FINAL 11/01

Comprehensive Water Supply Management Plan

Burke County And Municipalities:

Girard

Keysville

Midville

Sardis

Vidette

Waynesboro

Rutherford & Associates

Savannah, Georgia

2000

The Burke County Comprehensive Water Supply Management Plan

has been reviewed and approved by the

Georgia Environmental Protection Division (EPD) – July 2001

Georgia Department of Natural Resources
205 Butler Street, S.E., East Floyd Tower, Atlanta, Georgia 30334
Lonice C. Barrett, Commissioner
Harold F. Reheis, Director
Environmental Protection Division
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July 27, 2001

Mr. C.W. Hopper, Jr., County Administrator
Burke County Board of Commissioners
Post Office Box 89
Waynesboro, Georgia 30630

Dear Mr. Hopper:

In April of 1997, the Georgia Environmental Protection Division (EPD) announced, produced and distributed a document entitled An Interim Strategy for Managing Saltwater Intrusion in Southeast Georgia. That document outlined a process that EPD would employ to develop a long-term strategy for addressing the water supply needs of coastal Georgia while minimizing or arresting the saltwater encroachment and intrusion phenomena known to be occurring along the Georgia and South Carolina coasts. One important element of that strategy was the requirement that each of the 24 counties in the affected areas (as defined by EPD) would develop a comprehensive county water supply plan. In June 1997, EPD distributed an outline of a set of minimum criteria for these plans. In 1998 the Legislature approved funds to partially support the development of these plans in 22 of the 24 counties, and EPD and the Department of Community Affairs developed a process whereby funds would be distributed to these counties to assist them in producing their water supply plans. According to the time line established by EPD in the Interim Strategy, the plans were to be completed by the county by December, 2000. As of May, 2001, each of the 24 counties has submitted final plans.

With this letter I wish to thank you and your constituents in Burke County for successfully completing your water supply plan. EPD's review of your plan has found that it meets the State's minimum requirements. The data and information you have provided in your plan will allow EPD to begin the integration process which will lead to the production of a long-term regional plan for managing water to meet future water supply needs in coastal Georgia by December 2005. This process will require a "union" of your water supply plan and those of your neighboring counties. The process will also require that we utilize many of the findings from the "sound science" initiative also defined in the Interim Strategy. You and your constituents will continue to be an indispensable part of this integration process, and we will consult with you in many different forums as the process unfolds.

Again, my sincere thanks to you for your invaluable contributions to effective management of coastal Georgia's water resources.

Sincerely,

Harold F. Reheis

Harold Reheis
Director

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I. INTRODUCTION

A. General Description of the Water Plan

The Georgia Environmental Protection Division (EPD) issued its *Interim Strategy for Managing Salt Water Intrusion in the Upper Floridan Aquifer of Southeast Georgia* (Appendix B) in April 1997 to address saltwater intrusion that threatens future groundwater supplies in (see Appendix A) Savannah and Brunswick, and potentially other areas of Southeast Georgia encompassing 24 counties (see map Appendix A). As part of its interim strategy, EPD required Burke County and 23 other counties in the region that utilize the Upper Floridan Aquifer to develop a comprehensive water supply management plan that assesses water demand, water supply sources and wastewater management.

The Burke County Comprehensive Water Supply Management Plan (Plan) will examine past and present water use, project future water needs, assess future water supply options and serve as a decision-making tool for local elected officials and Georgia EPD. The goal of the plan is to manage and conserve Burke County's present and future water resources in order for reasonable residential, commercial, agricultural and industrial growth to occur in the future, and to protect the quality of groundwater for use by future generations. This Plan should be reviewed at least every ten years to address changing circumstances that affect water use in the county and its municipalities. The Plan's update schedule should coincide with the county's update of its Comprehensive Plan.

Specifically, the Burke County Comprehensive Water Supply Management Plan examines the following aspects of water use in Burke County:

- Historical water use perspective.
- Review of existing water supply needs and options studies.
- Current water management practices.
- Identification of possible sources of water other than the Upper Floridan Aquifer.
- Quantification of existing ground and surface water usage.
- Conservation efforts.
- Population, land use projections, and water demand projections to 2050.
- Development of water-supply management options.
- Implementation schedule.

Burke County and its aquifer users have identified the following principles as critical in the Burke County Water Supply Management Plan.

(1) Continue to utilize the Floridan Aquifer to meet domestic water demand.

(2) Continue to allow current and future industrial usage of the Floridan Aquifer with

proper conservation and water saving principles employed by each industrial user.

(3) Continue to utilize the Floridan Aquifer for agricultural irrigation purposes.

(4) Continue to utilize Brier Creek as a surface water source for public water for the City of Waynesboro.

(5) Employ "Best Management Practices" for agricultural irrigation systems. This can be accomplished by the County Extension Service working closely with the agricultural community.

(6) Seek legislative and financial assistance from State and Federal agencies to facilitate the use of surface water impoundments to utilize minor streams and capture rainfall run-off to reduce usage and dependence on the Floridan Aquifer for agricultural practices.

(7) Develop a countywide water conservation education program and utilize municipalities, school system, civic organizations and county extension service to inform citizens about conservation principles and practices.

(8) Seek assistance from state EPD and the University of Georgia College of Agriculture and Environmental Sciences to determine the viability of the Cretaceous Aquifer in the Coastal Plain as an alternative or supplemental source of fresh water.

(9) Determine, with state and federal assistance, the true availability of surface water from the Savannah River as a viable alternative or supplemental source of fresh water.

(10) The County will establish a committee of Floridan Aquifer users to monitor implementation of this plan and to promote water conservation principles and practices.

This Plan includes the municipalities of Girard, Keysville, Midville, Sardis, Vidette, Waynesboro and unincorporated Burke County.

B. The Problem - Saltwater Intrusion

The Upper Floridan Aquifer is the primary source of water for drinking, industrial processes, and agricultural irrigation for Burke County and the other 23 Southeast Georgia counties required to prepare comprehensive water supply management plans. The aquifer underlies Southeast Georgia, most of Southwest Georgia, Coastal South Carolina, a portion of Southern Alabama and Florida (see Appendix A). Secondary aquifers include the Surficial, Upper and Lower Brunswick (Miocene) and Lower Floridan and various

aquifers in the Cretaceous strata. The location of the Cretaceous aquifer is shown in Appendix A.

Most groundwater management issues in Coastal Georgia relate to lateral or upward movement of freshwater-saltwater interface in the Upper Floridan Aquifer. Due to over pumping, a reversal of the seaward hydraulic gradient has caused lateral encroachment of seawater in the aquifer at the north end of Hilton Head Island, South Carolina, and vertical intrusion of saltwater in the aquifer at Brunswick, Georgia.

The United States Geological Survey (USGS) and the Georgia Environmental Protection Division (EPD) have conducted numerous studies of the Floridan aquifer system in Southeast Georgia. These studies provide guidance in the preparation of the County's water supply management plan. The studies are listed in Appendix C.

The State Environmental Protection Division is currently conducting a seven-year $15 million comprehensive study of the Floridan aquifer system to answer many of the questions that have been raised by regulators and stakeholders during the past ten years. This Plan will have to be reviewed and updated as soon as that study is complete.

C. Committee Members/Structure

In order to develop a comprehensive water supply management plan for Burke County that addresses the interests of all stakeholders, an advisory committee was established to guide the plan development process. The advisory committee was comprised of county and city elected and appointed officials; citizens; industrial, business, agricultural and environmental representatives; public drinking water and wastewater managers; industrial engineers; and others with technical interests. This committee met during the Plan development process to prepare a workable Plan that would meet the county's diverse needs. One public meeting was held during the Plan development process, and the County will hold a final meeting after the EPD review process and prior to final submittal of the Plan to the State. The members of the advisory committee are shown in Table 1-1.

Table 1-1: Burke County Comprehensive Water Supply Management Plan Advisory Committee Members

Committee Member	Interest
Ellis Godbee	County Commissioner
Jimmy Dixon	County Commissioner
Woodrow Harvey	County Commissioner
Herman Lodge	County Commissioner
Frank Williams	County Commissioner

Billy Hopper	County Administrator
Martin Dolin	Mayor, Waynesboro
Jack Brantley	Administrator, Waynesboro
Ed Grunewald	Mayor, Girard
John Hamilton	Mayor, Sardis
Virgil Choate	Former Mayor, Midville
Harry Whitehead	Mayor, Midville
Everett McBride	Mayor, Vidette
Emma Gresham	Mayor, Keysville
Richard McDaniel	County Extension
Sam Story	Farmer
Stan Hillis	Farmer
Ralph Sanderford	Farmer
W. H. Harper	Chair, Burke Development Authority
Tommy Rowell	Well Driller
Doug Day	School Superintendent
Stephen Murray	Health Department
Wayne Weddon	Chamber of Commerce
Jerry Long	Director, Industrial Development
Paul Shiver	Real Estate
Alphonso Andrews	Home & Hospital Authority
Jesse Burke	Road Superintendent
Earl Porterfield	Director, Emergency Management Agency

Through the County Extension agent, the farm community participated in the planning process to assist in determining present and future agricultural water use.

D. County Overview

Burke County is located in east central Georgia in the Atlantic Coastal Plain physiographic province. This province is generally characterized by flat areas that slope gently southward. The County Seat of Waynesboro is located 31 miles south of Augusta, 110 miles northwest of Savannah, and 105 miles northeast of Macon, Georgia. The county is located in the Central Savannah River Area and is bounded on the east by the Savannah River, on the south by Emanuel, Jenkins, and Screven counties, on the west by Jefferson County and on the north by Richmond County. Burke County contains 834.1 square miles. Of this area, 532,992 acres are land and 832 acres are covered by water. This ranks Burke County as the second largest county in the state of Georgia.

Burke County is served by two separate aquifer systems. The northern portion of the county lies over the Cretaceous Aquifer. The southern portion of the county lies over the Floridan Aquifer. Currently, the cities of Keysville, Sardis, Midville, Vidette, and Girard withdraw 100 percent of their public water from groundwater wells. Waynesboro utilizes ground water and some surface water from Brier Creek to meet its water supply demand. There are no public water service areas in the unincorporated areas of Burke County. There are several large areas identified throughout the County as Aquifer Recharge Areas. These recharge areas are located near the cities of Keysville, Waynesboro, Sardis, and Girard. There are no identified recharge areas located near the cities of Midville and Vidette. The recharge areas have been mapped by the Georgia Department of Natural Resources. See Map in Appendix A.

The county government is conducted through an elected Board of Commissioners. The County employs an Administrator to assist in implementation of policies and to oversee day-to-day operations. The City of Waynesboro employs a City Administrator to assist its Mayor and Council in daily operations. The cities of Girard, Keysville, Midville and Vidette conduct business through a Mayor and Council form of government and each employs a city clerk for assistance.

E. County climate, hydrology, hydrogeology

The average daily temperature in Burke County is 64.4 degrees Fahrenheit. Average daily low is 52.3 degrees Fahrenheit and average daily high is 76.4 degrees Fahrenheit. Precipitation average is 44.89 inches annually.[1] Table 1-2 depicts the average rainfall in inches by month of the year.

Table 1-2: Average Rainfall by Month - 1961 through 1990

Month	*Rainfall (In Inches)*
January	4.10
February	4.11
March	4.35
April	3.10
May	3.61
June	3.90
July	4.56
August	5.38
September	3.41
October	2.58
November	2.63
December	3.16
TOTAL	**44.89**

[1] Data from 1961 – 1990. Source: Natural Resources Conservation Service, National Water and Climate Center.

The surface water sources of the county are depicted on a hydrology map in Appendix A. Surface sources that could be used as a potential water supply source are the Savannah River and Brier Creek. The large number of creeks and streams throughout the county does present possible opportunities for impoundments to be utilized as part of the overall agricultural irrigation system.

Burke County lies within the Tifton Upland and Louisville Plateau, a generalized topographic division of the Coastal Plain province. The Tifton Upland ranges from about 120 to 400 feet in altitude and is characterized by rolling hills and both gentle and deeply incised valleys. The Louisville Plateau ranges in altitude from about 300 to 600 feet and is characterized by broad, flat uplands. The area of the Louisville Plateau is roughly the same as the area extent of sand and calcareous sand that is equivalent in age to the Upper Floridan aquifer.

The Coastal Terraces boundary of the Tifton Upland is the approximate down dip edge of the Gulf Trough. The Trough is narrow, generally less than 5 miles wide, but as much as 10 miles wide in central Georgia and near the Florida and Georgia state line.

The Gulf Trough (a depressed segment of the earth's crust bounded on at least two sides by faults) is caused by high-angle faulting that was active during much of the time of the deposition of rocks that make up the Floridan aquifer system. Within the depressed segments (grabens) are thick accumulations of low permeability, clastic (rock) sediments and argillaceous (clay or clay minerals) carbonate rocks.

The Trough has a pronounced effect on the hydrology of the aquifer system, as the fine clastic material in the trough impedes groundwater flow. The water quality, as mineralized water, is associated with evaporites downgradient from the trough. Because of large quantities of recharge and discharge in the flow system upgradient from the Gulf Trough, water is low in dissolved solids and is moderately hard.

Groundwater flow in the Floridan aquifer system is partially impeded by the Gulf Trough as a result of two mechanisms. First, near-vertical displacement of rocks along the faults of the graben system has juxtaposed rocks of lower permeability against the more permeable rocks of the aquifer system. Second, within the graben system, the aquifer system consists of relatively low permeability material, which decreases the aquifer system's effective thickness.

The area of highest recharge to the aquifer system prior to development was chiefly updip and upgradient from the Gulf Trough, where the aquifer system is exposed or thinly covered and least confirmed. In this area, recharge occurred in the topographically high areas, either directly into the exposed or thinly covered Upper Floridan.

The small quantity of flow passing downgradient through the Upper and Lower Floridan aquifers across the Gulf Trough, compared to the total flow in the area upgradient from the

trough, further supports the existence of an active but nearly isolated flow system in the Floridan Aquifer upgradient from the Gulf Trough. The Gulf Trough, however, has been determined to be an area where development potential is small, because of the low transmissivities that would result in large localized water level decline.

The Sound Science Initiative Study of the Floridan aquifer system that is being conducted by the state EPD should shed more light on this prominent geological structure as to whether or not it has an impact on the ground-water flows of the Floridan aquifer system. As a result of the study, it may be that withdrawal upgradient of the trough has no impact on the withdrawal downgradient of the trough. If so, then the opportunity for salt water intrusion in the upgradient areas of the trough would be greatly minimized. This does not, however, remove the possibility of water level declines in areas of the Gulf Trough resulting in reduced water quality.

Preliminary seismic results from the Sound Science Initiative Study indicate that the Gulf Trough does not extend across Burke County. There does not appear to be any influence of the Trough at work in Burke County. See map in Appendix A for area of the Gulf Trough.

EPD and USGS have studied a number of different aquifers within the Coastal Plain. The interbedded sands and clays of the Cretaceous units of the Coastal Plain form a number of aquifers and confining units. Seven such Cretaceous aquifers in the Coastal Plain have been identified and designated aquifers A_1 through A_7. These aquifers are rarely tapped due to the ease of obtaining water from the shallower Floridan aquifer system.

Aquifer A_1 extends into Burke County. In 1976, 1.5 million gallons per day were pumped from this aquifer for industrial use in Screven County.

Other aquifers available for use are the Dublin, Midville and Dublin-Midville aquifer systems. Two wells in Screven County drilled in the Dublin aquifer in the mid-1960s and late 1971 yielded up to 1,500 gallons and 1,750 gallons a minute, respectively.

The Millhaven site, located in northeastern Screven County, was studied during 1991 – 1994. This study was to determine groundwater flow and stream-aquifer relations in the vicinity of the Savannah River Site. The test site consisted of a 1,452-foot deep core-hole drilled into sediments of the late Cretaceous age. Five test wells were developed at depths ranging from 50 to 1,300 feet. Test well 3 was in the lower zone of the Upper Floridan aquifer. It produced over 207 gallons a minute when pumped. Test well 4 was in the lower Dublin aquifer and it produced 76 gallons a minute when pumped. Test well 5 was in the lower Midville aquifer and only produced about 15 gallons a minute when pumped.

The Millers Pond test site in northeastern Burke County was constructed in 1991 – 1992 to characterize the geologic, hydrologic, and water quality characteristics of a multi-aquifer

system in Coastal Plain sediments. Seven test wells were developed ranging in depth from 80 to 735 feet. The test wells were screened in the Upper Three Runs aquifer, Dublin aquifer system and the Midville aquifer system. Three wells in the Dublin aquifer system produced from 12 to 41 gallons a minute. Three wells in the Midville aquifer system produced from 65 to 178 gallons a minute. One well was drilled in the Upper Three Runs aquifer and it only produced 8 gallons a minute.

F. County/Region economic setting

Burke County has close to 50 percent of its total land area identified as prime farmland. This is approximately 240,367 acres. As of 1989, there were an estimated 293,529 acres or 55 percent of the total land area identified as forestland. Continued development pressures for subdivisions and other rural development could cause these acres to decline in the future. This change in land use can create a demand for more water to serve the new residents and support their intense water-use practices.

Government employment, retail trade and services, and manufacturing are the major employment sectors in the county. Retail trade and services plays a significant role in Burke County's economy and generates approximately 33 percent of the employment opportunities. Farming and Forestry provide about 10 percent of the employment opportunities for the county. However, farming has continued to decline as a chosen vocation. The number of farms and the number of acres farmed are about half of the 1964 total.

The County does seem to benefit from some tourism activities such as the annual Bird Dog Field Trials and the Ogeechee Redbreast Festival. It is suggested that tourism opportunities could be further developed and is quite likely that tourism will increase in years to come.

Population projections for Burke County and its municipalities are provided in the next section.

II. BURKE COUNTY POPULATION PROJECTIONS

A. Historical Population: 1970 - 2000

Burke County's population has not grown significantly since the 1970s. Table 2-1 lists the county and municipal populations from 1970 to 1995, as well as a population estimate for the year 2000 from the CSRA RDC and the U.S. Bureau of Census.

Table 2-1: Population for Burke County and Municipalities for 1970 - 2000

	1970	*1980*	*1985*	*1990*	*1995*	*2000*
Girard	241	225	212	219	218	216
Keysville	NA	408	400	391	403	415
Midville	665	670	656	623	605	587
Sardis	643	1,180	1,321	1,339	1,386	1,432
Vidette	131	103	88	75	77	80
Waynesboro	5,530	5,750	6,079	6,056	6,146	6,237
Total Municipality	**7,210**	**8,336**	**8,756**	**8,703**	**8,835**	**8,967**
Unincorporated County	11,045	11,411	12,444	12,762	13,277	13,792
Total County	**18,255**	**19,747**	**21,200**	**21,465**	**22,112**	**22,759**

Source: CSRA & US Bureau of Census

Table 2-2 lists historical household sizes for Burke County and its municipalities.

Table 2-5: Average Household Size 1990

Jurisdiction	*1990*
Girard	2.9
Keysville	4.1
Midville	2.6
Sardis	3.0
Vidette	2.5
Waynesboro	2.7
Burke County	2.7

Source: CSRA RDC 1992 & US Bureau of Census

B. Population projections: 2000 - 2050

1. Population estimates

Table 2-3 compares population projections for the time frame of 2000 to 2050 from two different sources. DRI/McGraw Hill was employed by EPD to prepare population projections for the entire state by river basins. Rutherford & Associates prepared estimates for Burke County after discussions with representatives of the Chamber of Commerce, Industrial Development Authority, farmers, elected and appointed officials of the County and local municipalities. Rutherford & Associates also considered current growth trends of adjoining counties. Rutherford & Associates prepared projections based on the following growth rates:

2000	- 2010	10%
	- 2020	12%
	- 2030	15%
	- 2040	15%
	- 2050	15%

Table 2-3: Comparison of Population Projections for 2000-2050

	2000	*2005*	*2010*	*2015*	*2020*	*2025*	*2030*	*2035*	*2040*	*2045*	*2050*
DRI	20,507	20,632	20,981	21,331	21,851	22,605	23,552	24,522	25,464	26,386	27,422
Rutherford & Assoc.	23,174	24,912	26,650	28,648	30,647	32,945	35,244	37,359	39,473	41,467	43,420

The population forecast prepared in 1996 by DRI/McGraw-Hill for the Georgia Environmental Protection Division raised questions and concerns about validity because of population projections for neighboring counties. Bryan and Effingham Counties will exceed the estimated growth prepared by DRI for the 50-year term. The 2000 DRI estimate for Effingham County is only 29,695 while the county population estimate in 1997 was 37,781. The 2050 DRI estimate is only 42,814 while the county's water plan indicates a potential population of 195,000 in 2050. The DRI population projection for Bryan County in 2000 is 19,337. However, the 2000 population in Bryan County will actually exceed the DRI estimate of 32,881 for the year 2050.

Current trends of people moving to Burke County will only grow because of the desire of people to live in a rural setting and yet be able to travel to their job. With the widening of US Highway 25, more people will move to Burke County. The price of land is much less than in neighboring Richmond County. When the road project is fully complete, people living in Waynesboro will be less than 30 minutes away from Augusta. Trends have shown that people do not mind commuting up to 45 minutes if they can enjoy a quality of life in a more rural setting.

Tables 2-4 and 2-5 list the population projections for the County and its municipalities for the time period 2000 to 2050.

Table 2-4: Population Projections for Burke County And Municipalities for 2000-2025

	2000	*2005*	*2010*	*2015*	*2020*	*2025*
Waynesboro	6,237	6,823	7,408	8,147	8,887	9,730
Keysville	415	598	742	1,003	1,165	1,384
Girard	216	241	266	285	306	329
Midville	587	639	692	760	827	943
Sardis	1,432	1,569	1,705	1,864	2,022	2,244
Vidette	107	133	159	172	184	198
Total Municipality	**8,994**	**10,003**	**10,972**	**12,231**	**13,391**	**14,828**
Unincorporated County	14,180	14,909	15,678	16,417	17,256	18,117
Total County	**23,174**	**24,912**	**26,650**	**28,648**	**30,647**	**32,945**

Source: Rutherford & Associates

Table 2-5: Population Projections for Burke County And Municipalities for 2030-2050

	2030	*2035*	*2040*	*2045*	*2050*
Girard	352	373	395	415	434
Keysville	1,586	1,830	2,013	2,268	2,475
Midville	1,058	1,141	1,224	1,328	1,433
Sardis	2,467	2,635	2,802	2,964	3,126
Vidette	212	225	237	249	261
Waynesboro	10,573	11,405	12,237	13,066	13,894
Total Municipality	**16,248**	**17,609**	**18,908**	**20,290**	**21,623**
Unincorporated County	18,996	19,750	20,565	21,187	21,797
Total County	**35,244**	**37,359**	**39,473**	**41,477**	**43,420**

Source: Rutherford & Associates

2. *Household Estimates*

Tables 2-6 and 2-7 provide projections for the number of households in each of the municipalities and unincorporated county.

Table 2-6: Household Projections for Burke County And Municipalities for 2000-2025

	2000	*2005*	*2010*	*2015*	*2020*	*2025*
Girard	83	93	102	110	118	127
Keysville	160	230	285	386	448	532
Midville	226	246	266	292	318	363
Sardis	551	603	656	717	778	863
Vidette	41	51	61	66	71	76
Waynesboro	2,399	2,624	2,849	3,133	3,418	3,742
Total Municipality	**3,459**	**3,847**	**4,220**	**4,704**	**5,150**	**5,703**
Unincorporated County	5,454	5,734	6,030	6,314	6,637	6,968
Total County	**8,913**	**9,582**	**10,250**	**11,018**	**11,787**	**12,671**

Based on 2.6 persons per household
Source: Rutherford & Associates

Table 2-7: Household Projections for Burke County And Municipalities for 2030-2050

	2030	*2035*	*2040*	*2045*	*2050*
Girard	135	143	152	160	167
Keysville	610	704	774	872	952
Midville	407	439	471	511	551
Sardis	949	1,013	1,078	1,140	1,202
Vidette	82	87	91	96	100
Waynesboro	4,067	4,387	4,707	5,025	5,344
Total Municipality	**6,249**	**6,773**	**7,272**	**7,804**	**8,317**
Unincorporated County	6,249	7,596	7,910	8,149	8,383
Total County	**12,498**	**14,369**	**15,182**	**15,953**	**16,700**

Based on 2.6 persons per household
Source: Rutherford & Associates

Table 2-8 provides additional information regarding household projections. It is quite evident that the projected population growth is achievable, particularly given the low number of new households needed to meet the demand. Only 156 new households need to be added annually throughout the county to meet the projected projections. This equates to only 13 new residences a month throughout the county. It must be remembered that a manufactured home is a household.

Table 2-8: Estimated Household Summary Related to Population Projection, 2000 - 2050

	Total Increase In Households	*Households Needed Per Year for Projected Population*
Girard	84	2
Keysville	792	16
Midville	325	7
Sardis	651	13
Vidette	59	1
Waynesboro	2,945	59
Total Municipality	4,856	98
Unincorporated County	2,929	59
TOTAL	7,785	156

Source: Rutherford & Associates

III. WATER USE INVENTORY - BACKGROUND

A. EPD Groundwater Withdrawal Permits

EPD issues groundwater withdrawal permits for all industrial, municipal and agricultural uses withdrawing more than 100,000 gallons of groundwater per day (based on an annual use average). Table 3-1 lists the four groundwater withdrawal permits (excluding agricultural) in Burke County in 1999, including permitted monthly and yearly average withdrawal per day. The permitted monthly average withdrawal allows a groundwater user to meet seasonal peak flow demand, but the permitted yearly average withdrawal (gallons per day) cannot be exceeded over the course of a year. Surface water users are listed in Table 3-2.

Groundwater withdrawal permits are classified by EPD as municipal, industrial or agricultural (there are 115 agricultural permits in the county). Each of the permitted users withdraws groundwater from the Upper Floridan Aquifer.

Table 3-1: Groundwater Withdrawal Permits (>100,000 gallons per day) in Burke County

Permitted Facility	*Permit Type*	*Permitted Monthly Average Withdrawal (MGD)*	*Permitted Yearly Average Withdrawal (MGD)*
City of Sardis	Municipal	.207	.200
City of Waynesboro	Municipal	4.00	3.500
Plant Vogtle	Industrial	6.00	5.500
International Paper (McBean Woodyard)	Industrial	.180	.180
TOTAL		10.380	9.380

Source: EPD

Table 3-2: Surface Water Reported Usage

Permitted Facility	*Facility Type*	*Water Usage (MGD)*
Waynesboro	Municipal	.680
Plant Vogtle	Industrial	62.830
TOTAL		63.510

Source: USGS

B. EPD Safe Drinking Water Permits

EPD issues safe drinking water permits for all water systems with at least 15 connections or serving more than 25 individuals (community systems) and for those systems serving at least 25 individuals more than 60 days per year (non-community systems). Table 3-2 lists the 12 safe drinking water permits in Burke County in 1998, including the population served by each water system as most recently reported to EPD. Types of water suppliers and users covered by safe drinking water permits include municipal water systems, such as those operated by the City of Girard; industrial facilities (with more than 25 employees or on-site customers), such as Georgia Power-Simulator building, that supply their own water for production and use a portion for employee and/or customer consumption; community water systems serving residential subdivisions, mobile home parks and other residential uses not supplied by municipal water systems; and non-community water systems, designated by EPD as transient or non-transient, serving schools, businesses, parks and other non-residential uses not supplied by municipal water systems. Only community and non-community water systems that meet EPD's minimum size requirement noted above require safe drinking water permits.

Table 3-2: Safe Drinking Water Permits in Burke County (August 1999)

Permitted System	*Type of Water System (EPD Classification)*	*Population Served**
Burke Academy	Non-Transient, Non Community	500
Burke County Training Center	Non-Transient, Non Community	64
Georgia Power-Simulator Bldg.	Non-Transient, Non Community	125
Georgia Power- Vogtle makeup	Non-Transient, Non Community	1,100
Georgia Power-Vogtle Rec. Area	Transient, Non Community	300
City of Girard	Community	220
City of Keysville	Community	400
City of Midville	Community	840
City of Sardis	Community	1,383
City of Vidette	Community	83
City of Waynesboro	Community	5,161
Mamie Jo Rhodes Harrison Subdivision	Community	47

Source: GA EPD

*Population estimates are from EPD records, which cover 1989 to 1998.

C. Local Domestic Well Permits

The Burke County Health Office does not issue permits for domestic wells serving individual residences in the county. Each municipality has the authority to issue permits for domestic wells in areas not served by public supply.

D. Assessing Burke County's Water Demand

As part of EPD's comprehensive water supply management plan requirements, each county must assess past, present and future water demand. It should be noted that Burke County's present water supply is derived almost entirely from groundwater, and the use of surface water for Waynesboro is considered in this water use inventory and projection.

For the purpose of this Plan, Burke County water demand is analyzed for the following categories of wells and water systems, based on EPD's groundwater management regulatory structure, Burke County's well permitting process, and present water withdrawal and use in the county:

- Industrial wells
  - Provide industrial process water to industrial facilities not connected to municipal water systems
  - May require EPD groundwater withdrawal permit and EPD safe drinking water permit
- Municipal water systems
  - Serve residential, commercial and industrial customers inside and, in some cases, outside municipal boundaries
  - May require EPD groundwater withdrawal permit and require EPD safe drinking water permit
- Community water systems
  - Serve residential subdivisions and other small residential areas not connected to municipal water systems
  - Provide water to at least 15 residences or 25 individuals
  - Usually do not require EPD groundwater withdrawal permit, but require EPD safe drinking water permit
- Non-community water systems
  - Serve businesses, schools and other non-residential facilities not connected to municipal water systems
  - Provide water to at least 25 individuals more than 60 days per year
  - Usually do not require EPD groundwater withdrawal permit, but require EPD safe drinking water permit

- Domestic wells
  - Serve individual residences not connected to municipal water systems
  - Usually do not require EPD groundwater withdrawal permit, but may require Burke County Health Department well permit and/or local city permit
- Agricultural/golf course irrigation wells
  - Serve agricultural operations and golf courses not connected to municipal water systems
  - May require EPD groundwater withdrawal permit

IV. WATER DEMAND

A. Past Water Demand (1970 – 1990)

1. *Past domestic/commercial water demand*

Domestic and commercial water usage is shown in Table 4-1 for the time period of 1970 through 1990. Actual water usage is not available for each municipality. In most cases, per capita usage consumption is the basis for water use estimates. Maximum daily use information is not available.

Table 4-1: Domestic and Commercial Usage
Burke County (MGD), 1970 - 1990

	1970	*1975*	*1980*	*1985*	*1990*
Girard	0.036	0.035	0.034	0.032	0.033
Keysville	-	-	0.061	0.060	0.059
Midville	0.100	0.100	0.101	0.098	0.093
Sardis	0.096	0.137	0.177	0.198	0.201
Vidette	0.020	0.018	0.015	0.013	0.011
Waynesboro	0.830	0.847	0.864	0.912	0.908
Unincorporated County	1.657	1.684	1.712	1.867	1.914
Total County	2.738	2.820	2.964	3.180	3.219

Consumption calculated at 150 GPD per capita
Source: Rutherford & Associates

2. *Past Industrial water demand*

Past water use data for permitted industrial users is unavailable for 1970 – 1985 is unavailable.

Table 4-2: Industrial Water Usage
1970 - 1985

	1970	*1975*	*1980*	*1985*
Plant Vogtle - SIC	NA	NA	NA	NA

NA: Not Available

Water Conservation Measures Employed
There are no data available on water conservation measures employed by industrial users during the period from 1970 to1985.

3. *Past agricultural water demand*

Corn, cotton, peanuts and soybeans are the major irrigated crops.

Table 4-3 shows past and present water demand for agricultural uses. As evidenced from a comparison of 1986 and 1999, the acreage irrigated has increased by almost 10,000 acres. The fact that 1999 was a drought year shows almost triple the water needed for irrigation.

Table 4-3: Past Agricultural Water Demand

Surface Water and Groundwater (MGD)

1980 – 1999

		1980 [1]	*1986* [2]	*1990* [3]	*1997* [4]	*1999* [5]
Acres Irrigated		29,278	15,565	16,946	23,070	22,622
Water Used	Ground	18.409	5.527	2.570	7.08	13.388
	Surface	3.024	1.381	.450	1.870	3.034
Total Water Use		21.657	6.908	3.020	8.950	16.734

[1] Acres irrigated reported in 1996 Georgia County Guide. 1980 was a drought year. Assume 10 inches of irrigation per acre: 15% surface water, 85% groundwater.

[2] Acres irrigated reported in 1996 Georgia County Guide. Assumes 6 inches of irrigation per acre: 20% surface water, 80% groundwater.

[3] Water usage and acreage irrigated reported in EPD Information Circular 90.

[4] Water usage and acreage irrigated reported in EPD Information Circular 104.

[5] Acreage for working on Water Supply Management Plan. Assumes 10 inches of irrigation per acre: 20% surface water, 80% groundwater. 1999 was a drought year.

Water Use Inventory And Projection -Agricultural Irrigation Wells

This section addresses agricultural operations that utilize their own wells on-site for irrigation. EPD even considers golf courses to be an agricultural use for the purpose of groundwater management. Agricultural operations that withdraw more than 100,000 gallons of groundwater per day require an EPD groundwater withdrawal permit. One hundred and fifteen permits for agricultural operations presently meet this requirement in Burke County. EPD has begun issuing letters of concurrence for agriculture permits in coordination with the County Extension Office. The "letters" are only valid for two years. The well must be constructed and be in use within the two year period or the user will lose the right to construct a well.

Compared to its neighboring counties, Burke County has a significant amount of agriculture and related water use. According to the EPD Information Circular 104, approximately 23,070 acres were irrigated for farming purposes in 1997. According to information from EPD in 1999, over 22,662 acres are permitted for irrigation. Some agricultural acreage has been lost in Burke County over the past few years as the county

has become more urbanized. However, with the increased acres permitted for irrigation, an increase in farming can be expected.

For irrigation calculations, one inch of water per acre equals 27,000 gallons. Single crop farming has a growing season of approximately 120 days while double crop farming has a growing season of approximately 270 days. Irrigation does not occur each day of the respective growing season. However, during the growing seasons, there are critical periods when the crops need precise irrigation. During these times, the systems may work several days straight for 24 hours a day. For comparison, all irrigation use is shown as if the use occurred 365 days a year instead of the actual time period. By averaging daily water use, agricultural, domestic/commercial, and industrial usage may be compared more easily. Because of recovery characteristics of the aquifer, it is important to examine pumping effects on the aquifer on an annual basis rather than a daily basis.

Establishments that produce agricultural commodities, livestock, or operate timber tracts have been assigned major group numbers as part of the Standard Industrial Classification System (SIC). The SIC numbers for agricultural crops is SIC-01; for livestock is SIC-02; and for forestry practices is SIC-08.

The US Geological Survey estimates that 2.57 million gallons per day gallons of groundwater and .450 million gallons day of surface water for a total agricultural use of 3.02 million gallons per day were used for irrigation in 1990. In 1997, 7.08 million gallons per day ground water and 1.87 million gallons per day surface water were used for a total agricultural use of 8.95 million gallons per day. The US Geological survey produces these estimates for total water use in a county.

Each crop has a recognized amount of rainfall or irrigation that is needed to make the particular crop. Georgia EPD does not now require the crop information when withdrawal applications are filed. The State of Florida through its water management districts does permit irrigation by crop type and other climate information.

Major crops irrigated (w/irrigation acreage)
Corn, cotton, peanuts and soybeans are the major crops irrigated. Some pecan orchards are irrigated. Vegetable crops will begin to take a large percentage of irrigated areas. Data regarding acres irrigated by crop is shown in Table 4-4.

Water use by crop
Cotton and peanut crops can use the most water because they have critical periods in the growth cycle that must have adequate water in order to make a crop. Certain vegetable crops will require significant water. Water use by crop is shown in Table 4-4.

Table 4-4: Acres per Crop and Water Use (MGD) per Crop: 1970 - 1985								
	1970		1975		1980		1985	
	Acres	Water Use	Acres	Water Use	Acres	Water Use	Acres	Water Use
Corn	65	0.048	150	0.111	15,600	11.575	8,400	6.232
Cotton	55	0.041	165	0.122	800	0.593	900	0.667
Peanuts	-	0	-	0	3,600	2.671	2,200	1.632
Soybeans	-	0	-	0	4,300	3.190	3,800	2.819
Vegetables	-	0	-	0	100	0.133	50	0.066
Pecans	-	0	-	0	-	0	610	0.452
Pasture	-	0	-	0	2,650	1.966	1,533	1.137
TOTAL	120	0.089	315	0.233	27,050	20.128	17,493	13.005

Vegetables include cucumbers, squash, tomatoes, peppers, watermelons, and cantaloupes.
Source: Burke County

Water conservation measures employed
All farmers employ Best Management Practices (BMP) for agricultural activities. The use of too much water causes soil erosion and nutrient loss and creates additional problems and expense for the farmers. Farmers use electricity or diesel generators to run the pumps at the wells. Even though the water being pumped has no cost, the methods implemented to utilize that water for irrigation are expensive. The costs of a well and a center pivot system can run several thousand dollars.

Potential water savings and related costs have been identified in an EPD report entitled *Irrigation Conservation Practices Appropriate for the Southeastern United States.* The most important point in this report is that farmers should conduct an irrigation efficiency audit to determine where improvements in irrigation practices could occur.

B. Present Water Demand (1990 – 2000)

1. *Present Domestic/Commercial water demand - present permitted facilities*

The domestic and commercial water usage for each of the municipalities and the unincorporated county are shown in Tables 4-5 through 4-12.

Table 4-5: Domestic and Commercial Usage

Burke County (MGD), 1990 - 1999

	1990	*1995*	*1999*
	1990	*1995*	*1999*
Girard	0.033	0.033	0.033
Keysville	0.059	0.060	0.062
Midville	0.093	0.091	0.089
Sardis	0.201	0.208	0.214
Vidette	0.011	0.012	0.012
Waynesboro*	0.908	0.922	0.935
Unincorporated County	1.914	1.992	2.068

Consumption calculated at 150 GPD per capita

*Waynesboro data is reported usage for 1999

Source: Rutherford & Associates

Water use for 1990 and 1995 for the City of Waynesboro is shown in Table 4-6. The City of Waynesboro has employed leak detection programs as a practice to reduce its unaccounted for water loss. The City is working toward a 10% unaccounted for water loss.

Table 4-6: City of Waynesboro

Select Water Use and Per Capita for 1997, 1998, 1999

(Water use reported in MGD)

	1997		*1998*		*1999*	
	Population: 6,191		Population: 6,205		Population: 6,219	
	Daily Total Water Use	*Per Capita Water Use*	*Daily Total Water Use*	*Per Capita Water Use*	*Daily Total Water Use*	*Per Capita Water Use*
Jan	0.797	128	0.972	155	1.088	175
Feb	0.803	129	0.993	160	1.090	175
Mar	0.878	142	1.229	198	1.102	177
Apr	0.962	155	1.300	209	1.162	186
May	1.208	195	1.441	232	1.352	217
June	1.371	221	1.574	253	1.398	224
July	1.573	254	1.515	244	1.310	210
Aug	1.520	245	1.311	211	1.626	261
Sept	1.531	247	1.208	194	1.413	227
Oct	1.188	192	1.211	195	1.266	203
Nov	0.899	145	1.025	165	1.157	186
Dec	0.775	125	1.117	180	1.156	186

These per capita figures also include some commercial and industrial usage.

Source: City of Waynesboro, Rutherford & Associates

Table 4-7: City of Girard

Maximum Daily Water Use and Per Capita for 1990,1995, and 1999
(Water use reported in MGD)

	1990 Population: 219		*1995* Population: 218		*1999* Population: 214	
	Daily Water Use	Per capita*	Daily Water Use	Per capita*	Daily Water Use	Per capita*
Jan	0.029	132	0.028	128	0.029	136
Feb	0.030	137	0.029	133	0.029	136
Mar	0.031	142	0.032	147	0.031	145
Apr	0.032	146	0.033	151	0.033	154
May	0.033	151	0.033	151	0.034	159
June	0.035	160	0.036	165	0.036	168
July	0.038	174	0.039	179	0.037	173
Aug	0.037	169	0.036	165	0.037	173
Sept	0.036	164	0.036	165	0.036	168
Oct	0.034	155	0.033	151	0.034	159
Nov	0.033	151	0.031	142	0.032	150
Dec	0.030	137	0.029	133	0.029	136
Average	0.033	151	0.033	151	0.033	155

*These figures also include some commercial and industrial usage.
Source: Rutherford & Associates

Table 4-8: City of Keysville

Maximum Daily Water Use and Per Capita for 1990,1995, and 1999
(Water use reported in MGD)

	1990 Population: 391		*1995* Population: 403		*1999* Population: 410	
	Daily Water Use	Per capita*	Daily Water Use	Per capita*	Daily Water Use	Per capita*
Jan	0.056	143	0.057	141	0.058	141
Feb	0.057	146	0.057	141	0.058	141
Mar	0.058	148	0.058	144	0.059	144
Apr	0.058	148	0.060	149	0.061	149
May	0.060	153	0.061	151	0.063	154
June	0.061	156	0.063	156	0.065	159
July	0.063	161	0.065	161	0.066	161
Aug	0.063	161	0.066	164	0.065	159
Sept	0.061	156	0.060	149	0.064	156
Oct	0.060	153	0.060	149	0.063	154
Nov	0.059	151	0.058	144	0.062	151
Dec	0.055	141	0.057	141	0.061	149
Average	0.059	152	0.060	149	0.062	151

*These figures also include some commercial and industrial usage.
Source: Rutherford & Associates

Table 4-9: City of Keysville

Maximum Daily Water Use and Per Capita for 1990,1995, and 1999
(Water use reported in MGD)

	1990 Population: 623		*1995* Population: 605		*1999* Population: 596	
	Daily Water Use	Per capita*	Daily Water Use	Per capita*	Daily Water Use	Per capita*
Jan	0.089	143	0.088	145	0.086	144
Feb	0.091	146	0.089	147	0.086	144
Mar	0.092	148	0.091	150	0.087	146
Apr	0.093	149	0.092	152	0.089	149
May	0.095	152	0.093	154	0.091	153
June	0.097	156	0.094	155	0.092	154
July	0.098	157	0.095	157	0.093	156
Aug	0.095	152	0.095	157	0.093	156
Sept	0.094	151	0.092	152	0.090	151
Oct	0.092	148	0.090	149	0.089	149
Nov	0.090	144	0.088	145	0.087	146
Dec	0.089	143	0.087	144	0.087	146
Average	0.093	149	0.091	151	0.087	150

*These figures also include some commercial and industrial usage.
Source: Rutherford & Associates

Table 4-10: City of Sardis

Maximum Daily Water Use and Per Capita for 1990,1995, and 1999
(Water use reported in MGD)

	1990 Population: 1,339		*1995* Population: 1,386		*1999* Population: 1,422	
	Daily Water Use	Per capita*	Daily Water Use	Per capita*	Daily Water Use	Per capita*
Jan	0.189	141	0.196	141	0.193	136
Feb	0.190	142	0.199	144	0.195	137
Mar	0.195	146	0.203	146	0.205	144
Apr	0.199	149	0.210	152	0.215	151
May	0.210	157	0.224	162	0.235	165
June	0.231	173	0.245	177	0.256	180
July	0.230	172	0.237	171	0.248	174
Aug	0.216	161	0.215	155	0.227	160
Sept	0.199	149	0.201	145	0.213	150
Oct	0.190	142	0.197	142	0.20	141
Nov	0.185	138	0.188	136	0.194	136
Dec	0.180	134	0.184	133	0.189	133
Average	0.201	150	0.208	150	0.214	151

*These figures also include some commercial and industrial usage.
Source: Rutherford & Associates

Table 4-11: City of Vidette

Maximum Daily Water Use and Per Capita for 1990,1995, and 1999
(Water use reported in MGD)

	1990 Population: 75		*1995* Population: 77		*1999* Population: 78	
	Daily Water Use	Per capita*	Daily Water Use	Per capita*	Daily Water Use	Per capita*
Jan	0.009	120	0.008	104	0.009	115
Feb	0.010	133	0.009	117	0.009	115
Mar	0.011	147	0.012	156	0.011	141
Apr	0.012	160	0.013	169	0.012	154
May	0.012	160	0.014	182	0.015	192
June	0.013	173	0.015	195	0.015	192
July	0.014	187	0.015	195	0.016	205
Aug	0.012	160	0.013	169	0.014	179
Sept	0.011	147	0.012	156	0.013	167
Oct	0.009	120	0.011	143	0.011	141
Nov	0.009	120	0.010	130	0.010	128
Dec	0.008	107	0.009	117	0.010	128
Average	0.011	144	0.012	153	0.012	155

*These figures also include some commercial and industrial usage.
Source: Rutherford & Associates

Table 4-12: Unincorporated Burke County

Maximum Daily Water Use and Per Capita for 1990,1995, and 1999
(Water use reported in MGD)

	1990 Population: 12,762		*1995* Population: 13,277		*1999* Population: 214	
	Daily Water Use	Per capita*	Daily Water Use	Per capita*	Daily Water Use	Per capita*
Jan	1.715	134	1.750	132	1.875	137
Feb	1.830	143	1.845	139	1.990	145
Mar	1.850	145	1.910	144	2.100	153
Apr	1.900	149	1.940	146	2.125	155
May	1.938	152	2.010	151	2.270	166
June	2.100	165	2.140	161	2.405	176
July	2.250	176	2.325	175	2.350	172
Aug	2.050	161	2.290	172	2.190	160
Sept	1.990	156	2.119	160	2.011	147
Oct	1.800	141	1.950	147	1.900	139
Nov	1.795	141	1.850	139	1.850	135
Dec	1.750	137	1.780	134	1.750	128
Average	1.914	150	1.992	150	2.068	151

*These figures also include some commercial and industrial usage.
Source: Rutherford & Associates

2. *Present Industrial water demand - present permitted facilities*

Water use for currently permitted industrial users is shown in Table 4-13. Industrial classifications information is given by the North American Industrial Classification System (NAICS) codes.

Table 4-13: Industrial Water Usage (MGD) *1990 - 1999*

	1990	*1995*	*1997*	*1999*
Plant Vogtle (Total)* – NAICS 22113	64.54	NA	63.61	NA
Ground water	2.27	NA	.78	NA
Surface water	62.27	NA	62.83	NA
McBean Woodyard (Total)** – NAICS 113310	NA	.18	NA	.18

NA: Not Available

* Maximum Daily Use is not available. It can be expected that power generation would be higher in summer and winter months for increased cooling and heating demands.

**The permitted use is reported as a maximum daily and monthly use. The process of wetting down timber is fairly constant, except during the winter months when rainfall is high. The source of this water is the Cretaceous aquifer.

Water conservation measures employed include a leak detection program incorporating a goal of 10% reduction in unaccounted for water loss.

3. *Present Agricultural water demand*

Corn, cotton, peanuts and soybeans are the major irrigated crops.

Table 4-14 shows present water demand for agricultural uses. As evidenced from a comparison of 1997 and 1999, the acreage irrigated was higher in 1997. However, the fact that 1999 was a drought year shows almost double the water needed for irrigation.

Table 4-14: Present Agricultural Water Demand

Surface Water and Groundwater (MGD)

1990 – 1999

		1990 [1]	*1997* [2]	*1999* [3]
Acres Irrigated		16,946	23,070	22,622
Water Used	Ground	2.570	7.08	13.388
	Surface	.450	1.870	3.034
Total Water Use		3.020	8.950	16.734

[1] Water usage and acreage irrigated reported in EPD Information Circular 90.

[2] Water usage and acreage irrigated reported in EPD Information Circular 104.

[3] Acreage for working on Water Supply Management Plan. Assumes 10 inches of irrigation per acre: 20% surface water, 80% groundwater. 1999 was a drought year.

Acres per crop and water use per crop data are shown in Table 4-15.

Table 4-15: Acres per Crop and Water Use (MGD) per Crop: 1990 - 1999

	1990		*1995*		*1999*	
	Acres	*Water Use*	*Acres*	*Water Use*	*Acres*	*Water Use*
Corn	6,050	4.489	5,500	4.081	4,000	2.968
Cotton	2,010	1.491	8,153	6.049	13,513	10.026
Peanuts	3,200	2.374	3,250	2.411	4,500	3.339
Soybeans	2,060	1.528	800	0.593	500	0.371
Vegetables	50	0.067	200	0.266	100	0.133
Pecans	735	0.545	2,650	1.966	2,700	2.003
Pasture	2,400	1.78	2,000	1.484	2,000	1.484
TOTAL	16,505	12.274	22,553	16.850	27,313	20.324

Vegetables include cucumbers, squash, tomatoes, peppers, watermelons, and cantaloupes.
Source: Burke County

Water conservation measures employed
There is no list of specific water conservation measures employed for agricultural activities in the past. However, all farmers employ Best Management Practices (BMP) for agricultural activities. The use of too much water causes soil erosion and nutrient loss and creates additional problems and expense for the farmers. Farmers use electricity or diesel generators to run the pumps at the wells. Even though the water being pumped has no cost, the methods implemented to utilize that water for irrigation are expensive. The costs of a well and a center pivot system can run several thousand dollars. The county will have to develop a countywide conservation program for domestic and commercial usage. The county will have to work with local industries to assist them in efforts to reduce water usage. The agricultural community with support from the county will have to study and implement conservation practices as those discussed in the EPD report entitled *Irrigation Conservation Practices Appropriate for the Southeastern United States.*

C. Future Water Demand (2000 – 2050)

1. *Overall water demand projections*

Table 4-16 provides projections for total water use for Burke County from 2000 through 2050, including domestic, industrial and agricultural water use. This information assumes continuation of current water use patterns. Projected water usage under conservation efforts are shown in Table 8-1.

Table 4-16: Daily Water Demand Projections for Burke County Without Conservation Measures - 2000 to 2050

Year	Population	Domestic [1] (MGD)	Industrial [2] (MGD)	Agricultural [3] (MGD)	Total Water Use (MGD)
2000	23,174	5.840	5.680	22.538	34.058
2005	24,912	6.278	6.248	23.263	35.789
2010	26,650	6.716	6.873	24.848	38.437
2015	28,648	7.219	7.560	26.211	40.990
2020	30,647	7.723	8.316	27.811	43.850
2025	32,945	8.302	9.147	29.758	47.207
2030	35,244	8.881	10.062	30.789	49.732
2035	37,359	9.414	11.068	33.181	53.663
2040	39,473	9.947	12.175	36.097	58.219
2045	41,447	10.445	13.393	38.861	62.699
2050	43,420	10.942	14.732	40.962	66.636

1997 total water usage reported in an EPD information circular 104 was 12.720 MGD. (This excludes the 62.83 MGD surface water used for thermoelectric.)
[1] Per capita usage is calculated at 252 gpd.
[2] Industrial usage grows by 10% each five-year increment through year 2050.
[3] Agricultural usages increases by acreage irrigated from 28,550 acres in 2000 to 42,250 in 2050. Agricultural includes forestry and aquiculture.

2. *Future Domestic/Commercial Water Demand*

Tables 4-17 through 4-20 provide estimates for water usage for each municipality and the unincorporated portion of the county. Again, these estimates are based on continuation of current water use practices.

Table 4-17: Projected Water Demand (in gallons)				
	Girard		Keysville	
Year	Population	Water Demand*	Population	Water Demand*
2000	216	54,432	415	104,580
2005	241	60,732	598	150,696
2010	266	67,032	742	186,984
2015	285	71,820	1,003	252,756
2020	306	77,112	1,165	293,580
2025	329	82,908	1,384	348,768
2030	352	88,704	1,586	399,672
2035	373	93,996	1,830	461,160
2040	395	99,540	2,013	507,276
2045	415	104,580	2,268	571,536
2050	434	109,368	2,475	623,700

* Current consumption of 252 gpd (This is based on county average usage)
Source: Rutherford & Associates

Table 4-18: Projected Water Demand (in gallons)				
	Midville		Sardis	
Year	Population	Water Demand*	Population	Water Demand*
2000	587	147,924	1,432	360,864
2005	639	161,028	1,569	395,388
2010	692	174,384	1,705	429,660
2015	760	191,520	1,864	469,728
2020	827	208,404	2,022	509,544
2025	943	237,636	2,244	565,488
2030	1,058	266,616	2,467	621,684
2035	1,141	287,532	2,635	664,020
2040	1,224	308,448	2,802	706,104
2045	1,328	334,656	2,964	746,928
2050	1,433	361,116	3,126	787,752

* Current consumption of 252 gpd (This is based on county average usage)
Source: Rutherford & Associates

Table 4-19: Projected Water Demand (in gallons)				
	Vidette		Waynesboro	
Year	Population	Water Demand*	Population	Water Demand*
2000	107	26,964	6,237	1,571,724
2005	133	33,516	6,823	1,719,396
2010	159	40,068	7,408	1,866,816
2015	172	43,344	8,147	2,053,044
2020	184	46,368	8,887	2,239,524
2025	198	49,896	9,730	2,451,960
2030	212	53,424	10,573	2,664,396
2035	225	56,700	11,405	2,874,060
2040	237	59,724	12,237	3,083,724
2045	249	62,748	13,066	3,292,632
2050	261	65,772	13,894	3,501,288

* Current consumption of 252 gpd (This is based on county average usage)
Source: Rutherford & Associates

Table 4-20: Projected Water Demand (in gallons)		
	Unincorporated County	
Year	Population	Water Demand*
2000	14,180	3,573,360
2005	14,909	3,757,068
2010	15,678	3,950,856
2015	16,417	4,137,084
2020	17,256	4,348,512
2025	18,117	4,565,484
2030	18,996	4,786,992
2035	19,750	4,977,000
2040	20,565	5,182,380
2045	21,187	5,339,124
2050	21,797	5,492,844

* Current consumption of 252 gpd
(This is based on county average usage)
Source: Rutherford & Associates

Monthly average & maximum day use for each month, peak summer/winter consumption
It is unrealistic to project these numbers because of the multiple unknown factors, such as effectiveness of water conservation and water reuse measures, technological advancements, types of industry, etc.

3. *Industrial water demand projections*

Table 4-21 provides projections for water demand for industrial uses.

*Table 4-21: Projected Industrial Water Demand (MGD)**

2000	2010	2020	2030	2040	2050
.50	2.50	4.00	5.40	7.20	9.00

* Does not include Plant Vogtle groundwater use

Source: Rutherford & Associates

Industrial growth is a possible reality for Burke County when one considers the Georgia Ports Authority expansion, the widening of US Highway 25 and the close proximity of areas of the County to the Augusta and Statesboro areas. Areas of the County north of Waynesboro are in close proximity to Augusta. Land costs, work force, and proximity to markets or export areas make Burke County a contender for industrial expansion. Efforts of the County Commission, the Development Authority, and the Chamber of Commerce will be critical to the County's success as an industrial site. Industries to be served will include the current NAICS industries of Plant Vogtle 221113 and McBean Woodyard 113310.

Monthly average & maximum day use for each month, peak summer/winter consumption

It is unrealistic to project these numbers because of the multiple unknown factors, such as effectiveness of water conservation and water reuse measures, technological advancements, types of industry, etc.

Water conservation measures to be employed

There are many possibilities for water conservation as technology continues to develop. Possibilities exist for recycling of process water, water reuse opportunities, and improvements in overall production that may result in lower requirements for water.

4. *Agricultural Water Demand Projections*

Table 4-22 shows projections for single-crop and double-crop agricultural uses from 2000 through 2050. The table also projects the different acreage in single crop and double crop production.

Table 4-22: Burke County

Agricultural Water Demand for Single and Double Crop Use

Year	Single crop acres[1]	Water Use (MGD)	Double crop acres[2]	Water Use (MGD)	Total Daily Use (MGD)
2000	27,710	20.561	840	1.119	21.680
2005	28,050	20.813	950	1.265	22.079
2010	29,300	21.741	1,200	1.598	23.339
2015	29,800	22.112	1,450	1.931	24.043
2020	30,550	22.668	1,700	2.264	24.933
2025	31,550	23.410	2,000	2.664	26.074
2030	32,300	23.967	2,000	2.664	26.631
2035	33,550	24.894	2,500	3.330	28.224
2040	34,125	25.321	3,625	4.829	30.149
2045	35,875	26.619	4,125	5.495	32.114
2050	38,750	28.753	3,500	4.662	33.415

[1] 10 inches irrigation for 120 day growing season= 742 gals/acre/day

[2] 18 inches irrigation for 270 day growing season=1332 gals/acre/day.

Source: Burke County Agricultural Extension Office; Rutherford & Associates

Some new uses for groundwater in agricultural practices include aquaculture (catfish farming) and vegetable crops. Kenaf, a fibrous crop that is a possible substitute for pulp trees, is being examined at the University of Georgia experimental stations. A new hybrid grain, pearl millet, is being considered as a crop that is drought-tolerant.

Aquaculture

In 1980, over 2,000 acres of ponds were used in commercial catfish production in Georgia. Farmers in Burke County have expressed an interest in catfish farming. Catfish farming requires a warm water environment for good growth. Optimum temperature is 85 degrees Fahrenheit. South Georgia has about 250 days when the water is above 60 degrees Fahrenheit. Ponds can be any size depending upon projected stocking rates. Depth of the water plays no part in determining the stock rate.

Pond sizes of approximately 10 acres seem to be the easiest to work and control water quality issues. A pond of 10 acres averaging 5 feet in depth will require approximately 16.3 million gallons of water.[2] Water has to be added to the ponds periodically to replace

[2] 5 ft. = 326,000 acres ft. x 5 ft. = 1,630,000 x 10 = 16,300,000 gallons

water lost to evaporation. Assuming a one-inch loss of water per week to evaporation, approximately 3,847 gallons a day per acre would be required to maintain the original depth.[3] This does not include the water needed to initially fill the pond. The Burke County Cooperative Extension Service office has estimated that 1,250 acres of catfish farms could be in existence by 2050.

Kenaf

Kenaf is being tested at several of the University of Georgia College of Agriculture and Environmental Science Branch Experiment stations. Kenaf is a tree-free paper made from a plan related to cotton and okra. Its historical roots go back thousands of years to ancient Africa, the Middle East, and Asia. The United States Department of Agriculture became interested in this environmentally-friendly source of paper pulp during the 1940s and early '50s when paper usage in the U.S. nearly doubled. To meet the demand, forest were being logged at a tremendous rate, so the USDA began looking for a non-wood alternative. After much research, the agency decided that kenaf was the best choice.

Kenaf compares favorably in quality with trees as a source of fibers for paper, and it yields more fiber per acre than southern pines grown in tree plantations. While trees can take 20 to 25 years to reach maturity, kenaf can be harvested in just five months. Another advantage of growing this tree-free substitute is that it is naturally resistant to most pests and disease. The plant crowds out weeds, reducing the need for herbicides.

Using kenaf as a source of paper pulp can help save natural resources and the energy needed to produce wood-based paper. In addition, it reduces pollution, and substituting it for tree fibers helps to preserve wildlife habitats that are lost in logging.

Pearl Millet

Pearl millet is a grain crop common to Africa and India. Pearl millet, a member of the grass family, grows in heights ranging from 3 to 16 feet. It produces a long, dark spike, resembling a cattail, which holds hundreds of small blue or white grains resembling pearls. There are two types of pearl millet. One type produces grain and the other produces forage for cattle. Farmers in semi-arid parts of India and west Africa grow 64 million acres of pearl millet. Fifty million acres are for food, making it the world's fourth most important tropical food cereal.

Pearl millet might be an alternative to soybeans and corn, which to meet the demand in Georgia, have to be imported from the Midwest. The Georgia poultry industry consumption of soybeans is more than 15 times the amount grown in Georgia. Pearl millet could become a new cash crop for Georgia farmers and could ultimately reduce irrigation needs for farms in the future.

Vegetable farming

Vegetable farming is moving from Florida to Georgia. South Georgia enjoys similar climate

[3] 1 inch = 27,000 gallons/week x 52 weeks/year = 1,404,000/year = 3,847 gallons/day

to that of Florida. With irrigation, vegetable farming can be very productive and profitable for the farmers. In most cases, the farmers can get two vegetable crops a year with a growing season of approximately 270 days. Vegetable farming will become a large irrigation use in the future.

Acres per crop and water usage per crop data are shown in Table 14-23.

Table 14-23: Acres per Crop and Water Use (MGD) per Crop: 2000 - 2050

	2000		2005		2010		2015		2020		2025	
	Acres	*Water Use*	*Acres*	*Water Use*	*Acres*	*Water Use*	*Acres*	*Water Use*	*Acres*	*Water Use*	*Acres*	*Water Use*
Corn	4,500	3.339	4,500	3.339	5,000	3.710	5,000	3.710	5,000	3.710	5,500	4.081
Cotton	14,000	10.385	14,000	10.388	14,500	10.759	14,500	10.759	15,000	11.130	15,500	11.501
Peanuts	4,500	3.339	4,500	3.339	4,750	3.524	4,800	3.561	4,800	3.561	4,800	3.561
Soybeans	700	0.932	650	0.866	700	0.932	700	0.932	700	0.932	1,000	1.332
Vegetables	150	0.200	300	0.400	500	0.666	750	0.999	1,000	1.332	1,000	1.332
Pecans	2,700	2.003	2,800	2.077	2,800	2.077	3,000	2.226	3,000	2.226	3,000	2.226
Pasture	2,000	1.484	2,250	1.669	2,250	1.669	2,500	1.855	2,750	2.040	2,750	2.040
TOTAL	28,550	21.682	29,000	22.078	30,500	23.337	31,250	24.042	32,250	24.931	33,550	26.073

Acres per Crop and Water Use (MGD) per Crop: 2000 - 2050 (Cont.)

	2030		2035		2040		2045		2050	
	Acres	*Water Use*	*Acres*	*Water Use*	*Acres*	*Water Use*	*Acres*	*Water Use*	*Acres*	*Water Use*
Corn	5,500	4.081	6,000	4.452	6,500	4.823	7,000	5.194	7,500	5.565
Cotton	16,000	11.872	16,500	12.243	17,000	12.614	17,500	12.985	18,000	13.356
Peanuts	4,800	3.561	4,800	3.561	5,000	4.081	5,000	4.081	6,000	4.452
Soybeans	1,000	1.332	1,500	1.998	2,000	2.664	2,500	3.330	2,500	3.330
Vegetables	1,000	1.332	1,000	1.332	1,000	1.332	1,000	1.332	1,000	1.332
Pecans	3,000	2.226	3,000	2.226	3,000	2.226	3,500	2.597	3,500	2.597
Pasture	3,000	2.226	3,250	2.411	3,250	2.411	3,500	2.597	3,750	2.782
TOTAL	34,300	26.630	36,050	28.223	37,750	30.151	40,000	32.116	42,250	33.414

Vegetables include cucumbers, squash, tomatoes, peppers, watermelons, and cantaloupes. Acreage of vegetable crops will be determined by market and other economic conditions.

Source: Burke County, Rutherford & Associates

Table 6-8 shows water use projections for agriculture, forestry and aquaculture.

Table 6-8: Burke County
Water Demand For Agricultural and Forestry Uses
Year 2000 to 2050

Year	Agriculture [1]		Forest [2]		Aquaculture [3]		Total Water Use (MGD)
	Acres	Water (MGD)	Acres	Water (MGD)	Acres	Water (MGD)	
2000	28,550	21.68	200	0.089	200	0.769	22.538
2005	2,900	22.079	500	0.222	250	0.962	23.263
2010	30,500	23.339	800	0.355	300	1.154	24.848
2015	31,250	24.043	1,200	0.533	425	1.635	26.211
2020	32,250	24.933	1,500	0.666	575	2.212	27.811
2025	33,550	26.074	1,800	0.799	750	2.885	29.758
2030	34,300	26.631	2,000	0.888	850	3.270	30.789
2035	36,050	28.224	2,500	1.110	1000	3.847	33.181
2040	37,750	30.149	3,000	1.332	1200	4.616	36.097
2045	40,000	32.114	3,500	1.554	1350	5.193	38.861
2050	42,250	33.415	4,000	1.776	1500	5.771	40.962

[1] Irrigation uses include single and double crop production: 120 days single crop; 270 days double crop.
[2] 6 inches irrigation for forestry use=444 gals/acre/day.
[3] To replace water loss due to evaporation, 1" loss/week (27,000 gallons/acre/week) converted to daily need (3,857 gallons/acre/day). Water needed to initially fill the ponds is not included.
Source: Rutherford & Associates

Water conservation measures to be employed

Water conservation measures will have to be employed in order to maintain reasonable use of the Floridan aquifer as a primary source of water. The county will have to develop a countywide conservation program for domestic and commercial usage. The county will have to work with local industries to assist them in efforts to reduce water usage. The agricultural community with support from the county will have to study and implement conservation practices as those discussed in the EPD report entitled *Irrigation Conservation Practices Appropriate for the Southeastern United States.*

V. WATER SUPPLY AND SYSTEMS MANAGEMENT

A. Present Water Supply and Systems Management

1. Groundwater supply sources

The northern portion of Burke County lies over the Cretaceous aquifer. All the municipalities within Burke County utilize the Floridan aquifer. However, the City of Waynesboro also utilizes the Cretaceous aquifer and surface water from Brier Creek. Individual private wells are supplied by the Floridan aquifer. The 12 Safe Drinking Water Permit systems in the county are supplied by the Floridan aquifer or the Cretaceous aquifer. Each municipality in the county has a water system. The water and sewer service areas of each municipality are shown on the maps in Appendix A.

The County does not presently own or operate a water system. The County should begin discussions with the cities to best determine how and when water service can be offered to citizens or industrial prospects.

The United States Geologic Survey (USGS) has conducted numerous studies of the Floridan aquifer system in Southeast Georgia. These studies are made available to the Georgia Environmental Protection Division (EPD) for their review. Water quality is good for the Floridan aquifer system as used in Screven County. Numerous studies, relied on for sources in development of this plan, indicate that water quality is not an issue. All public water systems are required to complete Consumer Confidence Reports (CCR). The CCR was mandated by the U.S. Environmental Protection Agency and contains information on the quality of drinking water provided by the public systems.

The Georgia Department of Natural Resources Environmental Protection Division (EPD) is the state agency that has statutory authority to regulate water use through a permitting system. This system requires permits for all withdrawals of surface water or groundwater that exceed 100,000 gallons per day. EPD issues Safe Drinking water permits for systems withdrawing less than 100,000 gallons per day.

It became apparent that some limitations on additional withdrawal from the Floridan Aquifer system were appropriate in some parts of Coastal Georgia to protect the quality of public water supplies. The Interim Strategy was developed and implemented to address these issues and to study the safe yield of groundwater sources through the Sound Science Initiative. Until the Sound Science Initiative concludes, the safe yield of groundwater sources cannot be determined or planned for by local governments.

Wellhead protection programs are critical to reduce the potential to impact groundwater quality. The county in partnership with the County Health Department should make sure that all wells in service in the county are part of a wellhead protection program.

The existing permitted systems have the capabilities to exceed their permitted withdrawal amount. However, since a permit exists for each system, the likelihood of exceeding the permit is minimal.

2. *Surface water supply sources*

Approximately 64 of the 115 agricultural withdrawal permits utilize a surface source, as is reported in EPD records, such as a pond, tributary of 8-mile Creek, Brier Creek or the Savannah River. The City of Waynesboro operates the County's only surface water treatment plant at Brier Creek about 5 miles northeast of the City on State Route 56. Water Supply Watershed criteria are in effect for this area.

The Savannah River could be utilized as a water supply option. However, the cost of treatment and distribution could be limiting. The opportunity for a major reservoir to be constructed in the future by municipalities and the agricultural sector could present a solution for both public and private users. Information on possible withdrawal amounts from the Savannah River is available from EPD. However, the safe yield of the river would have to be determined after consultation with the U.S. Army Corps of Engineers and the EPD.

A surface water withdrawal permit is needed to utilize water from any of the state's many surface sources. Information concerning safe yield and water quality could be obtained.

As to source protection measures for surface water, many communities are now or will soon be required to meet certain stormwater discharge criteria. The quality of surface streams can be negatively impacted by poor stormwater management practices. This is an area that rural counties will begin addressing in the near future.

Any public water systems utilizing surface water in the future would have a system capabilities analysis at that time.

The County, in coordination with the cities and farmers, need to petition the state and federal government to re-examine the possibilities of impoundment construction. The U.S. Army Corps of Engineers will be a lead player in this endeavor along with the USDA's Natural Resources Conservation Service (NRCS) to study impacts of impoundment and possible site locations.

Impoundments could be a major conservation tool since significant rainfall occurs during non-growing months. The capture of this rainfall could provide a supplemental source of water for irrigation. Furthermore, treated effluent from the wastewater treatment plants could potentially discharge directly to impoundments, thus eliminating a point source discharge into rivers while providing irrigation water for agriculture. This effluent may require higher standards for agricultural use, depending on the crop.

3. Present water supply intergovernmental cooperation

There are no intergovernmental water supply agreements. All the municipalities are located such a distance from each other that interconnection is not possible at this time. As the county grows, it is possible that Waynesboro may have the opportunity for expanded service outside its corporate limits, as growth will probably occur along US Highway 25 as it is expanded to four lanes from Statesboro to Millen and Waynesboro.

4. Water Supply Capabilities

The City of Waynesboro has a total water supply capacity, surface water and groundwater, of 3.5 million gallons per day. Midville has a capacity of .288 million gallons per day. Sardis has a capacity of .200 million gallons per day. The cities of Girard, Keysville, and Vidette have capacities of less that .100 million gallons per day each.

B. Future Water Supply and Systems Management

Overall water quality data from the Cretaceous, Dublin, and Midville aquifers is not completely known. The safe yield and quality will have to be determined through studies. Wellhead protection programs and other source protection programs will be needed.

1. Groundwater supply options

It is anticipated that Burke County and its municipalities will develop the Cretaceous aquifer system to supplement the Floridan aquifer as their primary source of water. The Cretaceous aquifer may serve as a viable source of water to reduce the County's overall dependence on the Floridan aquifer. The Dublin and Midville aquifers may provide some limited amount of supply. However, it is important to continue to study the alternative aquifers prior to becoming dependent on them only to find that there may be a problem.

It is very likely that Waynesboro will extend water and sewer services outside its corporate limits to meet future water and wastewater demands. Depending on the location of new growth, the smaller cities in the county without wastewater treatment capabilities may have to construct small wastewater systems. Waynesboro will need to continue to upgrade its wastewater collection system to reduce inflow and infiltration (I/I) during storm events. The wastewater capacity saved from I/I reductions can be used for new customers.

2. Surface water supply options

Additional surface water sources may be developed from Brier Creek or the Savannah River. However, the cost of treatment and distribution could be limiting. The opportunity for a major reservoir to be constructed in the future by municipalities and the agricultural sector could present a solution for both public and private users. The safe yield of the Savannah River would have to be determined after consultation with the U.S. Army Corps of Engineers and the EPD.

The County, in coordination with the cities, and farmers need to petition the state and federal government to re-examine the possibilities of impoundment construction. The U.S. Army Corps of Engineers will be a lead player in this endeavor along with the USDA's Natural Resources Conservation Service (NRCS) to study impacts of impoundment and possible site locations.

Impoundments could be a major conservation tool since significant rainfall occurs during non-growing months. The capture of this rainfall could provide a supplemental source of water for irrigation. Furthermore, treated effluent from the wastewater treatment plants could potentially discharge directly to impoundments, thus eliminating a point source discharge into rivers while providing irrigation water for agriculture. This effluent may require higher standards for agricultural use, depending on the crop.

As to source protection measures for surface water, many communities are now or will soon be required to meet certain stormwater discharge criteria. The quality of surface streams can be negatively impacted by poor stormwater management practices. This is an area that rural counties will begin addressing in the near future. Another source protection measure may include a watershed protection strategy as required by EPD.

VI. FUTURE LAND USE

Future land uses for each jurisdiction in Burke County are depicted in Tables 6-1 through 6-8. One basic assumption that the reader must keep in mind is that the acres within a particular jurisdiction will not change. In other words, no annexations by local cities were calculated.

The tables show the increase in acres for a particular land use, such as residential, to cover new homes constructed and commercial to show more acres being utilized as commercial use as the population increases and so forth. Of course, as more development occurs, the property identified as vacant/undeveloped will decrease. In some cases, agricultural/forestry land will decrease also.

Review of the Burke County Current Land Use Map (in Appendix A) shows the vast amount of agricultural/forestry land in the County and the opportunities for new growth.

Total acres in the county equal 532,992.

Table 6-1: Distribution of Land Uses for Girard for 2000 - 2050

	2000			2025				2050			
	Population	216		Population	329			Population	434		
	Households	83		Households	127			Households	167		
	Total Acres	2,058		Total Acres	2,058			Total Acres	2,058		
Land Use Type	*Acres*	*Acres per Household*	*Percent Land Area*	*Acres*	*Acres per Household*	*Percent Land Area*	*Change in Acres*	*Acres*	*Acres per Household*	*Percent Land Area*	*Change in Acres*
Residential	126	1.518	6.12%	170	1.339	8.26%	44	210	1.257	10.20%	40
Commercial	4	0.050	0.20%	6	0.050	0.31%	2	10	0.060	0.49%	4
Industrial	0	0.000	0.00%	9	0.070	0.43%	9	13	0.080	0.65%	4
Vacant/ Undeveloped	443	5.336	21.52%	379	2.981	18.40%	-64	323	1.933	15.69%	-56
Recreation/ Open Space	3	0.040	0.16%	6	0.050	0.31%	3	8	0.050	0.41%	2
Trans/Comm/ Utilities	6	0.070	0.28%	9	0.070	0.43%	3	12	0.070	0.57%	3
Public/ Semi-Public	6	0.070	0.28%	9	0.070	0.43%	3	12	0.070	0.57%	3
Agricultural/ Forestry	1470	17.711	71.43%	1470	11.575	71.43%	0	1470	8.802	71.43%	0

Source: Rutherford & Associates from data in Burke County Comprehensive Plan, 1990 - 2010

Table 6-2: Distribution of Land Uses for Keysville for 2000 - 2050

	2000			2025				2050			
	Population	415		Population	1,384			Population	2475		
	Households	160		Households	532			Households	952		
	Total Acres	486		Total Acres	486			Total Acres	486		
Land Use Type	*Acres*	*Acres per Household*	*Percent Land Area*	*Acres*	*Acres per Household*	*Percent Land Area*	*Change in Acres*	*Acres*	*Acres per Household*	*Percent Land Area*	*Change in Acres*
Residential	223	1.394	45.88%	335	0.629	68.85%	112	398	0.418	81.81%	63
Commercial	5	0.030	0.99%	11	0.020	2.19%	6	19	0.020	3.92%	8
Industrial	1	0.005	0.16%	3	0.005	0.62%	2	7	0.000	1.44%	4
Vacant/ Undeveloped	153	0.956	31.47%	43	0.081	8.82%	-110	21	0.022	4.26%	-22
Recreation/ Open Space	1	0.005	0.16%	3	0.005	0.55%	2	5	0.005	0.98%	2
Trans/Comm/ Utilities	1	0.008	0.26%	4	0.008	0.88%	3	8	0.008	1.57%	4
Public/ Semi-Public	2	0.015	0.49%	8	0.015	1.64%	6	14	0.015	2.94%	6
Agricultural/ Forestry	100	0.625	20.58%	80	0.150	16.46%	-20	15	0.016	3.09%	-65

Source: Rutherford & Associates from data in Burke County Comprehensive Plan, 1990 - 2010

Table 6-3: Distribution of Land Uses for Midville for 2000 - 2050

	2000			2025				2050			
	Population 587 Households 226 Total Acres 1,423			Population 943 Households 363 Total Acres 1,423				Population 1443 Households 551 Total Acres 1,423			
Land Use Type	*Acres*	*Acres per Household*	*Percent Land Area*	*Acres*	*Acres per Household*	*Percent Land Area*	*Change in Acres*	*Acres*	*Acres per Household*	*Percent Land Area*	*Change in Acres*
Residential	160	0.708	11.24%	297	0.818	20.87%	137	485	0.880	34.08%	188
Commercial	7	0.030	0.48%	11	0.030	0.77%	4	17	0.030	1.16%	6
Industrial	1	0.005	0.08%	3	0.000	0.21%	2	7	0.000	0.49%	4
Vacant/ Undeveloped	1146	5.071	80.54%	998	2.748	70.10%	-148	792	1.438	55.69%	-206
Recreation/ Open Space	5	0.020	0.32%	7	0.020	0.51%	2	11	0.020	0.77%	4
Trans/Comm/ Utilities	2	0.010	0.16%	4	0.010	0.26%	2	6	0.010	0.39%	2
Public/ Semi-Public	2	0.010	0.16%	4	0.010	0.26%	2	6	0.010	0.39%	2
Agricultural/ Forestry	100	0.442	7.03%	100	0.275	7.03%	0	100	0.181	7.03%	0

Source: Rutherford & Associates from data in Burke County Comprehensive Plan, 1990 - 2010

Table 6-4: Distribution of Land Uses for Sardis for 2000 - 2050

	2000			2025				2050			
	Population 1,432 Households 551 Total Acres 807			Population 2,244 Households 863 Total Acres 807				Population 3,126 Households 1,202 Total Acres 807			
Land Use Type	*Acres*	*Acres per Household*	*Percent Land Area*	*Acres*	*Acres per Household*	*Percent Land Area*	*Change in Acres*	*Acres*	*Acres per Household*	*Percent Land Area*	*Change in Acres*
Residential	320	0.581	39.65%	476	0.552	58.98%	156	588	0.489	72.85%	112
Commercial	6	0.010	0.68%	9	0.010	1.07%	3	36	0.030	4.47%	27
Industrial	3	0.005	0.34%	3	0.005	0.37%	0	7	0.000	0.87%	4
Vacant/ Undeveloped	355	0.644	44.00%	187	0.216	23.12%	-168	50	0.042	6.24%	-136
Recreation/ Open Space	3	0.005	0.34%	4	0.005	0.53%	2	6	0.005	0.74%	2
Trans/Comm/ Utilities	4	0.008	0.55%	7	0.008	0.86%	2	10	0.008	1.19%	3
Public/ Semi-Public	17	0.030	2.05%	22	0.025	2.67%	2	30	0.025	3.72%	8
Agricultural/ Forestry	100	0.181	12.39%	100	0.116	12.39%	0	80	0.067	9.91%	-20

Source: Rutherford & Associates from data in Burke County Comprehensive Plan, 1990 - 2010

Table 6-5: Distribution of Land Uses for Vidette for 2000 - 2050

	2000			2025				2050			
	Population 107 Households 41 Total Acres 532			Population 198 Households 76 Total Acres 532				Population 261 Households 100 Total Acres 532			
Land Use Type	*Acres*	*Acres per Household*	*Percent Land Area*	*Acres*	*Acres per Household*	*Percent Land Area*	*Change in Acres*	*Acres*	*Acres per Household*	*Percent Land Area*	*Change in Acres*
Residential	54	1.317	10.15%	80	1.056	15.08%	26	92	0.923	17.34%	12
Commercial	4	0.100	0.77%	6	0.080	1.14%	2	9	0.090	1.69%	3
Industrial	0	0.000	0.00%	0	0.000	0.00%	0	0	0.000	0.00%	0
Vacant/ Undeveloped	23	0.559	4.31%	10	0.134	1.91%	-13	12	0.118	2.21%	2
Recreation/ Open Space	3	0.080	0.62%	5	0.070	1.00%	2	7	0.070	1.32%	2
Trans/Comm/ Utilities	7	0.160	1.23%	8	0.100	1.43%	1	12	0.120	2.26%	4
Public/ Semi-Public	6	0.150	1.16%	8	0.100	1.43%	2	10	0.100	1.88%	2
Agricultural/ Forestry	435	10.610	81.77%	415	5.461	78.01%	-20	390	3.900	73.31%	-25

Source: Rutherford & Associates from data in Burke County Comprehensive Plan, 1990 - 2010

Table 6-6: Distribution of Land Uses for Waynesboro for 2000 - 2050

	2000			2025				2050			
	Population	6,237		Population	9,730			Population	13,894		
	Households	2,399		Households	3742			Households	5,344		
	Total Acres	3,373		Total Acres	3,373			Total Acres	3,373		
Land Use Type	*Acres*	*Acres per Household*	*Percent Land Area*	*Acres*	*Acres per Household*	*Percent Land Area*	*Change in Acres*	*Acres*	*Acres per Household*	*Percent Land Area*	*Change in Acres*
Residential	1010	0.421	29.94%	1547	0.413	45.87%	537	2028	0.379	60.12%	481
Commercial	336	0.140	9.96%	374	0.100	11.09%	38	454	0.085	13.47%	80
Industrial	300	0.125	8.89%	318	0.085	9.43%	18	331	0.062	9.82%	13
Vacant/ Undeveloped	1223	0.510	36.27%	590	0.158	17.50%	-633	112	0.021	3.33%	-478
Recreation/ Open Space	24	0.010	0.71%	37	0.010	1.11%	13	53	0.010	1.58%	16
Trans/Comm/ Utilities	48	0.020	1.42%	60	0.016	1.78%	12	80	0.015	2.38%	20
Public/ Semi-Public	192	0.080	5.69%	206	0.055	6.10%	14	214	0.040	6.34%	8
Agricultural/ Forestry	240	0.100	7.11%	240	0.064	7.12%	0	100	0.019	2.96%	-140

Source: Rutherford & Associates from data in Burke County Comprehensive Plan, 1990 - 2010

Table 6-7: Distribution of Land Uses for Unincorporated Burke County for 2000 - 2050

	2000			2025				2050			
	Population 14,180 Households 5,454 Total Acres 524,313			Population 18,117 Households 6,968 Total Acres 524,313				Population 21,797 Households 8,383 Total Acres 524,313			
Land Use Type	*Acres*	*Acres per Household*	*Percent Land Area*	*Acres*	*Acres per Household*	*Percent Land Area*	*Change in Acres*	*Acres*	*Acres per Household*	*Percent Land Area*	*Change in Acres*
Residential	30,000	5.50	5.72%	33,028	4.740	6.30%	3,028	35,151	4.193	6.70%	2123
Commercial	436	0.08	0.08%	488	0.070	0.09%	52	503	0.060	0.10%	15
Industrial	404	0.07	0.08%	530	0.076	0.10%	126	671	0.080	0.13%	141
Vacant/ Undeveloped	73,259	13.43	13.97%	69,183	9.929	13.19%	-4,076	68,984	8.229	13.16%	-199
Recreation/ Open Space	12,108	2.22	2.31%	13,588	1.950	2.59%	1,480	15,089	1.800	2.88%	1501
Trans/Comm/ Utilities	8,454	1.55	1.61%	11,009	1.580	2.10%	2,556	13,329	1.590	2.54%	2320
Public/ Semi-Public	382	0.07	0.07%	488	0.070	0.09%	106	587	0.070	0.11%	99
Agricultural/ Forestry	399,271	73.21	76.15%	396,000	56.831	75.53%	-3,271	390,000	46.523	74.38%	-6000

Source: Rutherford & Associates from data in Burke County Comprehensive Plan, 1990 - 2010

Table 6-8: Distribution of Land Uses for Burke County (Total) for 2000 - 2050

	2000			2025				2050			
	Population 23,174 Households 8,913 Total Acres 532,992			Population 32,945 Households 12,671 Total Acres 532,992				Population 43,420 Households 16,700 Total Acres 532,992			
Land Use Type	*Acres*	*Acres per Household*	*Percent Land Area*	*Acres*	*Acres per Household*	*Percent Land Area*	*Change in Acres*	*Acres*	*Acres per Household*	*Percent Land Area*	*Change in Acres*
Residential	31,893	3.58	0.060	35,933	2.84	0.067	4,040	38,952	2.33	0.073	3,019
Commercial	798	0.09	0.001	905	0.07	0.002	107	1,048	0.09	0.002	143
Industrial	709	0.08	0.001	866	0.07	0.002	157	1,036	0.08	0.002	170
Vacant/ Undeveloped	76,600	8.59	0.144	71,387	5.63	0.134	-5,213	70,292	4.21	0.132	-1,095
Recreation/ Open Space	12,147	1.36	0.023	13,650	1.08	0.026	1,503	15,179	1.36	0.028	1,529
Trans/Comm/ Utilities	8,522	0.96	0.016	11,101	0.88	0.021	2,579	13,457	0.96	0.025	2,356
Public/ Semi-Public	607	0.07	0.001	745	0.06	0.001	138	873	0.07	0.002	128
Agricultural/ Forestry	401,716	45.07	0.754	398,405	31.44	0.747	-3,311	392,155	23.48	0.736	-6,250

Source: Rutherford & Associates from data in Burke County Comprehensive Plan, 1990 - 2010

VII. WASTEWATER TREATMENT AND DISPOSAL

A. Present Wastewater Treatment and Disposal

There is no public sewer system in the unincorporated county. The cities of Girard, Keysville, and Midville do not currently own or operate a public sewer system.

1. Wastewater Systems with Discharges (NPDES)

The City of Waynesboro operates a 2.0 million gallon per day extended aeration treatment facility with effluent discharge to McIntosh Creek, a tributary of Brier Creek. The plant, in year 2000, is operating at about 50% of capacity. The average daily flow is .978 to 1.0 million gallons per day. Domestic wastewater flow rates are indicated in Table 7-1.

Table 7-1: Wastewater Treatment (Domestic) by the City of Waynesboro, 1990 – 1999

Year	Population	Water Use (MGD)	Wastewater Flow (MGD)[1]
1990	6,056	.908	.726
1995	6,146	.922	.738
1999	6,219	.935	.748

[1] Wastewater flow equals 80% of water use

The City of Waynesboro provides wastewater treatment for the different small businesses located in the city.

The City of Sardis operates public sewer collection and treatment facilities. The facility includes a one-half acre oxidation pond and one-half acre created wetland-polishing system, which discharges into Brier Creek. No pretreatment is utilized. The City's permit is .150 million gallons per day. Wastewater flows are indicated in Table 7-2.

Table 7-2: Wastewater Treatment by the City of Sardis, 1990 - 1999

Year	Population	Water Use (MGD)	Wastewater Flow (MGD)[1]
1990	1,339	.201	.161
1995	1,386	.208	.166
1999	1,423	.214	.171

[1] Wastewater flow equals 80% of water use

There are no privately owned wastewater treatment facilities in the County.

2. *Wastewater Systems with Land Application Systems (LAS)*

There are currently no land application systems in operation anywhere in the County.

3. *Water Reuse Systems*

There are currently no water reuse systems in operation anywhere in the County.

4. *Individual On-site Disposal Systems*

The majority of residents in the County utilize septic systems for wastewater treatment. Flow rates are indicated in Table 7-3.

Table 7-3: Wastewater Treatment by the Cities of Girard, Keysville, Midville, Vidette and Unincorporated County, 1990 - 1999

Year	Population	Water Use (MGD)	Wastewater Flow (MGD)[1]
1990	14,070	2.110	1.688
1995	14,580	2.188	1.750
1999	15,498	2.264	1.811

[1] Wastewater flow equals 80% of water use

B. Future Wastewater Treatment and Disposal

1. *Future domestic/commercial wastewater demand projections*

Future wastewater demand in Burke County will be handled by on-site treatment and disposal and by municipal sewer systems. The following tables indicate the projected amount of wastewater to be treated in the county. Table 7-4 projects wastewater flows from individual homes in the unincorporated county and the municipalities of Girard, Keysville, Midville, and Vidette. Tables 7-5 and 7-6 show projected wastewater flows for Sardis and Waynesboro. It should be remembered that projected wastewater flow is a function of water use (wastewater equal to 80 percent of water use). Tables 7-4 through 7-6 reflect projected wastewater flow based on both current trends (252 gallons per person per day) and with conservation methods. Per capita water use decreases each year with conservation measures. These figures can be seen in Table 8-1.

Table 7-4: Onsite Wastewater Treatment and Disposal
Population Served (including community systems and private on-site treatment)
Unincorporated County, Girard, Keysville, Midville, and Vidette

			Current Trends [2]		With Conservation Measures [4]	
Year	Population	Households [1]	Water Use (MGD)	Wastewater Flow (MGD) [3]	Water Use (MGD)	Wastewater Flow (MGD) [3]
2000	15,505	5,963	3.907	3.126	3.907	3.126
2005	16,520	6,354	4.163	3.330	3.882	3.106
2010	17,537	6,745	4.419	3.535	3.858	3.087
2015	18,637	7,168	4.697	3.757	3.727	2.982
2020	19,738	7,592	4.974	3.979	3.652	2.921
2025	21,031	8,089	5.300	4.240	3.680	2.944
2030	22,204	8,540	5.595	4.476	3.664	2.931
2035	23,319	8,969	5.876	4.701	3.614	2.892
2040	24,434	9,398	6.157	4.926	3.543	2.834
2045	25,447	9,787	6.413	5.130	3.435	2.748
2050	26,400	10,154	6.653	5.322	3.300	2.640

[1] 2.6 persons per household
[2] Water consumption based on 252 gallons per person
[3] Wastewater flow is equal to 80% of water used
[4] Conservation programs developed and implemented to achieve reduced per capita use of 125 gpd in 2050.
Source: Rutherford & Associates

Table 7-5: Wastewater Treatment and Disposal by
The City of Sardis

			Current Trends [2]		With Conservation Measures [4]	
Year	Population	Households [1]	Water Use (MGD)	Wastewater Flow (MGD) [3]	Water Use (MGD)	Wastewater Flow (MGD) [3]
2000	1,432	551	0.139	0.111	0.361	0.289
2005	1,569	603	0.152	0.122	0.369	0.295
2010	1,705	656	0.165	0.132	0.375	0.300
2015	1,864	717	0.181	0.145	0.373	0.298
2020	2,022	778	0.196	0.157	0.374	0.299
2025	2,244	863	0.217	0.174	0.393	0.314
2030	2,467	949	0.239	0.191	0.407	0.326
2035	2,635	1,013	0.255	0.204	0.408	0.327
2040	2,802	1,078	0.272	0.217	0.406	0.325
2045	2,964	1,140	0.287	0.230	0.400	0.320
2050	3,126	1,202	0.303	0.242	0.391	0.313

[1] 2.6 persons per household
[2] Water consumption based on 252 gallons per person
[3] Wastewater flow is equal to 80% of water used
[4] Conservation programs developed and implemented to achieve reduced per capita use of 125 gpd in 2050.
Source: Rutherford & Associates

Table 7-6: Wastewater Treatment and Disposal by The City of Waynesboro

			Current Trends [2]		With Conservation Measures [4]	
Year	Population	Households [1]	Water Use (MGD)	Wastewater Flow (MGD) [3]	Water Use (MGD)	Wastewater Flow (MGD) [3]
2000	6,237	2,399	1.572	1.257	1.572	1.257
2005	3,823	1,470	0.963	0.771	0.898	0.719
2010	7,408	2,849	1.867	1.493	1.630	1.304
2015	8,147	3,133	2.053	1.642	1.629	1.304
2020	8,887	3,418	2.240	1.792	1.644	1.315
2025	9,730	3,742	2.452	1.962	1.703	1.362
2030	10,573	4,067	2.664	2.132	1.745	1.396
2035	11,405	4,387	2.874	2.299	1.768	1.414
2040	12,237	4,707	3.084	2.467	1.774	1.419
2045	13,066	5,025	3.293	2.634	1.764	1.411
2050	13,894	5,344	3.501	2.801	1.737	1.389

[1] 2.6 persons per household
[2] Water consumption based on 252 gallons per person
[3] Wastewater flow is equal to 80% of water used
[4] Conservation programs developed and implemented to achieve reduced per capita use of 125 gpd in 2050.
Source: Rutherford & Associates

2. *Future industrial wastewater demand*

If new industries locate in the county, wastewater flow from industrial users will increase. Projections are shown in Table 8-5.

Table 8-5: Projected Industrial Wastewater Demand Treated by Waynesboro (MGD)

	2000	2010	2020	2030	2040	2050
Wastewater Flow	.250	.800	1.50	2.30	3.30	4.50

Source: Rutherford & Associates

Major industrial growth will create a much larger demand for wastewater treatment capacity. Waynesboro will probably have to expand its wastewater treatment plant to meet the projected increase in flow.

As the county and cities continue to grow and wastewater treatment is expanded and effluent quality improves, there will be opportunities for water reuse. These opportunities would most easily be met for domestic irrigation needs. However, there might be an industrial opportunity for reclaimed water to become part of the process water. Agricultural irrigation also provides an opportunity for water reuse.

VIII. PREFERRED WATER SUPPLY MANAGEMENT SCENARIO

A. Conservation/reduction/reuse measures

As the population of Burke County continues to grow, the demand on water resources will increase. Therefore, water conservation methods will become more important. Water conservation and reduction in water use can be achieved through educational efforts, maintenance of water distribution systems, and improvements in technology. Water reuse is already being utilized by some communities in Georgia and will likely become a reality in Burke County within the next fifty years.

Table 8-1 shows the projections of water use from 2000 through 2050 with implementation of water conservation, reduction, and reuse measures. The reader may compare these values with Table 4-16, which has been duplicated on the following page for the reader's convenience.

Table 8-1: Daily Water Demand Projections for Burke County with Conservation Measures, 2000 to 2050

Year	Population	Gallons Per Capita [1]	Domestic (MGD)	Industrial (MGD) [2]	Agricultural (MGD) [2]	Total Water Use (MGD)
2000	23,174	252	5.840	5.112	20.284	31.236
2005	24,912	235	5.854	5.623	20.937	32.414
2010	26,650	220	5.863	6.186	22.363	34.412
2015	28,648	200	5.730	6.048	20.969	32.746
2020	30,647	185	5.670	6.653	22.249	34.571
2025	32,945	175	5.765	7.318	23.806	36.889
2030	32,496	165	5.362	8.050	24.631	38.043
2035	37,359	155	5.791	8.854	26.545	41.190
2040	39,473	145	5.724	9.740	28.878	44.341
2045	41,477	135	5.599	10.714	31.089	47.403
2050	43,420	125	5.428	11.786	32.770	49.983

[1] Conservation programs developed and implemented to achieve projected per capita water use.
[2] Water use from 2000 – 2010 reduced 10%; use from 2015 – 2050 reduced 20%. Agricultural includes forestry and aquiculture.
Source: Rutherford & Associates

Table 4-16: Daily Water Demand Projections for Burke County

Without Water Conservation - 2000 to 2050

Year	*Population*	*Domestic (MGD)*	*Industrial (MGD)*	*Agricultural (MGD)*	*Total Water Use (MGD)*
2000	23,174	5.840	5.680	22.538	34.058
2005	24,912	6.278	6.248	23.263	35.789
2010	26,650	6.716	6.873	24.848	38.437
2015	28,648	7.219	7.560	26.211	40.990
2020	30,647	7.723	8.316	27.811	43.850
2025	32,945	8.302	9.147	29.758	47.207
2030	35,244	8.881	10.062	30.789	49.732
2035	37,359	9.414	11.068	33.181	53.663
2040	39,473	9.947	12.175	36.097	58.219
2045	41,447	10.445	13.393	38.861	62.699
2050	43,420	10.942	14.732	40.962	66.636

1997 total water usage reported in an EPD information circular 104 was 12.720 MGD.
(This excludes the 62.83 MGD surface water used for thermoelectric.)

1. Per capita usage is calculated at 252 gpd.
2. Industrial usage grows by 10% each five-year increment through year 2050.
3. Agricultural usage increases by acreage irrigated from 28,550 acres in 2000 to 42,250 in 2050. Agricultural includes forestry and aquiculture.

IX. IMPLEMENTATION SCHEDULE

A. 2000 –2010 implementation

- Revise this plan with new information from the Sound Science Initiative.
- Establish water conservation education programs at the county level.
- Begin study of the Cretaceous aquifer as an alternative or supplemental source for the Floridan aquifer.
- Study feasibility of impoundments for rainfall or reservoir for the Savannah River.
- Continue to work with farm community to promote conservation and best Management Practices for agricultural lands.
- Work closely with University of Georgia's agricultural programs to investigate different crops which are less water dependent.
- Examine opportunities for water reuse of the effluent from the City of Waynesboro.
- Encourage the location of non-water dependent industries.
- Develop and implement programs to achieve 5% water reduction in industrial and agricultural uses.
- Implement new technological irrigation advances. The County should coordinate these efforts with the farmers.
- Study the feasibility of expanded use of Brier Creek as a water supply source.
- Implement wellhead protection programs.

B. 2010 - 2020 implementation

- Prepare full update to water supply management plan.
- Continue to promote conservation efforts.
- Undertake the procurement of funds (grants or other) to construct impoundments.
- Examine opportunities for water reuse for the remainder of the county, including agriculture.
- Begin implementing the results of the alternative aquifer studies.
- Develop and implement programs to achieve 10% water reduction in industrial and agricultural uses.

C. 2020 - 2050 implementation

- Continue to promote conservation programs.
- Continue to investigate different crops for agricultural production.
- Develop and implement programs in 2030 to achieve 20% reduction in water use for industrial and agricultural users.
- Continue to review and update the Comprehensive Water Supply Management Plan.

X. APPENDICES

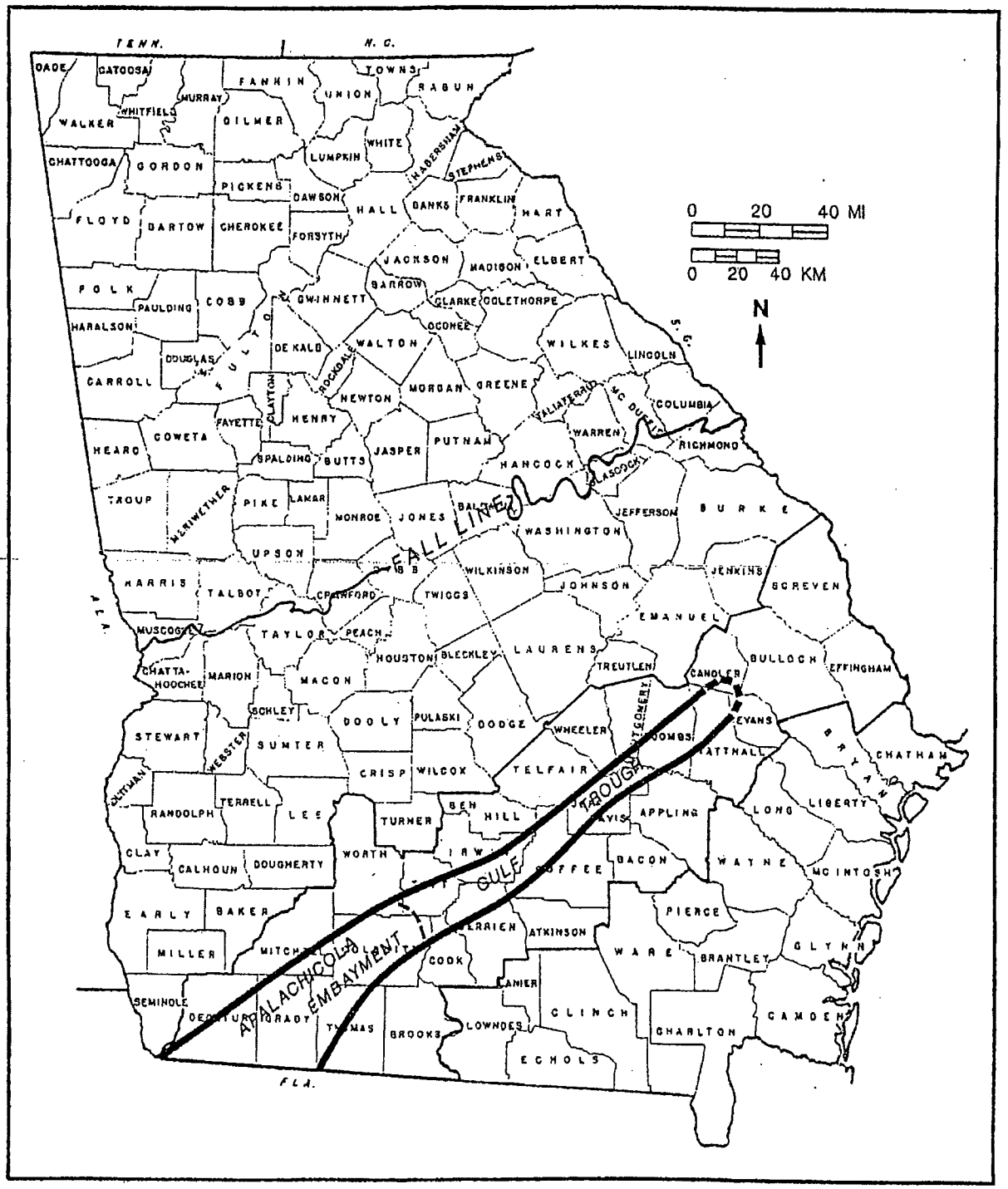
A. Maps

X. Appendices

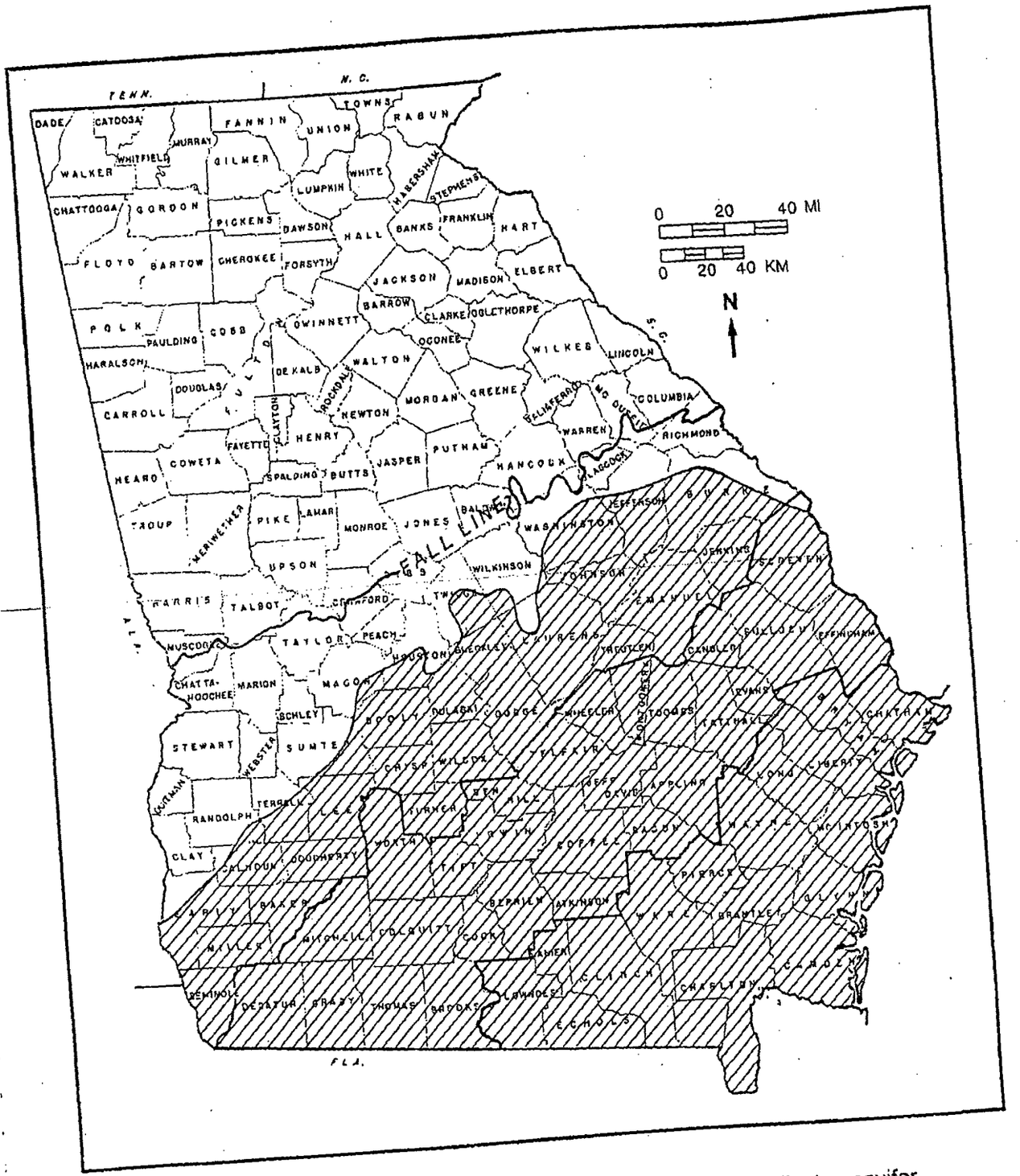
A. Maps

Location of the Gulf Trough
Geographic Extent of the Floridan Aquifer
Divisions of the Coastal Plain province
Cretaceous aquifer system
Dublin and Dublin-Midville Aquifer Systems
Burke County and Municipalities
Aquifer Recharge Areas in Burke County
Hydrology of Burke County
Current Land Use – Burke County
Water and Sewer Service Areas:

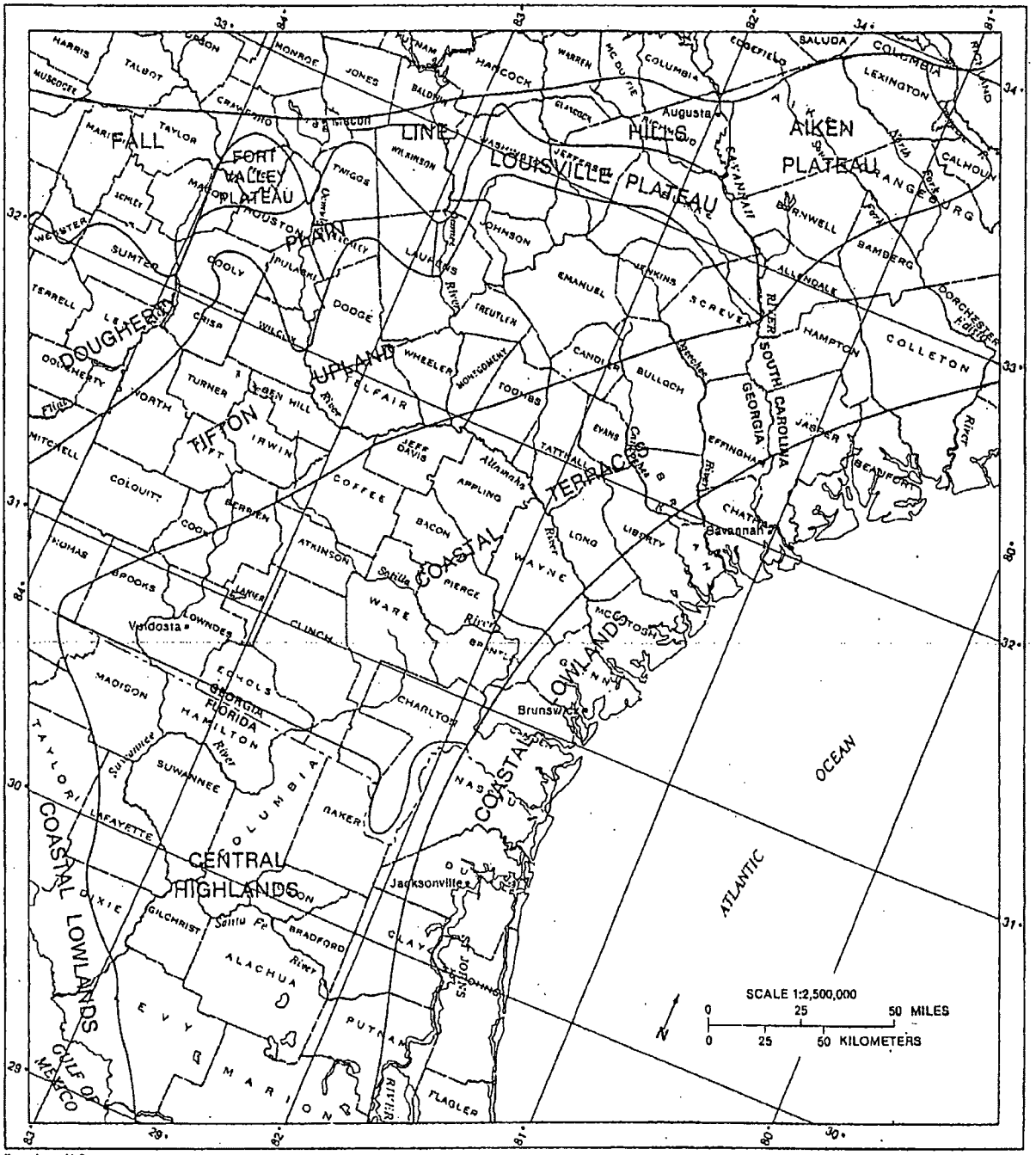
- City of Girard
- City of Keysville
- City of Midville
- City of Sardis
- City of Vidette
- City of Waynesboro



Approximate location of the Gulf Trough and Apalachicola Embayment
Source: Kellam and Gorday, 1990.



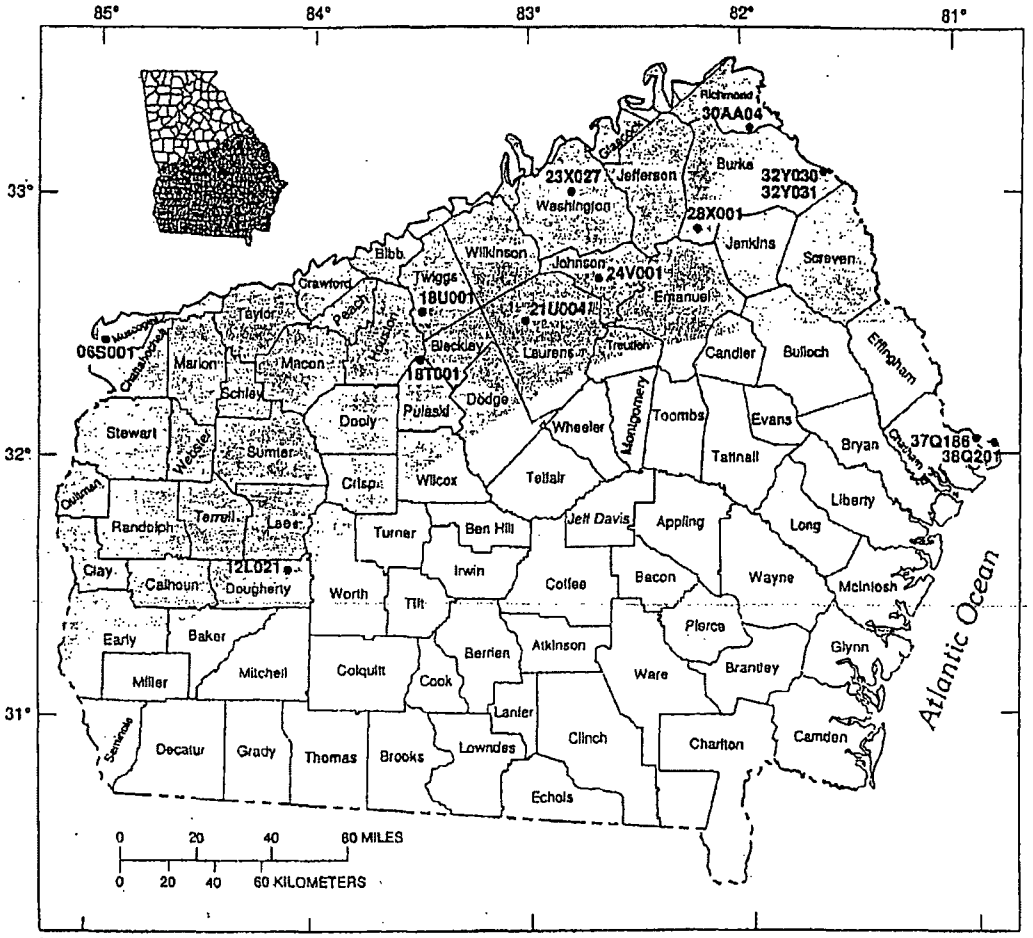
Geographic extent of the Floridan aquifer system. Shaded area indicates aquifer.
Source: Kellam and Gorday, 1990.



Base from U.S.
National Atlas, 1970

Generalized topographic divisions of the Coastal Plain province.

Source: Krause and Randolph, 1989.



Base modified from U.S.Geological Survey
State base map

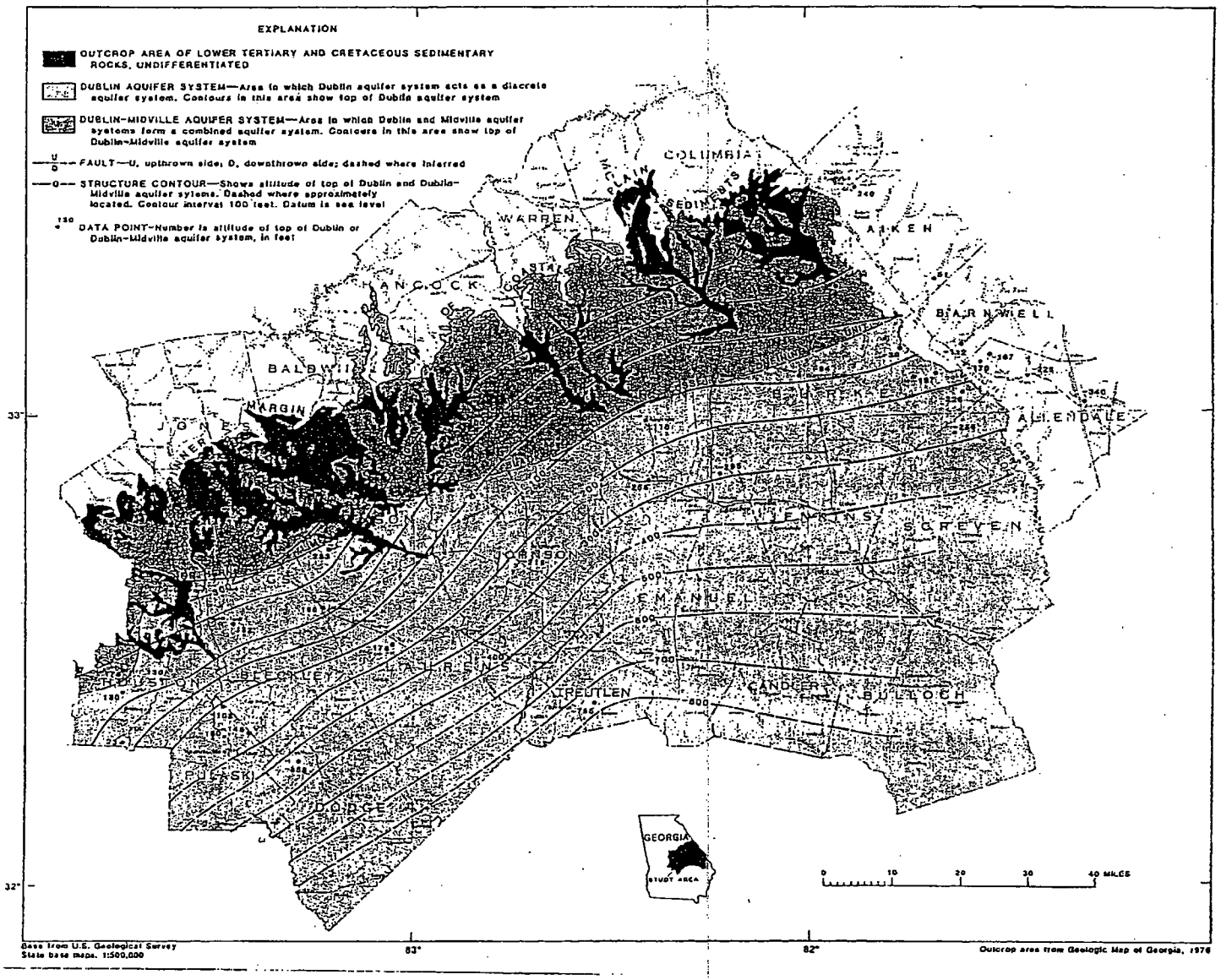
EXPLANATION

CRETACEOUS AQUIFER SYSTEMS

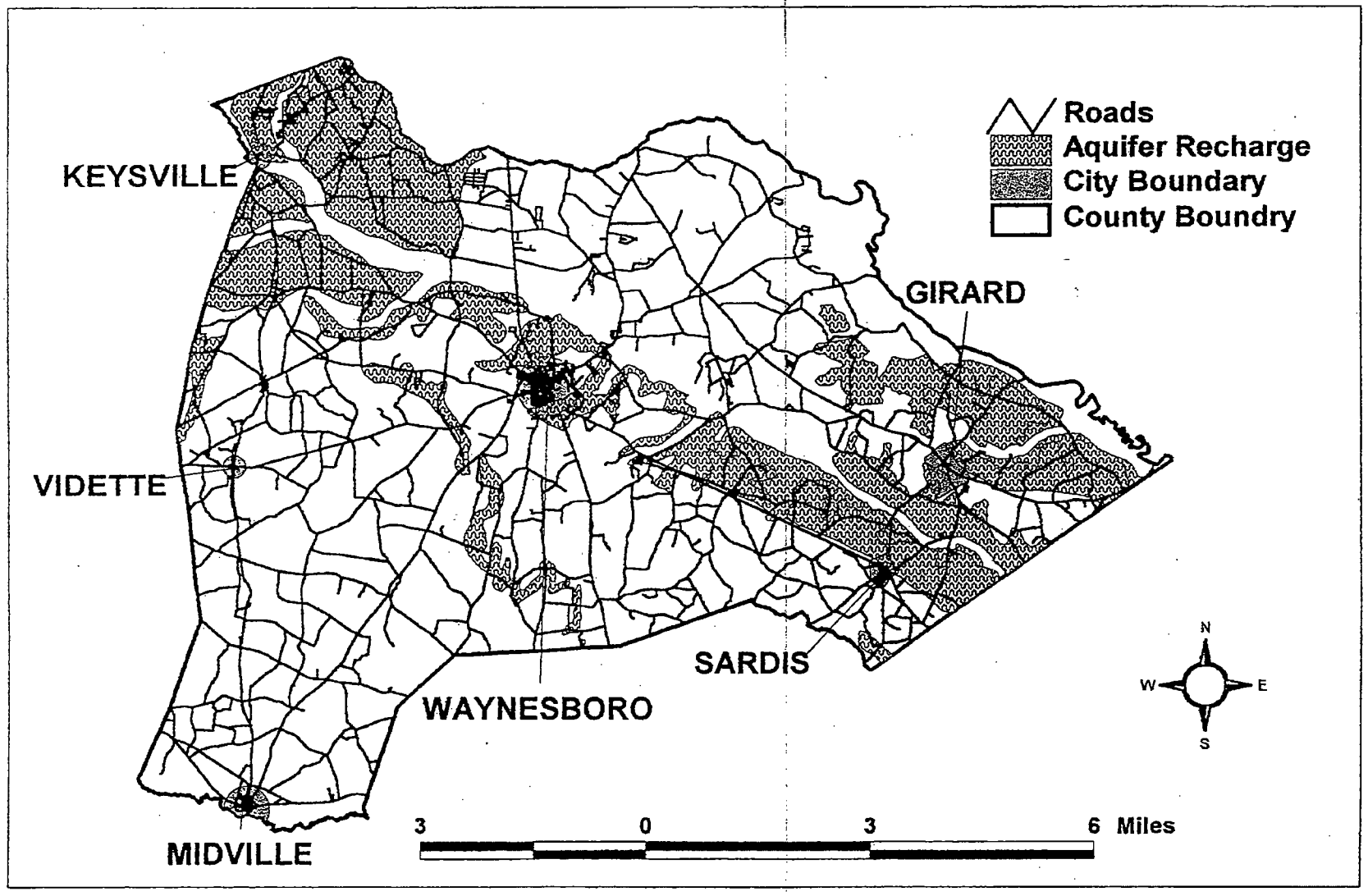
21U004 OBSERVATION WELL AND IDENTIFICATION NUMBER

Location of Cretaceous aquifer system and observation wells.

Source: *Groundwater Conditions in Georgia, 1999.* Open-File Report 00-151, US Department of the Interior, USGS, in cooperation with GA DNR-EPD, GA Geologic Survey, Albany Water, Gas, and Light Commission, City of Brunswick, Glynn County, Cressler, 2000.



Structural features, outcrop area, and altitude of the top of the Dublin and Dublin-Midville aquifer systems. Source: Clarke, Brooks, and Faye, 1985.

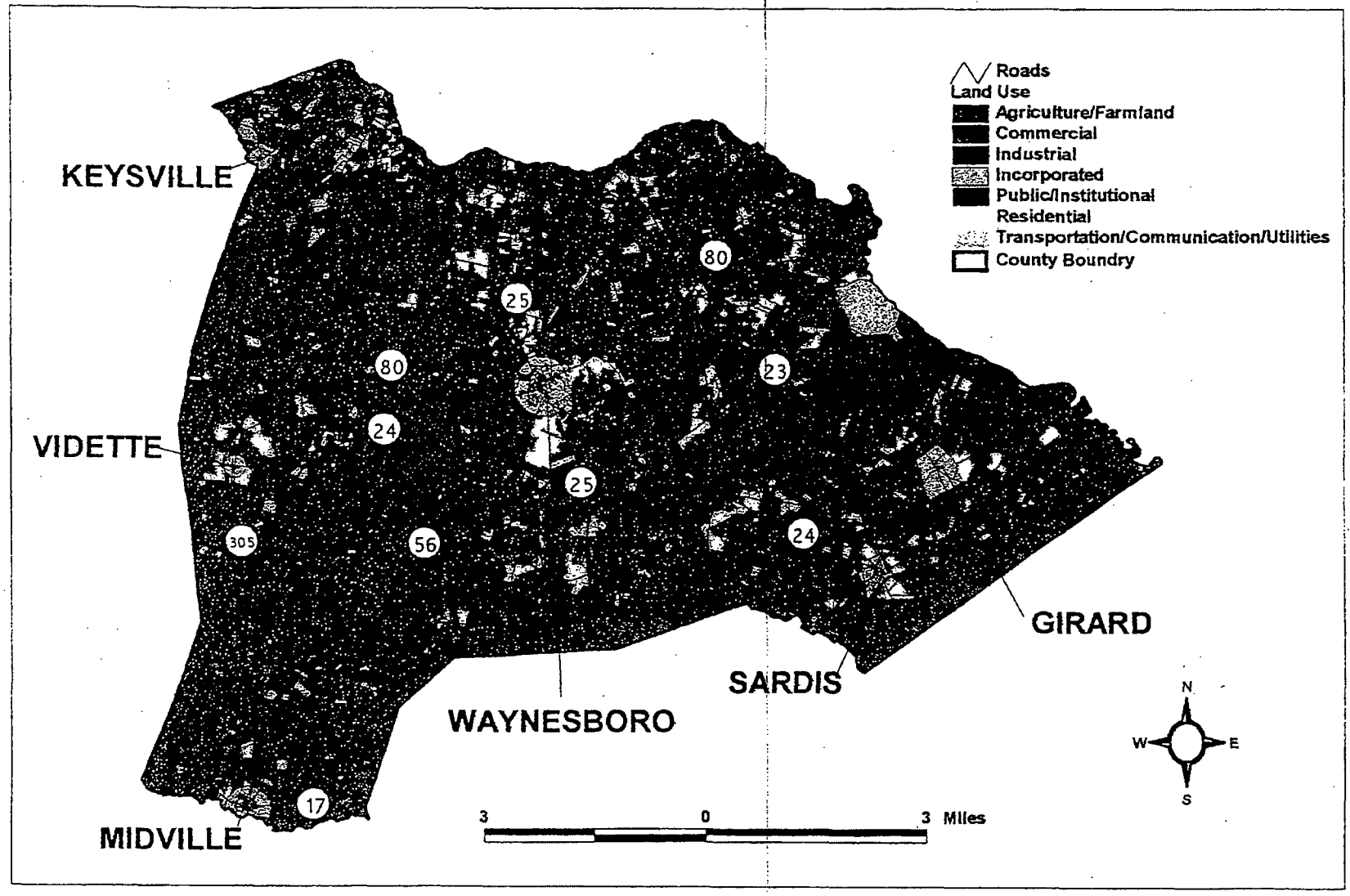


Aquifer Recharge Areas in Burke County

Maps Edited by Rutherford & Associates, March, 2000

Maps Created from Data Compiled by Central Savannah River Regional Development Center

Rutherford & Associates assumes no liability for map accuracy or any decisions which user may make based on this map.



Current Land Use for Burke County, 2000

Maps Edited by Rutherford & Associates, March, 2000

Maps Created from Data Compiled by Central Savannah River Regional Development Center

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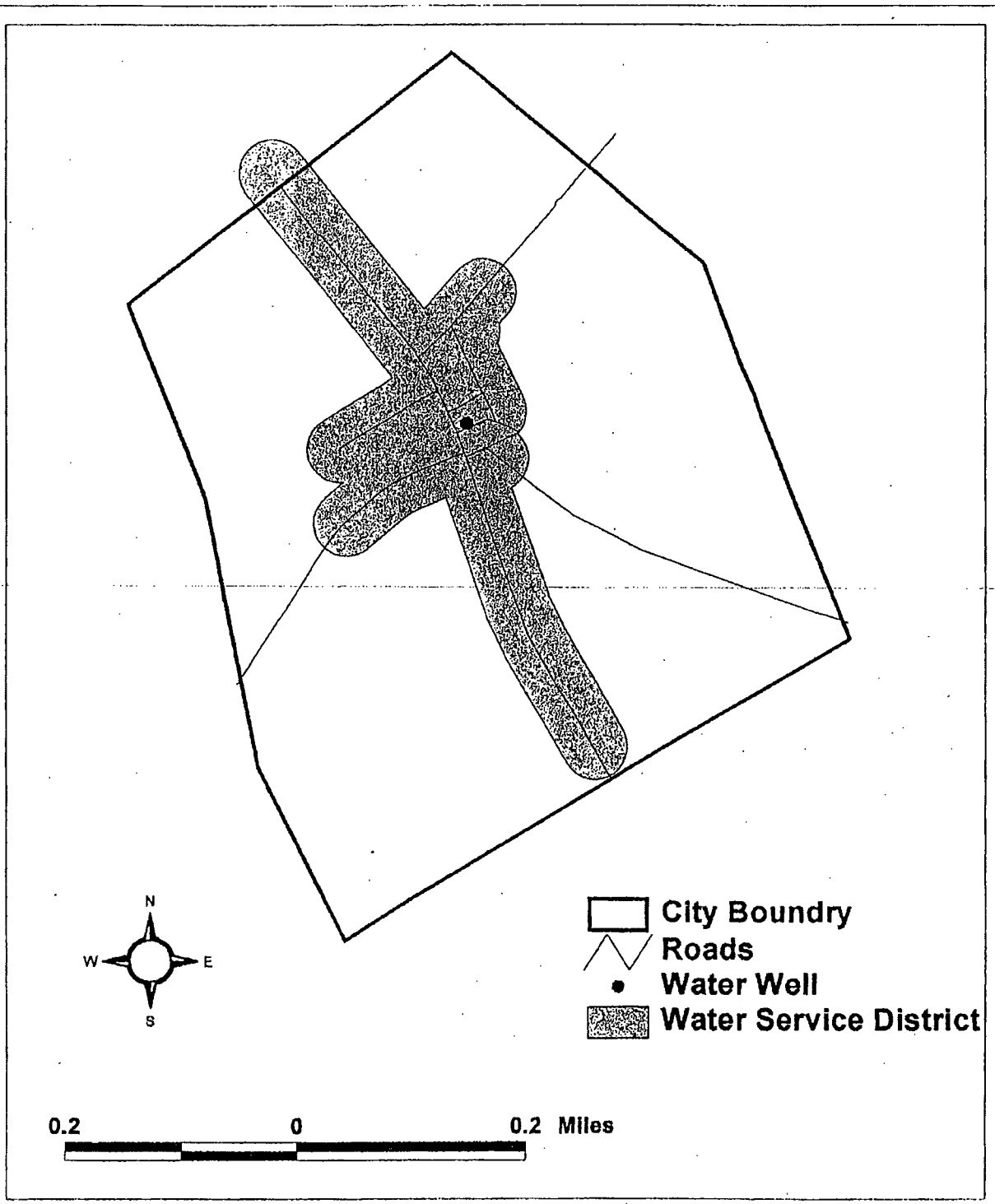

Water Service Area for the City of Girard

Maps Edited by Rutherford & Associates, March, 2000

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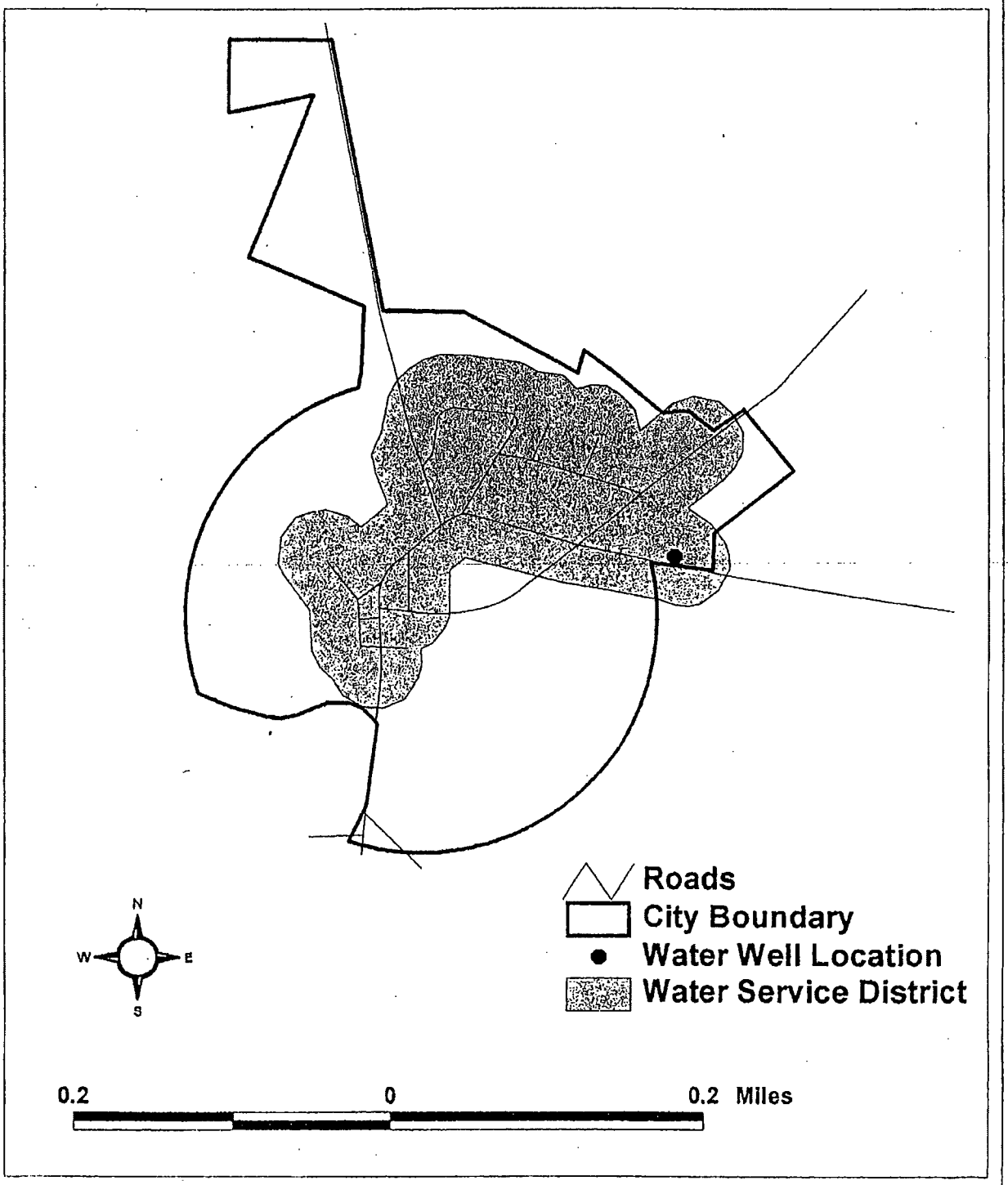

Water Service Area for the City of Keysville

Maps Edited by Rutherford & Associates, March, 2000

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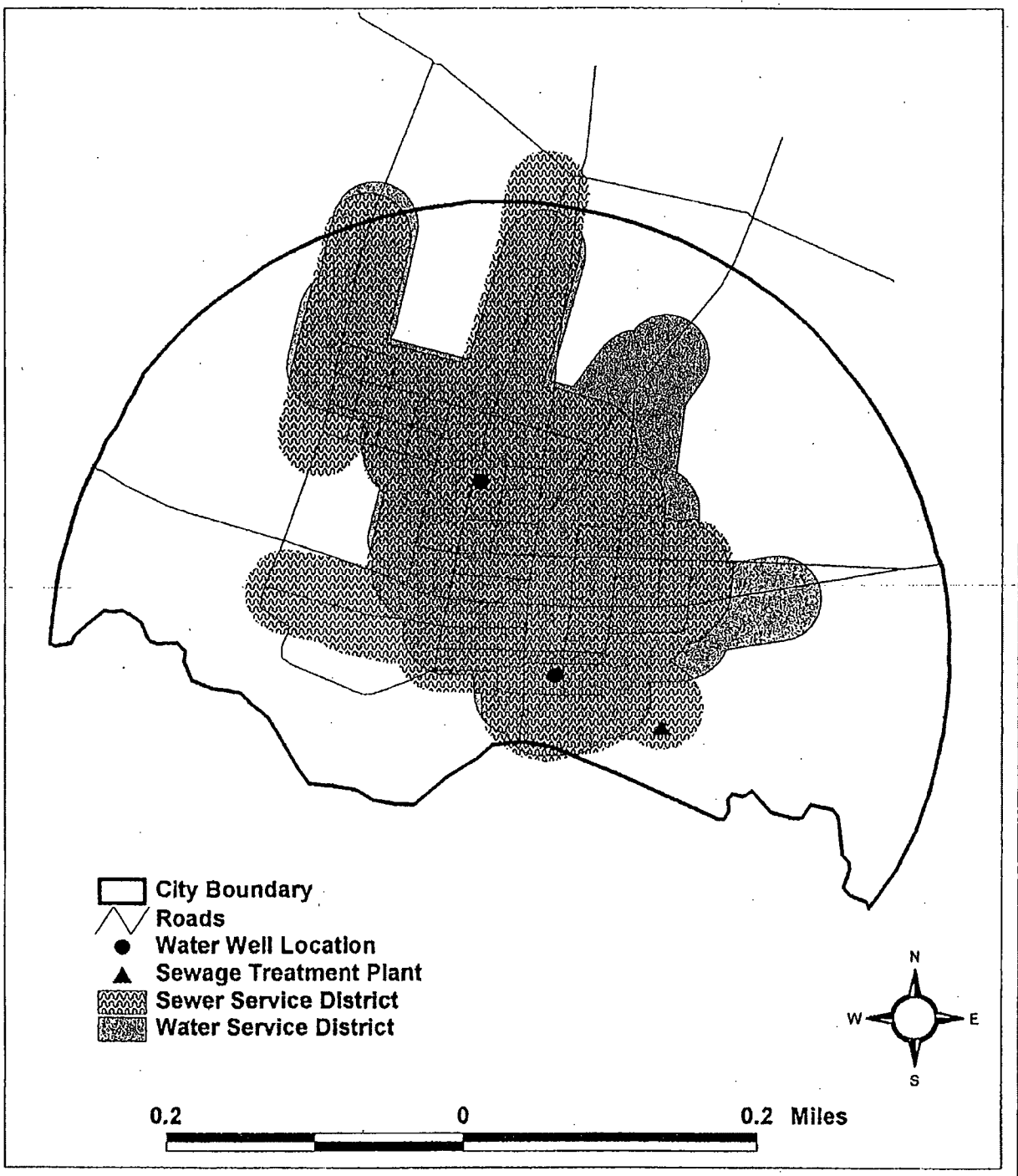

Water and Sewer Service Area for the City of Midville

Maps Edited by Rutherford & Associates, March, 2000

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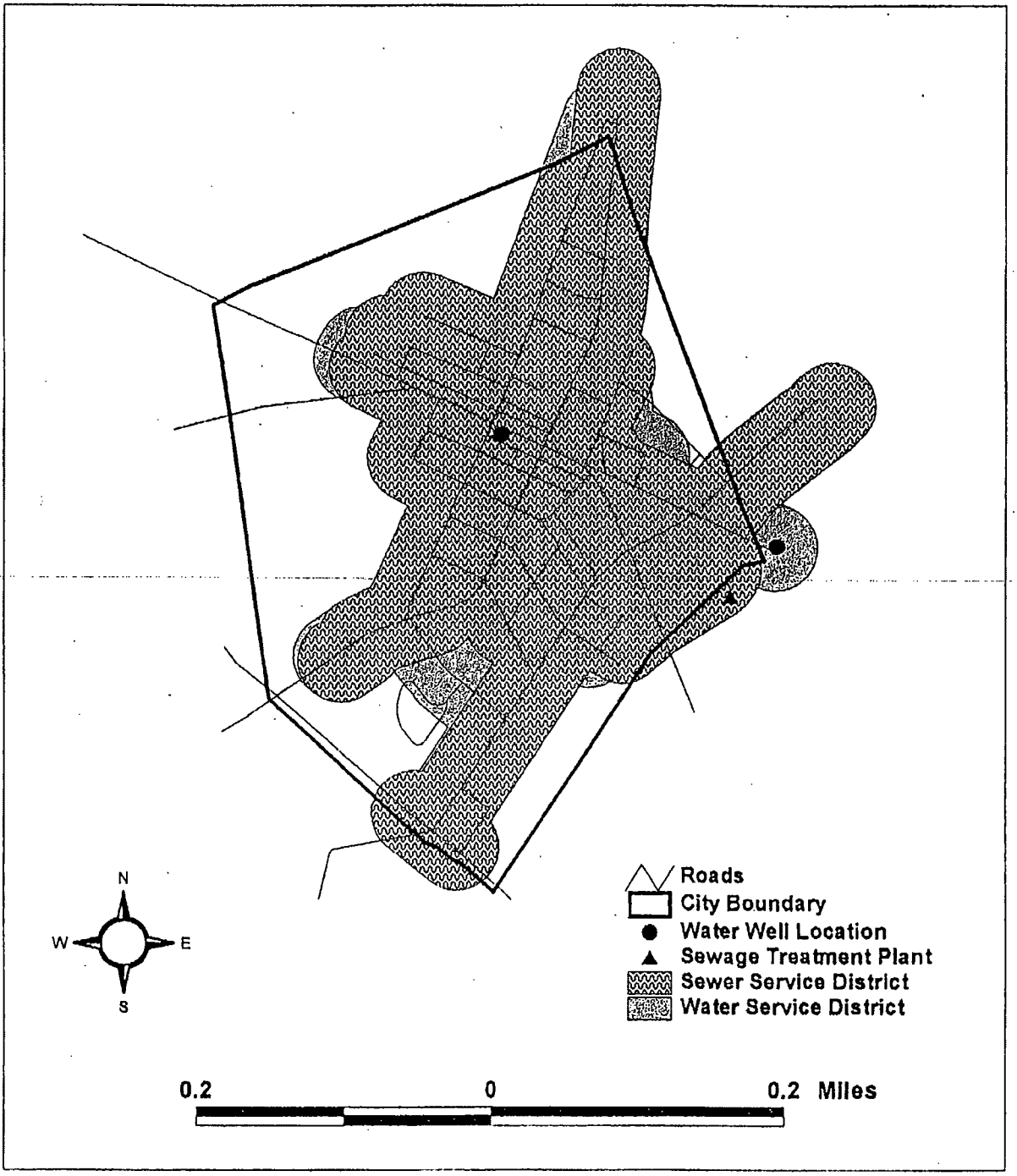

Water and Sewer Service Area for the City of Sardis

Maps Edited by Rutherford & Associates, March, 2000

Maps Created from Data Compiled by Central Savannah River Regional Development Center

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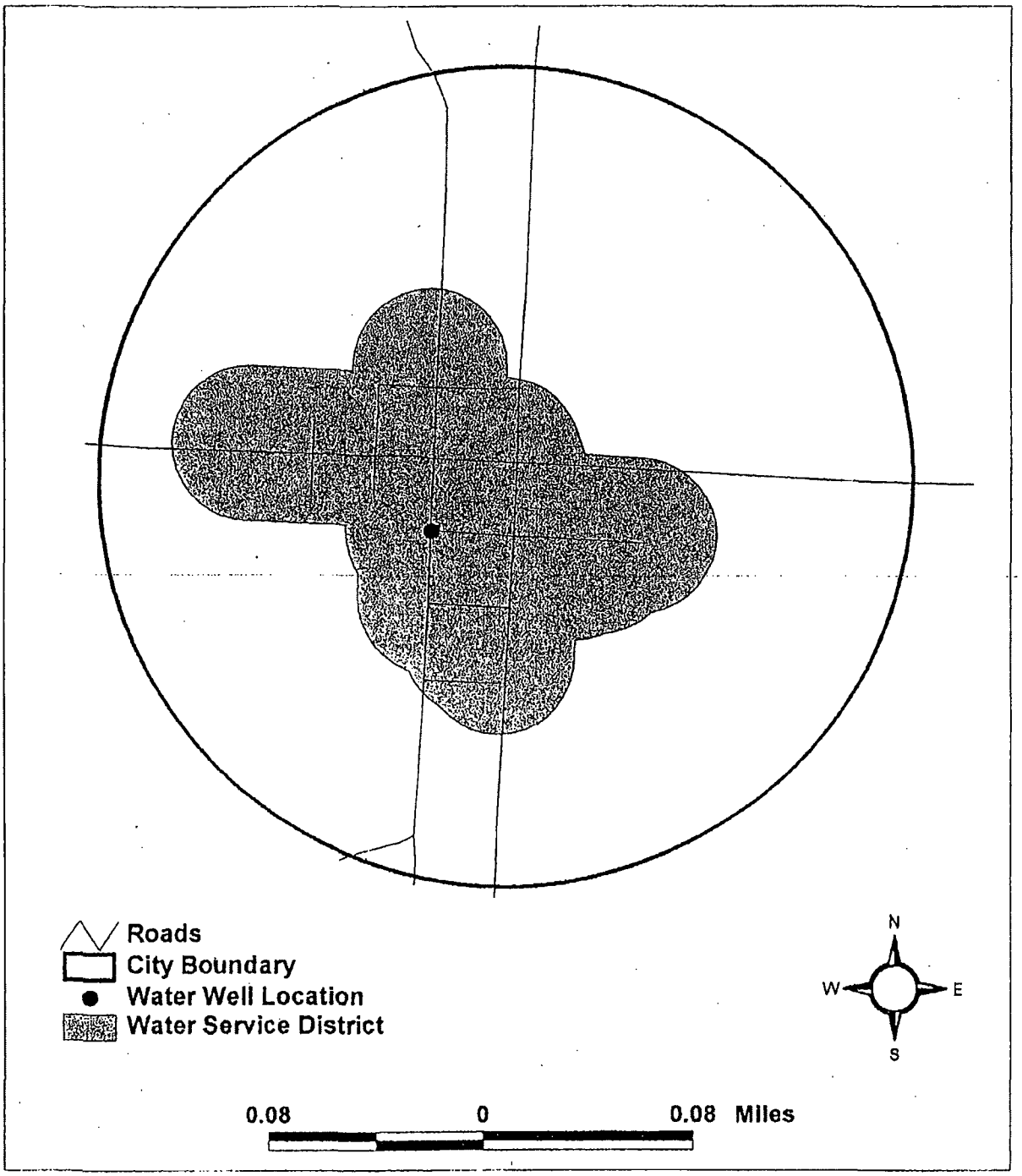

Water Service Area of the City of Vidette

Maps Edited by Rutherford & Associates, March, 2000

Maps Created from Data Compiled by Central Savannah River Regional Development Center

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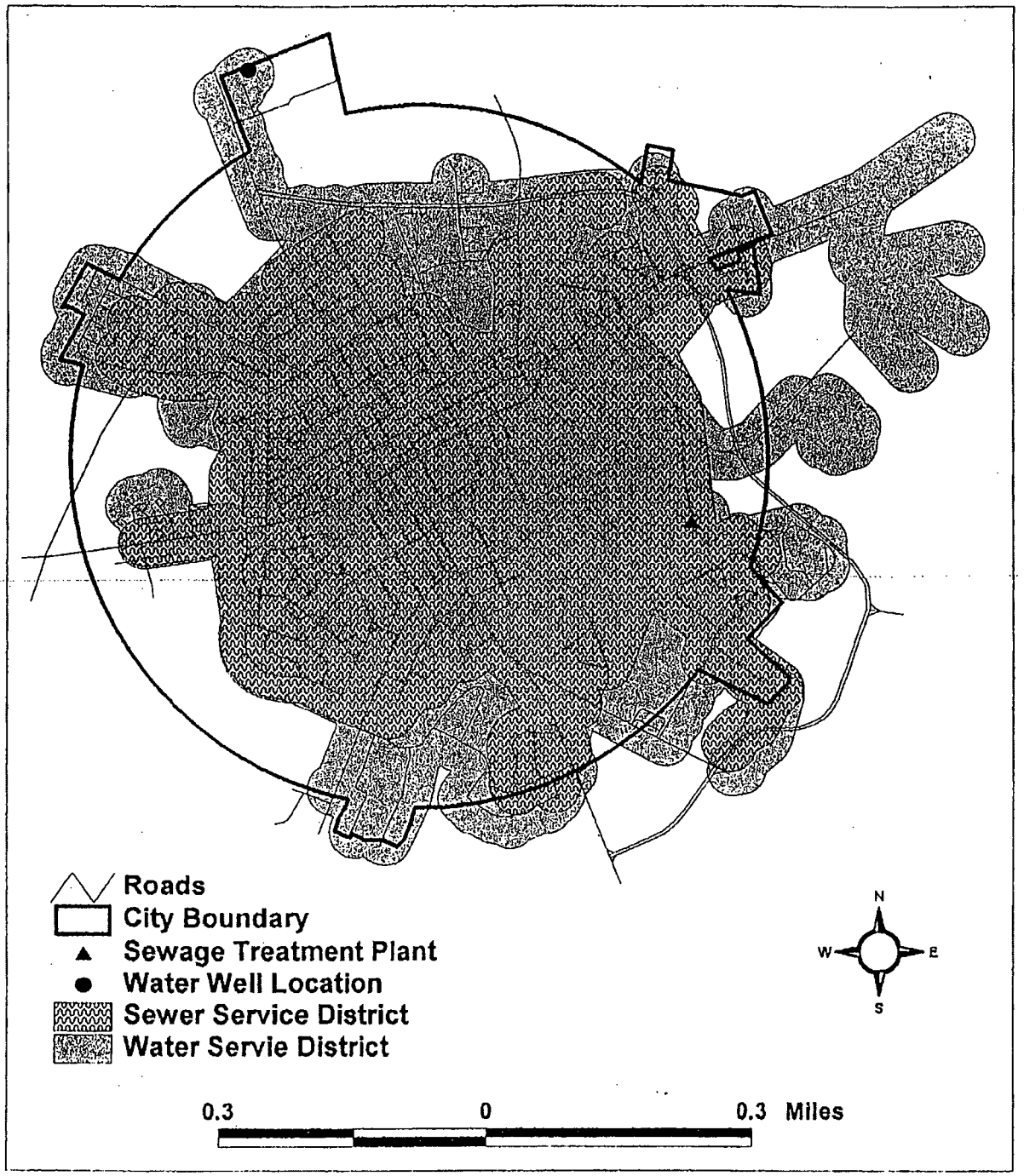

Water and Sewer Service Area for the City of Wayneboro

Maps Edited by Rutherford & Associates, March, 2000

Maps Created from Data Compiled by Central Savannah River Regional Development Center

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B. EPD Interim Strategy and Minimum Requirements

INTERIM STRATEGY

FOR MANAGING

SALT WATER INTRUSION

IN THE UPPER FLORIDAN AQUIFER

OF SOUTHEAST GEORGIA

April 23, 1997

INTERIM STRATEGY FOR MANAGING SALT WATER INTRUSION IN THE UPPER FLORIDAN AQUIFER OF SOUTHEAST GEORGIA

April 23, 1997

Executive Summary

The Georgia Environmental Protection Division's objective is to STOP THE INTRUSION OF SALT WATER before municipal water supply wells on Hilton Head Island, South Carolina and Savannah, Georgia are contaminated, and to prevent an existing salt-water problem at Brunswick, Georgia from worsening. Salt water intrusion into the Upper Floridan Aquifer threatens ground water supplies in the Hilton Head-Savannah and Brunswick areas. Intrusion rates, however, are quite slow, being more than a hundred years to reach Savannah. To accomplish this objective, EPD will to do the following:

(1) Conduct expanded scientific and feasibility studies to determine with certainty how to permanently stop the salt water intrusion moving towards Hilton Head Island, South Carolina and Savannah, Georgia and how to prevent the existing salt water intrusion at Brunswick, Georgia from worsening.

(2) Require the development of comprehensive local water supply plans in a 24 county area of southeast Georgia.

(3) Create one or more advisory committees. With their input, the additional scientific information and the local water supply plans, develop a long term ground water management plan for southeast Georgia by the end of the year 2005, which will protect the Upper Floridan aquifer from further salt water intrusion.

(4) Impose caps on ground water use in Glynn County, Chatham County, and portions of Bryan and Effingham counties, to avoid worsening the rate of salt water intrusion at Hilton Head - Savannah and at Brunswick.

(5) Reduce ground water use in Chatham County by at least 10 million gallons per day by December 31, 2005 through conservation and substitution of surface water for ground water. Union Camp will provide at least 6.5 Mgd of the total 10 Mgd of ground water reduction in Chatham County. This will be affirmed through reductions in ground water use permits.

(6) Allow on an interim basis increases in ground water withdrawals in the areas of southeast Georgia that have little impact on salt water intrusion problems.

(7) Encourage and promote water conservation and reduced ground water usage wherever feasible, throughout southeast Georgia.

Introduction

The Upper Floridan Aquifer of southeast Georgia is susceptible to salt water intrusion. The aquifer is a primary source of drinking and industrial process water throughout 24 counties of the region. The United States Geological Survey (USGS) estimates 1995 ground water use in the area to be about 359 million gallons per day (Mgd).

EPD believes only a small portion of the aquifer is susceptible to salt water intrusion. There is one confirmed source of salt water and two additional suspected sources of salt water threatening Savannah. A salt water wedge exists on the northern end of Hilton Head Island; this wedge is slowly moving beneath the Island toward Savannah. Further south near the eastern end of Bull Island in South Carolina, geologic conditions favorable for ocean water to enter the aquifer also exist. Some wells in this area have higher than expected salinity. Based on ground water modeling, the United States Geological Survey (USGS) reports that salt water may be entering the aquifer offshore from Tybee Island. Salt water, originating from deeply buried brines currently is intruding the aquifer at Brunswick. Further south in the St. Marys-Fernandina Beach area, the USGS reports that salt water intrusion conditions are similar to those at Brunswick; some wells in northern Florida have been abandoned because of salt water problems.

In February of 1996, EPD proposed a draft Interim Strategy to protect the Upper Floridan Aquifer in twenty-four southeast Georgia counties from salt water intrusion. In the draft Interim Strategy, EPD subdivided southeast Georgia into three subareas (i.e., northern, central, and southern), which were separated because of geological information (Figure 1). The proposed Interim Strategy could be carried out within the confines of EPD's existing statutory authority. Minimal regulations were proposed for the northern and southern subareas. For the central subarea, EPD proposed that permittee meet certain standards of water-use efficiency, use alternate sources of water, or trade ground water allocations. If the proposed Interim Strategy were carried out as it was originally presented, the net result would be equivalent to a 12-Mgd reduction in ground water withdrawals in Chatham County. The bulk of the actual reductions, however, would have been in counties other than Chatham.

Between early March and mid-April 1996, EPD held nine public meetings to solicit comments, and received over four hundred written and oral responses. One of the primary comments was that

the impacts (costs vs. benefits) of the proposed Interim Strategy needed clarification. There was the perception that the proposed Interim Strategy could create adverse economic impacts on some categories of users. The remaining comments generally fell into six categories; as follows (in no particular order):

(1) There was a need for comprehensive water supply planning in southeast Georgia.

(2) The level of scientific knowledge needed to be expanded, particularly with respect to locations where salt water is entering the aquifer, and where and when salt water would reach Georgia users. Moreover, there were considerable misconceptions about the geological nature of the salt water intrusion problem.

(3) Sources of water that are alternate to the Upper Floridan Aquifer need to be identified, described, and tested.

(4) There was the perception that the proposed Interim Strategy was unfair to some categories of users, particularly those that are not close to the aquifer drawdown areas in Chatham and Glynn counties.

(5) The relationship between Georgia, Florida, and South Carolina needed clarification. Clarification was particularly needed with respect to each state's expectation of the others.

(6) The information base on agricultural water use was too poor to be used for meaningful ground water management purposes.

After receiving the comments, it was clear to EPD that the draft proposed Interim Strategy required considerable rethinking; and that a non-regulatory perspective should be one of the avenues investigated. To achieve this, EPD contracted with the School of Policy Studies of Georgia State University (GSU). The GSU principal investigators had backgrounds in environmental economics and interstate water negotiations. GSU completed its analysis on October 1, 1996, and recommended that EPD's Interim Strategy pursue a policy of Rational (or expanded) Use.

The primary thrust of GSU's proposal was that a policy of Rational Use would be conducive to economic development. GSU pointed out that salt water intrusion velocities were very low. Therefore, a nominal user fee could be instituted to replace those wells in Chatham and Glynn counties, when such wells became salty in the future. The user fees would be placed in a fund and allowed to grow by accruing interest. By the time salt water actually began to contaminate wells in either Chatham or Glynn counties, the fund would be more than adequate to construct surface water treatment plants, construct engineered barriers to salt water intrusion, or to develop other aquifers.

A number of stakeholders expressed concerns that such a policy would deplete the aquifer. Some of those expressing this viewpoint requested that EPD pursue a policy of "sustainable use" (i.e., a policy that when implemented would result in withdrawal reductions of sufficient magnitude to ensure that continued use of the Upper Floridan Aquifer at such reduced use levels would not result in any further movement of the salt water wedge). Some stakeholders commented that EPD should expand upon the economic analysis that GSU had attempted. Many stakeholders were supportive of using fees to expand the level of scientific knowledge. Based on public comments, EPD decided not to pursue a policy which would allow the aquifer to become salty at Chatham County, or which would allow any further salting of the aquifer in Glynn County.

After considering all of the oral and written comments received, EPD released a proposed Revised Interim Strategy on December 20, 1996. Three public meetings were held on the proposal in January 1997 and approximately 90 oral and written comments were received. Many comments contradicted one another; for example, some stakeholders advocated pumpage reductions whereas other stakeholders advocated no pumpage reductions. Nevertheless, there were several consistent themes; among them:

- Scientific studies should be colleague reviewed.
- EPD should aggressively promote water conservation.
- The requirement of comprehensive water supply planning should be expanded to all of southeast Georgia on an accelerated schedule.
- EPD should solicit ideas from technical advisory committees.
- 1995 or 1996 pumping levels might not be hydrologically appropriate for establishing permit caps.
- Water conservation or reductions in pumpage could be more readily achieved via incentives.
- EPD should allow flexibility in permits in those areas where pumpage is capped, if total withdrawals do not exceed the cap.

New Geological Information

Since first proposing the Interim Strategy in February, 1996, EPD has embarked on a $1,500,000 five-year study. The purpose of this study is to better define the mechanics of salt water intrusion and to identify those areas that would be most susceptible to intrusion. At the time of this writing deep wells have been constructed on Tybee Island, and are in progress at St. Marys. Several shallow wells also have been drilled at Hilton Head Island. During the summer and fall of 1996, about two dozen separate ground water modeling runs were performed. Some newly developed information includes:

(1) Under 1985 pumping conditions (the date to which the USGS models are calibrated), the salt water wedge could reach the center of the cone of depression at Savannah in about 120-270

years from now (from the vicinity of Bull Island or from northern Hilton Head Island, respectively). At Brunswick, the plume occupies about 2.8 square miles and may be growing.

(2) Under expanded pumping scenarios, where withdrawals are consistent with population increases, only two areas within the central subarea are susceptible to salt water intrusion; namely Hilton Head-Chatham County and eastern Glynn County. Increasing pumping would result in salt water reaching these areas more rapidly. All other parts of the central subarea should continue to have fresh ground water.

(3) The Upper Floridan Aquifer is not susceptible to depletion because ground water withdrawn by pumping is replaced by lateral and vertical inflow. After more than 100 years of pumping, the Aquifer remains completely full. Continued pumping at reasonable growth rates would result in salt water slowly reaching currently unaffected fresh water supply wells in these two areas.

(4) Based on USGS modeling, there would have to be about a 60-65 Mgd reduction in pumpage in Chatham County and about a 100% reduction in Glynn County and all remaining central subarea counties maintaining constant pumpage (i.e., no increases) to halt salt water intrusion. As long as there is significant pumping in southeast Georgia, salt water intrusion is irreversible.

(5) Other than accelerated salt water intrusion, there are no known or expected environmental impacts associated with increased pumpage. No surface water bodies or habitat would be affected.

(6) Within the central subarea, the further pumpage is away from Chatham and Glynn counties, the less would be the impact on the potentiometric surface and salt water intrusion. For example, ground water models performed by the USGS at EPD's request suggest that one gallon of ground water pumped at Savannah has about the same impact on salt water intrusion at the northern end of Hilton Head Island as about 100 gallons pumped at Sylvania or about 25 gallons pumped at Brunswick.

Impacts of the Strategies Proposed To Date

There have been several salt water intrusion mitigation strategies proposed to date. For each strategy, EPD had the USGS perform a modeling run, using either the EPD Coastal Model, the RASA Model, the Brunswick Vicinity Model or the Savannah Vicinity Model. All models were developed by the USGS and follow USGS modeling protocols; all are interrelated and information can be cross-compared. Using the USGS models, EPD estimated the impact of each of the proposed

strategies on salt water intrusion; that is, how much would intrusion be quickened or slowed if that strategy were employed. The results are presented in Table 1.

EPD has authorized and provided funding to the USGS to publish these model runs with accompanying assumptions. This publication will conform to USGS colleague-review procedures.

INTERIM STRATEGY

General

This Interim Strategy is intended to continue the process of protecting the Upper Floridan Aquifer of southeast Georgia from salt water intrusion. Once implemented, the Interim Strategy will continue until December 31, 2005. During the time that the Interim Strategy is in effect, EPD will work with a broad-based stakeholder advisory committee on information exchange, and will encourage and accept input from the committee on matters related to both the implementation of the Interim Strategy and development of a final strategy. EPD also would cooperate with other public and private entities to develop comprehensive water supply plans, and to gather water use, engineering, and geologic information. The outcome will be the development of a final strategy (by December 31, 2005) which is a broadly understood and supported, and which will stop salt water intrusion at Hilton Head, Savannah, and Brunswick and also allow additional ground water withdrawals in the 24 counties of southeast Georgia.

When fully implemented the Interim Strategy will:

(1) Develop the information needed to assist Georgia's stakeholders with the development and implementation of a final strategy that will acceptably address salt water intrusion and encroachment problems along Georgia's coast.

(2) Recognize the importance of all users throughout southeast Georgia.

(3) Promote conservation of ground water throughout southeast Georgia.

(4) Develop comprehensive water supply plans throughout southeast Georgia.

(5) Develop feasibility studies (with economic analysis) of engineered barriers, redistributed pumpage, and alternate sources of water in the central subarea.

(6) Develop expanded scientific studies throughout southeast Georgia.

(7) Minimize restrictions on those users that have minimal impact on salt water intrusion.

(8) Allow reasonable expanded use of the Upper Floridan Aquifer in those areas of southeast Georgia where such use has been found, based on sound science, to not have a significant influence on salt water encroachment in Chatham County or salt water intrusion in Glynn County.

(9) Utilize input from stakeholder advisory committees to develop planning, science, and feasibility scopes of work.

For the purposes of managing the Upper Floridan Aquifer, EPD will continue to subdivide southeast Georgia into three separate subareas as shown in Figure 1. Based on information provided in USGS Professional Paper 1403-D, ground water pumping in the northern subarea has little or no impact on salt water intrusion; the impact of pumpage in the southern subarea on salt water intrusion is not known; ground water pumpage in the central subarea impacts salt water intrusion.

Based on currently available scientific information and EPD's interpretation of the results of recent USGS modeling runs, EPD cannot demonstrate that pumping from the Upper Floridan Aquifer in the northern and southern subareas will significantly affect the movement of the salt water intrusion towards Chatham County or the upward movement of salt water in Glynn County. EPD will therefore not cap withdrawals in these subareas at any specific level, but will allow reasonable additional pumping from the aquifer until such time as it can be shown that such withdrawals exercise unacceptable adverse influence on the two problem areas.

For the central subarea, exclusive of Chatham and Glynn counties and defined portions of Bryan and Effingham counties, the Interim Strategy would permit some limited increases in withdrawals for those counties that have comprehensive water supply plans. [Note: EPD estimates that through 2005, total new ground water withdrawals in the central subarea would be about 15 Mgd, an increase of about 6 percent over current use. This would include issuing permits for those applications currently in review as well as new permit applications.] For Chatham and Glynn counties and defined portions of Bryan and Effingham counties (see Figure 2), the Interim Strategy would be based on the principle of "No Impact of Salt Water Intrusion on Existing Users". Ground water withdrawals in this area would be capped at some defined levels, and withdrawals from the Upper Floridan Aquifer in Chatham County would be reduced by at least 10 Mgd by December 31, 2005. The effect of this capping will be that at the end of the interim period, Chatham, Bryan and Effingham counties will still have a reliable source of fresh water for at least 100 years. On the other hand, salt water is already impinging on some existing Glynn County water supply wells; therefore capping of ground water use in Glynn County will better protect the existing users and should provide them with access to the aquifer for at least 50 years or more.

Depending on the scientific information gathered during the period that the Interim Strategy is in effect, it may be appropriate in the Final Strategy to limit or restrict ground water withdrawals in the northern and southern subareas. The decision to do this, however, would not be made until 2005 as the Final Strategy is being developed.

Scientific studies and comprehensive water supply planning cost money. Such money could be obtained through direct appropriations or through user fees. EPD believes that user fees are most appropriate as the users receive the direct benefit of having a reliable long-term water supply.

However, the final decision regarding the best mechanism to fund studies and to conduct planning, rests with the General Assembly and the Governor. This matter should be dealt with by the General Assembly in the 1998 legislative session.

Assuming the General Assembly and the Governor support a fee based system during the 1998 legislative session, it is likely that EPD will recommend a nominal and equitable user fee be assessed on all permitted users in all three subareas. It is also likely that EPD will recommend that the proceeds from the fees be used, (1) to provide for comprehensive water supply planning, (2) to perform scientific studies to monitor and predict salt water intrusion, and (3) to perform feasibility studies of redistributing pumpage, of obtaining water from sources other than the Upper Floridan Aquifer, and of creating engineered barriers to salt water intrusion.

Finally, EPD will likely recommend that until the Final Strategy is developed, fee money only be used for the development of comprehensive water-supply plans, the gathering of scientific studies, and the performing of such feasibility studies. Some or all of these thoughts may be modified prior to the General Assembly's consideration of the matter next year.

Implementation of this strategy, however, will require some changes in State laws and EPD's Rules. Interested legislators have introduced a resolution to the 1997 Session of the General Assembly to create a Study Committee. The purpose of the Study Committee is to hold hearings, to receive recommendations on legislation to protect southeast Georgia from salt water intrusion, and to identify a mechanism for funding further studies and planning. Based upon the strategy and the Study Committee findings, implementing legislation may be introduced in the 1998 session of the General Assembly. If the General Assembly and the Governor concur, then EPD would begin collecting fees and using them to carry out the Interim Strategy.

EPD would conduct regular (at least yearly) progress meetings to update stakeholders on new monitoring information, technological advances, and so forth. EPD would continue to coordinate with the St. Johns River Water Management District in Florida and the South Carolina Department of Health and Environmental Control to establish consistent salt water intrusion protection measures across state boundaries.

Water-Supply Planning

EPD recognizes that local comprehensive water-supply planning is critical to prudent management of the Upper Floridan Aquifer in southeast Georgia. Such plans should be prepared utilizing public participation and should, at a minimum, address the following issues for each county:

- Historical water use perspective.
- Review of existing water supply needs and options studies.

- Current water management practices.
- Identification of possible sources of water other than the Upper Floridan Aquifer.
- Quantification of existing ground and surface water usage.
- Conservation efforts.
- Population, land use projections, and water demand projections to 2050.
- Development of water-supply management options.
- Implementation schedules.

To ensure that the plans are consistent in content, format, and methods, EPD will distribute a detailed water supply plan outline by May 30, 1997.

New withdrawal permit applications from the Upper Floridan Aquifer will be reviewed by EPD for all southeast Georgia counties, except in Chatham, Glynn, and the southern portions of Bryan and Effingham counties, effective January 1, 1997. However, comprehensive water supply planning is extremely important for southeast Georgia. Therefore, EPD will not issue new municipal, industrial, and agricultural Upper Floridan Aquifer ground water permits, after December 31, 2000, to applicants in any county of the 24 county area which has not developed a comprehensive water supply plan and had it approved by EPD.

Agricultural water use information is lacking. This is particularly significant as agriculture is a rapidly expanding user group in southeast Georgia (an estimated 200% increase in permitted usage between 1985 and 1995). To expand the level of knowledge of this important user group, EPD will work with agricultural interests to develop a statistically valid yearly estimate of agricultural water uses for each southeast Georgia county, and a program to educate agricultural water users on best management practices to conserve irrigation water.

EPD would contract to develop an general educational program on irrigation best management practices and irrigation-water conservation.

Conservation

EPD will regulate Upper Floridan Aquifer ground water withdrawals in Chatham County so that at least 10 Mgd of the 14.59 Mgd reductions identified by the Savannah/Chatham County Metropolitan Planning Commission's (MPC) Comprehensive Water Supply will be achieved by December 31, 2005.

EPD expects the pulp and paper industry to carry out those ground water conservation measures identified in the 1995 Institute of Paper Science and Technology Study.

After January 1, 2001, EPD will only issue any new or expanded permits for municipal ground water supply, where the local government has developed water-conservation ordinances, including ultra-low flow plumbing requirements, audits to find out transmission losses, and so forth. This would apply to users in all three subareas.

After January 1, 2001, EPD will only allow new or expanded agricultural use of ground water for those owners who have taken a course on irrigation best management practices and irrigation water conservation. This would apply to users in all three subareas.

After January 1, 2001, EPD will only allow new or expanded industrial use of ground water for those owners who have developed a water conservation plan. This would apply to users in all three subareas.

EPD encourages Chatham and Glynn counties, along with those portions of Bryan and Effingham counties where ground water is fully capped, to use surface water or shallow aquifers for future water supply. In these areas EPD will also require water users, wherever feasible, to substitute surface water, treated wastewater, or water from shallow aquifers for golf course irrigation and non-contact cooling water currently being withdrawn from the Upper Floridan Aquifer.

EPD recognizes that incentives can be conducive to conservation, especially for those users that would have to make capital improvements.

Permitting (Upper Floridan Aquifer, only)

- During the period in which the Interim Strategy is in effect, EPD, in consultation with the affected permittees, will reasonably adjust some existing municipal and industrial ground water withdrawal permits to a yet to be determined level. A review of EPD's permits shows that some permits are for rates that greatly exceed actual usage.

- Inactive ground water use permits will be canceled. This would apply to all three subareas.

- A significant amount of the 10 Mgd of reduced Upper Floridan Aquifer ground water use will come from voluntary reductions by Union Camp. Union Camp has agreed to reduce its permitted withdrawal by 6.5 Mgd, which is the equivalent of its prorata share of industrial ground water pumping in Chatham County. In conjunction with that, EPD will also reduce Union Camp's ground water withdrawal permit by 1.9 Mgd (from 28.5 Mgd to 26.6 Mgd) in order to eliminate unused capacity made available by increased water use efficiencies achieved by Union Camp. Union Camp's permit thus will be further reduced from 26.6 Mgd to 20.1 Mgd by December 31, 2005.

Union Camp has made a further commitment to transfer 2.5 Mgd in ground water capacity if it is needed by other permittees for domestic growth. Union Camp will make this capacity available for transfer (assuming surface water treatment plant capacity is available to replace this quantity of water) after EPD develops suitable guidance governing such transfers.

- EPD believes that certain water use practices are no longer wise for the Upper Floridan Aquifer. These include golf course irrigation and non-contact cooling water. EPD will not issue any new permits for golf-course irrigation or non-contact cooling water, where alternate sources of water exist. This would apply to users in all three subareas.

- EPD will not issue any new ground water withdrawal permits in Chatham or Glynn counties without associated reductions in water usage elsewhere within the county. If consistent with EPD approved, comprehensive local water supply plans, EPD would consider allowing the transfer of some or all of a permitted ground water withdrawal from one user to others, provided such transfer shifts pumpage away from the deepest portions of the potentiometric cone of depression. (See "Reallocation of Water" for further details.)

- On the basis of ground water modeling that has been performed, EPD will cap future withdrawals from the Upper Floridan Aquifer in those portions of Bryan and Effingham counties that have the same hydrodynamic impact on salt water intrusion as Chatham County withdrawals. The affected areas generally are those portions of Bryan County southeast of Fort Stewart and those portions of Effingham County south of Georgia Highway #119. EPD, however, will consider public water supply applications in these areas which have been submitted to EPD before April 23, 1997 or for which project applications have been submitted to the local zoning board before April 23, 1997.

- EPD will establish the permit limit for each individual Upper Floridan Aquifer permit holder in Chatham, Glynn and those capped portions of Bryan and Effingham counties. The modified annual permitted withdrawal limit will be based upon an evaluation of annual reported ground water withdrawals over the interval from 1990 to 1996. In most instances, caps are expected to be based upon the highest annual reported ground water withdrawal during that period.

- EPD will not issue water withdrawal permits or safe drinking water permits for the development or construction of new public water systems in the Chatham County or Glynn County cap areas after April 23, 1997, if the source of water supply is the Upper Floridan Aquifer, with the possible exception of transfers which shift pumpage away from the cone of depression. This also applies to the Bryan County and Effingham County cap areas except as provided for in the preceding paragraphs. EPD will continue to evaluate the issuance, modification and renewal requests for permits to operate a public water system for existing

systems and for new systems that had initiated the permitting process prior to the implementation of this strategy.

- For public water systems using less than 0.10 Mgd in Chatham and Glynn counties and in the capped portions of Bryan and Effingham counties, EPD will modify existing Safe Drinking Water permits to require the permittee to begin metering and reporting their water use by December 31, 1998.

- For all 24 counties covered by this strategy, any request for the expansion of a public water system would require the submittal, approval and implementation of a water conservation plan. Also, metering of the water system and water use monitoring will be required (all sources, treatment facilities and service connections). After December 31, 2000, EPD would not approve or permit any new project for development or construction within the counties which have not developed comprehensive water supply plans and had them approved by EPD.

- EPD will not necessarily permit all new additional withdrawals within the central subarea. For applications received after April 23, 1997, new ground water withdrawal permits within the central subarea, outside the capped areas, will only be issued after EPD has assessed the impact on salt water intrusion on other users. EPD would perform similar assessments on withdrawal permit applications that average 1 Mgd or more in the northern and southern subareas.

- With the exception of Glynn and Chatham counties and capped portions of Bryan and Effingham counties, EPD will limit total new permitted withdrawals in the counties covered by this strategy to 10% above the USGS's estimate of 1995 ground water use for the entire 24 counties. This limit is equivalent to 36 Mgd, and would apply to all three subareas. This value will be periodically reassessed as new scientific information is developed.

Reallocation of Water

Reductions in Upper Floridan Aquifer ground water use will occur as a result of conservation, source substitution, and other means. As such reductions opportunities are identified, EPD will modify permits (in consultation with permittees) to reduce permit limits to agreed upon levels over agreed upon periods of time. In consultation with the permittee and other Upper Floridan Aquifer stakeholders in the affected area, EPD will consider reallocating this unused capacity in one or more of the following ways:

- Permanently remand the reclaimed water to the Upper Floridan Aquifer unencumbered so that it contributes to the maintenance of the potentiometric surface.

- Temporarily remand the reclaimed water to the Upper Floridan Aquifer until such time as municipal water needs (as identified in the EPD approved regional/local water supply plan) is such that this reclaimed water can be allocated to municipal water users in "the affected area." Again priority will be given to reallocations that have the effect of redistributing pumpage to points further away from the centers of established cones of depression, and to reallocations to areas where surface water is not economically available.

- Distribute to municipal water supply system(s) within the previously described area in a fashion outlined in EPD approved regional (or local) water supply plan. Priority will be given to such reallocations that have the effect of redistributing pumpage to points further away from the centers of established cones of depression, and to reallocations to areas where surface water is not economically available. However, EPD will not reallocate ground water in such amounts that would prevent the attainment of a total 10 Mgd reduction in use in Chatham County by December 31, 2005.

Sound Science

EPD currently is in the second year of a five-year program to expand knowledge of ground water and geology in the 24 county area. The USGS is participating in these studies as a cooperator. In addition, using state appropriations, EPD personnel are drilling approximately two dozen additional monitoring wells in Southeast Georgia, EPD is also financing the construction of some monitoring wells in the Hilton Head and Bull Island area of South Carolina. The five-year program is designed to establish an early warning system of salt water monitoring wells, evaluate alternate sources of water to the Upper Floridan Aquifer, and expand EPD's version of the USGS ground water models into South Carolina and Florida. EPD will continue to pursue these scientific investigations.

During the public meetings that were held on the draft Interim Strategy, a number of stakeholders requested an expansion of scientific studies to more precisely locate the position of fresh water-salt water interface, to more precisely identify the locations where salt water is entering the aquifer, to more precisely predict the velocity and route of salt water movement, to perform feasibility studies of possible engineered barriers to salt water intrusion or pumpage redistribution, and to more precisely assess the impact of withdrawals in the northern and southern subarea on salt water intrusion in the central subarea and vice versa.

Doing this would require expanded geological studies, possibly including offshore drilling, land and marine seismic surveys, and development of new salt water transport models. To achieve this and assuming funds are available for scientific studies, EPD also would perform additional geological and engineering studies, as recommended by a Technical Advisory Committee. The primary objective of these studies would be to obtain a more precise estimate of the time that salt

water will begin to contaminate currently fresh water wells and to establish the feasibility of methods that can be employed to prevent or slow such contamination.

Wherever possible, EPD will use the services of the USGS to take advantage of the USGS's ability to match offerings on a dollar for dollar basis.

Conclusions

EPD's objective is to STOP THE INTRUSION OF SALT WATER before municipal water supply wells on Hilton Head Island and Savannah are contaminated, and to prevent an existing salt water problem at Brunswick from worsening. Salt water intrusion into the Upper Floridan Aquifer threatens ground water supplies in the Hilton Head-Savannah and Brunswick areas. The implementation of the recommendations included in this interim Strategy will set the stage for the development of the final strategy by December 31, 2005.

SUB-AREA DIVISIONS

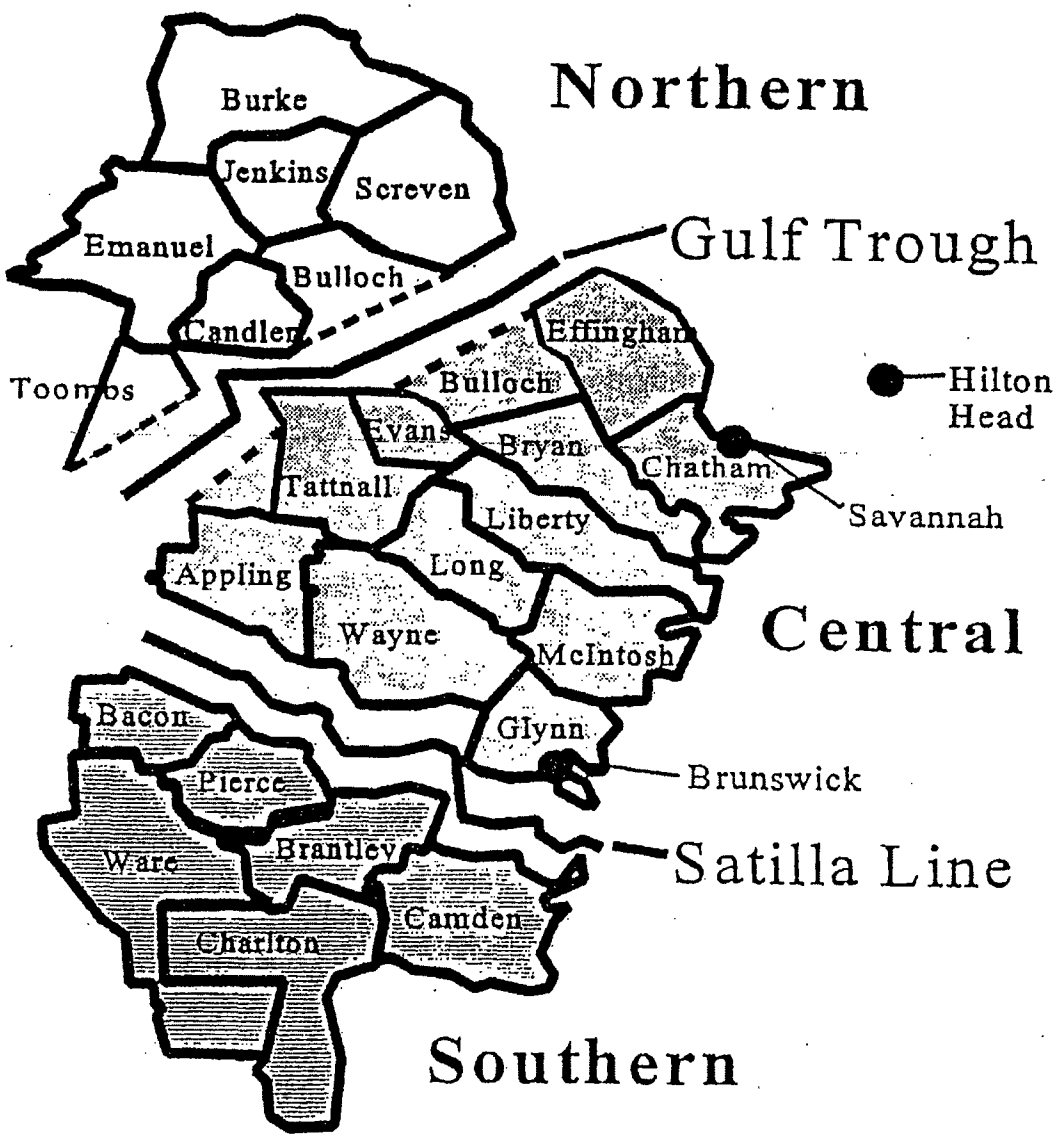

Figure 1

CAPPED AREA

All of Chatham and Glynn counties
Effingham County-South of Hwy 119
Bryan County-South of Fort Stewart

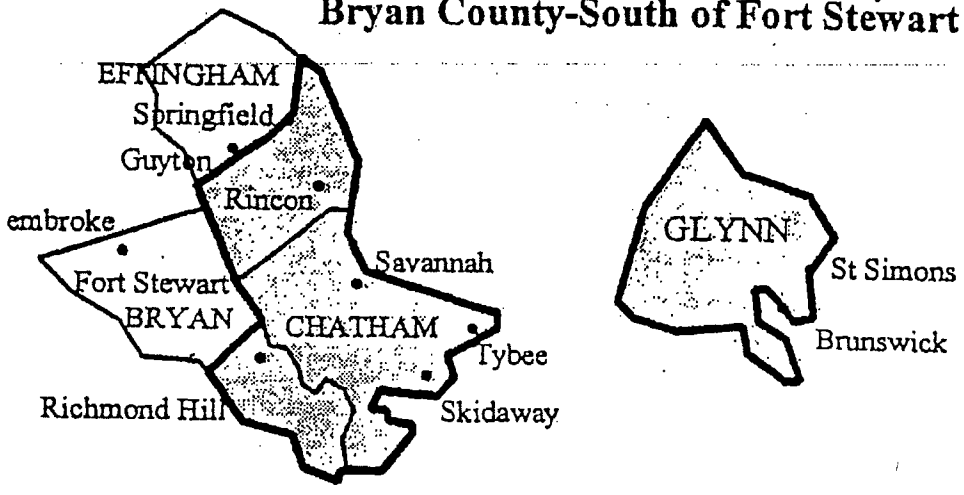

TABLE 1

RESULTS OF MODELING OF VARIOUS STRATEGIES

SITUATION / PLAN	ASSUMPTIONS	TRAVEL TIME FROM EAST END OF BULL ISLAND, S.C.; Years FROM 2005	TRAVEL TIME FROM N. END OF HILTON HEAD ISLAND, S.C.; Years FROM 2005	SIZE OF SALT WATER PLUME AT BRUNSWICK
1985 Conditions	Assume that 1985 pumping conditions continue until 2005.	≈110 years	≈260 years	About 41.5 Mgd of upward flux flow into Lower Floridan Aquifer; about 2.8 square miles currently contaminated.
SC DHEC Plan Applies to Chatham County only	20 Mgd reduction in Chatham County from 1995 pumping rates. Other counties not considered.	≈150 years Pumpage from other counties not considered.	≈370 years Pumpage from other counties not considered.	Not applicable.
EPD Interim Strategy (Initial Version) Applies to Central Subarea	145 gpd per person; Chatham County implements some of MPC Plan; pulp and paper industry implements IPST recommendations; golf course and cooling water use curtailed; water offsets implemented.	≈120 years	≈300 years	Upward flux flow into Lower Floridan Aquifer reduced by about 5.5 Mgd. Contaminated area of about 2.4 sq. mi.
MPC Plan Applies to all of Southeast Georgia	14.59 Mgd reduction in Chatham County from 1995 pumping rates. All other counties held at 1985 pumpage.	≈130 yrs.	≈360 yrs.	Upward flux flow into Lower Floridan Aquifer reduced by about 0.1 Mgd. Size of contaminated area essentially unchanged.
1985 x 110% Applies to all of Southeast Georgia	10% increase across the board for 1985 users.	≈80 yrs	≈240 yrs.	Upward flux flow into Lower Floridan Aquifer increases by about 2.7 Mgd. Contaminated area of about 3.0 sq. mi.
1985 x 90% Applies to all of Southeast Georgia	10% decrease across the board for 1985 users.	≈140 yrs	≈350 yrs	Upward flux flow into Lower Floridan Aquifer decreases by about 2.4 Mgd. Contaminated area of about 2.6 sq. mi.

EPD Interim Strategy (second version) Applies to Central Subarea	Pumpage in Chatham and Glynn Counties capped at current levels; 15 Mgd in rest of Central Subarea to account for existing applications and reasonable growth in other counties (GSU growth rate projections).	≈ 110 yrs.	≈ 290 yrs. See note # 5.	Upward flux flow into Lower Floridan Aquifer decreases by 1.9 Mgd. Contaminated area of 2.7 sq. Mi.
Sustainable Use Applies to Central Subarea	Reduce pumpage in Chatham County to reverse gradient from Port Royal Sound. Reduce pumpage in Glynn County to reduce flux from Fernandina Permeable Zone into Lower Floridan Aquifer to 0 Mgd or to pre-development conditions, whichever is less.	To achieve permanent elimination of the salt-water threat, pumpage in Chatham County will have to be reduced about 60-65 Mgd from current pumping rates.	To achieve permanent elimination of the salt-water threat, pumpage in Chatham County will have to be reduced about 55-60 Mgd from current pumping rates.	Model indicates that there was upward flux flow from the Fernandina Permeable Zone into the Lower Floridan Aquifer prior to development. This suggest that there may have been salt-water intrusion in the Brunswick area prior to pumping. To return to pre-development conditions will require a 100% reduction in pumpage in Glynn County.
50 Mgd increase in Chatham County from current pumping rates.	Chatham County specifically requested an assessment of the impact of replacing surface water from the I&D plant with ground water from the northwestern part of the County.	≈60 yrs.	≈180 yrs.	Not applicable

Georgia Department of Natural Resour
205 Butler St. S.E., East Floyd Tower, Atlanta, Georgia
Lonice C. Barrett, Comm
Harold F. Reheis,
Environmental Protection

June 4, 1997

MEMORANDUM

TO: County Commission Chairpersons (Southeast Georgia)

FROM: Harold F. Reheis, Director
Georgia Environmental Protection Division

SUBJECT: Minimum Requirements of A Cooperative Comprehensive Water Supply Plan

One of the tenets of the *Interim Strategy for Managing Salt Water Intrusion in the Upper Floridan Aquifer of Southeast Georgia* is the requirement that each of the 24 counties covered by the strategy must develop a comprehensive local water supply plan to be reviewed and approved by the Environmental Protection Division by December 31, 2000. To assist with the development of a set of consistent comprehensive local water supply plans, EPD committed to producing and distributing guidelines upon which these plans should be based. I have attached a document entitled *Minimum Requirements of a Cooperative Comprehensive County-wide Water Supply Plan*. The document outlines the minimum requirements of these plans in a topical manner, and should be used to guide the development of your county's comprehensive local water supply plan.

My understanding is that there has been a fair amount of discussion in the region pertaining to how best to move forward with development of each of these plans. The discussions are reportedly centered around whether the plans should be developed by one entity to ensure consistency and uniformity, or developed separately by each county. I think this is a necessary and useful discussion, and it should continue with the attached minimum requirements as a basis. My staff is prepared to be an active participant in that discussion if that is your wish.

In 1996, EPD contracted with DRI/McGraw-Hill (an international demographics firm) to produce a set of long-term (through the year 2050) population and employment forecasts for the "whole county approximations" of Georgia's 14 river basins. That work has been completed, and once the results have been properly interpreted for the counties in your area, these data will be available to assist you with development of the water demand and wastewater sections of your comprehensive local water supply plan.

If these plans are to be developed, reviewed, and approved in a timely fashion, it is important that the planning effort get underway as soon as possible.

I appreciate your continuing cooperation as we move forward with the early stages of implementing the southeast Georgia ground water management strategy.

attachment

cc stake holders (w/attachment)

W:\CALDWELL\WRMP\DOCUMNTS\H2OPLNNG.MMO

MINIMUM REQUIREMENTS OF A COOPERATIVE COMPREHENSIVE COUNTY-WIDE WATER SUPPLY PLAN

I. INTRODUCTION
- A. County Geographical/Geo-political Setting
- B. Climatological, Hydrological, and Hydrogeological Setting
- C. County/Region Economic Setting

II. WATER DEMAND
- A. Past
  - 1. Domestic/Commercial Water Demand (1970 - 1990)
    - a. Population Served
    - b. Annual Water Use Statistics (e.g., monthly average & maximum day use for each month, peak summer/winter consumption)
    - c. Water Conservation Measures Employed (with water savings by category)
  - 2. Industrial Water Demand (1970 - 1990) - *municipal customers and self-supplied*
    - a. Standard Industrial Classifications Served (four digit SIC)
    - b. Water Use Statistics by SIC (e.g., monthly average & maximum day use for each month, peak summer/winter consumption)
    - c. Water Conservation Measures Employed (with water savings by category)
  - 3. Agricultural Water Demand (1970 - 1990)
    - a. Major Crops Irrigated (with irrigated acreage for each crop)
    - b. Water Use by Crop
    - c. Water Conservation Measures Employed
- B. Present
  - 1. Domestic/Commercial Water Demand (1990 - 2000)
    - a. Population Served
    - b. Annual Water Use Statistics (e.g., annual per capita use, monthly average & maximum day use for each month, per summer/winter consumption)
    - c. Water Conservation Measures Employed (with water savings by category)
  - 2. Industrial Water Demand (1990 - 2000) - *municipal customers and self-supplied*
    - a. Standard Industrial Classifications Served (four digit SIC)
    - b. Water Use Statistics by SIC (e.g., monthly average & maximum day use for each month, peak summer/winter consumption)
    - c. Water Conservation Measures Employed (with water savings by category)
  - 3. Agricultural Water Demand (1990 - 2000)
    - a. Major Crops Irrigated (with irrigated acreage for each crop)
    - b. Water Use by Crop
    - c. Water Conservation Measures Employed
- C. Future
  - 1. Domestic/Commercial Water Demand (2010, 2020, 2030, and 2050)
    - a. Population to be Served (to be completed for each of the target years)

b. Annual Water Use Statistics (e.g., annual per capita use, monthly average & maximum day use for each month, per summer/winter consumption)
c. Water Conservation Measures Employed (with water savings by category)

2. Industrial Water Demand (2010, 2020, 2030, and 2050) - *municipal customers and self-supplied*
   a. Standard Industrial Classifications to be Served (four digit SIC)
   b. Water Use Statistics by SIC (e.g., monthly average & maximum day use for each month, peak summer/winter consumption)
   c. Water Conservation Measures Employed (with expected water savings by category)

3. Agricultural Water Demand (2010, 2020, 2030, and 2050)
   a. Major Crops to be Irrigated (with irrigated acreage for each crop)
   b. Water Use by Crop
   c. Water Conservation Measures to be Employed (with expected water savings by category)

III. WATER SUPPLY & SYSTEMS MANAGEMENT

A. Present

1. Ground Water Supply Sources
   a. Source Identification,
   b. Safe Yield of Source
   c. Quality of Source
   d. Source Protection Measures
   e. Service Areas and Interconnections
   f. System Capabilities

2. Surface Water Supply Sources
   a. Source Identification
   b. Safe Yield of Source
   c. Quality of Source
   d. Source Protection Measures
   e. Service Areas and Interconnections
   f. System Capabilities

3. Intergovernmental Cooperation

B. Future

1. Ground Water Supply Options
   a. Source Identification, Quantity, and Quality
   b. Safe Yield of Source
   c. Quality of Source
   d. Source Protection Measures
   e. Service Areas and Interconnections
   f. System Capabilities and Required Upgrades

2. Surface Water Supply Options
   a. Source Identification, Quantity, and Quality
   b. Safe Yield of Source

c. Quality of Source
d. Source Protection Measures
e. Service Areas and Interconnections
f. System Capabilities and Required Upgrades

3. Intergovernmental Cooperation Opportunities

IV. WASTEWATER TREATMENT AND DISPOSAL

A. Present

1. Wastewater Systems with Discharges (NPDES)

a. Domestic/Commercial Publically Owned
(1) Population Served
(2) Wastewater Flowrates
(3) Receiving Streams
(4) Permitted Discharge Limits
(5) Type of Treatment Provided

b. Domestic/Commercial Privately Owned
(1) Population Served
(2) Wastewater Flowrates
(3) Receiving Streams
(4) Permitted Discharge Limits
(5) Type of Treatment Provided

c. Industrial
(1) Standard Industrial Classifications Served
(2) Wastewater Flowrates
(3) Receiving Streams
(4) Permitted Discharge Limits
(5) Type of Treatment Provided

2. Wastewater Systems with Land Treatment (LAS)

a. Domestic/Commercial Publically Owned
(1) Population Served
(2) Wastewater Flowrates
(3) Total Acreage Utilized
(4) Type of Pretreatment Provided

b. Domestic/Commercial Privately Owned
(1) Population Served
(2) Wastewater Flowrates
(3) Total Acreage Utilized
(4) Type of Pretreatment Provided
(5) Biosolid Handling Methods

c. Industrial
    (1) Standard Industrial Classifications Served
    (2) Wastewater Flowrates
    (3) Total Acreage
    (4) Type of Pretreatment Provided
    (5) Biosolid Handling Methods

3. Water Reuse Systems

a. Domestic/Commercial Publically Owned
    (1) Population Served
    (2) Wastewater Flowrates
    (3) How Reclaimed Water Utilized
    (4) Type of Pretreatment Provided
    (5) Biosolid Handling Methods

b. Domestic/Commercial Privately Owned
    (1) Population Served
    (2) Wastewater Flowrates
    (3) How Reclaimed Water Utilized
    (4) Type of Pretreatment Provided
    (5) Biosolid Handling Methods

c. Industrial
    (1) Standard Industrial Classifications Served
    (2) Wastewater Flowrates
    (3) How Reclaimed Water Utilized
    (4) Type of Pretreatment Provided
    (5) Biosolid Handling Methods

4. Onsite Wastewater Treatment and Disposal
    a. Population Served
    b. Wastewater Flowrates

B. Future

1. Domestic/Commercial Demand
    a. Population to be served (community systems)
    b. Projected Wastewater Flowrates (community systems
    c. Population to be served (onsite systems)
    d. Projected Wastewater Flowrates (onsite systems)
    e. Water Reuse Opportunities

2. Industrial Demand
    a. Standard Industrial Classification to be Served
    b. Projected Wastewater Flowrates
    c. Water Reuse Opportunities

C. USGS Floridan Aquifer Studies

(1) *Geology and Ground-Water Resources of the Coastal Area of Georgia*, Bulletin 113, 1990, USGS, Clarke, Hacke & Peck.

(2) *Hydrology of the Floridan Aquifer System in Southeast Georgia and Adjacent Parts of Florida and South Carolina*, USGS Professional Paper 1403-D, 1989, Krause & Randolph.

(3) *Water-Supply Potential of the Floridan Aquifer System in Coastal Area of Georgia - A Digital Model Approach*, Bulletin 116, 1991, USGS, Randolph, Pernik & Garza.

(4) *Water-Supply Potential of Major Streams and the Upper Floridan Aquifer in the Vicinity of Savannah, Georgia*, Report 92-629, 1992, USGS, Garza & Krause.

D. References

(1) *Hydrogeology of the Dublin and Midville Aquifer Systems of East-Central Georgia*, Information Circular 74, 1985; GA DNR-EPD, GA Geologic Survey; Clark, Brooks, and Faye.

(2) *Hydrogeologic Data and Aquifer Interconnection in a Multi-aquifer System in Coastal Plain Sediments Near Millhaven, Screven County, Georgia, 1991-95.* Information Circular 99, 1996; US Department of the Interior, USGS, US Department of Energy; Clarke, Falls, Edwards, Frederiksen, Bybell, Gibson, Gohn, and Fleming.

(3) *Geologic, Hydrologic, and Water Quality Data for a Multi-aquifer System in Coastal Plain Sediments Near Millers Pond, Burke County, Georgia, 1992-93*, Information Circular 96, 1994; U.S. Department of the Interior, USGS, U.S. Department of Energy; Clarke, Falls, Edwards, Frederiksen, Bybell, Gibson, and Litwin.

(4) *The Hydrogeology of the Coastal Plain Strata of Richmond and Northern Burke Counties, Georgia*, Information Circular 61, 1985; GA DNR-EPD, GA Geologic Survey; Gorday.

(5) *The Lithostratigraphic Framework of the Uppermost Cretaceous and Lower Tertiary of Eastern Burke County, Georgia*, Bulletin 127, 1996; GA DNR-EPD, GA Geologic Survey; Huddlestun and Summerour.

(6) *Hydrogeology of the Gulf Trough – Apalachicola Embayment Area, Georgia*, Bulletin 94, 1990; GA DNR-EPD, GA Geologic Survey; Kellam and Gorday.

(7) *Geologic, Hydrologic, and Water-Chemistry Data for a Multi-Aquifer System in Coastal Plain Sediments Near Girard, Burke County, Georgia, 1992-95*, Information Circular 100, 1996; US Department of the Interior, USGS, US Department of Energy; Leeth, Falls, Edwards, Frederiksen, and Fleming.

(8) *Potentiometric Surface of the Upper Floridan Aquifer in Georgia and Adjacent Parts of Alabama, Florida, and South Carolina, May 1998, and Water-Level Trends in Georgia, 1990-98*, 1999; US Department of the Interior, GA DNR-EPD, GA Geologic Survey; Peck, Clarke, Ransom, and Richards.

(9) *The Geohydrology of the Cretaceous Aquifer System in Georgia*, 1980; GA DNR-EPD, GA Geologic Survey; Pollard and Vorhis.

(10) *Irrigation Conservation Practices Appropriate for the Southeastern United States*, 1998; GA DNR, GA Geologic Survey; Evans, Harrison, Hook, Privette, Segars, Smith, Thomas, and Tyson.

E. Local Adoption Resolutions

Board Of Commissioners Of Burke County

COMMISSIONERS

ELLIS GODBEE
Chairman
616 Godbee Road
Waynesboro, Ga. 30830

WOODROW HARVEY
199 Gresham Avenue
Gough, Ga. 30811

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FRANK WILLIAMS
Vice-Chairman
410 Liberty Street
Waynesboro, Ga. 30830

ADMINISTRATOR

C.W. HOPPER JR.
Waynesboro, Ga.

SUPT. OF ROADS

JESSE BURKE
Waynesboro, Ga.

ATTORNEY

P.B. LEWIS JR.
Waynesboro, Ga.

August 25, 2000

Nap Caldwell, Program Manager
Water Resources Management Program
205 Butler Street, S. E., East Floyd Tower
Atlanta, Georgia 30334

Dear Mr. Caldwell:

The Burke County Board of Commissioners has reviewed the Burke County Water Supply Management Plan prepared by Rutherford and Associates. The Commission finds that the plan is ready to be submitted to EPD for necessary review for compliance with the requirements and criteria established in EPD's 1997 Interim Strategy.

If you have any questions, please contact my office.

Sincerely,

C.W. Hopper Jr.

C. W. Hopper, Jr.
County Administrator

CWHJR:lf

(706) 554-2324 • FAX (706) 554-0350
P.O. BOX 89, WAYNESBORO, GEORGIA 30830