	8	0	8	12	12	3	11	2	7	6	8	9	8	7
	NON	3	22	33	6	0	4	5	4	8	0	8	12	12	3	11	2	7	6	8	9	8	7
50-00883	NON	3	5	18	6	1	5	3	5	11	7	19	18	18	3	12	3	8	5	7	9	5	11
50-00865	NON	3	5	31	4	0	4	1	5	7	7	13	12	12	7	12	0	7	5	7	6	11	13
50-00855	NON	3	6	30	15	0	15	4	17	27	28	48	44	46	25	46	0	26	18	25	24	40	47
50-00741	NON	3	5	23	177	0	174	47	194	309	318	554	503	525	288	526	0	294	205	285	275	461	535
50-00268	NON	3	8	25	15	0	15	4	17	27	27	48	43	45	25	45	0	25	18	25	24	40	46

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Permit #	Use Type*	Layer	Row	Col	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May
50-00967	NON	4	8	27	4	0	4	1	5	7	7	13	12	12	7	12	0	7	5	7	6	11	12
50-00140	NON	2	8	31	4	0	4	1	5	8	8	14	12	13	7	13	0	7	5	7	7	11	13
50-00631	NON	3	9	25	4	0	4	1	4	7	7	13	11	12	7	12	0	7	5	6	6	10	12
50-00452	NON	3	12	32	32	0	21	23	20	39	0	40	61	63	18	55	11	37	29	40	44	40	37
50-00866	NON	2	9	40	27	0	17	19	19	35	10	38	54	54	22	45	13	29	23	32	35	35	35
50-00407	AG	3	37	19	26	0	11	14	8	1	0	0	0	0	0	39	0	10	12	31	24	3	0
50-00158	AG	3	26	30	12	0	8	9	7	15	0	15	23	23	7	20	4	14	11	15	16	15	14
50-00390	AG	3	28	30	10	0	7	7	6	13	0	13	20	20	6	18	4	12	9	13	14	13	12
50-00396	AG	3	27	30	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	1	1	0	0
50-00455	AG	4	25	25	29	0	19	21	18	36	0	37	57	58	16	51	10	34	27	37	40	37	35
	AG	4	26	25	14	0	9	10	9	18	0	18	28	29	8	25	5	17	13	18	20	18	17
50-00923	AG	3	26	23	6	0	4	5	4	8	0	8	12	13	4	11	2	7	6	8	9	8	7
50-00433	AG	4	31	24	8	0	5	6	5	10	0	10	15	15	4	13	3	9	7	10	11	10	9
50-01071	AG	4	32	22	4	0	2	3	2	4	0	5	7	7	2	6	1	4	3	5	5	5	4
	AG	4	32	23	4	0	2	3	2	4	0	5	7	7	2	6	1	4	3	5	5	5	4
50-01345	AG	4	31	24	7	0	5	5	4	9	0	9	14	14	4	12	2	8	6	9	10	9	8
	AG	4	32	24	3	0	2	3	2	4	0	4	7	7	2	6	1	4	3	4	5	4	4
50-00577	AG	4	33	21	6	0	4	5	4	8	0	8	12	13	4	11	2	7	6	8	9	8	7
50-00911	AG	4	32	22	7	0	5	5	4	9	0	9	14	14	4	12	3	8	7	9	10	9	8
50-00288	AG	4	33	28	47	0	31	34	29	58	0	59	91	93	26	82	17	55	43	60	65	59	55
	AG	4	32	28	5	0	3	4	3	6	0	7	10	10	3	9	2	6	5	7	7	7	6
50-00930	AG	4	35	31	11	0	7	8	7	14	0	14	22	22	6	19	4	13	10	14	15	14	13
	AG	4	34	31	23	0	15	17	14	28	0	29	44	45	13	39	8	26	21	29	31	29	27
50-00943	AG	3	35	31	6	0	4	5	4	8	0	8	12	13	4	11	2	7	6	8	9	8	7
50-00959	AG	4	35	29	5	0	3	4	3	6	0	6	10	10	3	9	2	6	5	7	7	6	6
	AG	4	34	29	5	0	3	4	3	6	0	6	10	10	3	9	2	6	5	7	7	6	6
50-00904	AG	4	34	29	6	0	4	5	4	8	0	8	12	13	4	11	2	7	6	8	9	8	7
50-00960	AG	4	36	27	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
50-00872	AG	4	38	21	19	0	12	14	12	24	0	24	37	38	11	33	7	22	17	24	26	24	22
50-00103	AG	3	18	31	8	0	5	6	5	10	0	10	16	16	5	14	3	10	8	11	11	10	10
50-00124	AG	3	24	31	16	0	8	14	10	6	0	0	0	0	0	21	8	15	11	21	19	6	0
50-00144	AG	4	18	32	8	0	5	6	5	10	0	10	15	16	4	14	3	9	7	10	11	10	9
50-00145	AG	3	19	30	9	0	6	7	6	11	0	12	18	18	5	16	3	11	8	12	13	12	11
50-00206	AG	4	23	25	17	0	11	12	10	21	0	21	32	33	9	29	6	19	15	21	23	21	20
50-00250	AG	3	20	20	18	0	8	15	12	8	0	0	0	0	0	22	10	15	11	21	20	8	0
50-00264	AG	3	19	20	11	0	5	9	7	5	0	0	0	0	0	14	7	9	7	14	13	5	0
50-00343	AG	3	16	33	8	0	5	5	5	9	0	10	15	15	4	13	3	9	7	10	10	10	9
	AG	3	17	33	4	0	2	3	2	5	0	5	7	7	2	6	1	4	3	5	5	5	4
50-00364	AG	3	16	32	12	0	8	9	7	15	0	15	24	24	7	21	4	14	11	16	17	15	14
	AG	3	17	32	3	0	2	2	2	4	0	4	6	6	2	5	1	4	3	4	4	4	4
50-00670	AG	3	20	32	4	0	3	3	3	6	0	6	9	9	2	8	2	5	4	6	6	6	5

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Permit #	Use Type*	Layer	Row	Col	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May
50-00910	AG	3	22	23	9	0	4	8	6	4	0	0	0	0	0	12	5	9	6	12	11	4	0
50-00919	AG	3	23	22	6	0	3	5	3	2	0	0	0	0	0	7	3	5	4	7	7	2	0
	AG	3	22	22	6	0	3	5	3	2	0	0	0	0	0	7	3	5	4	7	7	2	0
50-00956	AG	4	22	28	5	0	3	3	3	6	0	6	9	9	3	8	2	6	4	6	7	6	6
50-00957	AG	3	16	31	17	0	8	15	10	6	0	0	0	0	0	21	8	15	11	22	20	7	0
50-00966	AG	3	22	21	10	0	5	9	6	4	0	0	0	0	0	13	5	9	7	13	12	4	0
	AG	3	21	21	10	0	5	9	6	4	0	0	0	0	0	13	5	9	7	13	12	4	0
50-00977	AG	4	24	29	10	0	6	7	6	12	0	12	18	19	5	16	3	11	9	12	13	12	11
50-00988	AG	3	23	26	6	0	4	4	4	8	0	8	12	12	3	11	2	7	6	8	9	8	7
50-00438	AG	3	5	30	9	0	9	2	10	16	17	29	26	27	15	27	0	15	11	15	14	24	28
	AG	3	4	30	5	0	4	1	5	8	8	14	13	13	7	13	0	8	5	7	7	12	14
50-00882	AG	3	9	14	3	0	3	1	4	6	6	10	9	10	5	10	0	5	4	5	5	9	10
50-00955	AG	3	12	30	5	0	3	3	3	6	0	6	9	9	3	8	2	6	4	6	7	6	6
50-00979	AG	3	8	18	9	0	5	5	6	6	0	0	0	0	0	13	5	9	6	11	11	0	0

* PWS=public water supply NONAG=non-agricultural

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APPENDIX P

SENSITIVITY RUN HEAD CHANGE MAPS

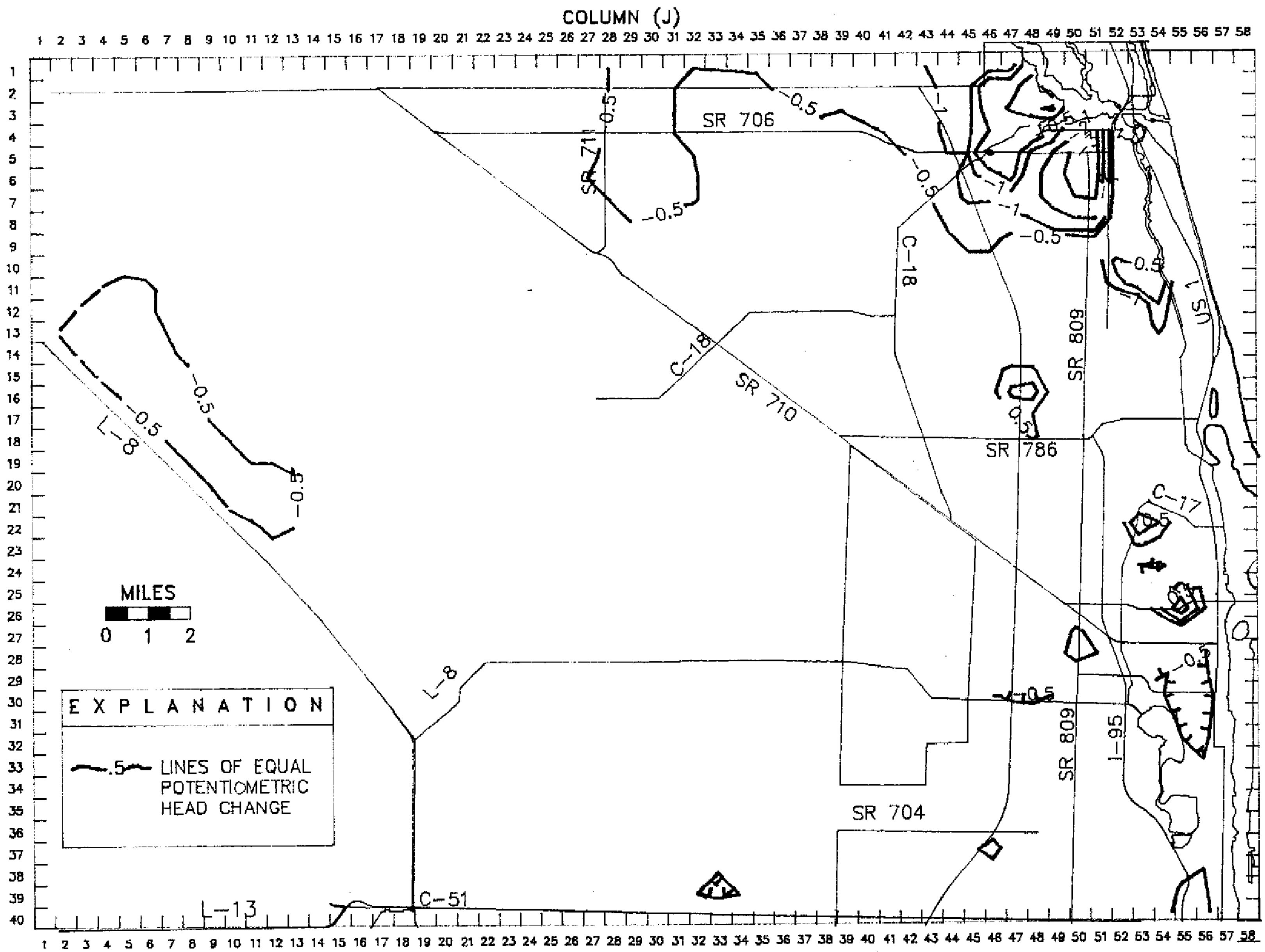

Figure P-1 CHANGE IN SIMULATED HEADS IN LAYER 1 OF THE NORTH MODEL WHEN HYDRAULIC CONDUCTIVITY AND VERTICAL CONDUCTANCE ARE INCREASED TO DOUBLE THE CALIBRATION VALUES

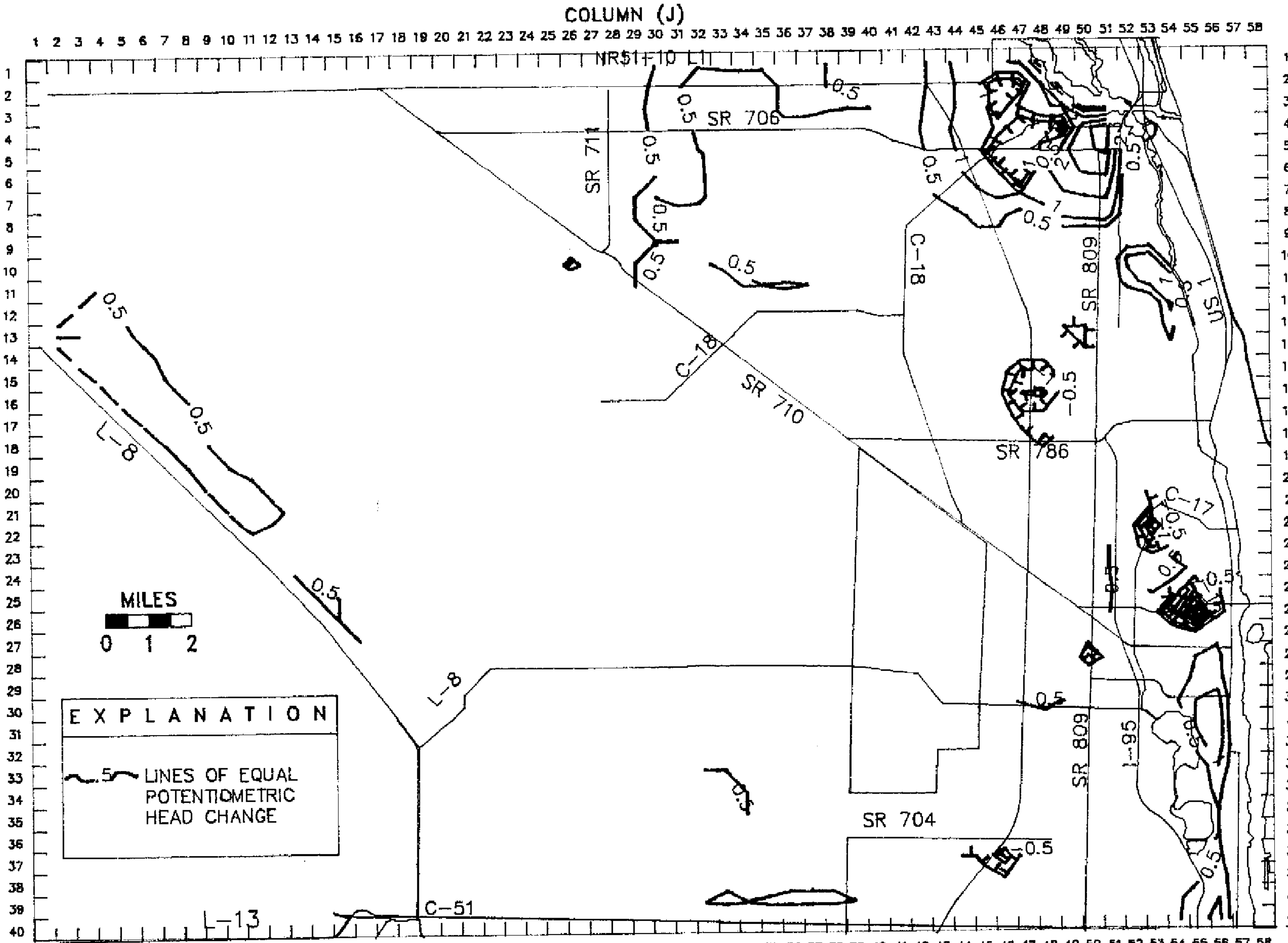

Figure P-2 CHANGE IN SIMULATED HEADS IN LAYER 1 OF THE NORTH MODEL WHEN HYDRAULIC CONDUCTIVITY AND VERTICAL CONDUCTANCE ARE DECREASED TO HALF THE CALIBRATION VALUES

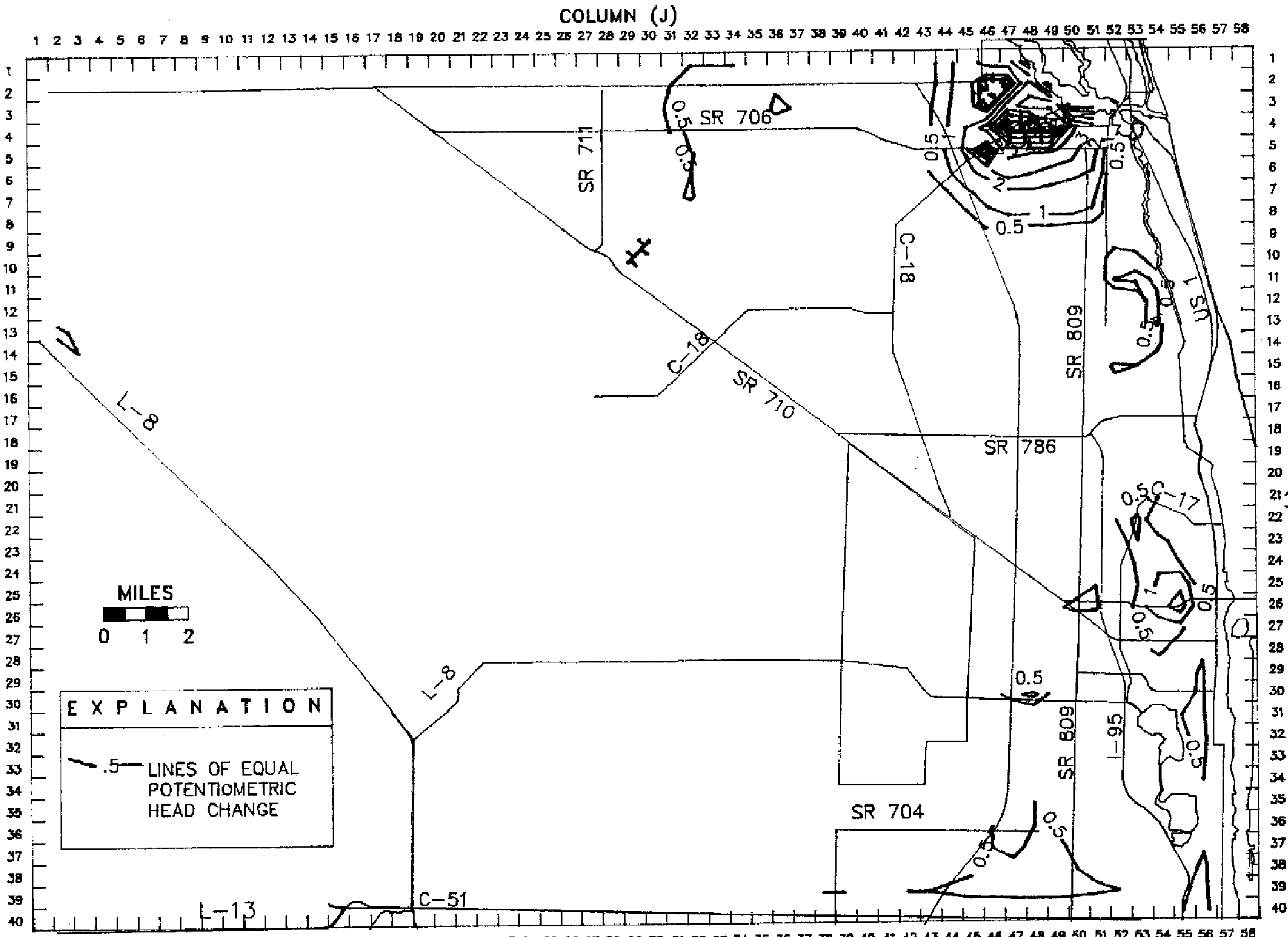

Figure P-3 CHANGE IN SIMULATED HEADS IN LAYER 1 OF THE NORTH MODEL WHEN THE VERTICAL TO HORIZONTAL ANISOTROPY RATIO IS DECREASED AN ORDER OF MAGNITUDE FROM THE CALIBRATION VALUES

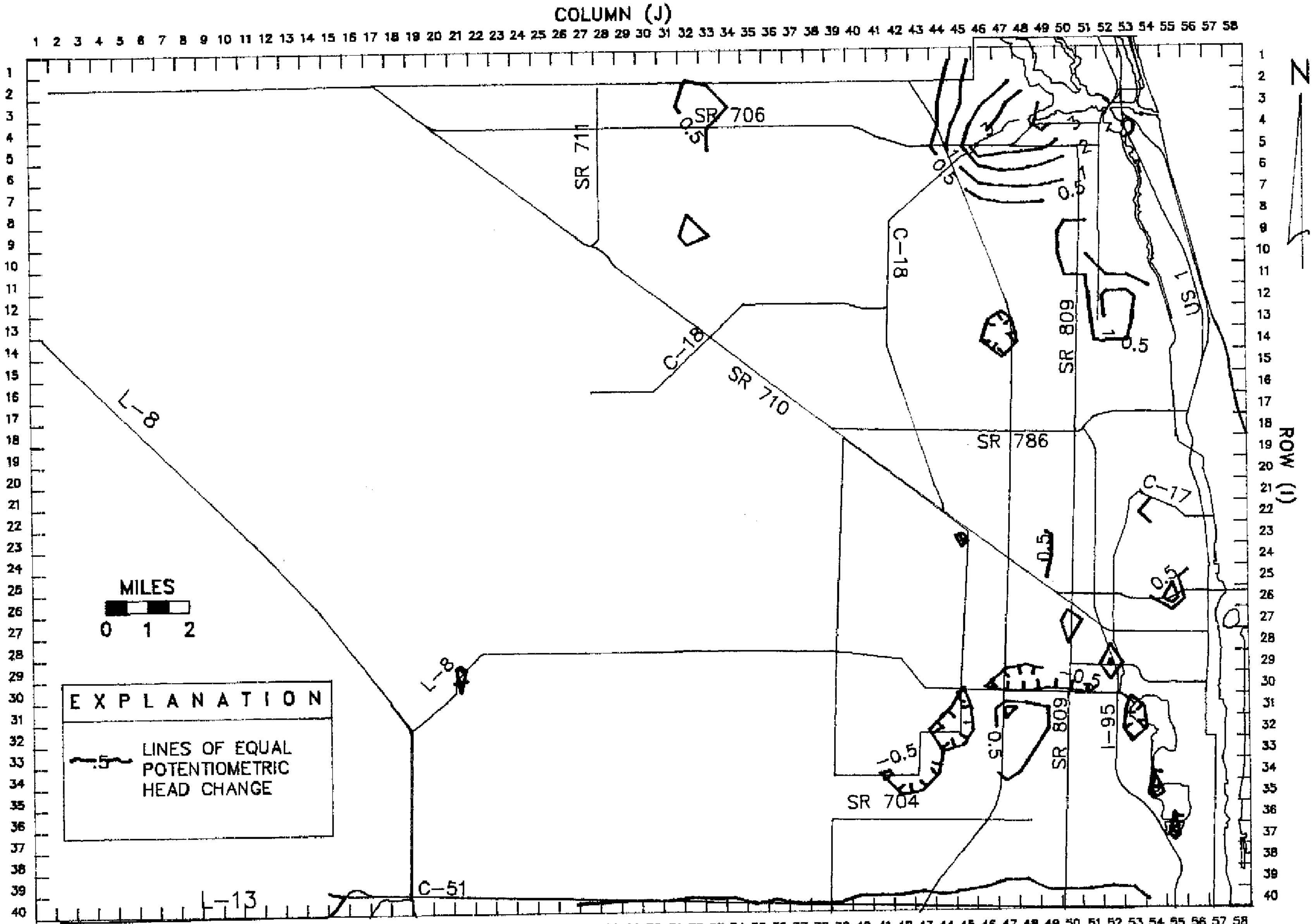

Figure P-4 CHANGE IN SIMULATED HEADS IN LAYER 3 OF THE NORTH MODEL WHEN THE VERTICAL TO HORIZONTAL ANISOTROPY RATIO IS DECREASED AN ORDER OF MAGNITUDE FROM THE CALIBRATION VALUES

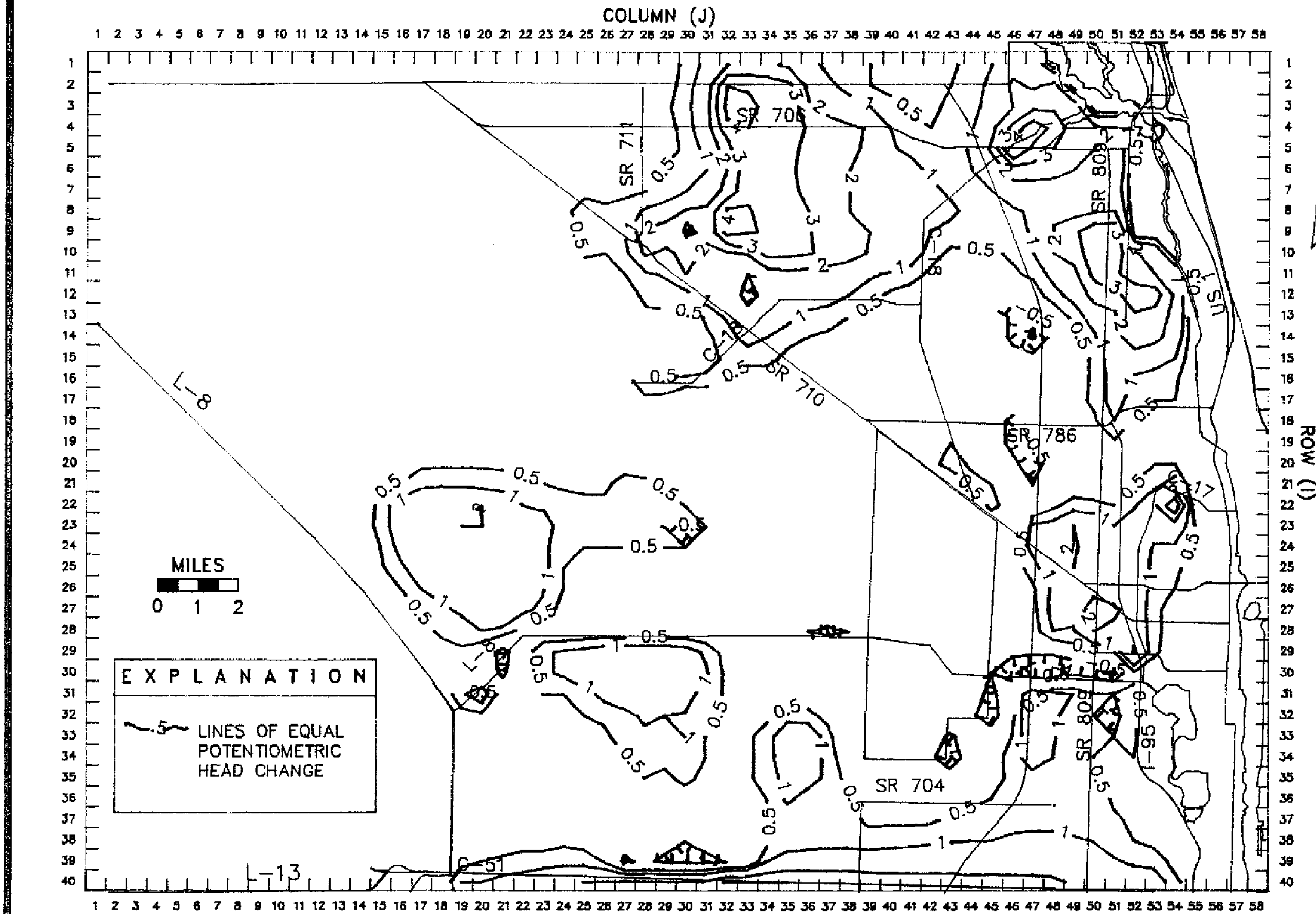

Figure P-5 CHANGE IN SIMULATED HEADS IN LAYER 1 OF THE NORTH MODEL WHEN THE CANAL SEDIMENT HYDRAULIC CONDUCTIVITY IS DECREASED AN ORDER OF MAGNITUDE FROM 1.0 FT/DAY TO 0.1 FT/DAY

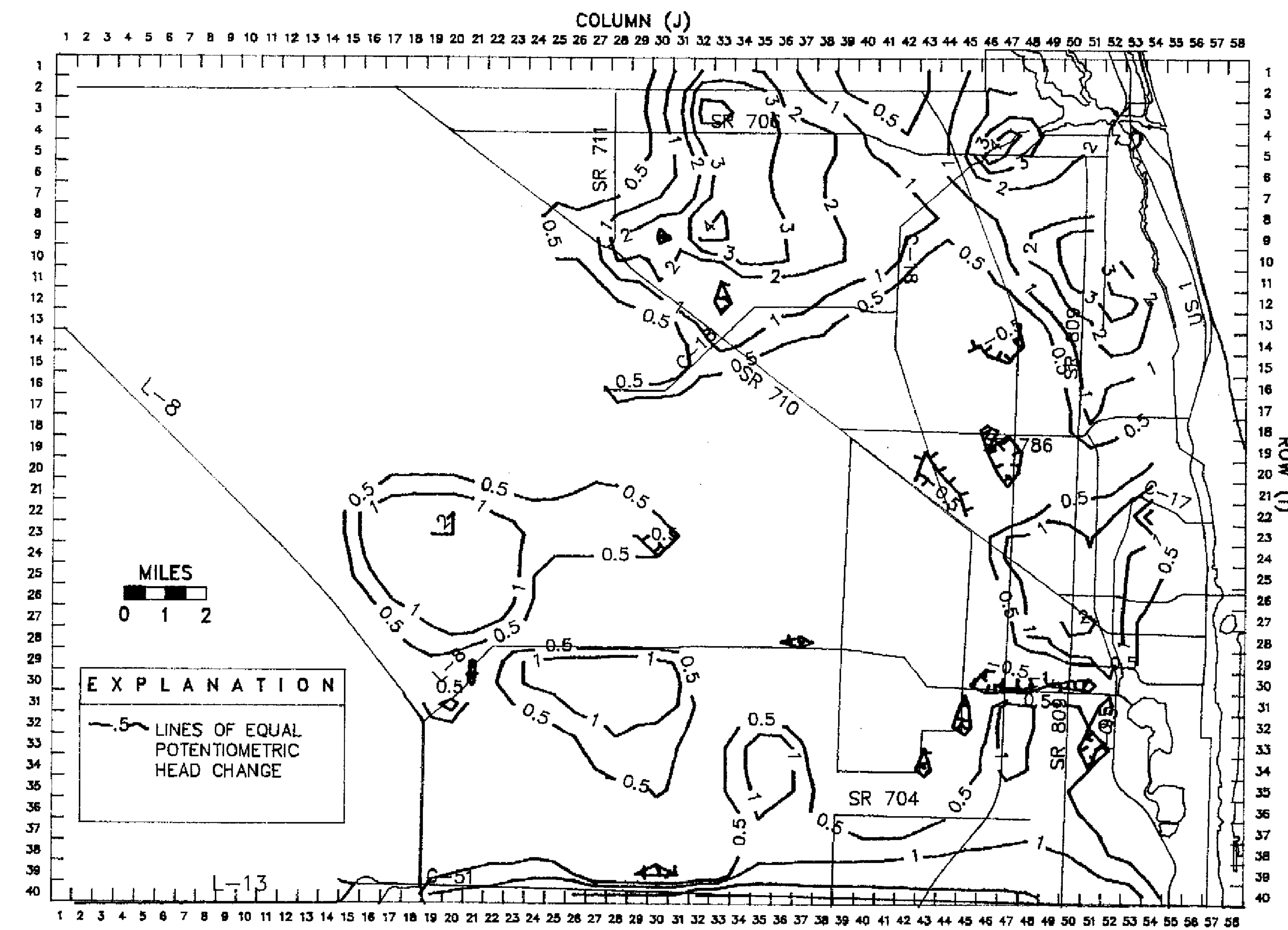

Figure P-6 CHANGE IN SIMULATED HEADS IN LAYER 3 OF THE NORTH MODEL WHEN THE CANAL SEDIMENT HYDRAULIC CONDUCTIVITY IS DECREASED AN ORDER OF MAGNITUDE FROM 1.0 FT/DAY TO 0.1 FT/DAY

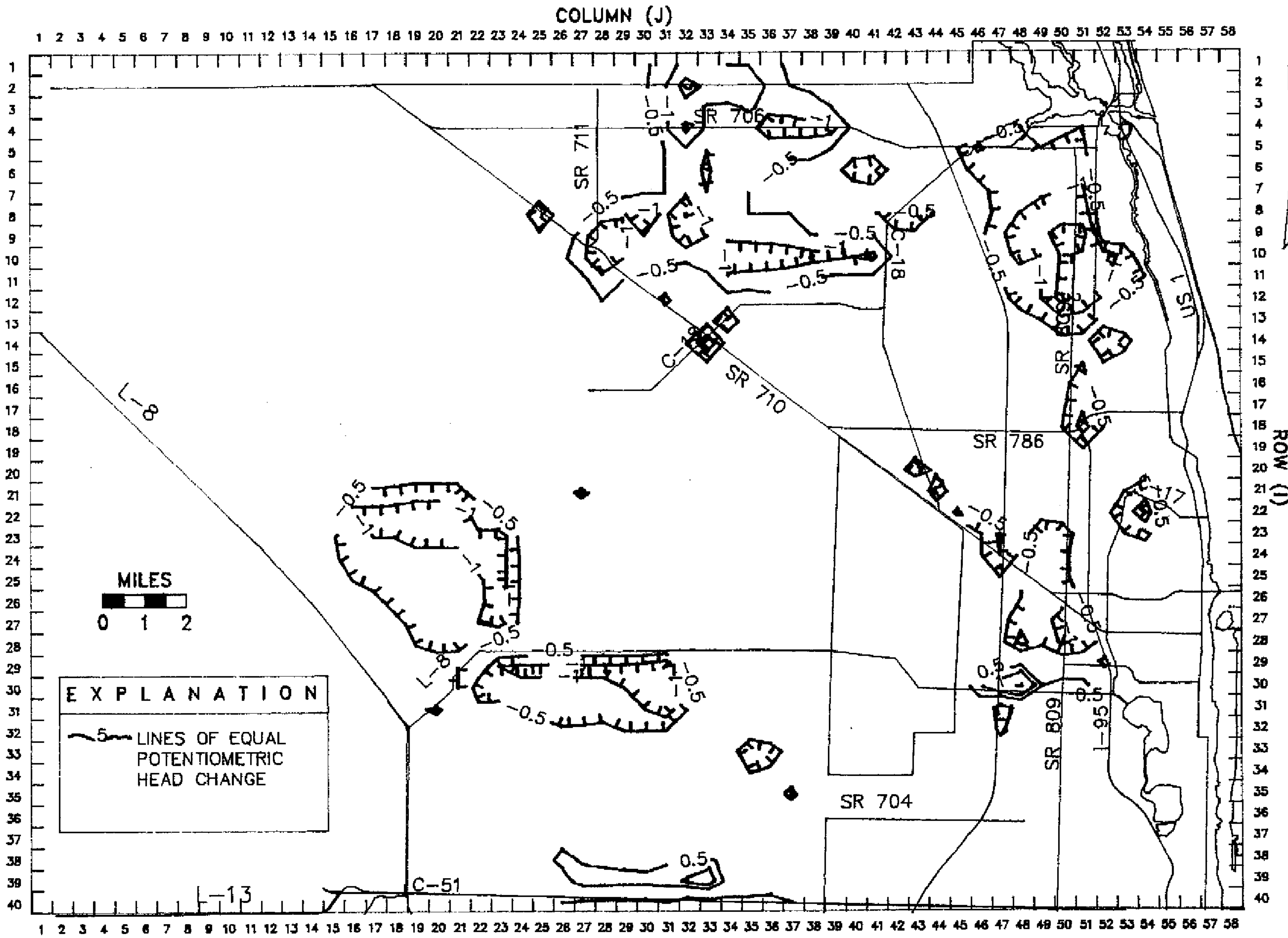

Figure P-7 CHANGE IN SIMULATED HEADS IN LAYER 1 OF THE NORTH MODEL WHEN THE CANAL SEDIMENT HYDRAULIC CONDUCTIVITY IS INCREASED AN ORDER OF MAGNITUDE FROM THE CALIBRATION VALUE

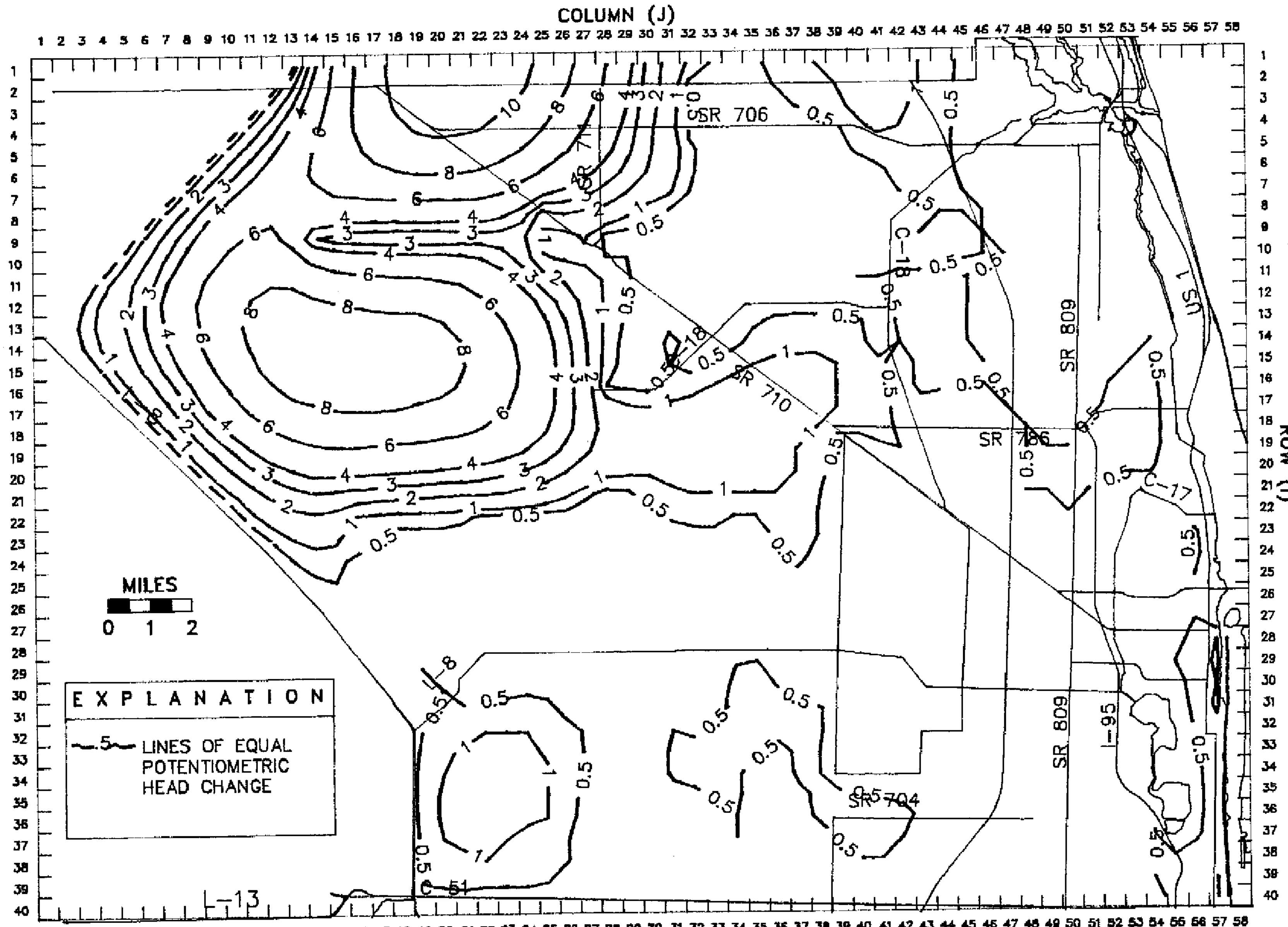

Figure P-8 CHANGE IN SIMULATED HEADS IN LAYER 1 OF THE NORTH MODEL WHEN MAXIMUM EVAPOTRANSPIRATION IS REDUCED 25% FROM THE CALIBRATION VALUE

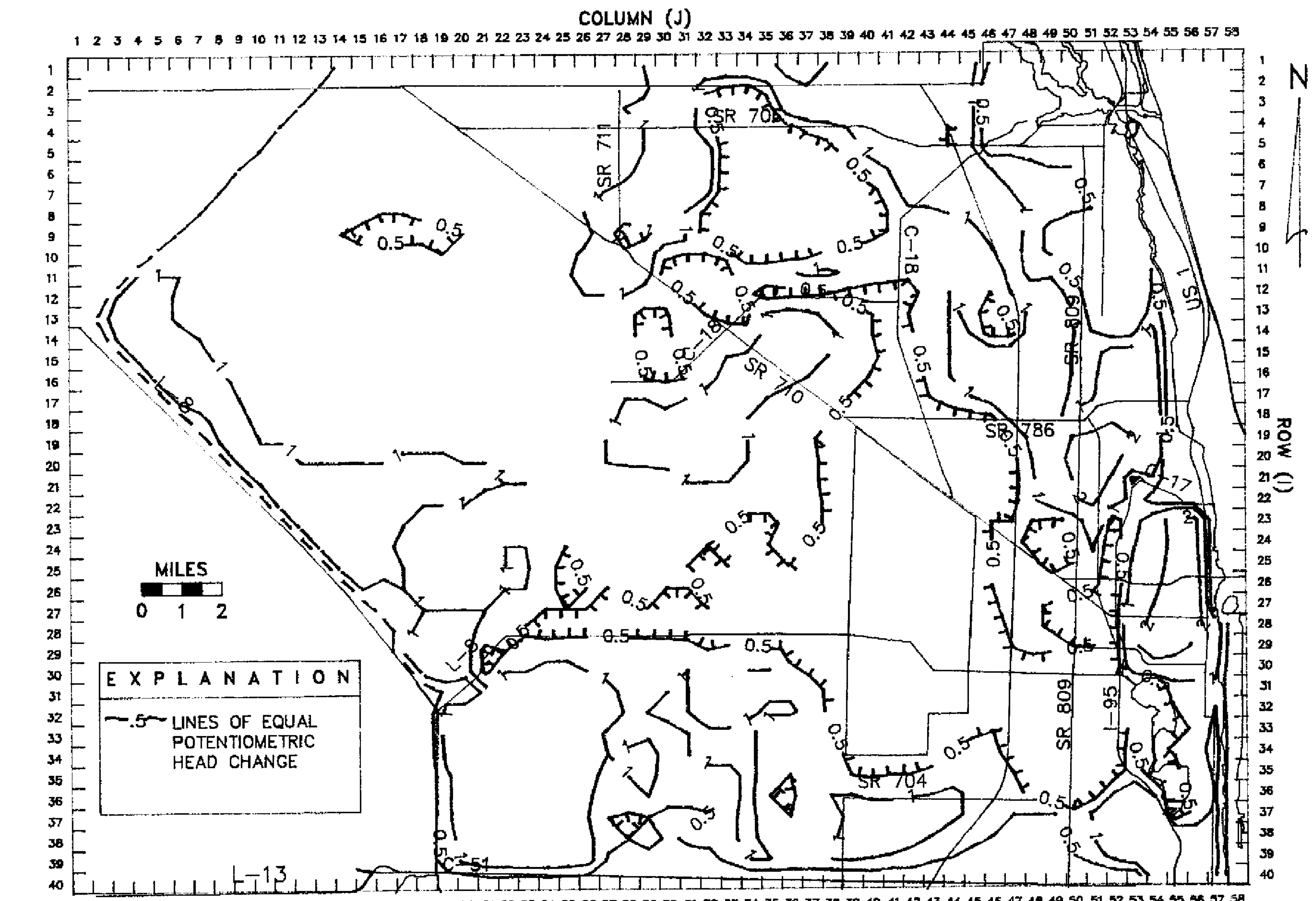

Figure P-9 CHANGE IN SIMULATED HEADS IN LAYER 1 OF THE NORTH COUNTY MODEL WHEN THE EVAPOTRANSPIRATION EXTINCTION DEPTH IS HALVED FROM THE CALIBRATION VALUE

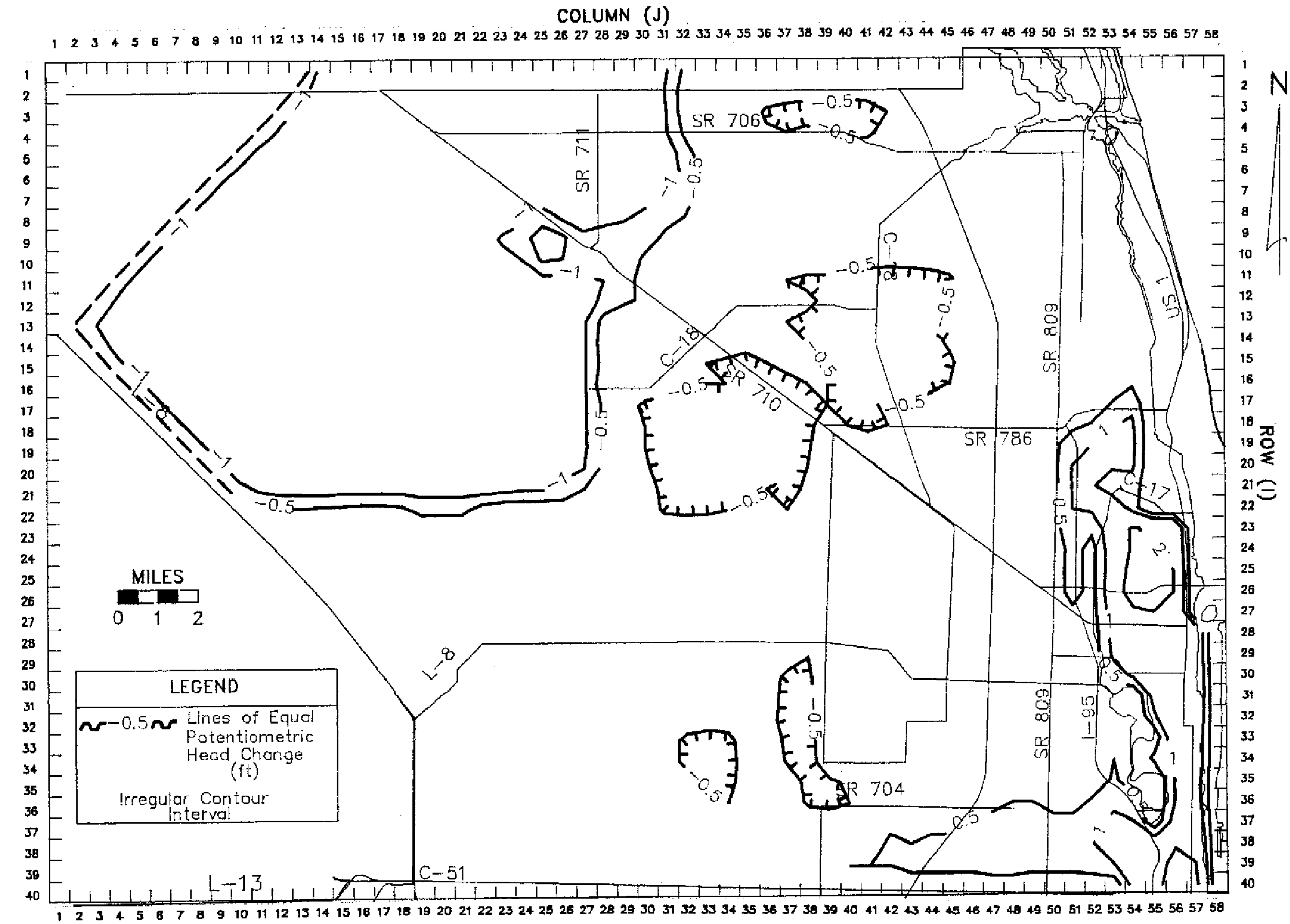

Figure P-10 CHANGE IN SIMULATED HEADS IN LAYER 1 OF THE NORTH MODEL WHEN A UNIFORM RECHARGE FACTOR OF 0.75 IS USED

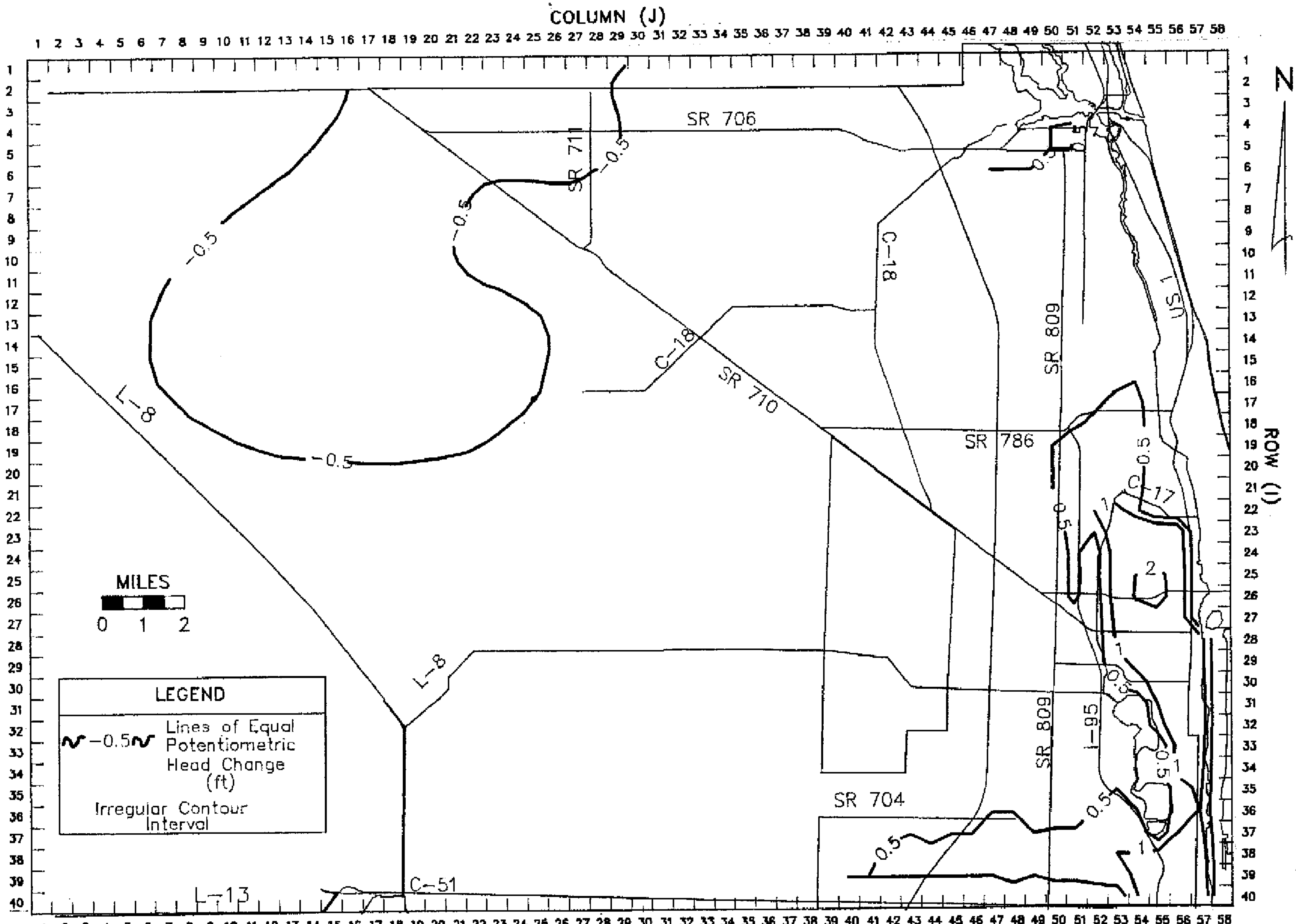

Figure P-11 CHANGE IN SUMULATED HEADS IN LAYER 1 OF THE NORTH MODEL WHEN THE RECHARGE FACTORS ARE CHANGED FROM 1.0,.75 AND 0.5 TO .9,.8, AND .7 RESPECTIVELY

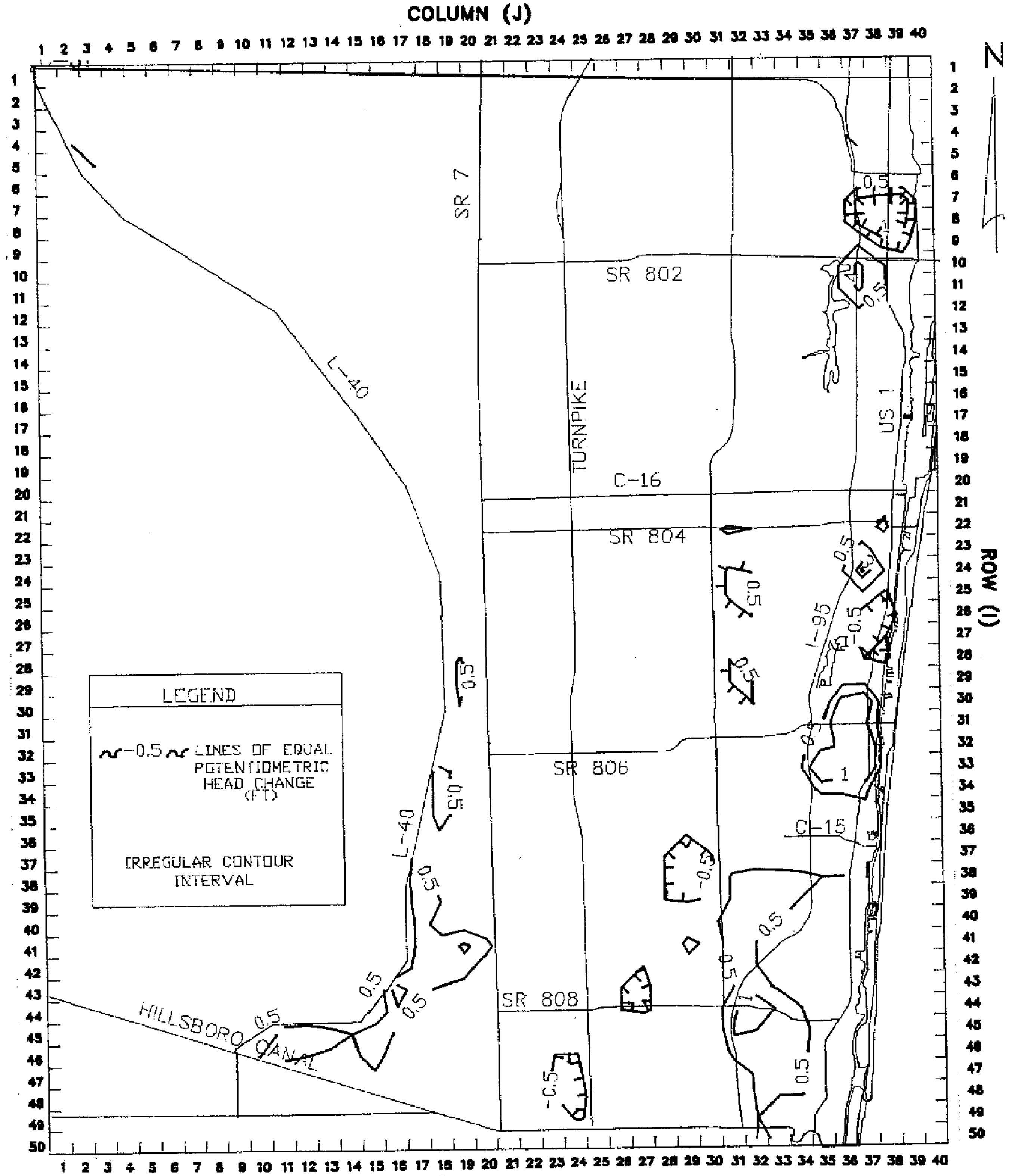

Figure P-12 CHANGE IN SIMULATED HEADS IN LAYER 1 OF THE SOUTH MODEL WHEN HYDRAULIC CONDUCTIVITY AND VERTICAL CONDUCTANCE ARE INCREASED TO DOUBLE THE CALIBRATION VALUES

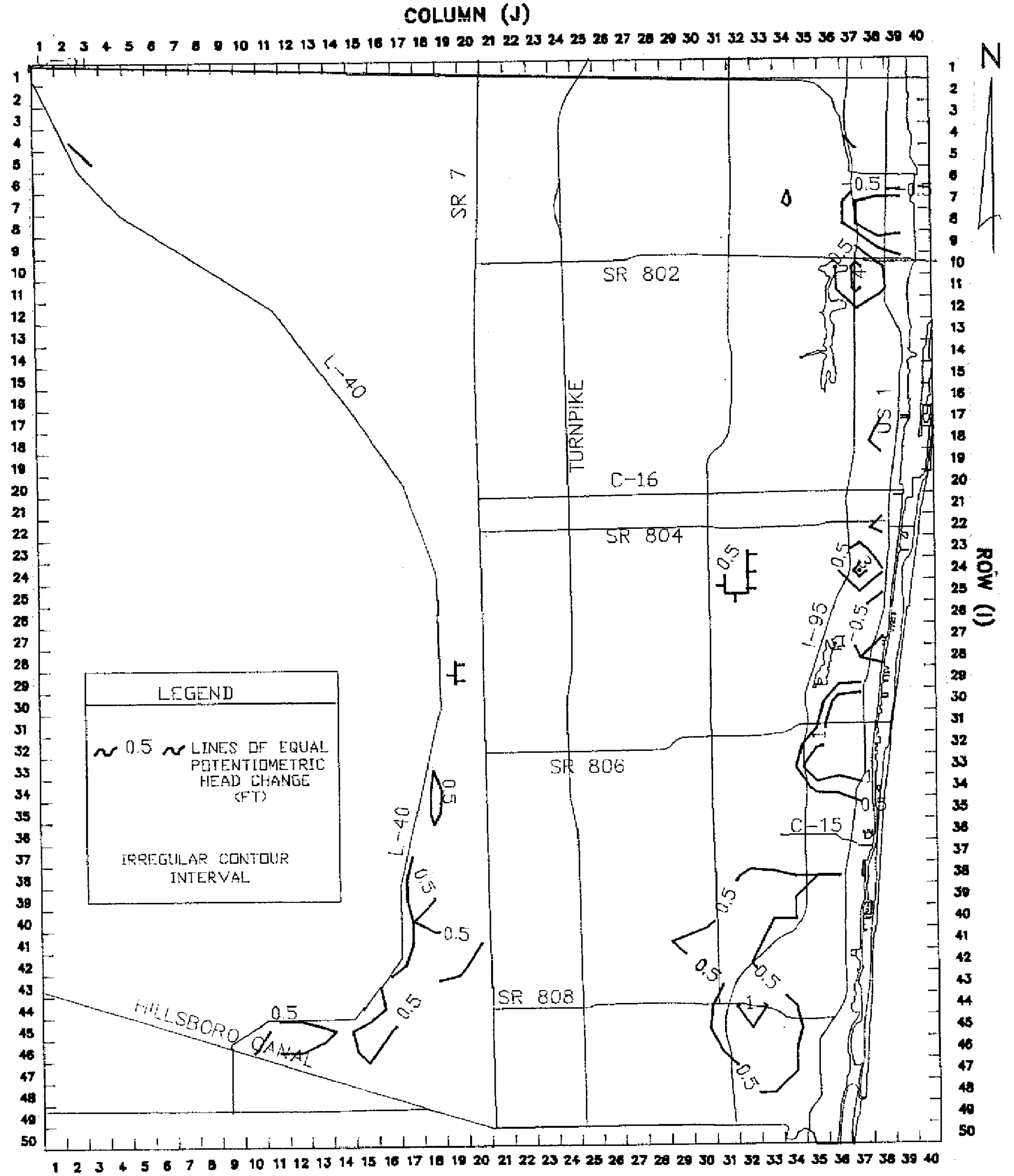

Figure P-13 **CHANGE IN SIMULATED HEADS IN LAYER 3 OF THE SOUTH MODEL WHEN HYDRAULIC CONDUCTIVITY AND VERTICAL CONDUCTANCE ARE INCREASED TO DOUBLE THE CALIBRATION VALUES**

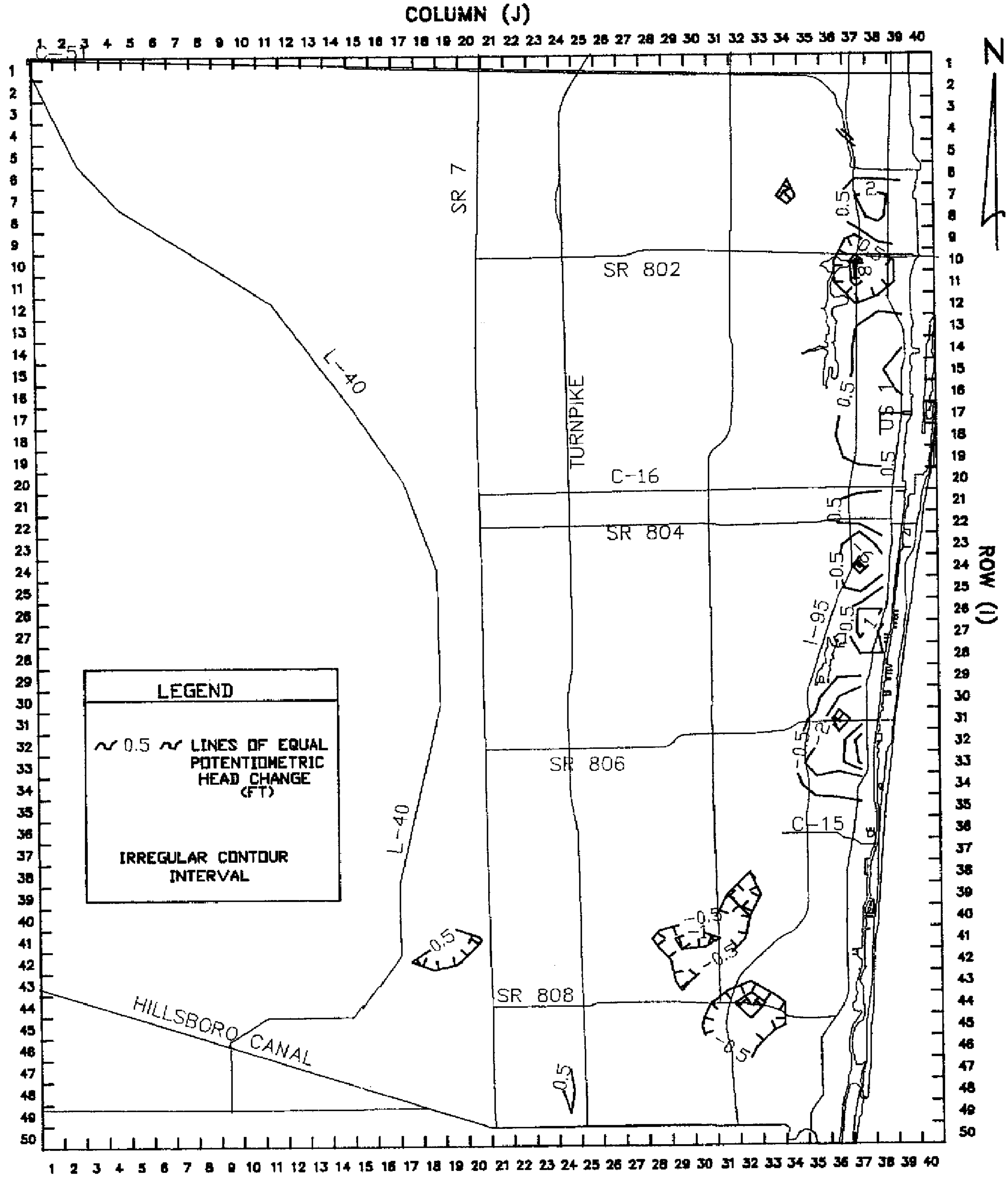

Figure P-15 CHANGE IN SIMULATED HEADS IN LAYER 3 OF THE SOUTH MODEL WHEN HYDRAULIC CONDUCTIVITY AND VERTICAL CONDUCTANCE ARE DECREASED TO HALF THE CALIBRATION VALUES

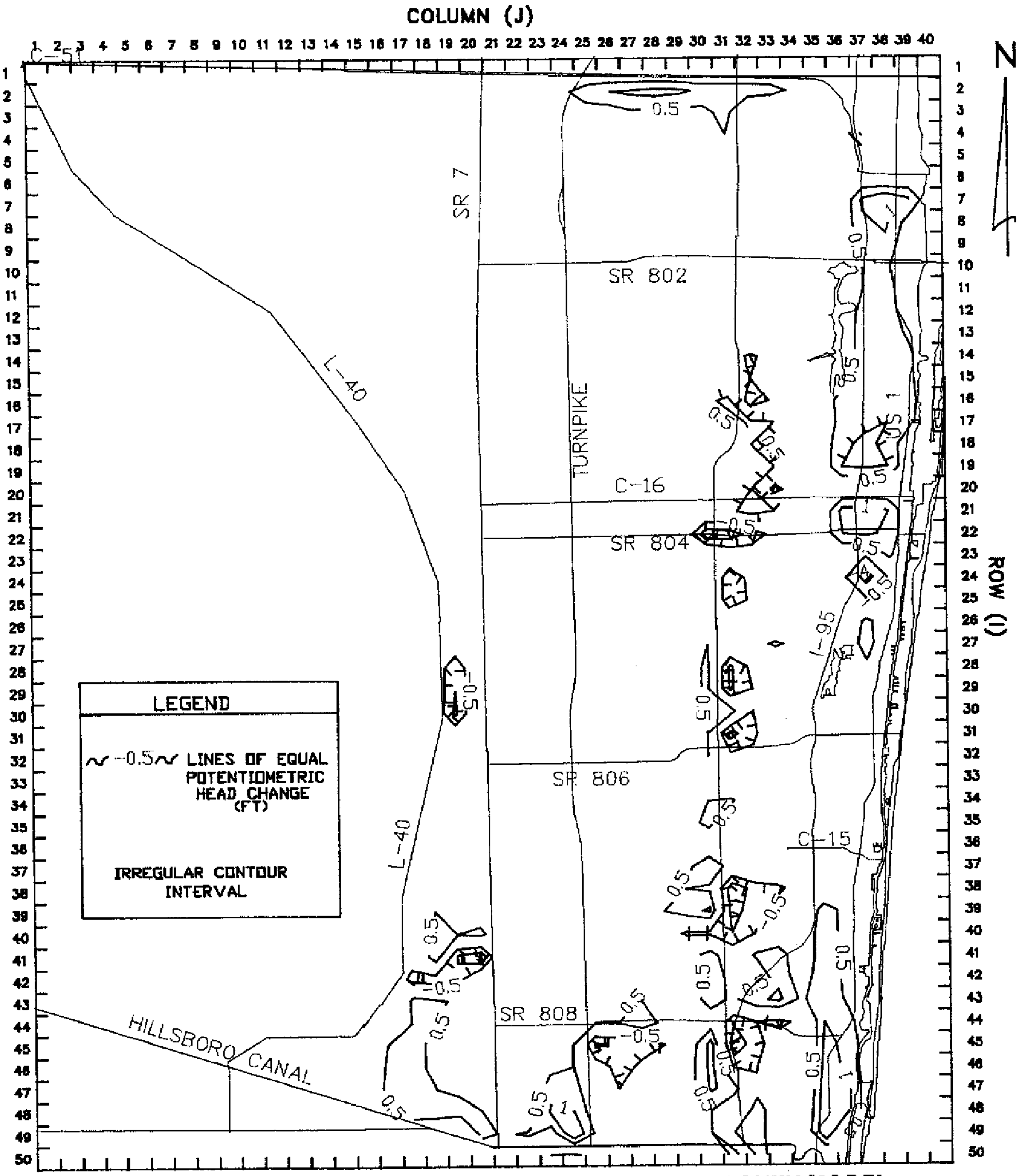

Figure P-16 CHANGE IN SIMULATED HEADS IN LAYER 1 OF THE SOUTH MODEL WHEN THE VERTICAL TO HORIZONTAL ANISOTROPY RATIO IS DECREASED AN ORDER OF MAGNITUDE FROM THE CALIBRATION VALUE

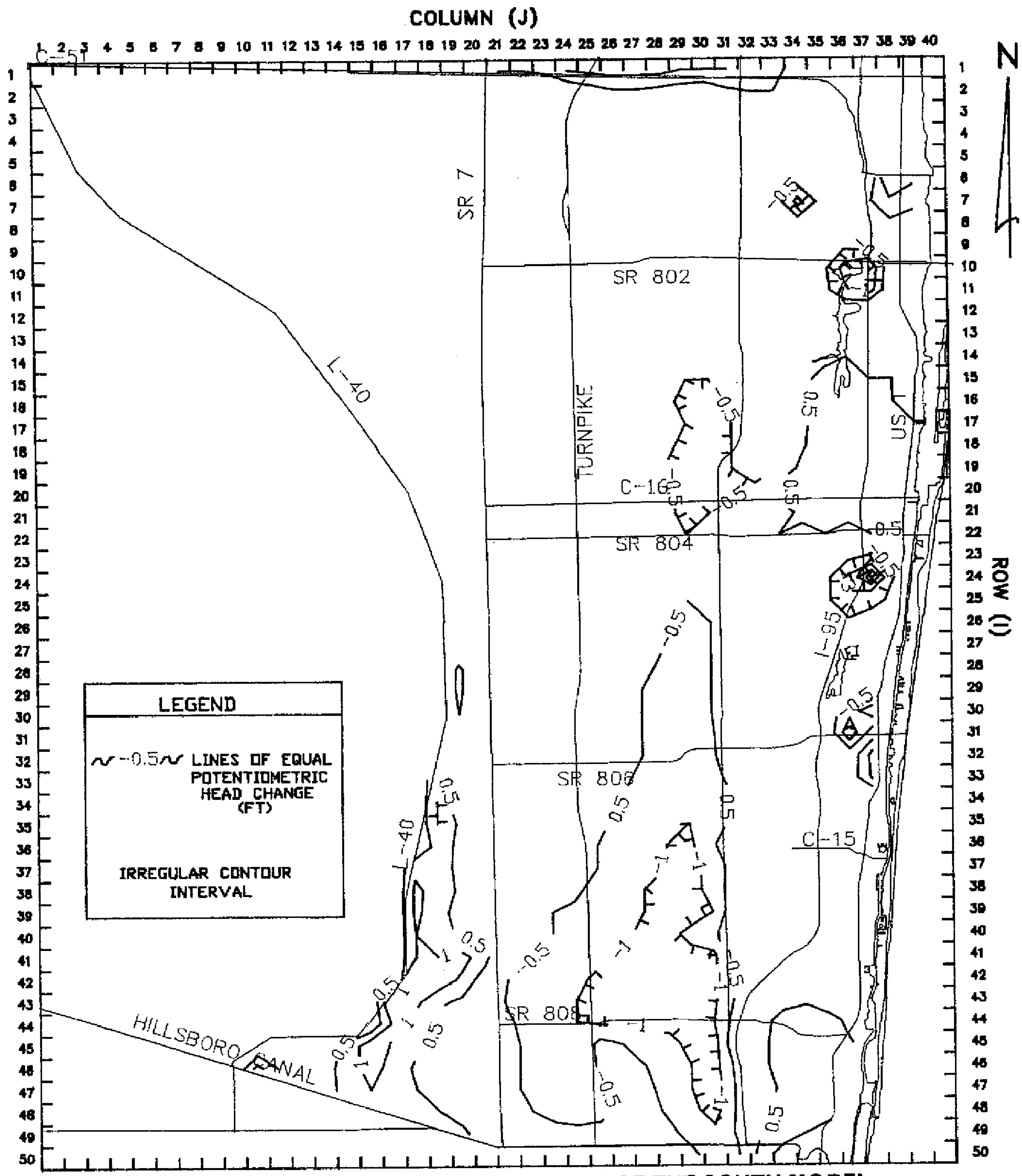

Figure P-17 CHANGE IN SIMULATED HEADS IN LAYER 3 OF THE SOUTH MODEL WHEN THE VERTICAL TO HORIZONTAL ANISOTROPY RATIO IS DECREASED AN ORDER OF MAGNITUDE FROM THE CALIBRATION VALUE

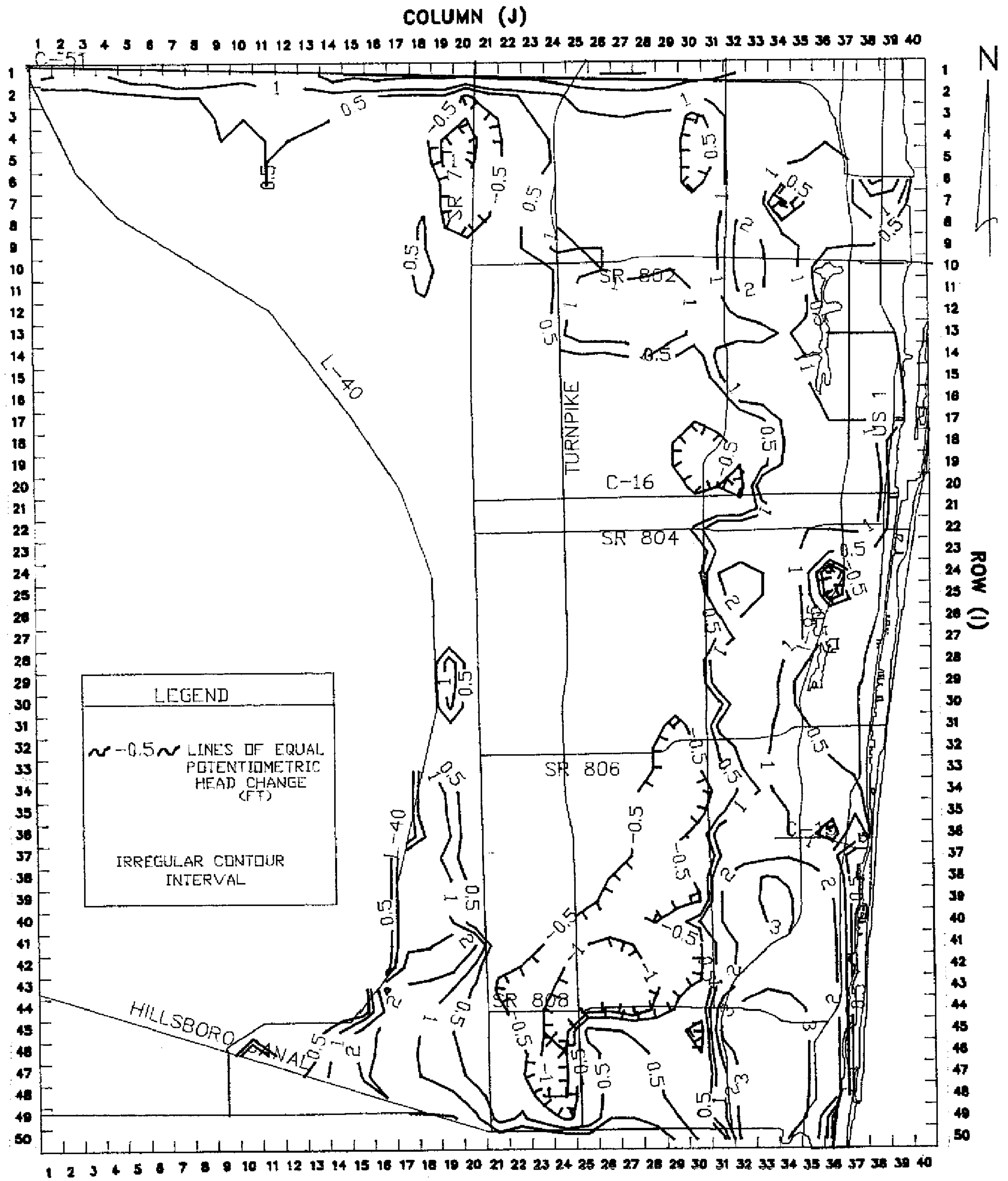

Figure P-18 CHANGE IN SIMULATED HEADS IN LAYER 1 OF THE SOUTH MODEL WHEN THE CANAL SEDIMENT CONDUCTIVITY IS DECREASED AN ORDER OF MAGNITUDE FROM 1 TO .1 FT/DAY

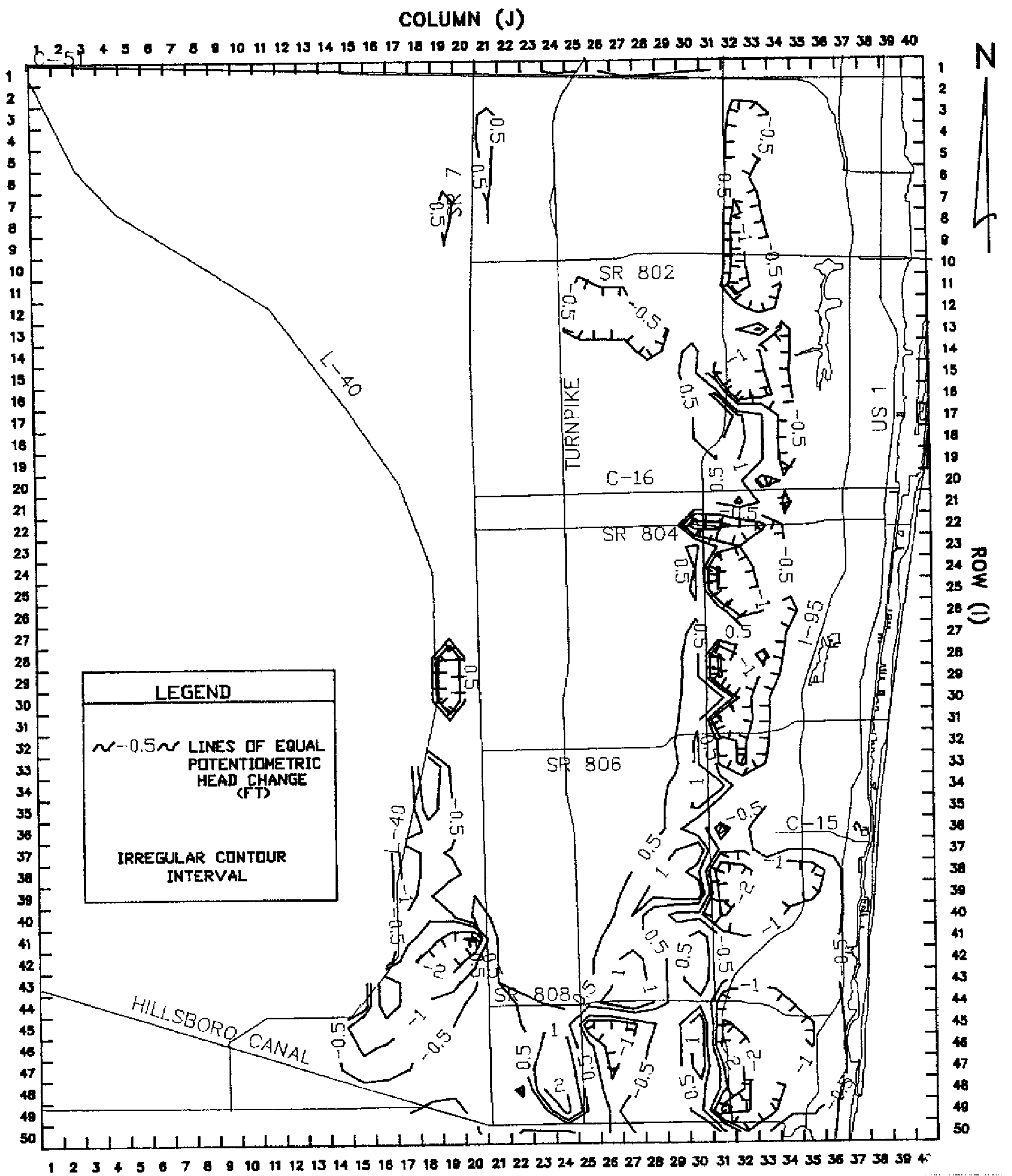

Figure P-19 CHANGE IN SIMULATED HEADS IN LAYER 1 OF THE SOUTH MODEL WHEN THE CANAL SEDIMENT CONDUCTIVITY IS INCREASED AN ORDER OF MAGNITUDE FROM 1 TO 10 FT/DAY

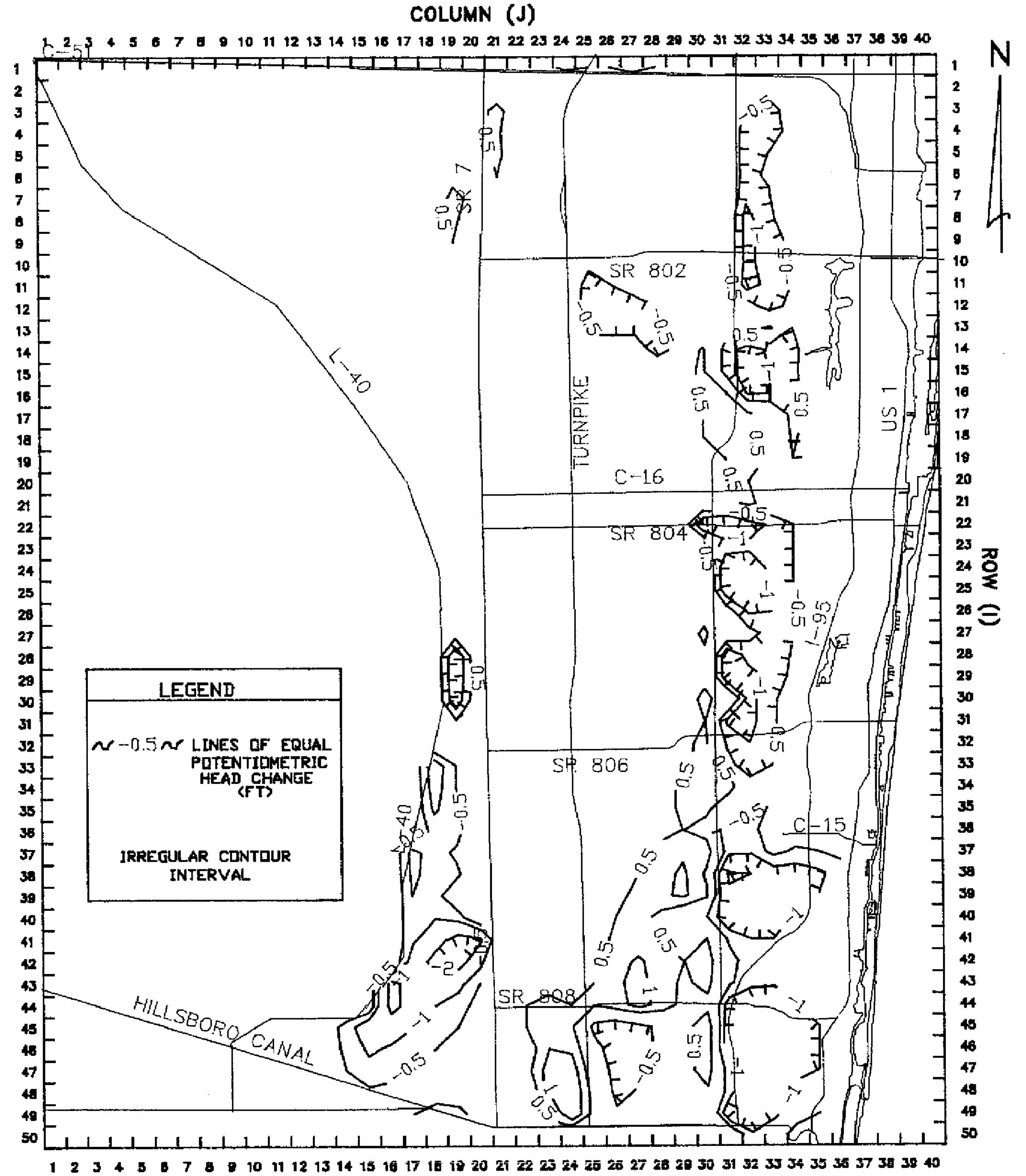

Figure P-20 CHANGE IN SIMULATED HEADS IN LAYER 3 OF THE SOUTH MODEL WHEN THE CANAL SEDIMENT CONDUCTIVITY IS INCREASED AN ORDER OF MAGNITUDE FROM 1 TO 10 FT/DAY

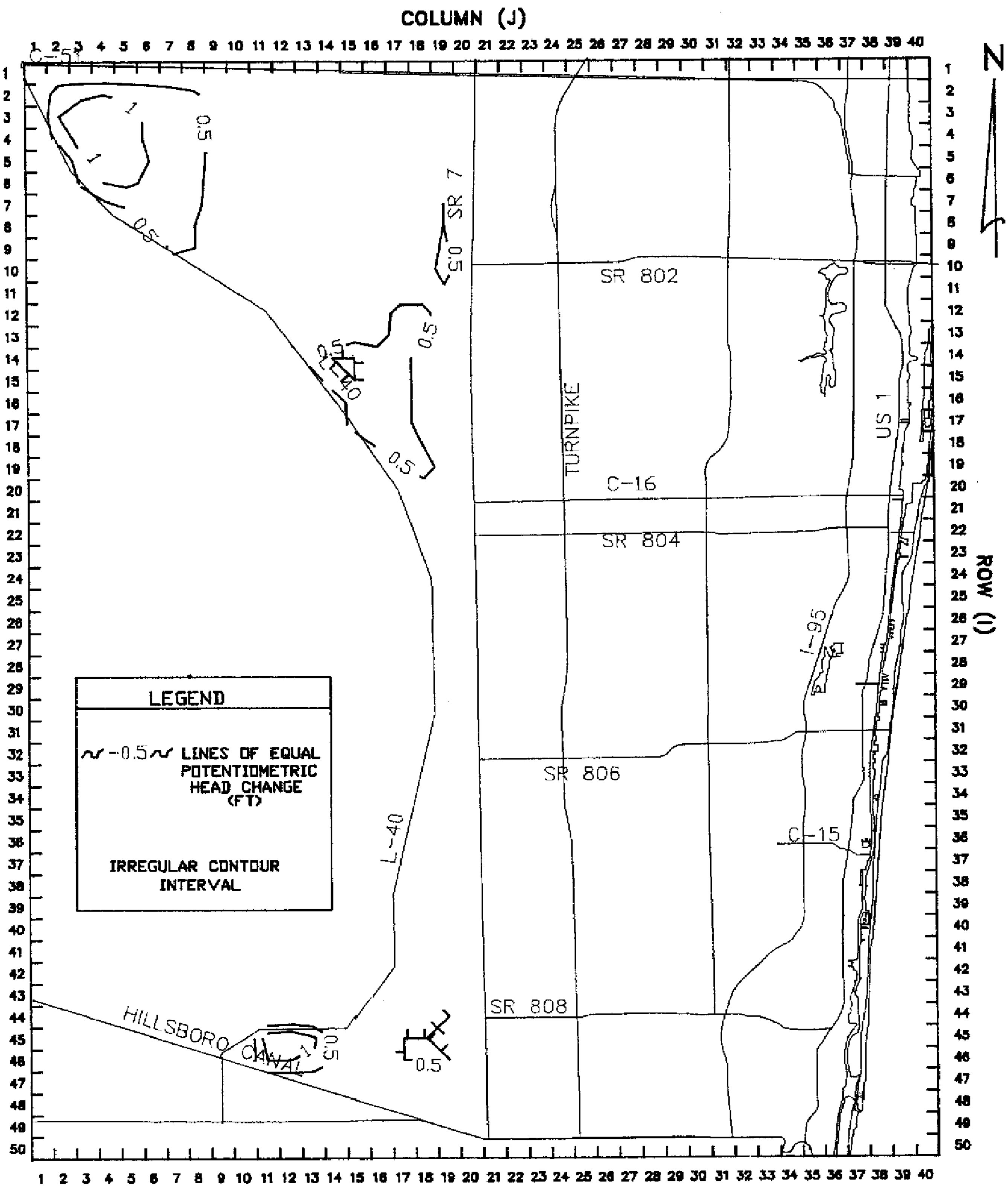

Figure P-21 CHANGE IN SIMULATED HEADS IN LAYER 1 OF THE SOUTH MODEL WHEN MAXIMUM EVAPOTRANSPIRATION IS REDUCED 25% FROM THE CALIBRATION VALUE

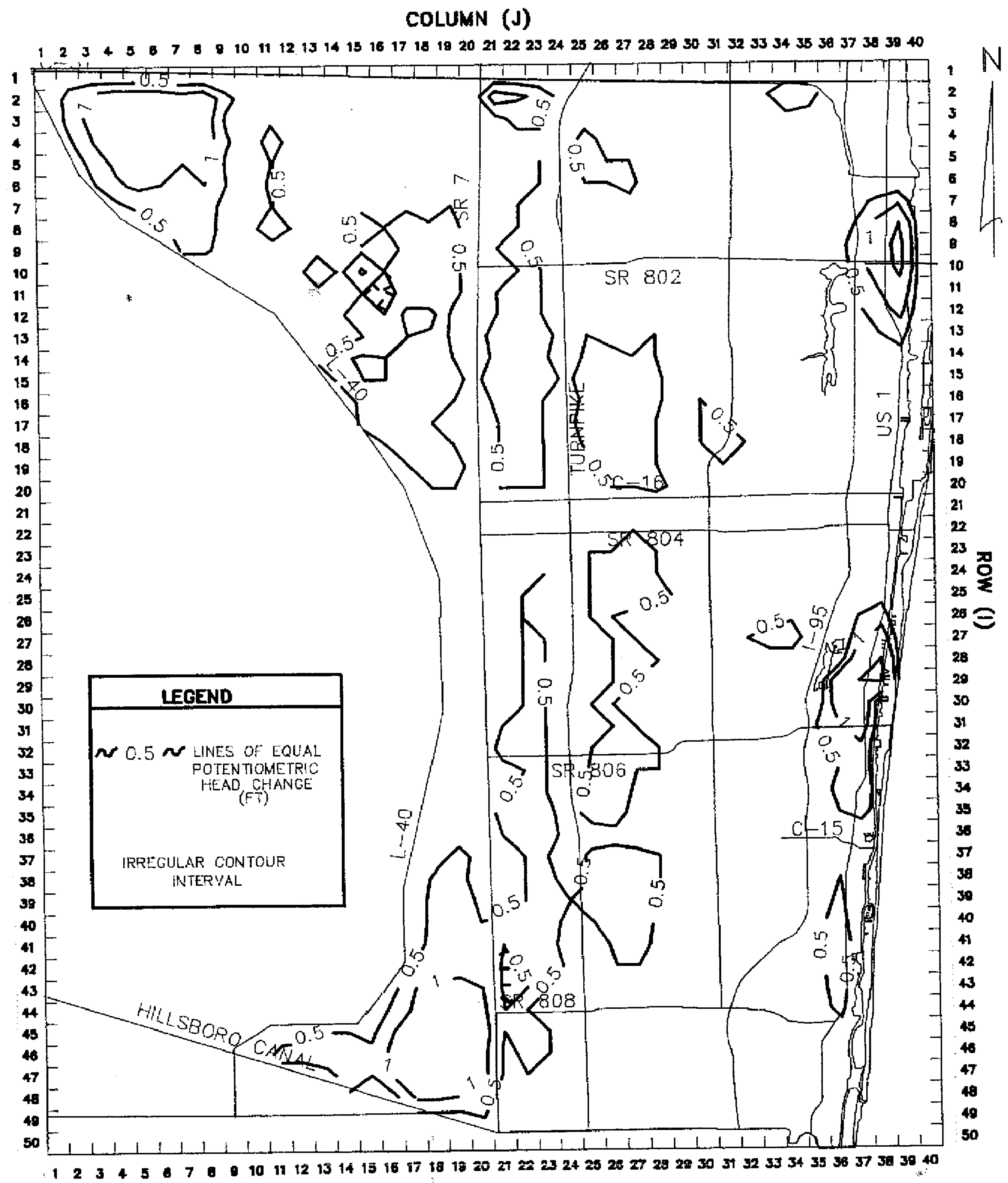

Figure P-22 CHANGE IN SIMULATED HEADS IN LAYER 1 OF THE SOUTH MODEL WHEN THE EVAPOTRANSPIRATION EXTINCTION DEPTH IS HALVED FROM THE CALIBRATION VALUE

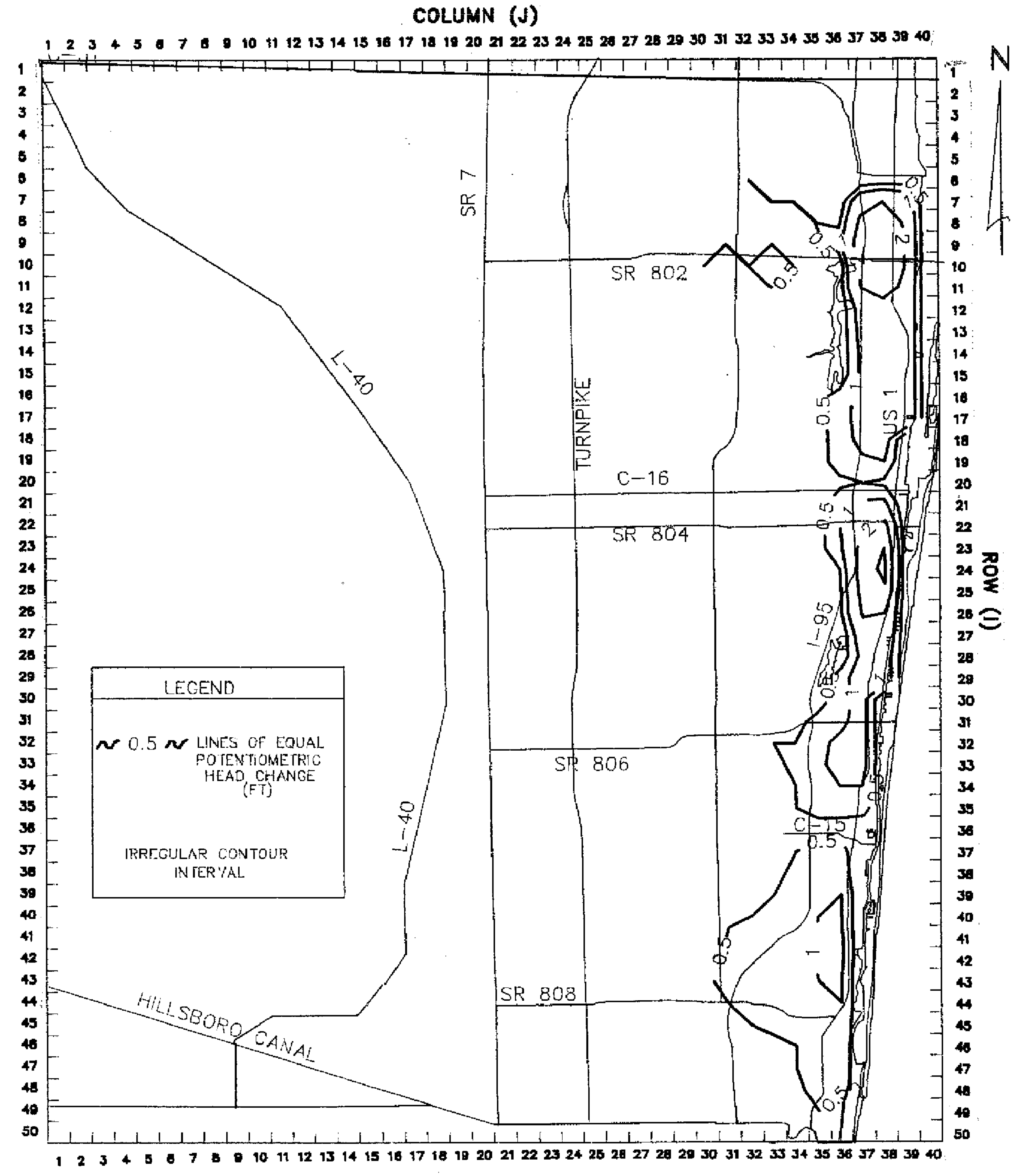

Figure P-23 CHANGE IN SIMULATED HEADS IN LAYER 1 OF THE SOUTH MODEL WHEN A UNIFORM RECHARGE FACTOR OF 0.75 IS USED

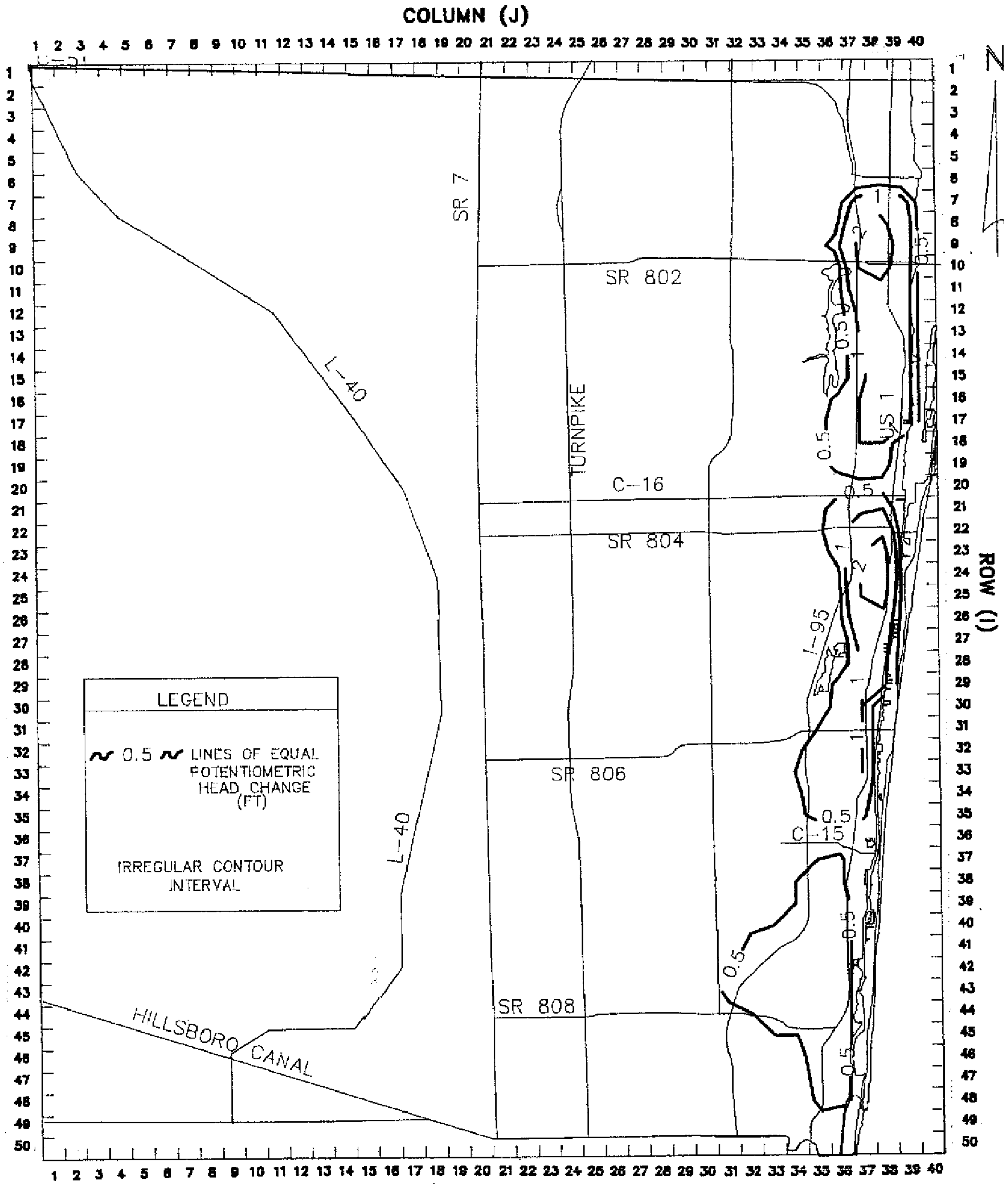

Figure P-24 CHANGE IN SIMULATED HEADS IN LAYER 1 OF THE SOUTH MODEL WHEN THE RECHARGE FACTORS ARE CHANGED FROM 1.0,0.75 AND 0.5 TO 0.9,0.8 AND 0.7 RESPECTIVELY

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APPENDIX Q

ALLOCATED AND BUILDOUT WATER USE DATA

TABLE Q-1 North Model 1988/89 Allocated Water Use Pumpage Distribution (page 1)

Permit #	Permittee	Use* Type	Layer	Row	Column	Node % Pumpage	Node Pumpage (ft3/day X 1000)
50-00010	JUPITER (Wellfield 2)	PWS	4	6	47	100	249
50-00010	JUPITER (Wellfield 3)	PWS	4	6	48	50	128
		PWS	4	7	48	25	64
		PWS	4	6	47	25	64
50-00010	JUPITER (Wellfield 4)	PWS	4	8	46	14	59
		PWS	4	8	47	43	180
		PWS	4	8	48	43	180
50-00010	JUPITER (Wellfield 5)	PWS	4	9	46	17	56
		PWS	4	9	47	33	109
		PWS	4	10	47	50	165
50-00010	JUPITER (Wellfield 6)	PWS	4	9	47	10	55
		PWS	4	9	48	30	165
		PWS	4	10	48	30	165
		PWS	4	11	48	20	110
		PWS	4	10	47	10	55
50-00030	MANGONIA	PWS	5	29	54	40	34
		PWS	5	28	54	60	51
50-00135	PB COUNTY #8W	PWS	5	37	45	27	272
		PWS	5	37	46	64	645
		PWS	5	36	46	9	91
50-00135	PB COUNTY #1W	PWS	4	38	50	8	9
		PWS	4	38	51	25	28
		PWS	5	39	50	17	19
		PWS	4	39	51	17	19
		PWS	4	39	52	33	37
50-00178	CENTURY	PWS	4	36	48	100	218
50-00365	SEACOAST (PB Gardens)	PWS	5	19	50	17	56
		PWS	5	19	51	17	56
		PWS	5	20	50	17	56
		PWS	5	20	51	50	168
50-00365	SEACOAST (Hood)	PWS	5	15	47	15	254
		PWS	4	15	48	8	127
		PWS	4	16	47	31	508
		PWS	4	16	48	39	635
		PWS	4	17	47	8	127
50-00365	SEACOAST (North Palm Beach)	PWS	5	21	53	13	38
		PWS	4	22	53	88	264
50-00365	SEACOAST (Burma)	PWS	5	23	52	60	181
		PWS	5	23	53	40	121
50-00444	ROYAL PLM BCH	PWS	3	36	37	43	133
		PWS	3	37	37	57	178
50-00460	RIVERIA BCH (East)	PWS	5	26	53	6	20
		PWS	5	26	54	17	59
		PWS	5	28	54	6	20
		PWS	5	25	55	22	79
		PWS	5	26	55	50	179
50-00460	RIVERIA BCH (West)	PWS	4	29	49	13	104
		PWS	4	29	50	13	104
		PWS	4	28	50	38	312
		PWS	4	29	48	25	208
		PWS	4	28	51	13	104
50-00501	PRATT-WHITNEY	PWS	2	10	26	75	294
		PWS	2	10	27	25	98
50-00562	MEADOWBROOK	PWS	4	38	46	100	229
50-00653	GOOD SAMARITAN HOSP.	PWS	2	34	57	100	33
50-00713	CONSOLIDATED	PWS	4	28	49	100	32
50-00605	LION COUNTRY	PWS	3	35	24	100	21

* PWS=public water supply NONAG=non-agricultural AG=agricultural

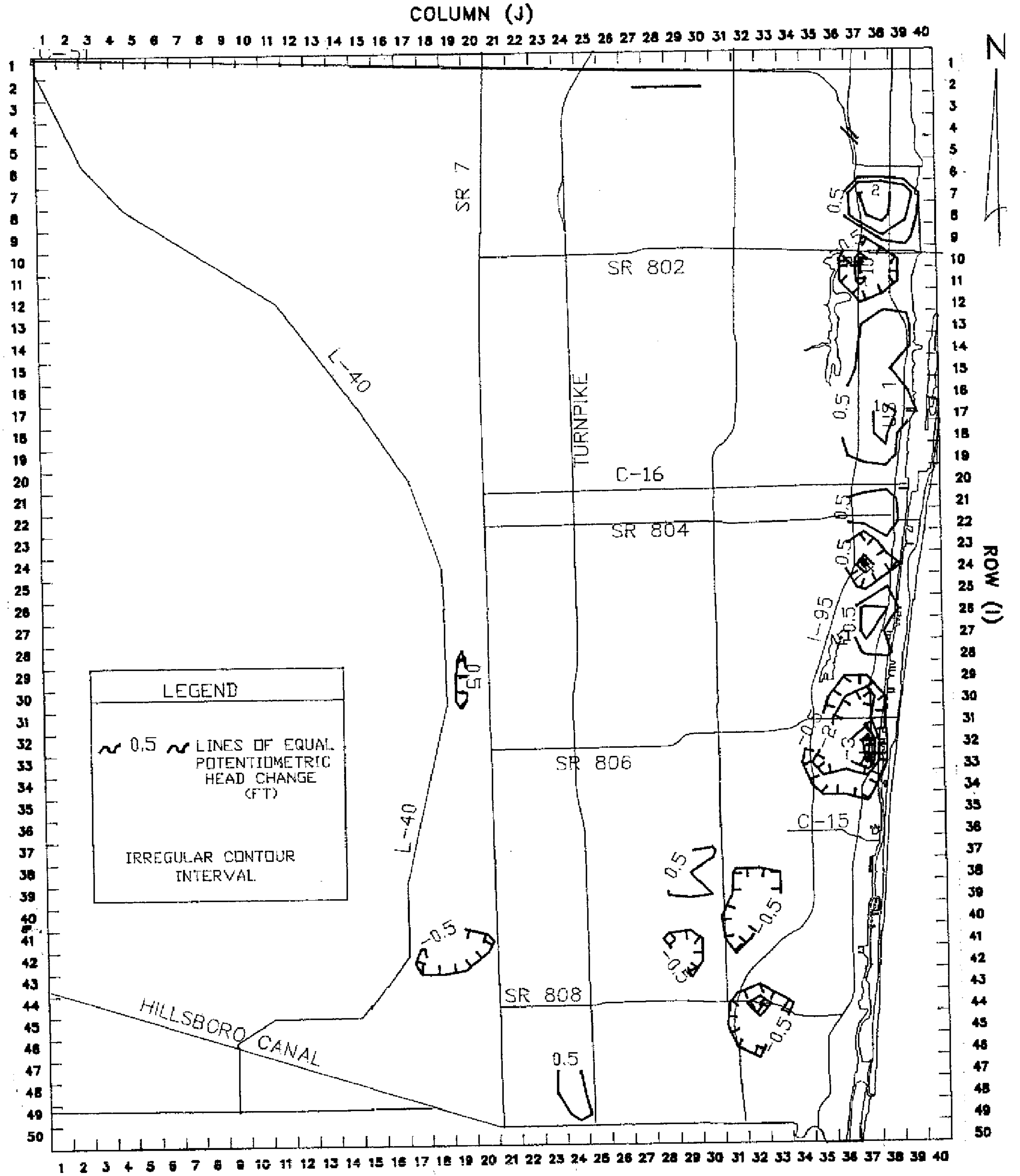

Figure P-14 CHANGE IN SIMULATED HEADS IN LAYER 1 OF THE SOUTH MODEL WHEN HYDRAULIC CONDUCTIVITY AND VERTICAL CONDUCTANCE ARE DECREASED TO HALF THE CALIBRATION VALUES

TABLE Q-1 North Model 1988/89 Allocated Water Use Pumpage Distribution (page 2)

Permit #	Permittee	Use* Type	Layer	Row	Column	Node % Pumpage	Node Pumpage (ft3/day X 1000)
50-00203	FLAGLER SYSTEM, INC	NONAG	4	38	39	100	190
50-00849	BELVEDERE GOLF CLUB	NONAG	3	39	47	100	15
50-00218	ROYAL PALM MEMORIAL GRDN	NONAG	5	29	56	100	59
50-00224	PRESIDENT COUNTRY CLUB	NONAG	5	32	53	50	140
		NONAG	5	33	53	50	140
50-00233	PB LAKES GOLF CLUB	NONAG	5	34	53	100	109
50-00256	WEST PALM BEACH, CITY OF	NONAG	4	33	55	100	56
50-00257	WEST PALM BEACH, CITY OF	NONAG	5	37	57	100	22
50-01469	WEST PALM BEACH, CITY OF	NONAG	3	37	56	100	14
50-00255	HOLIGOLF, INC	NONAG	5	26	50	100	40
50-00617	PGA NATIONAL VENTURE	NONAG	4	18	44	14	56
		NONAG	4	19	45	29	113
		NONAG	4	20	45	29	113
		NONAG	4	18	46	14	56
		NONAG	4	19	46	14	56
50-00852	J.D.M. COUNTRY CLUB	NONAG	3	18	48	100	46
50-00421	LOST TREE CLUB, INC	NONAG	1	16	55	13	4
		NONAG	1	17	55	13	4
		NONAG	1	17	56	38	11
		NONAG	1	17	57	38	11
50-00063	OUR LADY OF FLA PASSIONIST MON	NONAG	2	18	56	100	2
50-00237	JONATHAN'S LANDING	NONAG	2	5	52	29	59
		NONAG	2	6	52	43	89
		NONAG	2	7	52	29	59
50-00941	EASTPOINTE COUNTRY CLUB	NONAG	4	13	47	100	74
50-01443	OLD MARSH PARTNERS	NONAG	3	14	44	100	134
50-01391	LANDSITES, INC	NONAG	2	5	54	100	3
50-01169	JUPITER 1 HOMEOWNERS	NONAG	2	7	54	100	1
50-01204	OCEANSIDE TERRACE HOMEOWNERS	NONAG	3	8	54	100	1
50-01203	RADNOR CORPORATION	NONAG	2	8	55	25	3
		NONAG	2	9	55	75	8
50-01282	BURG & DIVOSTA CORP.	NONAG	1	9	55	25	5
		NONAG	1	10	55	63	12
		NONAG	2	11	55	13	2
50-01373	BURG & DIVOSTA CORP.	NONAG	2	9	54	33	3
		NONAG	2	10	54	33	3
		NONAG	2	10	55	33	3
50-01392	L.J. JUPITER VENTURE	NONAG	1	10	55	50	2
		NONAG	1	11	55	50	2
50-01131	SEA OATS OF JUNO BEACH	NONAG	1	12	56	100	5
50-01484	CROSSWINDS JUPITER SOUTH	NONAG	1	11	56	100	0
50-01442	ENGLE GROUP, INC	NONAG	5	14	54	100	5
50-00349	SEMINOLE GOLF CLUB	NONAG	5	14	55	57	35
		NONAG	5	14	56	43	26
50-00223	TEQUESTA COUNTRY CLUB	NONAG	3	1	49	100	62
50-00126	LOX RIV ENVIRONMENTAL	NONAG	4	6	46	100	25
50-00727	RCA	NONAG	5	18	51	93	51
		NONAG	1	19	51	7	4
50-00111	TRAF DEV (EASTPIONT)	NONAG	4	14	47	17	70
		NONAG	4	14	46	14	58
		NONAG	4	13	46	42	174
		NONAG	4	13	47	28	116
50-01225	AMREP S.E. INC	NONAG	3	37	46	100	2
50-01670	FOUNDATION LAND CO	NONAG	5	17	52	100	4
50-01643	NPB CO WATER CNTL DIST	NONAG	5	17	52	33	12
		NONAG	5	16	52	33	12
		NONAG	5	16	53	33	12

* PWS=public water supply NONAG=non-agricultural AG=agricultural

TABLE Q-1 North Model 1988/89 Allocated Water Use Pumpage Distribution (page 3)

Permit #	Permittee	Use* Type	Layer	Row	Column	Node % Pumpage	Node Pumpage (ft3/day X 1000)
50-00120	MEDOWBROOK MH	NONAG	4	37	46	50	3
		NONAG	4	38	46	50	1
50-00599	PEDRO CORZO	AG	1	39	27	100	1
50-00578	AMERICAN FOODS	AG	5	12	48	29	9
		AG	5	12	49	14	5
		AG	5	11	48	14	5
		AG	5	11	49	29	9
		AG	5	10	49	14	5

* PWS=public water supply NONAG=non-agricultural AG=agricultural

TABLE Q-2 South Model 1988/89 Allocated Water Use Pumpage Distribution (page 1)

Permit #	Permittee	Use* Type	Layer	Row	Column	Node % Pumpage	Node Pumpage (ft3/day X 1000)
50-00036	PALM SPRINGS (Forest Hill)	PWS	4	6	29	29	171
50-00036	PALM SPRINGS (Main)	PWS	4	6	33	21	124
		PWS	4	6	34	14	82
		PWS	4	7	34	36	212
50-00083	ATLANTIS (Main)	PWS	4	12	34	100	98
50-00135	PB COUNTY (WTP #5)	PWS	4	20	27	100	112
50-00177	DELRAY BEACH (North)	PWS	3	30	37	12	25
		PWS	4	30	36	13	27
		PWS	4	31	36	19	39
50-00177	DELRAY BEACH (South)	PWS	4	32	36	6	12
		PWS	3	32	37	19	39
		PWS	3	33	37	19	39
		PWS	4	33	36	12	25
50-00177	DELRAY BEACH (West/20)	PWS	4	33	35	100	616
50-00177	DELRAY BEACH (Golf)	PWS	4	32	33	29	358
		PWS	4	32	34	29	358
		PWS	4	33	34	42	518
50-00179	JAMACIA BAY	PWS	3	20	31	67	19
		PWS	3	20	32	33	9
50-00234	LAKE WORTH	PWS	4	10	37	50	522
		PWS	4	11	37	50	522
50-00346	HIGHLAND	PWS	4	38	36	100	186
50-00367	BOCA RATON (Southeast)	PWS	4	46	35	15	29
		PWS	4	45	35	31	59
		PWS	4	44	35	31	59
		PWS	4	44	34	23	44
50-00367	BOCA RATON (Northeast)	PWS	4	43	34	36	343
		PWS	3	42	34	36	343
		PWS	3	41	34	18	171
		PWS	4	41	35	9	86
50-00367	BOCA RATON (Central)	PWS	4	44	32	100	386
50-00367	BOCA RATON (Southwest)	PWS	4	47	30	33	381
		PWS	4	46	30	23	265
		PWS	4	45	30	33	381
		PWS	4	44	30	11	127
50-00367	BOCA RATON (Northwest)	PWS	4	43	29	14	252
		PWS	4	42	29	7	126
		PWS	4	42	30	14	252
		PWS	4	41	30	29	522
		PWS	4	41	31	7	126
		PWS	4	41	29	14	252
		PWS	4	41	28	14	252
50-00367	BOCA RATON (Northern)	PWS	4	39	27	20	257
		PWS	4	39	28	30	386
		PWS	4	39	29	10	129
		PWS	4	39	30	20	257
		PWS	4	39	31	10	129
		PWS	4	40	28	10	129
50-00401	PB COUNTY (System 9)	PWS	4	47	21	7	83
		PWS	4	47	22	13	153
		PWS	4	48	22	40	472
		PWS	4	48	21	7	83
		PWS	4	49	21	13	153
		PWS	4	49	22	20	236
50-00464	ACME IMPROVEMENT DIST.	PWS	3	2	18	6	47
		PWS	4	3	17	19	148
		PWS	3	3	18	19	148

* PWS=public water supply NONAG=non-agricultural AG=agricultural

TABLE Q-2 South Model 1988/89 Allocated Water Use Pumpage Distribution (page 2)

Permit #	Permittee	Use* Type	Layer	Row	Column	Node % Pumpage	Node Pumpage (ft3/day X 1000)
50-00464	ACME IMPROVEMENT DIST.(cont'd)	PWS	2	4	18	12	93
		PWS	3	5	18	6	47
		PWS	4	10	20	12	93
		PWS	3	11	19	13	101
		PWS	3	11	20	13	101
50-00499	BOYNTON BEACH (Wellfield 3)	PWS	4	24	37	55	341
50-00499	BOYNTON BEACH (Wellfield 4)	PWS	4	24	37	9	56
		PWS	4	23	37	18	112
50-00499	BOYNTON BEACH (Eastern)	PWS	4	23	37	9	56
		PWS	4	22	37	9	56
50-00499	BOYNTON BEACH (Wellfield 5)	PWS	4	24	36	50	310
		PWS	4	25	36	50	310
50-00499	BOYNTON BEACH (Wellfield 6)	PWS	4	20	29	15	279
		PWS	4	21	29	69	1284
		PWS	4	21	30	15	279
50-00506	MANALAPAN	PWS	4	16	38	29	50
		PWS	3	16	39	71	123
50-00511	PB COUNTY (System 3)	PWS	4	28	28	60	347
		PWS	4	28	29	10	58
		PWS	4	28	27	10	58
		PWS	4	29	27	20	116
50-00572	NATL. MOBILE IND.	PWS	3	10	30	100	32
50-00575	LANTANA	PWS	3	15	39	100	255
50-00584	PB COUNTY (System 2)	PWS	4	7	26	58	325
		PWS	4	8	26	25	140
		PWS	4	8	25	17	95
50-00612	VILLAGE OF GOLF	PWS	3	25	31	100	87
50-01007	FLA. WATER SERVICES	PWS	4	15	33	100	79
50-01092	A.G. HOLLEY (State of Fla.)	PWS	4	13	38	33	8
		PWS	4	14	38	67	16
50-01283	ARROWHEAD MHP.	PWS	3	14	32	100	21
50-00007	JOHN T. OXLEY FARMS	NONAG	4	37	28	100	14
50-00039	BOYNTON BEACH, CITY OF	NONAG	2	24	37	100	19
50-00054	BOCA DEL MAR C. C.	NONAG	4	47	29	100	17
50-00088	BOCA TEECA CORP.	NONAG	5	39	35	60	65
		NONAG	5	40	35	20	22
		NONAG	5	39	36	20	22
50-00140	JOHN I LEONARD HIGH SCHOOL	NONAG	2	8	31	100	25
50-00150	COUNTRY MANORS CONDO, INC.	NONAG	4	29	31	100	46
50-00159	ROYAL PALM YACHT & C. C.	NONAG	2	49	36	25	39
		NONAG	2	48	35	25	39
		NONAG	2	49	35	50	78
50-00268	PALM BCH. NATL. GOLF & C. C.	NONAG	3	8	25	100	80
50-00284	HAMLET OF DELRAY, THE	NONAG	3	33	32	100	28
50-00328	BOCA RATON HOTEL & CLUB	NONAG	4	47	35	50	124
		NONAG	4	47	36	50	124
50-00328	BOCA RATON HOTEL & CLUB	NONAG	4	47	37	65.1	24
		NONAG	4	47	36	34.9	13
50-00331	SUMMIT ASSOCIATES, LTD	NONAG	3	27	32	11	41
		NONAG	3	27	33	11	41
		NONAG	3	26	32	45	168
		NONAG	3	27	34	22	82
		NONAG	3	28	34	11	41
50-00377	GULF STREAM GOLF CLUB	NONAG	2	27	38	100	207
50-00406	ATLANTIS GOLF CLUB	NONAG	2	13	33	57.1	105
		NONAG	2	14	33	42.9	79
50-00411	SANDALFOOT COVE C. C.	NONAG	4	48	22	50	86

* PWS=public water supply NONAG=non-agricultural AG=agricultural

TABLE Q-2 South Model 1988/89 Allocated Water Use Pumpage Distribution (page 3)

Permit #	Permittee	Use* Type	Layer	Row	Column	Node % Pumpage	Node Pumpage (ft3/day X 1000)
50-00411	SANDALFOOT COVE C. C.(cont'd)	NONAG	4	49	22	50	86
50-00419	QUAIL RIDGE, INC.	NONAG	3	23	33	10	8
		NONAG	3	24	32	30	24
		NONAG	3	24	33	20	16
		NONAG	3	22	33	10	8
		NONAG	3	25	33	10	8
		NONAG	3	24	34	20	16
50-00434	LITTLE CLUB, INC., THE	NONAG	1	28	39	50	21
		NONAG	1	27	39	50	21
50-00452	ATLANTIS COUNTRY CLUB	NONAG	3	12	32	100	122
50-00472	GREENTREE VILLAS CONDO.	NONAG	2	23	31	100	38
50-00489	ARVIDA CORPORATION	NONAG	4	39	31	100	109
50-00502	IBM CORPORATION	NONAG	4	41	32	100	78
50-00534	DGC ASSOC. BY PAIR, INC.	NONAG	3	36	32	100	231
50-00535	PINE TREE GOLF CLUB, INC.	NONAG	3	23	32	100	190
50-00631	WILLOW BEND ASSOCIATES, INC.	NONAG	3	9	25	100	28
50-00697	BIERNBAUM, RALPH (HIGH RIDGE)	NONAG	3	17	36	100	175
50-00729	CENTURY VILLAGE WEST, INC.	NONAG	4	41	23	42.9	62
		NONAG	4	42	24	14.3	21
		NONAG	4	41	24	31.9	46
		NONAG	4	42	23	14.3	21
50-00741	DEPT. OF NATURAL RESOURCES	NONAG	3	5	23	100	34
50-00814	PB. CO. PARKS & REC. DEPT.	NONAG	5	26	35	100	6
50-00851	DELRAY DUNES GOLF & C. C.	NONAG	3	26	31	33	24
		NONAG	3	25	31	67	48
50-00855	RETIREMENT BUILDERS	NONAG	3	6	30	100	42
50-00865	PALM HILL VILLAS	NONAG	3	5	31	100	7
50-00866	LAKE WORTH, CITY OF	NONAG	2	9	40	100	66
50-00883	LANDMARK LAND CO. OF FLA.	NONAG	3	5	18	100	231
50-00883	LANDMARK LAND CO. OF FLA.	NONAG	3	7	14	100	40
50-00908	BOCA RAY, INC.	NONAG	4	36	29	67	36
		NONAG	4	36	30	33	18
50-00923	TALMO, ROY	NONAG	3	26	23	100	16
50-00945	CROUCH/PALERMO, INC.	NONAG	3	14	24	100	55
50-00967	LUCERNE PK, LTD. (PK. POINTE)	NONAG	4	8	27	100	13
50-00970	HIDDEN VALLEY GOLF	NONAG	2	37	36	100	13
50-00992	BOCA WEST CLUB, INC.	NONAG	3	42	26	25	115
		NONAG	3	42	25	25	115
		NONAG	3	43	25	25	115
		NONAG	3	44	27	16	73
		NONAG	3	43	28	9	41
50-01001	CADILLAC FAIRVIEW	NONAG	4	22	30	100	242
50-01001	CADILLAC FAIRVIEW	NONAG	4	25	28	54.5	29
		NONAG	4	25	29	45.5	24
50-01068	F.P.A. CORPORATION	NONAG	3	38	33	50	150
		NONAG	3	34	32	50	150
50-01079	GTR BOCA RATON BCH TAX DIST.	NONAG	4	41	31	100	28
50-01194	MOTOROLA, INC.	NONAG	3	20	35	100	43
50-01511	ARVIDA CORPORAION	NONAG	4	40	30	50	5
		NONAG	4	39	29	25	2
		NONAG	4	39	28	25	2
50-01523	SUMMIT ASSOCIATES	NONAG	3	26	33	100	14
50-01525	MINTO BUILDERS, INC.	NONAG	3	23	21	100	20
50-01585	PB COUNTY SCHOOL DIST.	NONAG	3	5	10	100	10
50-01586	BENT TREE WATER MGT. ASSN.	NONAG	3	22	32	33.3	11
		NONAG	3	22	31	66.7	22
50-01666	COLONIAL ESTATES, INC.	NONAG	1	27	30	100	8

* PWS=public water supply NONAG=non-agricultural AG=agricultural

TABLE Q-2 South Model 1988/89 Allocated Water Use Pumpage Distribution (page 4)

Permit #	Permittee	Use* Type	Layer	Row	Column	Node % Pumpage	Node Pumpage (ft3/day X 1000)
50-00103	MURRAY, ALLAN NURSERY, INC.	AG	3	18	31	100	24
50-00144	BOYNTON NURSERIES, INC.	AG	4	18	32	100	58
50-00145	BOYNTON NURSERIES, INC.	AG	3	19	30	100	26
50-00158	MICHAELS NURSERIES	AG	3	26	30	100	33
50-00206	MAZZONI FARMS INC.	AG	4	23	25	100	145
50-00250	DUBOIS, SR. W. A.	AG	3	20	20	100	80
50-00264	DUBOIS, SR. W. A.	AG	3	19	20	100	51
50-00288	FLORAL ACRES, INC.	AG	4	33	28	90	23
		AG	4	32	28	10	3
50-00325	DUBOIS FARMS, INC.	AG	4	32	23	100	18
50-00333	FLOWERLAND PARTNERS	AG	3	28	31	100	5
50-00343	KNOLLWOOD GROVES, INC.	AG	3	17	33	33	72
		AG	3	16	33	67	146
50-00347	J & N FARMS	AG	4	33	23	100	22
50-00363	MANGUS NURSERY & LANDSCAPE	AG	3	27	29	100	2
50-00364	MOESLY NURSERIES, INC.	AG	3	16	32	80	23
		AG	3	17	32	20	6
50-00390	LOREN MEREDITH FARMS	AG	3	28	30	100	29
50-00396	EAKER, S.	AG	3	27	30	100	7
50-00407	J & N FARMS	AG	3	37	19	100	385
50-00433	ROSACKER'S PLANTS	AG	4	31	24	100	19
50-00438	SANDY LOAM FARMS, INC.	AG	3	5	30	67	240
		AG	3	4	30	33	118
50-00455	WHITWORTH FARMS	AG	4	26	25	33	70
		AG	4	25	25	67	142
50-00577	PALM COAST NURSERY CORP.	AG	4	33	21	100	18
50-00670	COUNTRY JOE'S NURSERY	AG	3	20	32	100	6
50-00872	RAINBOW FARMS, INC.	AG	4	38	21	100	26
50-00882	OKEAN, H.	AG	3	9	14	100	7
50-00892	MORNINGSTAR NURSERY INC.	AG	3	16	32	100	16
50-00904	MCDOUGALD & SONS NURSERY	AG	4	34	29	100	9
50-00910	LUIS, J.	AG	3	22	23	100	34
50-00911	TROPICAL TREE FARM	AG	4	32	22	100	13
50-00919	DUBOIS, W. A.	AG	3	22	22	50	41
		AG	3	23	22	50	41
50-00930	BLOODS HAMMOCK GROVE	AG	4	34	31	67	48
		AG	4	35	31	33	24
50-00943	MILLER, E.	AG	3	35	31	100	16
50-00955	QUALITY ORNAMENTALS	AG	3	12	30	100	7
50-00956	CHAS. GREENS NURSERIES	AG	4	22	28	100	14
50-00957	OSWAYO VALLEY FARMS	AG	3	16	31	100	28
50-00959	GOLD HILL NURSERY	AG	4	35	29	50	9
		AG	4	34	29	50	9
50-00960	UNIV. OF FLA.- MORIKAMI FARMS	AG	4	36	27	100	69
50-00966	R & A FARMS	AG	3	21	21	50	55
		AG	3	22	21	50	55
50-00977	S.O. NURSERY	AG	4	24	29	100	27
50-00979	DUBOIS FARMS, INC.	AG	3	8	18	100	58
50-00988	WALLIN NURSERY	AG	3	23	26	100	29
50-01071	SHOEMAKER, J. D.	AG	4	32	23	50	21
		AG	4	32	22	50	21
50-01345	MORNINGSTAR NURSERY	AG	4	31	24	67	45
		AG	4	32	24	33	22

* PWS=public water supply NONAG=non-agricultural AG=agricultural

TABLE Q-3 North Model Buildout Water Use Pumpage Distribution

Permit #	Permittee	Use* Type	Layer	Row	Column	Node % Pumpage	Node Pumpage (ft3/day X 1000)
50-00010	JUPITER (Wellfield 2)	PWS	4	6	47	100	421
50-00010	JUPITER (Wellfield 3)	PWS	4	6	48	25	108
		PWS	4	7	48	25	108
		PWS	4	6	47	50	217
50-00010	JUPITER (Wellfield 4)	PWS	4	8	46	14	101
		PWS	4	8	47	43	299
		PWS	4	8	48	43	299
50-00010	JUPITER (Wellfield 5)	PWS	4	9	46	17	93
		PWS	4	9	47	33	186
		PWS	4	10	47	50	279
50-00010	JUPITER (Wellfield 6)	PWS	4	9	47	10	93
		PWS	4	9	48	30	279
		PWS	4	10	48	30	279
		PWS	4	11	48	20	186
		PWS	4	12	48	10	93
50-00030	MANGONIA	PWS	4	29	54	40	34
		PWS	4	28	54	60	51
50-00135	PB COUNTY #8W	PWS	4	37	45	27	548
		PWS	4	37	46	64	1279
		PWS	4	36	46	9	181
50-00135	PB COUNTY #1W	PWS	4	38	50	8	11
		PWS	4	38	51	25	33
		PWS	4	39	50	17	22
		PWS	4	39	51	17	22
		PWS	4	39	52	33	44
50-00178	CENTURY	PWS	4	36	48	100	218
50-00365	SEACOAST (PB Gardens)	PWS	4	19	50	17	100
		PWS	4	19	51	17	100
		PWS	4	20	50	17	100
		PWS	4	20	51	50	299
50-00365	SEACOAST (Hood)	PWS	4	15	47	15	452
		PWS	4	15	48	8	226
		PWS	4	16	47	31	903
		PWS	4	16	48	39	1129
		PWS	4	17	47	8	226
50-00365	SEACOAST (North Palm Beach)	PWS	4	21	53	13	67
		PWS	4	22	53	88	469
50-00365	SEACOAST (Burma)	PWS	4	23	52	60	321
		PWS	4	23	53	40	214
50-00444	ROYAL PLM BCH	PWS	3	36	37	33	232
		PWS	3	37	37	67	465
50-00460	RIVERIA BCH (East)	PWS	4	26	53	6	20
		PWS	4	26	54	17	59
		PWS	4	28	54	6	20
		PWS	4	25	55	22	79
		PWS	4	26	55	50	179
50-00460	RIVERIA BCH (West)	PWS	4	29	49	10	83
		PWS	4	29	50	10	83
		PWS	4	28	50	30	250
		PWS	4	29	48	20	167
		PWS	4	28	49	20	167
		PWS	4	28	51	10	83
50-00501	PRATT-WHITNEY	PWS	2	10	26	75	294
		PWS	2	10	27	25	98
50-00562	MEADOWBROOK	PWS	4	38	46	100	229
50-00653	GOOD SAMARITAN HOSP.	PWS	2	34	57	100	33
50-00605	LION COUNTRY	PWS	3	35	24	100	21

* PWS=public water supply

TABLE Q-4 South Model Buildout Water Use Pumpage Distribution (page 1)

Permit #	Permittee	Use* Type	Layer	Row	Column	Node % Pumpage	Node Pumpage (ft3/day X 1000)
50-00036	PALM SPRINGS (Forest Hill)	PWS	4	6	29	29	186
50-00036	PALM SPRINGS (Main)	PWS	4	6	33	21	135
		PWS	4	6	34	14	90
		PWS	4	7	34	36	231
50-00083	ATLANTIS (Main)	PWS	4	12	34	100	99
50-00135	PB COUNTY (WTP #5)	PWS	4	20	27	100	271
50-00177	DELRAY BEACH (North)	PWS	3	30	37	12	25
		PWS	4	30	36	13	27
		PWS	4	31	36	19	39
50-00177	DELRAY BEACH (South)	PWS	4	32	36	6	12
		PWS	3	32	37	19	39
		PWS	3	33	37	19	39
		PWS	4	33	36	12	25
50-00177	DELRAY BEACH (West/20)	PWS	4	33	35	100	616
50-00177	DELRAY BEACH (Golf)	PWS	4	32	33	29	358
		PWS	4	32	34	29	358
		PWS	4	33	34	42	518
50-00179	JAMACIA BAY	PWS	3	20	31	67	19
		PWS	3	20	32	33	9
50-00234	LAKE WORTH	PWS	4	10	37	50	570
		PWS	4	11	37	50	570
50-00346	HIGHLAND	PWS	4	38	36	100	193
50-00367	BOCA RATON (Southeast)	PWS	4	46	35	15	29
		PWS	4	45	35	31	59
		PWS	4	44	35	31	59
		PWS	4	44	34	23	44
50-00367	BOCA RATON (Northeast)	PWS	4	43	34	36	343
		PWS	3	42	34	36	343
		PWS	3	41	34	18	171
		PWS	4	41	35	9	86
50-00367	BOCA RATON (Central)	PWS	4	44	32	100	386
50-00367	BOCA RATON (Southwest)	PWS	4	47	30	33	381
		PWS	4	46	30	23	265
		PWS	4	45	30	33	381
		PWS	4	44	30	11	127
50-00367	BOCA RATON (Northwest)	PWS	4	43	29	14	252
		PWS	4	42	29	7	126
		PWS	4	42	30	14	252
		PWS	4	41	30	29	522
		PWS	4	41	31	7	126
		PWS	4	41	29	14	252
		PWS	4	41	28	14	252
50-00367	BOCA RATON (Northern)	PWS	4	39	27	20	257
		PWS	4	39	28	30	386
		PWS	4	39	29	10	129
		PWS	4	39	30	20	257
		PWS	4	39	31	10	129
		PWS	4	40	28	10	129
50-00401	PB COUNTY (System 9)	PWS	4	47	21	7	167
		PWS	4	47	22	13	311
		PWS	4	48	22	40	957
		PWS	4	48	21	7	167
		PWS	4	49	21	13	311
		PWS	4	49	22	20	478
50-00464	ACME IMPROVEMENT DIST.	PWS	3	2	18	6	71
		PWS	4	3	17	19	212
		PWS	3	3	18	19	212

* PWS=public water supply

TABLE Q-4 South Model Buildout Water Use Pumpage Distribution (page 2)

Permit #	Permittee	Use* Type	Layer	Row	Column	Node % Pumpage	Node Pumpage (ft3/day X 1000)
50-00464	ACME IMPROVEMENT DIST.(cont'd)	PWS	2	4	18	13	141
		PWS	3	5	18	6	71
		PWS	4	10	20	13	141
		PWS	3	11	19	13	141
		PWS	3	11	20	13	141
50-00499	BOYNTON BEACH (Wellfield 3)	PWS	4	24	37	55	338
50-00499	BOYNTON BEACH (Wellfield 4)	PWS	4	24	37	9	56
		PWS	4	23	37	18	113
50-00499	BOYNTON BEACH (Eastern)	PWS	4	23	37	9	56
		PWS	4	22	37	9	56
50-00499	BOYNTON BEACH (Wellfield 5)	PWS	4	24	36	50	310
		PWS	4	25	36	50	310
50-00499	BOYNTON BEACH (Wellfield 6)	PWS	4	20	29	15	287
		PWS	4	21	29	69	1288
		PWS	4	21	30	15	287
50-00506	MANALAPAN	PWS	4	16	38	29	50
		PWS	3	16	39	71	123
50-00511	PB COUNTY (System 3)	PWS	4	28	28	30	539
		PWS	4	28	29	5	90
		PWS	4	28	27	5	90
		PWS	4	29	27	10	180
		PWS	4	29	25	10	180
		PWS	4	29	26	15	269
		PWS	4	28	25	10	180
		PWS	4	28	26	15	269
50-00572	NATL. MOBILE IND.	PWS	3	10	30	100	67
50-00575	LANTANA	PWS	3	15	39	100	255
50-00584	PB COUNTY (System 2)	PWS	4	7	26	41	1020
		PWS	4	8	26	18	437
		PWS	4	8	25	29	729
		PWS	4	8	24	12	291
50-00612	VILLAGE OF GOLF	PWS	3	25	31	100	87
50-01007	FLA. WATER SERVICES	PWS	4	15	33	100	79
50-01092	A.G. HOLLEY (State of Fla.)	PWS	4	13	38	33	8
		PWS	4	14	38	67	16
50-01283	ARROWHEAD MHP.	PWS	3	14	32	100	69

* PWS=public water supply

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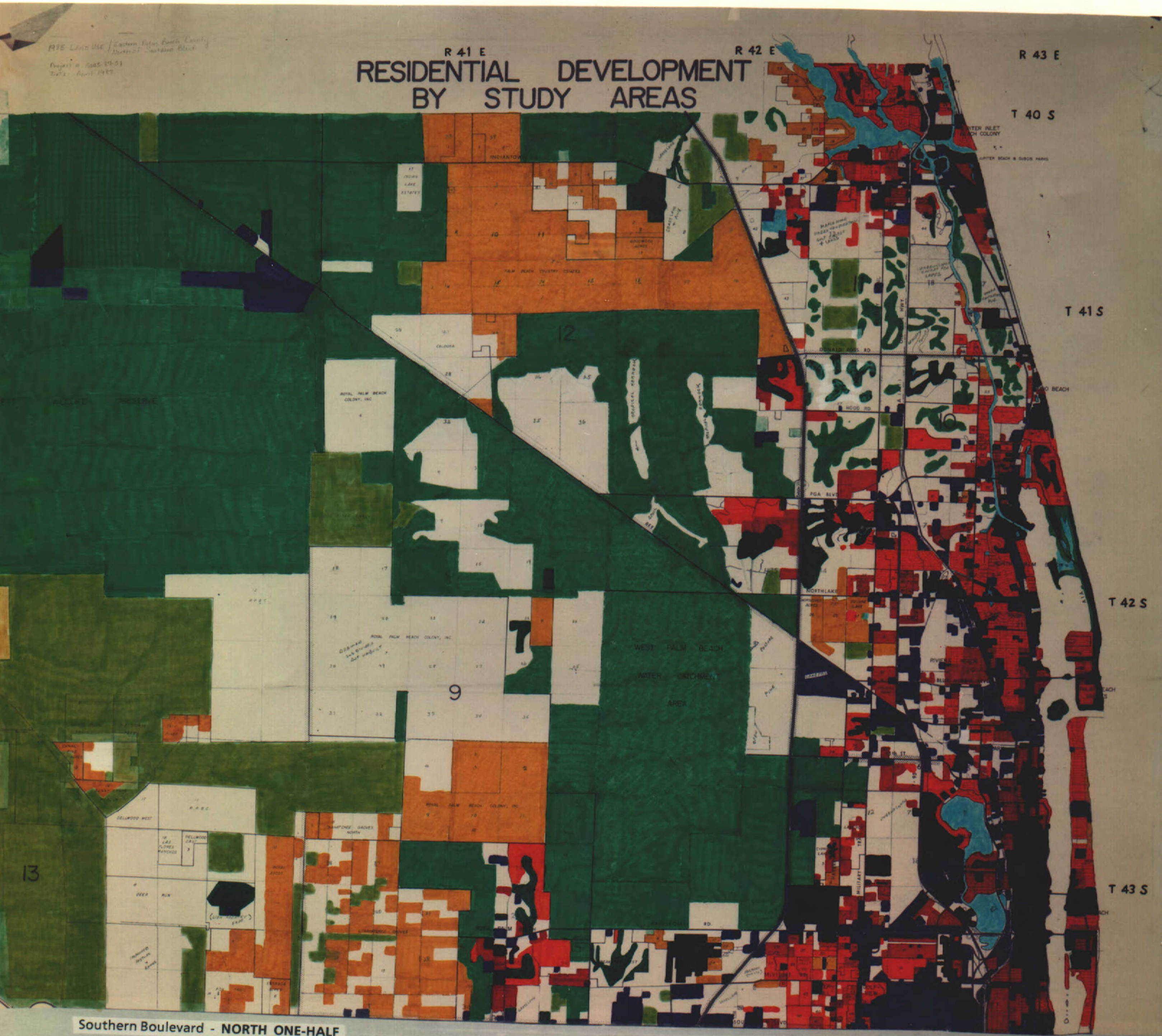


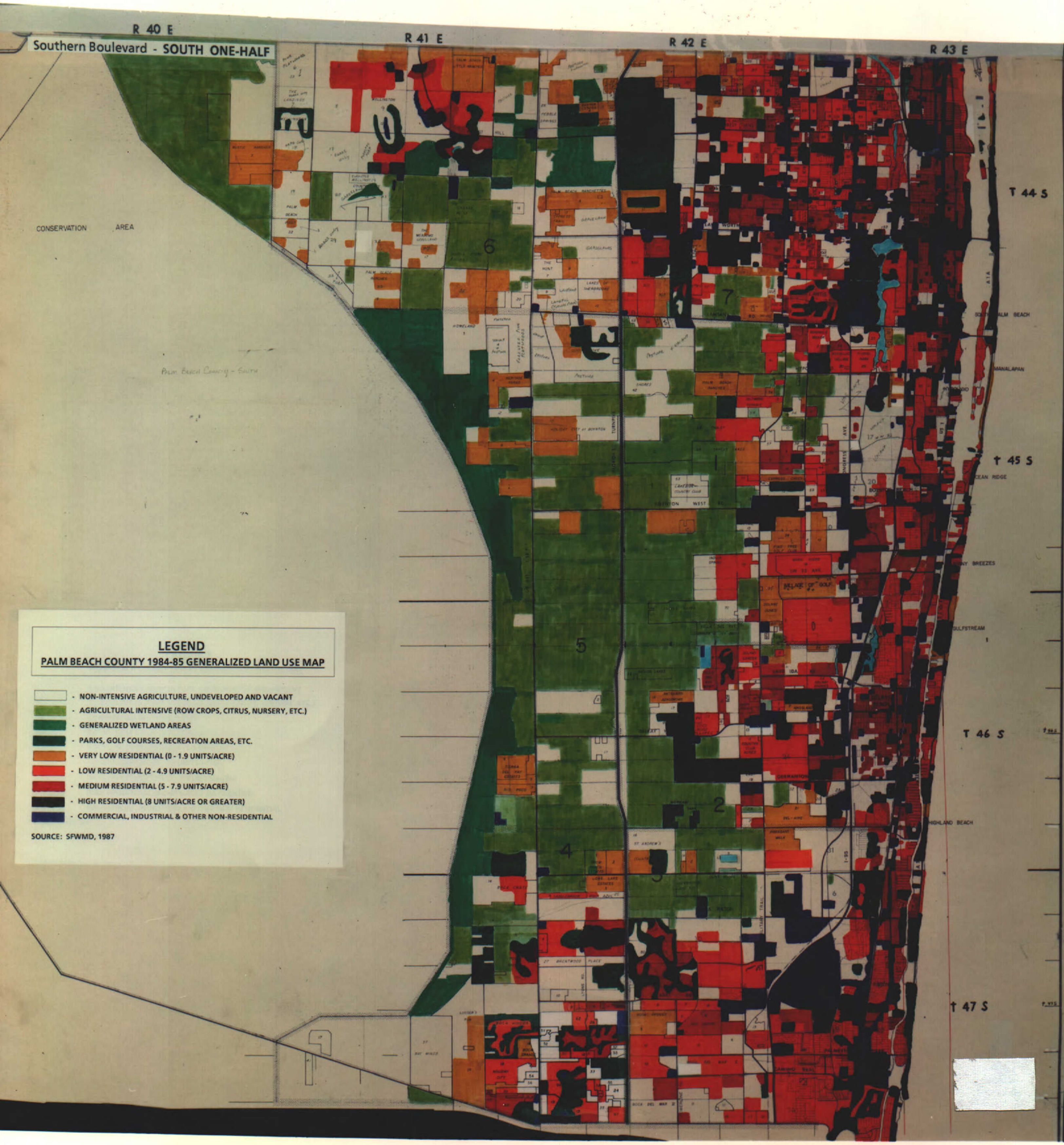
Southern Boulevard - **NORTH ONE-HALF**

LEGEND

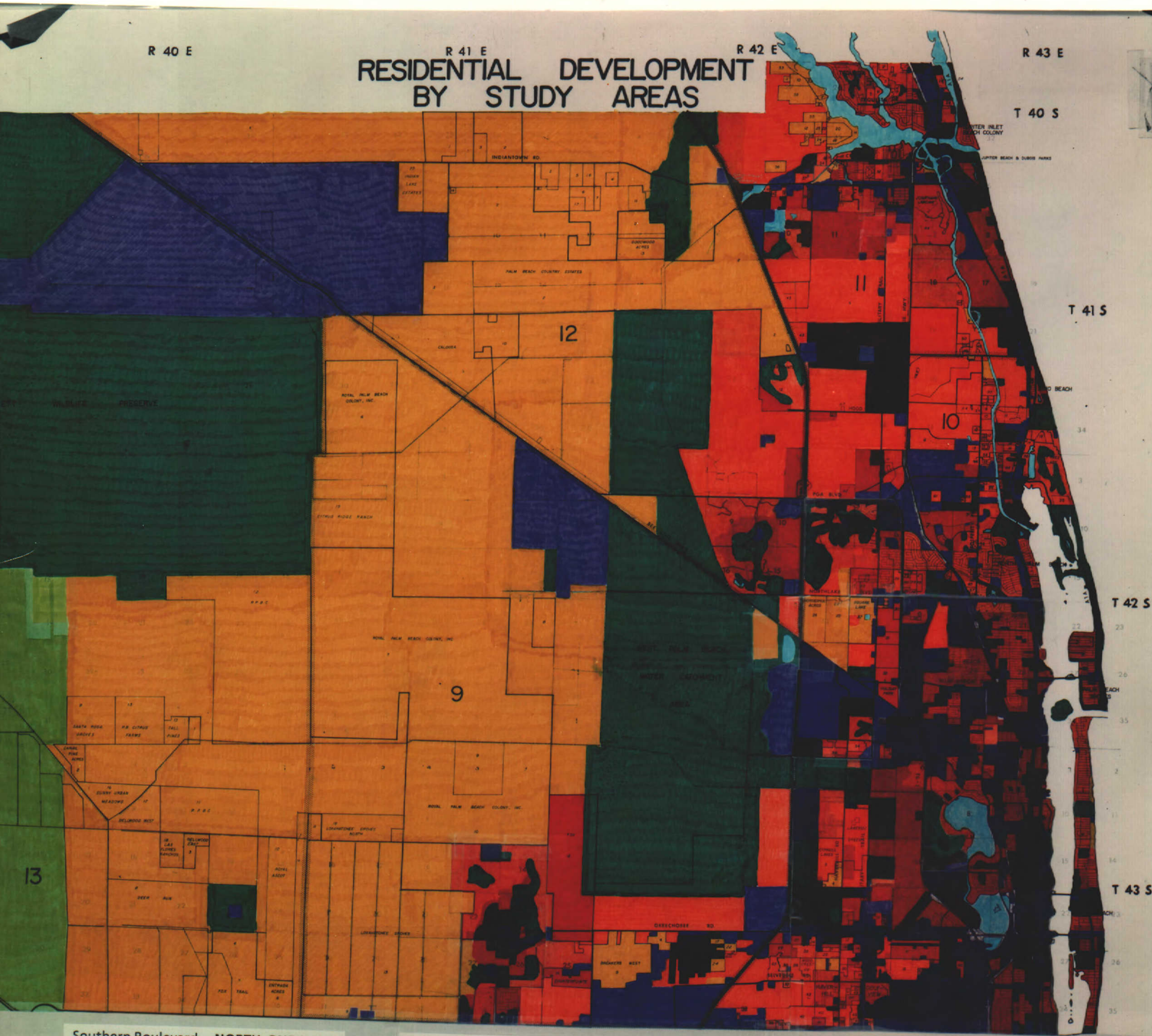
PALM BEACH COUNTY 1984-85 GENERALIZED LAND USE MAP

- NON-INTENSIVE AGRICULTURE, UNDEVELOPED AND VACANT
- AGRICULTURAL INTENSIVE (ROW CROPS, CITRUS, NURSERY, ETC.)
- GENERALIZED WETLAND AREAS
- PARKS, GOLF COURSES, RECREATION AREAS, ETC.
- VERY LOW RESIDENTIAL (0 - 1.9 UNITS/ACRE)
- LOW RESIDENTIAL (2 - 4.9 UNITS/ACRE)
- MEDIUM RESIDENTIAL (5 - 7.9 UNITS/ACRE)
- HIGH RESIDENTIAL (8 UNITS/ACRE OR GREATER)
- COMMERCIAL, INDUSTRIAL & OTHER NON-RESIDENTIAL

SOURCE: SFWMD, 1987


Southern Boulevard - SOUTH ONE-HALF
R 40 E
R 41 E
R 42 E
R 43 E
T 44 S
T 45 S
T 46 S
T 47 S
CONSERVATION AREA
LEGEND
PALM BEACH COUNTY 1984-85 GENERALIZED LAND USE MAP
- NON-INTENSIVE AGRICULTURE, UNDEVELOPED AND VACANT
- AGRICULTURAL INTENSIVE (ROW CROPS, CITRUS, NURSERY, ETC.)
- GENERALIZED WETLAND AREAS
- PARKS, GOLF COURSES, RECREATION AREAS, ETC.
- VERY LOW RESIDENTIAL (0 - 1.9 UNITS/ACRE)
- LOW RESIDENTIAL (2 - 4.9 UNITS/ACRE)
- MEDIUM RESIDENTIAL (5 - 7.9 UNITS/ACRE)
- HIGH RESIDENTIAL (8 UNITS/ACRE OR GREATER)
- COMMERCIAL, INDUSTRIAL & OTHER NON-RESIDENTIAL
SOURCE: SFWMD, 1987
MANALAPAN
GULFSTREAM
HIGHLAND BEACH

RESIDENTIAL DEVELOPMENT BY STUDY AREAS



Southern Boulevard - **NORTH ONE-HALF**

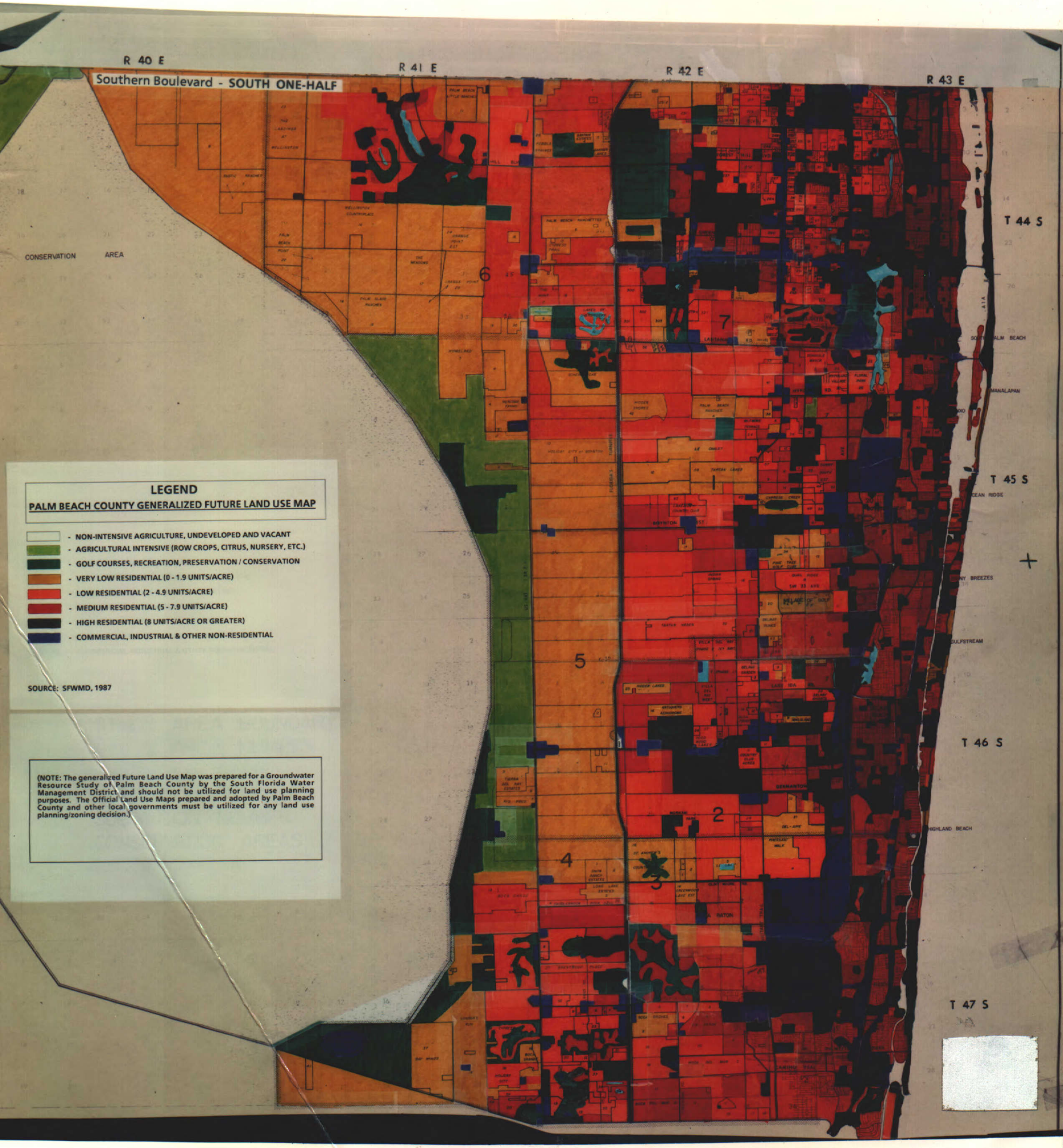
LEGEND

PALM BEACH COUNTY GENERALIZED FUTURE LAND USE MAP

- NON-INTENSIVE AGRICULTURE, UNDEVELOPED AND VACANT
- AGRICULTURAL INTENSIVE (ROW CROPS, CITRUS, NURSERY, ETC.)
- GOLF COURSES, RECREATION, PRESERVATION / CONSERVATION
- VERY LOW RESIDENTIAL (0 - 1.9 UNITS/ACRE)
- LOW RESIDENTIAL (2 - 4.9 UNITS/ACRE)
- MEDIUM RESIDENTIAL (5 - 7.9 UNITS/ACRE)
- HIGH RESIDENTIAL (8 UNITS/ACRE OR GREATER)
- COMMERCIAL, INDUSTRIAL & OTHER NON-RESIDENTIAL

SOURCE: SFWMD, 1987

(NOTE: The generalized Future Land Use Map was prepared for a Groundwater Resource Study of Palm Beach County by the South Florida Water Management District and should not be utilized for land use planning purposes. The Official Land Use Maps prepared and adopted by Palm Beach County and other local governments must be utilized for any land use planning/zoning decision.)


R 40 E
R 41 E
R 42 E
R 43 E
Southern Boulevard - SOUTH ONE-HALF
CONSERVATION AREA
T 44 S
T 45 S
T 46 S
T 47 S
HIGHLAND BEACH
LEGEND
PALM BEACH COUNTY GENERALIZED FUTURE LAND USE MAP
- NON-INTENSIVE AGRICULTURE, UNDEVELOPED AND VACANT
- AGRICULTURAL INTENSIVE (ROW CROPS, CITRUS, NURSERY, ETC.)
- GOLF COURSES, RECREATION, PRESERVATION / CONSERVATION
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