City of Griffin
Water Master Plan 2010-2050

Prepared for:

City of Griffin, Georgia

Submitted by:

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May 2011

TABLE OF CONTENTS

Page

LIST OF TABLES

LIST OF FIGURES

APPENDICES

Section 1
Introduction

SECTION 1
INTRODUCTION

1.1 Introduction and Objective

In the last 14 years, the City of Griffin has prepared or updated several master plan documents for its water system. A study prepared in 1997 focused on an existing shortage in water supply. The report identified several locations for a future water supply reservoir and recommended three sites for further evaluation. A subsequent study prepared in 1998 recommended one site as the preferred alternative for siting of the reservoir. Between 1998 and 2005, the City worked diligently to secure the necessary permits and funds to construct the reservoir, a new water treatment plant and transmission system. Construction of these facilities was completed in 2005. In 2007, an update to the master plan was prepared, mainly to address water treatment and transmission needs for the period 2007 to 2030. In 2009, the City conducted an evaluation of the storage capacity remaining in the City's Heads Creek Reservoir.

The purpose of this update to the master plan is to compile, in one report, the findings from the previous studies, to update the projections of water demand, and to recommend improvements needed to the system for the period 2010 to 2050.

1.2 Background

The Griffin water system began operations in the late 1800's, when Griffin was emerging as a manufacturing center in the region. Until the 2000 decade, Griffin's water system supplied drinking water to the incorporated City and to the Spalding County Water Authority, which serves unincorporated Spalding County. The Griffin water system is now a regional provider serving all of Spalding County and portions of the counties of Pike and Coweta, with Meriwether to be a future participant, as shown in Figure 1-1. Lamar County and Butts County are also customers of the regional system.

The City of Griffin is responsible for financing, constructing, managing, and operating facilities for water supply and treatment with capacity sufficient to meet the needs of Spalding County and of the other participants of the regional system.

1.3 Regional Water System

In 2005, the City of Griffin completed construction of a large project called the Flint River Regional Water Supply Project. This project was planned, financed and constructed by the City of Griffin as a truly regional project to serve four counties and several cities within those counties (Griffin, Williamson, Zebulon, and Concord). Planning for the project began in the mid-1990's as the City of Griffin started to evaluate options to increase its water supply. A thorough analysis of options determined a need to construct one or more reservoirs. During the search for reservoir sites it became clear that an off-stream reservoir sited near the Flint River, sufficiently downstream of Griffin so that stream flow would be ample, would be best not only for Griffin but for the entire region and would minimize impacts to the environment.

The City obtained a Clean Water Act Section 404 permit from the Corps of Engineers to construct a 475-acre reservoir on Still Branch, a small tributary of the Flint River. The site for the reservoir minimized impacts to wetlands, aquatic environment, property owners, and cultural and archaeological resources, and was located 21 miles south of Griffin where the Flint River provides ample flow to maintain a firm yield of 35 million gallons per day (MGD), sufficient to meet the water supply needs of the project's participants through the Year 2050 and beyond.

The Flint River Regional Water Supply Project consisted of the following elements, as shown in Figure 1-2:

- Intake and 40-MGD pump station on the Flint River (expandable to 50-MGD);
- 475-acre, 3.5-billion gallon reservoir (referred to as the Still Branch Reservoir);
- 42" raw water main from the river to the reservoir;
- 12-MGD reservoir pump station expandable to 48-MGD;
- Water treatment plant expandable to 48-MGD with initial capacity of 6 MGD (originally intended to be 8 MGD, as described later in this report); and
- 32 miles of large diameter water mains to transport drinking water to the water systems.

This project was the culmination of a commitment made in 1994 by the City of Griffin to study water supply alternatives and the feasibility of a multi-jurisdictional water supply system. The regional system officially began in December of 1995 when Spalding County and the City of Griffin executed a 25-year agreement, which provided for Spalding County to purchase all of its water from Griffin and for Griffin to take the necessary steps to finance and construct facilities for water supply and treatment with capacity sufficient to meet the needs of Spalding County.

The Griffin-Spalding agreement provided the foundation for a multi-county water supply plan and in 1996 the cities of Williamson and Zebulon, which are located in Pike County, executed 50-year agreements which provide that Griffin will supply treated water to each of these cities. Formal resolutions of participation were executed between Griffin and the following jurisdictions: Pike County, Meriwether County, City of Concord, City of Meansville and City of Molena, with the City of Concord later executing a 50-year agreement. These resolutions provided that each jurisdiction would be assured an allocation from the proposed water supply facilities. In December of 1999, Griffin executed a 50-year agreement with Coweta County to supply drinking water to the east portion of the county. The agreement with Coweta benefits Griffin and all other participants in the regional system by spreading the costs over a larger customer base and results in a lower cost to all participants. The annual average amount of water guaranteed to Coweta is 1.0 MGD beginning in 2006 and increases annually to 7.5 MGD in year 2025, then declines in later years, as shown in the table below. This agreement allowed Griffin to sell some of its excess capacity during earlier years, while retaining long-term capacity for later years when growth in the Griffin region was expected to increase demand for water. It also provided an additional water source to meet a critical need of Coweta County.

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Allocations to Coweta County, Gallons per Day, Average Basis			
Year	Water Allocated to Coweta	Year	Water Allocated to Coweta
2006	1,000,000	2031	7,500,000
2007	1,340,000	2032	7,250,000
2008	1,680,000	2033	7,000,000
2009	2,020,000	2034	6,750,000
2010	2,360,000	2035	6,500,000
2011	2,700,000	2036	6,250,000
2012	3,040,000	2037	6,000,000
2013	3,380,000	2038	5,750,000
2014	3,720,000	2039	5,500,000
2015	4,060,000	2040	5,250,000
2016	4,400,000	2041	5,000,000
2017	4,740,000	2042	5,000,000
2018	5,080,000	2043	5,000,000
2019	5,420,000	2044	5,000,000
2020	5,760,000	2045	5,000,000
2021	6,100,000	2046	5,000,000
2022	6,440,000	2047	5,000,000
2023	6,780,000	2048	5,000,000
2024	7,120,000	2049	5,000,000
2025	7,500,000		
2026	7,500,000		
2027	7,500,000		
2028	7,500,000		
2029	7,500,000		
2030	7,500,000		

The guaranteed peak daily demand will be limited to a maximum of 150 percent of the allocations above.

The agreements can be modified or terminated only by mutual consent of Griffin and each participant. The following table summarizes the existing agreements between Griffin and the participants.

Agreements between Griffin and Regional System Participants		
Participant	Date of Agreement	Duration (years)
Spalding County and Spalding County Water & Sewerage Authority	Jan. 1, 1996	25
City of Williamson	June 30, 1996	50
City of Zebulon	Aug. 1, 1996	50
City of Concord	March 24, 2005	50

Coweta County	Dec. 14, 1999	50
Lamar County Water and Sewer Authority	Nov. 27, 2002	50
Pike County	To be executed by agreement	50

The water supply agreement between Pike County and the City of Griffin has not been executed at the time of writing of this report. However, in a Settlement Agreement signed between the two parties, Pike agreed to execute a 50-year water supply agreement similar to the others.

As seen in the table above, the agreement with Spalding County and the Spalding County Water & Sewerage Authority expires on December 31, 2020, if not renewed by both parties. This is a significant factor in the future of the regional system and any decisions made with regard to improvements will need to be made based on discussions with Spalding County and its Water Authority. The City of Griffin has prepared a plan defining the master meter locations of the Griffin and Spalding County distribution systems. This document clearly identifies the assets of each system and the number of master meters needed to segregate them.

1.4 Master Plan Goals

Since the master plan update of 2007, there have been three significant developments that have prompted the need to update the master plan in 2010:

- Reduction in water demand;
- Evaluation of the remaining capacity of the Heads Creek Reservoir; and
- Evaluation of the capacity of the Still Branch Water Treatment Plant.

The goals of this plan are:

- To update the long-term water demands of participating jurisdictions;
- To identify alternatives for meeting future water demands;
- To perform preliminary cost estimates;
- To recommend to the City of Griffin the best alternatives for implementation.

1.5 Report Organization

This report is divided into the following sections:

- Section One Introduction
- Section Two Existing Conditions
- Section Three Population and Water Demand
- Section Four Alternatives Analysis
- Section Five Recommendations and Implementation

The capacity of the Heads Creek Reservoir and the Still Branch plant are included in Section 2 and the updated projection of demand is presented in Section 3.

1.6 Acknowledgement

This master plan update could have not been prepared without the efforts of individuals within the City. ESI would like to particularly acknowledge Mr. Brant D. Keller, Ph.D., Director of Public Works and Utilities, for providing data, information and significant input to the plan.

Others in the City that assisted in the preparation of this plan include Mr. Ernest Cousson, Superintendent of the Still Branch WTP; Mr. Mike Melton, Assistant Superintendent of the Still Branch WTP; Mr. Dave Moss, Superintendent of the Harry Simmons WTP; and Mr. James Beasley, Deputy Director of Water and Wastewater.

The City of Griffin has obtained many awards for operations of its treatment facilities. The City has also been a WaterFirst community since 2007. There are only 21 systems in the State of Georgia designated as WaterFirst communities. WaterFirst, a Department of Community Affairs' community water initiative, is:

- a voluntary partnership between local governments, state agencies and other organizations working together to increase the quality of life in communities through the wise management and protection of water resources;
- a proactive approach to water resources that makes the connection between land use and water quality and quantity;
- thinking beyond political boundaries, recognizing the inextricable links created by shared water resources, and considering the watershed as a whole;
- pursuing and rewarding environmental excellence beyond what is required by law in the management and protection of water resources; and
- an important step that communities can take to protect valuable water resources for both environmental and economic benefits today and tomorrow.

1.7 Participation in State Water Plan

The City of Griffin is a major stakeholder in the Upper Flint River basin and is therefore very interested in the planning that is being conducted at State level. The Georgia Comprehensive State-wide Water Management Plan (State Water Plan)was adopted by the General Assembly in 2008. The regional water planning councils represent regions in Georgia as designated in the water plan. Each council consists of individuals appointed by the Governor, Lt. Governor, and Speaker of the House. The City has two representatives on the Upper Flint Regional Water Planning Council, Mr. Dick Morrow, who is Vice-Chair of the Council, and Mr. Brant Keller, Ph.D.

The Upper Flint water planning region encompasses over 4,355 square miles in west-central Georgia and includes 13 counties (Crisp, Dooly, Macon, Marion, Meriwether, Pike, Schley, Spalding, Sumter, Talbot, Taylor, Upson, and Webster) as well as 48 towns and cities partially or fully within these counties. Major regional river basins include the Flint, Chattahoochee and small areas within both the Middle Ocmulgee and Suwannee. Spalding County, of which Griffin is the county seat, has by far the largest current and projected water demand of all the counties in the Upper Flint council. In the State Water Plan, the 2050 demand from public water supply is 17.3 MGD for Spalding County and 4.5 MGD for the second highest 2050 demand projected for Sumter County.

Section 2
Existing Conditions

SECTION 2
EXISTING CONDITIONS

2.1 Study Area

Based upon the long-term agreements and resolutions of participation that were executed as listed in Section 1.1 of this report, the study area includes the following jurisdictions:

- Spalding County (including all cities in the county);
- Pike County (including all cities in the county);
- Coweta County (specific water allocations made as listed in Section 1); and
- Meriwether County (northeastern portion of county).

These counties are shown in Figure 1-1, which shows the officially designated service areas in the application for water withdrawal submitted to the Georgia EPD. Lamar County is a small participant of the regional system, with its use limited to 100,000 gallons per day by agreement.

Spalding County and the City of Griffin have defined areas of service, as required by the State of Georgia's Service Delivery Act. These areas are shown in Figure 2-1. The service delivery agreement map is included in the Appendix. Service territories are defined between the two parties as follows: all customers inside the corporate limits of Griffin at the time of the agreement shall be Griffin's customers. Certain other defined city customers presently located outside the corporate limits shall remain Griffin customers; all other customers in unincorporated Spalding County shall be customers of Spalding County until annexation occurs, at which time the agreement provides procedures for the customers to be Griffin's if Griffin compensates Spalding for the water mains in the annexed area. The agreement defines the method for determining the purchase cost of water mains.

2.2 Existing Raw Water Supply Facilities

The City of Griffin obtains raw water from two locations on the Flint River, as shown in Figure 2-2. One intake (with pump station) is located in Spalding County west of Griffin near Old Salem Road and was originally constructed in 1929 and expanded in 1972. At this pump station, four centrifugal pumps force raw water through two 20-inch cast iron mains to either the Heads Creek Reservoir located approximately two miles away or to the J. Harry Simmons Water Treatment Plant in Griffin approximately 8 miles away. This system has an average capacity of

12 MGD and a peak-day capacity of 13.2 MGD and is permitted by EPD for those rates. In reality, due mainly to the capacity of the pumps and the raw water mains, the capacity of this system during periods of normal rainfall is approximately 11 MGD. As described below, the capacity is severely limited during droughts by the remaining usable volume in the Heads Creek Reservoir.

The other, newer river intake is located in Pike County near Still Branch west of Molena. It consists of a pump station with initial capacity of 40 MGD. The station contains two vertical turbine pumps and space for a third pump, which when installed, will increase the capacity to 50 MGD. This intake pumps to the Still Branch Reservoir. Construction of the intake and reservoir was completed in 2004.

The Still Branch system is designed to pump water from the Flint River into the reservoir as long as flow in the river exceeds the minimum streamflow required by the Georgia EPD. The minimum streamflow varies with the month of the year and also with whether the reservoir is below 70% full, as shown in the following table.

Minimum Streamflow in Flint River below Still Branch Intake

Month	Streamflow when Still Branch Reservoir Storage At or Above 70% Full (cfs)	Streamflow when Still Branch Reservoir Storage Below 70% Full (cfs)
January	247	235
February	247	247
March	247	247
April	247	247
May	247	111
June	247	60
July	247	60
August	247	60
September	247	60
October	247	60
November	247	60
December	247	136

The lowest streamflow of 60 cubic feet per second (cfs) corresponds to the 7Q10 for the location of this intake on the Flint River. The 7Q10 is defined as the minimum seven-day consecutive flow that occurs on average once every 10 years (60 cfs equals 39 MGD). A copy of the withdrawal permit for the Still Branch intake and reservoir is included in the Appendix.

2.2.1 Heads Creek Reservoir

The Heads Creek Reservoir covers 314 acres. The original volume of the reservoir after construction was completed in April 1963 was stated as 971 million gallons in a report prepared for the State of Georgia Safe Dams Program in 1979. In 2009, ESI performed a bathymetric (depth) survey of the reservoir. The results show a volume of 510 million gallons remaining in the reservoir above the sediment level. Therefore, the volume lost to sediment deposition in 47 years is 461 MG, or 47% of the total original volume.

The reservoir and its pump station were constructed in 1964 to supplement the supply from the Flint River during periods of drought when the river flow is too low to meet the City's demand. The reservoir pump station is comprised of two vertical turbine pumps. A diesel fuel powered generator was added to this station in 1995 to provide electricity during power outages.

The safe or firm yield of a reservoir is typically defined as the maximum quantity of water that can be supplied continuously throughout a severe drought. The firm yield is calculated by modeling inflows and outflows of water during a period similar to the worst drought recorded in the area. For the period beginning March 1937 and ending September 2008, the worst drought period in this area of Georgia occurred from January 1954 to September 1956. For public water supply systems, the Georgia Environmental Protection Division (EPD) stipulates that yield capacity be calculated for the 1954 drought if flows are available from a USGS gaging station in the vicinity of the proposed reservoir. The firm yield during a drought of the combined Heads Creek Reservoir and Flint River intake system is now estimated to be 5 MGD on an annual average basis. This is a markedly different yield than that calculated in the 2007 master plan update of 7 MGD. This reduced yield makes it very difficult for the leadership of the water system to make decisions regarding operation of the City's two treatment plants because it is almost impossible to predict when a drought will begin and how long it will last. If the Heads Creek Reservoir is allowed to fall to low levels, the City looses the entire capacity of the

Simmons treatment plant and must then rely solely on the Still Branch plant, which as described below, has a capacity that is lower than the existing demand in the water system. This is a difficult issue that must be resolved and is one of the most important components of this update to the master plan. Options that were discussed in the 2009 capacity evaluation of the Heads Creek reservoir are included below.

Increase Capacity by Raising the Dam

Two main options are available to increase the capacity of the reservoir: (1) dredging to restore capacity, and (2) increasing the normal pool level by either adding gates or a labyrinth weir to replace the existing spillway with or without raising the existing earthen dam.

The existing dam was constructed in 1963 with a top elevation of 779 feet above mean sea level, providing 10 feet of freeboard above the crest of the Ogee weir that maintains a normal pool elevation of approximately 769 feet. A report prepared for the Georgia Safe Dams Program in 1979 indicated that the dam would be overtopped if a rainfall event of half the Probable Maximum Precipitation (PMP) were to occur. Consequently, the dam was raised in 1983 by 1.8 feet to Elevation 780.8 feet.

In 1994, during Tropical Storm Alberto, the Ogee weir passed the flow generated by the storm without visible damage, however, the curved spillway channel was apparently partially overtopped, creating erosion in parts of the curved channel. This storm, while intense, did not approach the half PMP design rainfall for this area of 15.80 inches in six hours. Therefore, any means to raise the water level in the reservoir will require replacement of the existing Ogee weir and spillway.

For the capacity evaluation, it was assumed the water level would be raised 10 feet to a Normal Pool Elevation of 779 feet. The storage capacity at this elevation would increase by 1.5 billion gallons to a total usable volume of 2.0 billion gallons.

Reliable Yield

As mentioned above, the reliable yield of the reservoir is currently only 5 MGD due to reduced capacity caused by siltation. By raising the normal pool ten feet, the reliable yield of the reservoir would increase to 16 MGD, assuming the current non-depletable flow of 15 cfs at the Flint River intake would continue to be permitted and with the current pumping capacity of 11 MGD at the Flint River Pump Station.

Estimated Cost to Raise Water Level

The estimated cost to raise the water level 10 feet is $27.7 million. This cost estimate includes impact to approximately 21 structures (mainly residences, as observed from aerial photographs), construction of a new labyrinth spillway and straight channel, acquisition of additional property, and raising of the existing bridges at Highway 92 and Cheatham Road. Vaughn School Road, which runs parallel to the reservoir to the west, would be inundated in many places, therefore, it is expected that this road would need to be closed. This cost calculates to $18,467 per million gallons of volume added.

Dredging

As mentioned, approximately half the volume of the reservoir has been lost to accumulation of sediment carried with incoming runoff over 47 years since the reservoir was constructed. One obvious means to increase capacity is to conduct dredging to remove the accumulated sediment. The maximum volume gained without raising the dam would be approximately 460 million gallons. It should be noted that it is rarely cost effective to remove all the accumulated sediment.

Dredging would involve pumping the sediment from barges into either separator tanks built into other barges or into temporary settling ponds excavated around the periphery of the reservoir. For the amount of material that would be dredged from the Heads Creek Reservoir, temporary settling ponds would likely be chosen by contractors over barge separator tanks.

The main purpose of settling the dredged material is to decrease the volume to be hauled offsite and return the water to the reservoir. Once “dewatered” to approximately 20 percent solids, the material would then be hauled to approved sites. It is expected that, because the Heads Creek Reservoir is used to store water for drinking water purposes, the sediment should be free of hazardous pollutants. This would need to be confirmed through thorough sampling and testing prior to hauling of the dredged material.

A cursory review of maps for the area did not identify single sites that could be used for the hundreds of thousands of cubic yards that would need disposal. There exists an old quarry near County Line Road to the southwest but it is unknown at this time if this site would be suitable.

The estimated cost to dredge, haul and dispose of 450 MG of sediment slurry, at 20% solids, is $30.6 million. This cost assumes a round-trip haul distance of 40 miles. This total cost results in a unit cost of $68,000 per million gallons of volume restored, which is 5 times the unit cost of raising the dam and water level. The reliable yield of the reservoir and Flint River intake would be 8.5 MGD.

Comparison of Dredging and Raising of the Normal Pool

As described above, dredging of the reservoir would cost an estimated $30.6 million to re-gain 450 million gallons of capacity and to restore the original reliable yield to 8.5 MGD. Raising the normal pool would cost an estimated $27.7 million, would increase storage capacity by 1.5 billion gallons, and would increase the reliable yield to 16 MGD.

A third option would be to pump raw water from the Still Branch Reservoir to the Heads Creek Reservoir. This would allow for the excess storage capacity in the Still Branch Reservoir to be used at the Simmons plant. The raw water main would also be connected to the two existing 20-inch raw water mains between Heads Creek and the Simmons plant. A major advantage of this option is that this raw water main could be converted to a drinking water transmission main in the future. This option has been studied in detail, and, at an estimated capital cost of $19.8 million, would be more cost effective than either raising the water level or dredging the Heads Creek reservoir. These costs are summarized in the table below and are compared to the cost of the Still Branch Reservoir.

Important non-cost factors would need to be considered for the option of raising the dam at the Heads Creek Reservoir such as impact to residences, wetlands, streams, additional property required, and impacts to existing bridges and roads. From the standpoint of cost and overall impact, installation of a raw water main from the Still Branch Reservoir to the Heads Creek Reservoir is the preferred alternative. This main could be converted to a drinking water main in the future, whenever it becomes necessary to shut down the Simmons WTP, which has been in operation since 1929.

Cost Comparison of Options to Increase Capacity of the Heads Creek Reservoir				
Option	Description	Estimated Cost	Volume Gained, Million Gallons	Cost per Million Gallons
1	Dredge Heads Creek Reservoir	$ 30,600,000	450	$ 68,000
2	Raise Heads Creek Dam	$ 27,700,000	1,500	$ 18,467
3	Transfer raw water from Still Branch Reservoir to Heads Creek Reservoir	$ 19,800,000	3,500	$ 5,657
4	Compare to cost of Still Branch Reservoir	$ 13,000,000	3,500	$ 3,714

2.2.2 Still Branch Reservoir

The Still Branch Reservoir covers 475 acres and provides an estimated 3.5 billion gallons of usable storage. The reliable yield of the reservoir and river intake is 35 MGD. Figure 2-3 presents a stage-storage curve and table for the Still Branch Reservoir. The reservoir and its pump station were constructed in 2004. The reservoir pump station contains two vertical turbine pumps and space for a third pump. This pump station pumps to the Still Branch Water Treatment Plant and has an initial capacity of 12 MGD, when the reservoir is near its lowest level. The ultimate capacity of this station is 48 MGD after future replacement with large pumps.

2.2.3 GEFA's Inventory And Survey Of Feasible Sites For Water Supply Reservoirs

A study was conducted in 2008 for the Georgia Environmental Facilities Authority (GEFA) to inventory and survey feasible sites for multi-jurisdictional drinking water supply reservoirs in Georgia. This study was conducted in response to a mandate under the Georgia Water Supply Act of 2008. The results of the study are compiled in a report titled "Georgia Inventory And Survey of Feasible Sites For Water Supply Reservoirs" dated October 31, 2008, prepared by Mactec Engineering and Consulting, Inc. and a group of sub-consultants.

The report contains a listing of 16 existing reservoirs that have significant potential for increased water supply yield by raising the existing dam to provide more storage volume in combination with supplemental pumping from a nearby stream for reservoir filling. Two of these 16 reservoirs are owned by the City of Griffin, the heads Creek Reservoir and the Still Branch Reservoir.

The GEFA report stated the volume of the Heads Creek Reservoir as 2.5 billion gallons to the top of the dam and a proposed expansion volume of 1.5 billion gallons by raising the dam 10 feet, for a total volume of 4.0 billion gallons. As noted above in this master plan, the total volume if the dam is raised would be 2 billion gallons instead of 4 billion gallons as estimated in the GEFA report.

The GEFA report also stated the volume of the Still Branch Reservoir as 1.5 billion gallons to the top of the dam and a proposed expansion volume of 2.7 billion gallons by raising the dam 10 feet, for a total volume of 4.2 billion gallons. These estimates are incorrect, as the reservoir already contains a total volume of 3.9 billion gallons at the Normal Pool Elevation of 752 feet above mean sea level, with a usable volume of 3.5 billion gallons.

2.3 Existing Treatment Facilities

2.3.1 J. Harry Simmons Water Treatment Plant

The J. Harry Simmons Water Treatment Plant (referred in this report as the Simmons WTP) was constructed in 1929 with capacity of 4 MGD and has been expanded several times to its current capacity of 13.2 MGD (which as described above is limited to approximately 11 MGD during non-drought periods due to raw water pumping and transmission capacity). The treatment facility is a conventional surface water treatment plant that includes rapid mix coagulation with alum, pre-disinfection with chlorine dioxide, flocculation, sedimentation, filtration and disinfection with chlorine. Finished water is stored in two clearwells totaling 4.5 million gallons of storage. Residuals from the plant are separated and land applied.

2.3.2 Still Branch Water Treatment Plant

The Still Branch Water Treatment Plant was constructed in 2005. The initial capacity of the plant was intended to be 8 MGD with potential to high-rate to 12 MGD after demonstration of the higher rate during full-scale operation. The facility is a conventional surface water treatment plant that includes rapid mix coagulation, pre-disinfection with chlorine dioxide, flocculation, sedimentation with plate settlers, filtration and disinfection with chlorine. Finished water is stored in one clearwell with capacity of one million gallons of storage. Residuals from the plant are separated and land applied near the plant site.

The plant began full-scale operation in 2006. During the first and second years of operation, it became obvious that the duration of filter runs (time between filter backwash) at the plant was lower than expected and the plant used more water for each backwash than the Simmons plant. Plant staff experimented with many chemicals for coagulation and had the filters inspected by the manufacturer, ultimately settling for polyaluminum chloride and polymer as the optimum for this plant. However, even after thorough testing of chemicals, production of water at the plant could not be maintained consistently at more than approximately 6.5 MGD. Plant staff and observations of plants operations indicate the plant will work best at a rate of 6 MGD, with intermittent peak days of 6.5 MGD.

The treatment unit that appears to be limiting capacity is sedimentation. This plant utilizes stainless steel plate settlers that were designed for the full plant flow of 8 MGD with potential to high-rate to 12 MGD, as indicated by manufacturers of plate settlers. In reality, even at 8 MGD, the plate settlers do not perform satisfactorily and allow flocculated particles to carry over into the filters. When this occurs, the filters quickly become blinded and must be backwashed too frequently.

For this update, ESI researched the design criteria used for the plate settlers. The settling rate used for design was 0.26 gallons per minute per square foot for 8 MGD and 0.35 gallons per minute per square foot for 12 MGD, both values well within the recommended criteria. In reality, the rate that performs best is 0.20 gpm per square foot. ESI contacted operators of other plants with the same type of plate settlers but most plants are not operating at full capacity and thus have not had to operate at the full design capacity. One plant, however, in Charleston, South Carolina, has experienced problems very similar to the Still Branch plant. At this facility, plate settlers were pilot-tested against other technologies and, after performing better, were selected as the preferred technology. The full-scale plant was designed for a rate of 0.30 gpm per square foot (or higher) but has performed best at a rate almost identical to the Still Branch plant’s of 0.20 gpm per square foot. One of the problems identified at that plant was plugging of the slots in the influent channel that resulted in uneven flow to the plates. Cleaning and enlargement of the slots helped but did not increase the reliable capacity of the plate settlers beyond 0.20 gpm per square foot.

The raw water pumped into the Still Branch plant is more difficult to treat than at the Simmons plant due to the low turbidity of the water of approximately 2 Nephelometric Turbidity Units (NTU). This water does not provide sufficient ballast to create a strong, dense floc that will settle easily in the plate settlers and remain settled when higher flows are needed through the plate settlers. One of the options that will be described in Section 4 of this report is to conduct an evaluation and pilot-testing of the plant to determine if formation of a denser floc may result in improved settling in the existing sedimentation basins. For the purpose of current capacity of the water system, the Still Branch WTP is estimated at 6 MGD for average production with intermittent capacity of 6.5 MGD for peak days.

2.4 Existing Transmission and Distribution System

As shown in Figure 2-2, the system consists of 20-inch cast iron transmission mains from the Simmons WTP and of 36-inch to 24-inch ductile iron mains from the Still Branch WTP.

Griffin's distribution system includes three 1-million-gallon elevated storage tanks and approximately 150 miles of distribution piping ranging in size from 2" to 20" in diameter. The city-owned distribution system serves an area of approximately 16 square miles that includes all of the city and a small portion of unincorporated area. Spalding County's water distribution system covers all of the unincorporated area of the county and consists of a 12-inch loop with smaller mains branching from it and two 500,000-gallon elevated storage tanks. The County is currently in the process of constructing one new 1.5-million gallon elevated tank to serve the Sun City development and a 500,000-gallon tank to serve the Heron Bay development and areas in northeastern Spalding County.

Spalding County has recently experienced low chlorine residuals in northern portions of the County. The County is planning to install chlorine booster stations for these areas.

Section 3
Population and Water Demand

SECTION 3
POPULATION AND WATER DEMAND

This section presents the projection of water requirements from the present to the year 2050 for the service area described in Section 2.

3.1 Methodology Used to Project Water Demand

This master plan updates projections made in the Water Master Plan Update, 2010 – 2030, prepared in October 2007. The most significant change from the projection made in that study is the reduction in water usage in the last 3 years and the expected conservation of water prompted by the State of Georgia's 2010 Water Stewardship Act. The revised population and water demand projections are shown in Table 3-1.

3.2 Population Projection

3.2.1 Spalding County

In the case of Spalding County, the 2007 master plan update included high growth in population and demand due to new residential developments in northeast Spalding, as described in a letter from then County Manager William Wilson. Due to depressed economic conditions, the projected demand has not materialized. The projection made in this update is considered to be more realistic with buildout for those developments expected to occur over a period of 12 to 15 years. The estimate of water demand is made using the EPD-approved method of applying per capita water usage values typical for the county to the projected population. As seen in recent years and shown in Table 3-1, per capita usage has declined due to conservation and to the increasing cost of water. For the years between 2030 and 2050, the population projections developed for EPD by the Governor's Office of Planning and Budget (OPB) were used. These are the projections used by the Regional Water Councils for the Georgia Water Master Plan.

The demand projections developed for use by the Regional Water Councils used 2005 as a base year. For Spalding County, the per-capita rate was relatively high at 163 gallons per capita per day. This was due in great part to water use by Springs Industries, which was still active in 2005. If use by Springs and other industrial customers is subtracted from the total 2005 demand, the residential and commercial demand calculates to 85 gallons per capita per day. Further discussion of the unit rate is provided in the demand projection section below.

3.2.2 Pike County

Populations projections made in the 2007 update were found to provide reasonable estimates of water demands for Pike County. Therefore, these were used to project demand with the actual per capita factors that occurred in the last 3 years, as shown in Table 3-1.

3.2.3 Meriwether County

Only the northeastern portion of Meriwether County, excluding areas served by existing water systems, is expected to be served by the new system. The total demand projected from Meriwether County is fairly low when compared to other participants of the regional system. Population projections made in the 2007 master plan update were used in Table 3-1.

3.3 Water Demand Projection

3.3.1 Spalding County

Table 3-1 presents a projection of water demand using the method of population projection times a factor of gallons per capita per day plus allowance for commercial and industrial demand. The City of Griffin maintains very detailed records of retail water sales to different categories of customers such as residential, commercial and industrial as well as records of wholesale water sales to Spalding County. The city also maintains a record of water pumped from its supply sources and from its water production facilities. Using this historical data, water demand for all of Spalding County was disaggregated into Residential Demand and Commercial/Industrial Demand. In the City of Griffin, per capita usage has decreased from 71 gal/day in 2005 to 58 gal/day in 2010 (see Section 3.3.1.1 below for conservation efforts implemented in the City).

In Table 3-1, actual numbers are shown for 2005-2010 and projected numbers are shown for subsequent years. In the 2000 and 2007 master plans, the factor of gallons per capita per day was projected to increase at a rate of 0.5 gpcd per year due mostly to increased outdoor water use. In this 2010 update, given the aggressive conservation efforts promulgated by the State, we believe the per capita factors will remain low at 58 and 64 gal/day, for Griffin and Spalding, respectively. The numbers shown in Table 3-1 include water used in the water treatment plant and lost and unaccounted-for water in the distribution system.

The number of gallons per Commercial/Industrial customer was projected to remain at the 2010 level and the number of Commercial/Industrial customers was predicted to increase in proportion to population. The average annual water demand projection in Spalding County (not including Griffin) is expected to double from current levels in 2040, compared to the projection made in the 2007 plan of doubling the demand in 2030.

3.3.1.1 Water Conservation

The City of Griffin has implemented a comprehensive water conservation plan that consists of nine major elements. The most important advances accomplished in the plan include the following:

- System Maps: the City of Griffin's Public Works and Utilities Department operates the Geographic Information System (GIS). The department has a permanent staff and the system maps are updated on a continuous basis allowing for the distribution superintendent to have immediate access to valves, hydrants, and water mains for making quick repairs.
- Leak Detection and Elimination Program: The water department's distribution crews have replaced over 5,000 service connections with brass and copper since 2002, eliminating PVC and galvanized steel connections. All service repairs and replacements are logged and linked to the City's GIS system. The leak detection unit has recently purchased more modern equipment using Fluid Control's Data Loggers to enhance their capabilities to locate leaks in the system in conjunction with their mobile unit. In most cases all leaks are repaired within 96 hours after the locates clear and all major leaks are repaired in an average time of 4 hours
- Meter Replacement, Testing, and Replacement: All 22,500 residential meters have been replaced and currently 4,000 of those have been retrofitted with Neptune's R900 telemetry automatic read meters. The goal is within the next five years to have 100% completion of the R900's. Griffin has the software in place for a ten-year replacement cycle on all residential meters and backflow devices. Large meters are inspected and

tested annually. All water plant meters for wash water, raw water and finished water are calibrated twice a year.

- Prevention of Tank Overflows: Griffin completed in 2008 a replacement of its SCADA System at a cost of $500,000.00. The installation included all water and wastewater plants, tanks, and pumping stations. Along with the SCADA improvements, altitude valves were installed on all water tanks in the system. Griffin has a central control station and a 24-hours system-operations program in place to monitor the system at all times.
- Line Flushing: Flushing of water mains is practiced whenever water supply reserves are adequate. During drought conditions this is accomplished every other year. The program is designed to periodically and systematically remove oxidation byproducts and tuberculation that accumulate in the water mains. Valve and hydrant maintenance are part of the line flushing program along with pressure testing of each hydrant. All raw water transmission mains are pigged annually.
- Unauthorized Use: All fire hydrants used by contractors and other customers are regulated through issuance of hydrants meters and the customer billed for all usage.
- Zero Unmetered Service Connections: The City of Griffin requires that all service connections be metered and billed for consumption.
- Water Conservation Rates: On March 1, 2008, Griffin implemented tiered conservation water rates and separate irrigation water rates to ensure that water is used conservatively in the system.
- Improvements to Reduce Nonrevenue Water: A goal of 12% unaccounted-for water has been established as a target, 3% better than the industry standard of 15%. Griffin has made major strides since 2002 by reducing UAW from 34% to average of 17.5%. UAW is calculated by dividing the difference between water supplied to the system and water sold (billed) by the total water supplied to the system.
- Replacement or Rehabilitation of Pipes: In 2007, Griffin as well as 61 other counties in Georgia were impacted adversely by mandatory drought restrictions, which cost the City's system $2.1 million in revenue. This was the year Griffin made plans to initiate a systematic program to replace or rehabilitate sections of the system's water mains every year. Unfortunately, the loss of revenue has set the program back; however, Griffin plans to budget a set amount every year to replace or rehabilitate water mains using a

prioritized system.

- Audit of Metering and Billing Records: Audits are conducted regularly of the meters and billing records to ensure that no customers are being overlooked in billing and accounting. In 2008, Griffin updated the billing system with Cogsdale, a more robust reporting and billing system tied to financials than previously used.
- Toilet Rebate Program: In 2008, Griffin implemented a program to offer rebates to users that replaced toilets with low-flow toilets.
- Reuse-Recycle of Treated Wastewater: Griffin's Potato Creek WWTP and Cabin Creek WWTP use treated wastewater for in-plant use to the extent practical, including washdown of process equipment and chemical feed supply. This reduces the use of potable water significantly. Griffin's third WWTP, Shoal Creek LAS does not lend itself to reuse because LAS treatment does not generate effluent of adequate quality for in-plant use; however, design of a plant expansion has been completed and when the plant is expanded around 2016, in-plant reuse will be practiced.
- Recycle or Reuse of Cooling Water: Reuse of cooling water is required in industries located in the city. Since the 2000 drought cycle, all major industries have converted to recycling or reuse programs for cooling water.
- Urban Water Reuse: The demand for reclaimed quality in Griffin for urban reuse has not been sufficient to warrant the implementation of a city-wide reuse system. As effluent limits become more stringent for Griffin's WWTPs, due mainly to proposed nutrient limits at the Georgia-Florida state line, Griffin will evaluate the feasibility of implementing an urban reuse system.
- Public Education: Griffin has an extensive education program encompassing water, wastewater, and stormwater. In 2002, the City of Griffin combined its operations to house all three components under the same department which has allowed the coordinated effort for public education and public awareness of all water resources and its value to its citizens.
    - Billboards are used to promote water conservation and water quality.
    - Distribution (via libraries, schools, public buildings, water bills) of educational pamphlets promotes in-house water conservation, xeriscaping, watershed awareness, and water quality.
    - Public service announcements (PSA's) are used on local radio stations.

- Local news papers publish numerous articles to inform citizens of drought conditions urging conservation and provide educational ideas on how to conserve water.
- The Public Works and Utilities Department maintains its own website (www.griffinstorm.com) and offers numerous articles and links on water conservation to its customers and others.
- Griffin has an interactive kiosk in City Hall that contains links to numerous articles, websites, and programs for water conservation.
- The City employs, through the County Extension Office, a paraprofessional who teaches about water, wastewater, stormwater and watershed management for 20 hours a week and nine months out of the year.

These conservation efforts have been instrumental in reducing the per-capita water use to the current level of 58 gallons per capita per day.

3.3.2 Pike County

Compared to Spalding County, in which almost 100% of the population is served by the public water systems, only approximately 10 to 12% of Pike County's population purchases water from the municipally owned water systems. The remaining population depends on individual groundwater wells for water supply. Due to the connections of the Zebulon and Williamson systems to the Griffin water system, the number of public water system customers is expected to rise in the future. In Table 3-1, the percentage of population to be served is projected to increase from 10% currently to 70% by 2050.

3.3.3 Meriwether County

The portion of Meriwether County included in the service area consists of only the northeastern portion of the county and excludes the populations of the cities of Greenville, Gay and Woodbury, which own and operate public water systems. Meriwether County has recently reactivated its water authority and it is possible the County will be interested in connecting to the regional system. The percentage of population served within the service area is shown to increase annually starting in 2011. The total water demand from East Meriwether County is estimated to be 0.88 MGD by 2050.

3.3.4 Coweta County

As stated in Section 1 of this master plan, Griffin has agreed to provide Coweta County a certain allocation of water beginning with 1.00 MGD in 2006 and increasing to 7.5 MGD until 2031, then declining to 5 MGD by 2049, on an average basis. The agreement stipulates that Griffin will provide for peak daily demands of up to 1.5 times these average demands.

3.3.5 Total Demand

The total projected average demand for water required from the regional system in 2030 is 18.9 MGD, compared to 22.3 MGD that was projected in the 2007 master plan update (3.4 MGD reduction). The average demand for 2050 is projected at 23.8 MGD, as shown in Table 3-1. The table below shows the average demand by jurisdiction for the planning horizon.

AVERAGE DAY DEMAND PROJECTION							
Year	Griffin	Spalding	Coweta	Pike	Meri-wether	Total	Year
2010	2.46	3.24	2.43	0.31	0.00	8.44	**2010**
2015	2.56	3.76	4.18	0.40	0.09	11.00	**2015**
2020	2.84	4.60	5.93	0.52	0.17	14.07	**2020**
2025	3.20	5.54	7.73	0.69	0.26	17.42	**2025**
2030	3.65	6.29	7.73	0.89	0.34	18.90	**2030**
2035	3.89	7.19	6.70	1.13	0.45	19.36	**2035**
2040	4.17	8.11	5.41	1.43	0.59	19.71	**2040**
2045	4.45	9.07	5.15	2.02	0.77	21.46	**2045**
2050	4.75	10.07	5.15	2.86	1.01	23.84	**2050**

The numbers in the table above include a factor of 1.20 (water pumped from treatment plants to metered water) for Griffin and Spalding for the year 2010 and decreasing to 1.15 by the year 2015 and thereafter. Pumped Water for Coweta is taken as 1.03 times Metered Water since only transmission main losses apply. Pumped Water for Pike and Meriwether counties is taken as 1.15 times Metered Water for all years.

The annual average demand and peak day demands are shown graphically in Figures 3-1 and 3-2.

Section 4 Alternatives Analysis

SECTION 4
ALTERNATIVES ANALYSIS

4.1 Water Supply

As described in Section 2, Griffin's water supply was augmented greatly in 2004 by the addition of the Still Branch Reservoir and a new intake on the Flint River. The total reliable capacity of raw water for the City and the entire regional system is now 40 MGD on an annual average basis, including 35 MGD from the Still Branch Reservoir and intake on the Flint River near Still Branch, and 5 MGD from the Heads Creek Reservoir and intake on the Flint River west of Griffin. This total reliable yield, taken as a whole, should be adequate to meet the demands of the City and the regional system through the year 2050. However, a gap actually exists currently in the system due to the limited capacity of the Heads Creek Reservoir (5 MGD) when compared to the capacity of the Simmons plant that it supplies (11 MGD).

The Simmons plant can treat 11 MGD but the Heads Creek Reservoir that supplies it has been silted in, with remaining capacity of only 510 MG. A prolonged drought in Griffin normally translates to approximately 100 days of low flow in the Flint River when pumping from the river has to be curtailed. Therefore, during a prolonged drought such as this, the firm capacity of the Simmons plant is limited to 5 MGD.

The new Still Branch reservoir contains 3.5 billion gallons but the output of the Still Branch plant has been limited to 6.5 MGD. Therefore, the combined output of the two plants, during a prolonged drought, is 11.5 MGD; one plant's capacity reduced due to its supply reservoir and the other due to the plant's capacity. One main objective of this master plan update is to evaluate whether to increase the capacity of the Heads Creek Reservoir or the capacity of the Still Branch plant and accompanying transmission system, or both.

4.2 Water Treatment

The current capacity of the two treatment plants is as follows:

Plant	Peak Day Capacity, MGD	Reliable Annual Average Capacity, MGD
Simmons WTP	11.0	5.0 (limited by raw water supply)
Still Branch WTP	6.5	6.0
Total	17.5	11.0

Figure 4-1 is a plot of the annual average demand projected in Section 3 of this report with the reliable annual average capacity of the two plants superimposed to determine when additional capacity will be needed. As can be seen from this chart, additional capacity will be needed by the year 2016.

Figure 4-2 is a plot of the peak day demand projected in Section 3 of this report with the reliable peak day capacity of the two plants superimposed to determine when additional capacity will be needed. The total reliable capacity shown in this chart is 17.5 MGD. This chart also shows that additional capacity will be needed by the year 2016.

The first step should be to evaluate increasing the capacity of the Still Branch plant to be as close to the original intended capacity of 8 MGD as possible. The options for this include:

1. Add ballast to the raw water in the form of bentonite;
2. Improve flocculation of the coagulated water by means of chemicals or through evaluation of the existing flocculation basins;
3. Add sedimentation basins with a design rate of 0.20 gallons per minute per square foot.

Options 1 and 2 require pilot studies to determine optimum dosage, capital and operation costs, increase of sludge amounts, and overall feasibility. The capital cost of Option 1 is expected to be the lowest but the feasibility is questionable. Nevertheless, this option should be tried first because it carries the lowest capital cost and least amount of space required. Option 2 stems from the fact that the operators at Still Branch and the manufacturer representative for the plate settlers have stated that if the same floc that is currently formed at 6 MGD could be formed at 8 MGD, it would settle well in the existing plate settlers. These observations point to a possible limitation in either the coagulation process or the flocculation process, and not necessarily a problem with the plate settlers. Full-scale evaluation of the plant is recommended to determine if the coagulation or flocculation processes can be optimized to increase the capacity of the plant to 8 MGD without additional construction. Option 3 has the highest capital cost ($2.7 million) but the plant has proven to work satisfactorily at a settling rate of 0.20 gallons per minute per square foot.

4.3 Evaluation of Alternatives to Meet Projected Demand

Several alternatives were screened initially, which included combinations of increase in capacity to the Heads Creek Reservoir and expansion to the Still Branch plant. The options to increase capacity in the Heads Creek Reservoir included raising the water level and dredging, as previously described. A third option has been added which consists of pumping raw water from the Still Branch Reservoir to the Heads Creek Reservoir and connecting this raw water main to the two 20-inch raw water mains between Heads Creek and the Simmons plant. A major advantage of this option is that the main could be converted to a drinking water transmission main in the future. This option has been studied in detail, and, at an estimated capital cost of $17 million, would be more cost effective than either raising the water level or dredging the Heads Creek reservoir. Another advantage of the 25-mile raw water main is that this main could be used to provide raw water to Fayette or Clayton counties. Fayette's Horton Lake is approximately 4 miles from the Heads Creek Reservoir. If the Georgia Water Master Plan allows it or if the order by Judge Magnuson to reduce use from federal reservoirs to 1972 levels prevails, raw water could be provided to South Fulton County, as an interim measure, from the Still Branch reservoir, potentially through Fayette County. As such, construction of the raw water main could qualify for a partial grant from the State to alleviate the concerns of the metro area. It is important to note that this would be an interim use of the raw water and not a permanent interbasin transfer. A preliminary route for the raw water main is shown in Figure 4-3.

Two alternatives were selected for evaluation: Option 1 – expand the Still Branch plant without increasing the capacity of the Heads Creek Reservoir and Option 2 – increase the capacity of the Heads Creek Reservoir and expand Still Branch as needed.

4.3.1 Option 1 – Expand Still Branch WTP and Install New Water Mains

This option would require the Still Branch plant to expanded from 6 MGD to 22 MGD by the year 2016. The firm yield from the Simmons plant would be 5 MGD and therefore, large transmission mains would need to be added from Still Branch to Spalding County and Griffin. As shown in Table 4-1, the capital cost of Phase 1 would be $46.0 million. The Still Branch expansion would be adequate until 2027, when additional capacity would be needed. Therefore, the plant would need to be expanded again by 2027, this time to 28 MGD and with additional transmission mains added to Griffin. The capital cost of Phase 2 would be $24.4 million. The transmission mains that would be needed for Phases 1 and 2 are show in Figures 4-4 and 4-5. The total present-day cost of the two phases is estimated at $70.4 million.

4.3.2. Option 2 – Increase Capacity of Heads Creek Reservoir and Expand Still Branch WTP

This option would allow optimum use of the Heads Creek Reservoir, the Simmons plant and the transmission mains from Griffin and Spalding County to supply Pike and Coweta counties. A raw water main would be constructed as described above from Still Branch to Heads Creek. This would need to be in place by 2016. Based on the full-scale evaluation and pilot studies of the Still Branch plant, the facility would be expanded to 12 MGD; the resulting peak day capacity would be 24 MGD for the combination of the Simmons plant and the Still Branch plant. The estimated capital costs are shown in Table 4-1 at $25.3 million for Phase 1 and $21.4 million for Phase 2. The total cost of the two phases is estimated at $46.7 million, which is $23.7 million less than Option 1. As mentioned, the raw water main could be used in the future to transport drinking water from Still Branch to Griffin and Spalding County.

Based on capital costs and the stated advantages of Option 2, it is recommended to pursue evaluation of the Still Branch plant, and if expansion to 12 MGD is feasible at the estimated cost of $5.5 million, consider implementation of Option 2. Note the estimated cost of $5.5 million includes replacing the existing gaseous chlorine system with on-site generation of hypochlorite and construction of a 2 MG clearwell, as well as addition of a flocculation/sedimentation basin.

4.4 Water Transmission

4.4.1 Demands for Hydraulic Analysis

The demands projected in Section 3 were used in a hydraulic analysis of the regional system to determine where and when improvements to the transmission systems will be needed during the planning period. A peaking factor was applied to the annual average demand to estimate peak day demand based on past experience and on contract terms with the system participants. The following table shows average production from each plant, as well as, maximum day production from both plants, which was obtained by adding output for each day from August 1, 2008 through June 30, 2010.

Water Production 2008-2010 (all flows in MGD)					
Month	**Simmons WTP Average**	**Still Branch WTP Average**	**Total Monthly Average**	**Maximum Day Both Plants**	**Max Day to Average Ratio**
Aug-08	4.59	4.83	9.42	12.60	1.34
Sep-08	4.62	4.80	9.42	12.24	1.30
Oct-08	3.30	5.63	8.93	13.45	**1.51**
Nov-08	3.98	4.45	8.43	11.84	1.40
Dec-08	4.34	3.97	8.31	10.46	1.26
Jan-09	4.31	4.11	8.42	10.27	1.22
Feb-09	4.13	4.14	8.27	9.77	1.18
Mar-09	4.10	4.10	8.20	9.65	1.18
Apr-09	4.08	3.88	7.96	10.10	1.27
May-09	3.91	4.21	8.12	9.63	1.19
Jun-09	4.61	4.37	8.98	12.13	1.35
Jul-09	3.71	5.32	9.03	12.54	1.39
Aug-09	4.54	4.58	9.12	11.44	1.25
Sep-09	4.10	3.96	8.06	9.26	1.15
Oct-09	4.05	3.71	7.76	9.65	1.24
Nov-09	3.90	3.81	7.71	9.01	1.17
Dec-09	3.84	3.73	7.57	8.90	1.18
Jan-10	5.00	3.56	8.56	11.74	1.37
Feb-10	4.44	3.61	8.05	9.22	1.14
Mar-10	4.12	3.71	7.83	8.97	1.15
Apr-10	3.63	4.38	8.01	10.16	1.27
May-10	3.93	4.65	8.58	9.86	1.15
Jun-10	4.12	5.03	9.15	10.22	1.12

The highest peaking factor for the period August 2008 to June 2010 was 1.51 and occurred in October 2008. Therefore, a peaking factor of 1.5 will be applied to the projected average demands to obtain peak day demands. The resulting peak day demands are as shown in the table below for the planning period.

Maximum Day Demand Projection (all flows in MGD)

Year	Griffin	Spalding	Coweta	Pike	Meri-wether	Total	Year
2010	3.69	4.86	3.65	0.47	0.00	12.67	**2010**
2015	3.84	5.65	6.27	0.60	0.13	16.49	**2015**
2020	4.27	6.91	8.90	0.78	0.26	21.11	**2020**
2025	4.80	8.31	11.59	1.03	0.40	26.13	**2025**
2030	5.47	9.44	11.59	1.33	0.52	28.35	**2030**
2035	5.84	10.78	10.04	1.70	0.68	29.04	**2035**
2040	6.25	12.17	8.11	2.14	0.88	29.56	**2040**
2045	6.67	13.61	7.73	3.03	1.16	32.19	**2045**
2050	7.12	15.11	7.73	4.29	1.52	35.76	**2050**

Numbers in table include allowance for system losses as described in Section 3.

The demands above were allocated to nodes in the hydraulic analysis and extended period simulations were modeled from 24 hours to 96 hours in duration. Diurnal peaking factors were applied to residential and commercial nodes to account for demand variations during the day.

4.4.2 Results of Hydraulic Analysis

The hydraulic analysis for the period 2010-2015 confirmed a weakness in the distribution system's storage. During the demands projected for 2015, Spalding County's Sunny Side tank would almost empty during peak days and would not refill within 96 hours, the longest time that should be allowed for a tank to refill. This points to the need for additional storage in north Spalding County. Sun City Peachtree, a large development of 3,600 units, is expected to be built out by the year 2025. Two other developments in northeast Spalding, Heron Bay and a future Towaliga project, are expected to add another 1,900 units, with projected build-out also of 2025. These three developments will add a total of 5,500 units.

A study performed in November 2006 for the Minerva Development Group, developer of Sun City Peachtree, and entitled "Water System Evaluation for Northeast Spalding County and the

Sun City Peachtree Development" by Paragon Consulting Group and Carter & Sloope, Inc. also recognized the need for new storage tanks in north Spalding County. In the report, two new tanks were proposed, one with capacity of 1.5 million gallons to serve mostly Sun City Peachtree and the other with capacity of 500,000 gallons to serve Heron Bay and the future Towaliga project in northeast Spalding. This report also recommended several new water mains and four new booster pump stations. The booster stations would be on Griffin/Spalding's service zone with hydraulic grade line at Elevation 1095 feet.

One of the goals of the hydraulic analysis performed for this master plan was to attempt to add water mains from the water plants to north Spalding in an effort to avoid adding booster pump stations. Operation of one booster pump station within a hydraulic zone complicates the distribution system and adding four stations would be difficult, if not impossible, to operate or control.

Many iterations and "what if" scenarios were performed with different pipe sizes along different routes and with different combinations of high-service pumps operating at the water plants, to allow the volume of the proposed 1.5-MG Sun City tank to be used properly and for the tank to refill within 3 days, without booster pump stations. During this 2015 scenario, both plants in Griffin would be operating to meet the peak day demand of 16.5 MGD. Supply for demand variations during the day would be from storage in the elevated tanks.

The extended period simulation showed that the tanks in north Spalding would fluctuate properly and would refill without booster pump stations if new 20-inch water mains are added from near the Simmons WTP, as shown in Figure 4-3. The cost of adding these mains would be similar to the costs estimated in the report to Minerva for four booster stations and other mains.

According to a letter from Spalding County to Griffin dated June 25, 2007, the Spalding County Water Authority has authorized issuance of revenue bonds to fund the water distribution system improvements recommended in the report to Minerva. It is recommended that Spalding County and the City of Griffin coordinate their efforts to confirm that addition of 20-inch mains, as shown in Figure 4-3, will avoid installation of booster pump stations and that revenue bond funds be utilized to install these mains in lieu of other mains and booster stations recommended in the report to Minerva.

Other improvements needed before 2012 include the addition of a master meter for Coweta County at Highway 16 (Newnan Road), as shown in Figure 4-4. Currently, Coweta is limited to a supply of approximately 3.5 MGD from the master meter at Line Creek Road due to constraints within their system. The maximum day allocation to Coweta exceeded 3.5 MGD in 2010, however, Coweta requested that Griffin postpone construction of this water main until 2012. This master plan includes addition of a meter and 3,200 linear feet of 24-inch water main from Hollonville Road to the county line at an estimated cost of $400,000.

4.4.3 Results of Hydraulic Analysis - 2020 Demand

As demands increase in future years, additional transmission mains will be needed. A new 24-inch main will be needed on Hollonville Road from Line Creek Road to Highway 16 to connect to the 24-inch main installed in 2009 to Coweta's meter on Highway 16, as shown in Figure 4-4. The estimated cost of this main is $1.6 million.

4.4.4 Results of Hydraulic Analysis – 2025 - 2030 Demand

A new 36-inch main will be needed on Caldwell Bridge Road from Old Flat Shoals Road to Hollonville Road to connect to the existing 20-inch main, as shown in Figure 4-4. The estimated cost of this main is $6.3 million.

Installation of the transmission water mains shown above should be adequate to convey drinking water to all the project participants through 2050. A future update to this master plan will review the needs for additional mains after 2030.

4.5 Drinking Water Regulations

The Safe Drinking Water Act of 1974 (SDWA) and its subsequent amendments provide the basic rules for water quality produced by a water treatment system. The 1986 and 1996 amendments to the SDWA have brought about significant changes and present substantial challenges for regulators and the water industry. The Georgia EPD has primacy to enforce the federal regulations. All public water systems in Georgia are required to comply with the Georgia Rules for Safe Drinking Water, Chapter 391-3-5, promulgated under the Georgia Safe Drinking Water

Act. In general, the contaminant limits and requirements set forth in these state regulations have been and are expected to be the same as set forth by the federal regulations.

Review of the City's consumer confidence reports indicates that the City has been in compliance with all effective federal and State drinking water regulations. There has been a concern among all responsible water systems in the nation with future regulations regarding the fate of pharmaceuticals and personal care products (PPCPs). PPCPs comprise a very broad, diverse collection of thousands of chemical substances, including prescription, veterinary, and over-the-counter (OTC) therapeutic drugs, fragrances, cosmetics, sun-screen agents, diagnostic agents, nutraceuticals (a term combining the words "nutrition" and "pharmaceutical", such as in a food or food product that claims to provide health and medical benefits), biopharmaceuticals, growth enhancing chemicals used in livestock operations, and many others. This broad collection of substances refers, in general, to any product used by individuals for personal health or cosmetic reasons.

Currently there are no regulatory standards or requirements to monitor for these substances in treated wastewater effluent or in drinking water. EPA is responding to concerns about PPCPs in water with a four-pronged approach aimed at:

- Strengthening science - EPA has several activities underway to strengthen the science for understanding the behavior of PPCPs in water including, research, methods development, and occurrence studies;
- Improving public understanding - EPA has developed a website focusing specifically on PPCPs in water (http://water.epa.gov/scitech/swguidance/ppcp/index.cfm), and a website with a primary focus on the Agency's research (http://www.epa.gov/ppcp/). The agency has compiled a list of over 11,500 articles on PPCPs as of January 2011;
- Building partnerships and promoting stewardship opportunities - collaboration and partnerships for stewardship with Federal, state and local agencies, industry and others are important components; and
- Taking regulatory action when appropriate – regulatory action is the most important of these four items for the purposes of this long-range water master plan and therefore is discussed further below.

4.5.1 Regulatory Action on Pharmaceuticals

In September 2009, PPCPs were among the 104 chemicals EPA included in the Contamination Candidate List 3 (CCL 3) listed for possible regulation in drinking water. The Contamination Candidate List is a catalog of contaminants currently unregulated by federal authorities, but which are known or anticipated to be present in PWSs. This marked the first time the agency would consider pharmaceuticals for potential regulation under the Safe Drinking Water Act. It's important to note that many contaminants on the previous lists have not been regulated.

In the CCL 3 process, EPA evaluated the potential adverse health effects of pharmaceuticals and their occurrence in public drinking water systems to determine if pharmaceuticals should be added to the list. EPA concluded that one antibiotic (erythromycin) and nine hormones (17 alpha-estradiol, 17 beta-estradiol, equilenin, equilin, estriol, estrone, ethinyl estradiol, mestranol, and orethindrone), should be included on the CCL 3 because these contaminants are known or anticipated to occur in public water systems and may require regulation.

At an April 2010 stakeholders' meeting, the EPA discussed proposed plans for the third phase of the Unregulated Contaminant Monitoring Regulation (UCMR 3) program. UCMR 3 could require Public Water Systems (PWSs) to begin assessment monitoring for seven pharmaceuticals; 1,4–Dioxane; nine volatile organic compounds; four metals; chlorate and two additional microbials.

The UCMR program originated from amendments to the Safe Drinking Water Act enacted in 1996, which required the EPA to establish a program for monitoring up to 30 unregulated contaminants every five years. UCMR also requires three different screening techniques for unregulated contaminants: those commonly used; those more recently developed; and new or specialized techniques for pre-screen testing. The EPA also addresses system sizes in UCMR 3. Under UCMR 2, system size was based on the combined retail and wholesale service population, whereas under UCMR 3, the EPA would require the measurement to be based exclusively on retail service population.

EPA is currently soliciting feedback from stakeholders. EPA is requesting public comment on the proposed list of 30 contaminants until May 2, 2011. Following the public comment period, EPA will consider input before the list is scheduled to be finalized in 2012, with sampling to be conducted from 2013 to 2015. According to EPA, the proposed UCMR 3 changes will be published in the Federal Register in early 2011, with a final rule publish date set for 2012. Typically, the changes become official once the EPA Administrator approves the recommendations.

Section 5
Recommendations and Implementation

SECTION 5
RECOMMENDATIONS AND IMPLEMENTATION

5.1 Recommendations

In Section 4, several major improvements are recommended to the system during the planning period ending in 2050. These are based on the projected demands of the system and on detailed computerized hydraulic modeling where a multitude of alternatives are tried to arrive at the optimum solution.

The major improvements described so far include:

- Expansion of the Still Branch Water Treatment Plant by approximately 2016, 2025 and 2045;
- Addition of master meter to Coweta and of a segment of 24-inch transmission main;
- Addition of a raw water main from the Still Branch Reservoir to the Heads Creek Reservoir;
- Addition of 24-inch main on Hollonville Road from Line Creek Road to Newnan Road; and
- Addition of 36-inch main on Caldwell Bridge Road from Old Flat Shoals Road to Hollonville Road.

Other major improvements will be accomplished by the Spalding County Water Authority to add two water storage tanks and several distribution mains to serve approximately 5,500 units projected to be added in northeast Spalding County.

The City of Griffin should implement a program to remove the silted material that accumulates continually at the Heads Creek Reservoir. The volume lost yearly is estimated to be 10 million gallons. We recommend that an ongoing annual budget of $500,000 be planned to maintain the current volume of the reservoir. This effort will ensure maximum utilization of the raw water main that is proposed to be installed from the Still Branch Reservoir to the Heads Creek Reservoir.

5.2 Implementation

Table 5-1 shows a recommended implementation schedule with estimated costs for the noted improvements. A goal of the implementation schedule is to attempt to postpone improvements as much as possible to allow the City of Griffin to increase its bonding capacity in the next few years after having recently completed the Still Branch water supply project.

Tables

TABLE 3-1. WATER DEMAND PROJECTIONS - USING POPULATION PROJECTIONS FROM OFFICE OF PLANNING AND BUDGET (OPB)

Actual

Projected

Year	City of Griffin							Spalding Co (other than Griffin)							Coweta County Contract Minimum		Year
	Population	Population Served	Gal/cap /day [2]	Metered [1] Residential Water (MGD)	Metered [3] Comm & Ind Water (MGD)	Total Metered Usage (MGD)	Total Pumped Water (MGD)	Population	Population Served	Gal/cap /day	Metered Residential Water (MGD)	Metered Comm & Ind Water (MGD)	Total Metered Usage (MGD)	Total Pumped Water (MGD)	Total Metered Usage (MGD)	Total Pumped Water (MGD)	
2005	23,884	100%	70.6	1.69	1.92	3.60	4.50	37,394	80%	83.4	2.49	0.18	2.67	3.34	0	0.00	**2005**
2006	24,020	100%	70.9	1.70	2.00	3.70	4.59	38,243	81%	81.4	2.52	0.21	2.74	3.39	1.00	1.03	**2006**
2007	24,156	100%	65.3	1.58	2.01	3.59	4.41	39,092	82%	81.0	2.60	0.25	2.85	3.50	1.34	1.38	**2007**
2008	24,292	100%	61.9	1.50	1.59	3.09	3.77	39,941	83%	78.3	2.60	0.28	2.88	3.51	1.68	1.73	**2008**
2009	24,428	100%	56.5	1.38	0.99	2.37	2.86	40,790	84%	65.6	2.25	0.32	2.57	3.11	2.02	2.08	**2009**
2010	24,565	100%	57.9	1.42	0.63	2.05	2.46	41,638	85%	66.4	2.35	0.35	2.70	3.24	2.36	2.43	**2010**
2011	24,701	100%	58	1.43	0.63	2.06	2.45	42,851	86%	64	2.36	0.39	2.75	3.27	2.70	2.78	**2011**
2012	24,837	100%	58	1.44	0.66	2.10	2.48	44,065	87%	64	2.45	0.42	2.88	3.39	3.04	3.13	**2012**
2013	24,973	100%	58	1.45	0.69	2.14	2.50	45,278	88%	64	2.55	0.46	3.01	3.52	3.38	3.48	**2013**
2014	25,109	100%	58	1.46	0.72	2.18	2.52	46,492	89%	64	2.65	0.49	3.14	3.64	3.72	3.83	**2014**
2015	25,245	100%	58	1.46	0.76	2.22	2.56	47,705	90%	64	2.75	0.53	3.27	3.76	4.06	4.18	**2015**
2016	25,381	100%	58	1.47	0.80	2.27	2.61	49,038	91%	64	2.86	0.56	3.42	3.93	4.40	4.53	**2016**
2017	25,517	100%	58	1.48	0.84	2.32	2.67	50,371	92%	64	2.97	0.59	3.56	4.09	4.74	4.88	**2017**
2018	25,653	100%	58	1.49	0.88	2.37	2.72	51,705	93%	64	3.08	0.63	3.71	4.26	5.08	5.23	**2018**
2019	25,789	100%	58	1.50	0.92	2.42	2.78	53,038	94%	64	3.19	0.66	3.85	4.43	5.42	5.58	**2019**
2020	25,926	100%	58	1.50	0.97	2.47	2.84	54,370	95%	64	3.31	0.70	4.00	4.60	5.76	5.93	**2020**
2021	26,062	100%	58	1.51	1.02	2.53	2.91	55,835	96%	64	3.43	0.73	4.16	4.79	6.10	6.28	**2021**
2022	26,198	100%	58	1.52	1.07	2.59	2.98	57,300	97%	64	3.56	0.77	4.32	4.97	6.44	6.63	**2022**
2023	26,334	100%	58	1.53	1.12	2.65	3.04	58,764	98%	64	3.69	0.80	4.49	5.16	6.78	6.98	**2023**
2024	26,470	100%	58	1.54	1.18	2.72	3.12	60,229	99%	64	3.82	0.84	4.65	5.35	7.12	7.33	**2024**
2025	26,607	100%	58	1.54	1.24	2.78	3.20	61,693	100%	64	3.95	0.87	4.82	5.54	7.50	7.73	**2025**
2026	26,743	100%	58	1.55	1.30	2.85	3.28	63,267	100%	64	4.05	0.90	4.95	5.69	7.50	7.73	**2026**
2027	26,879	100%	58	1.56	1.37	2.93	3.37	64,841	100%	64	4.15	0.93	5.08	5.84	7.50	7.73	**2027**
2028	27,015	100%	58	1.57	1.44	3.01	3.46	66,416	100%	64	4.25	0.96	5.21	5.99	7.50	7.73	**2028**
2029	27,151	100%	58	1.57	1.51	3.08	3.55	67,990	100%	64	4.35	0.99	5.34	6.14	7.50	7.73	**2029**
2030	27,288	100%	58	1.58	1.59	3.17	3.65	69,563	100%	64	4.45	1.02	5.47	6.29	7.50	7.73	**2030**
2031	27,426	100%	58	1.59	1.64	3.23	3.72	71,487	100%	64	4.58	1.05	5.63	6.47	7.50	7.73	**2031**
2032	27,564	100%	58	1.60	1.67	3.27	3.76	73,409	100%	64	4.70	1.08	5.78	6.65	7.25	7.47	**2032**
2033	27,703	100%	58	1.61	1.70	3.31	3.80	75,331	100%	64	4.82	1.12	5.94	6.83	7.00	7.21	**2033**
2034	27,843	100%	58	1.61	1.73	3.34	3.85	77,253	100%	64	4.94	1.15	6.09	7.01	6.75	6.95	**2034**
2035	27,983	100%	58	1.62	1.76	3.38	3.89	79,174	100%	64	5.07	1.18	6.25	7.19	6.50	6.70	**2035**
2036	28,125	100%	58	1.63	1.80	3.43	3.95	81,094	100%	64	5.19	1.22	6.41	7.37	6.25	6.44	**2036**
2037	28,267	100%	58	1.64	1.84	3.48	4.00	83,013	100%	64	5.31	1.26	6.57	7.56	6.00	6.18	**2037**
2038	28,409	100%	58	1.65	1.88	3.53	4.06	84,931	100%	64	5.44	1.30	6.73	7.74	5.75	5.92	**2038**
2039	28,553	100%	58	1.66	1.92	3.58	4.11	86,849	100%	64	5.56	1.33	6.89	7.93	5.50	5.67	**2039**
2040	28,697	100%	58	1.66	1.96	3.62	4.17	88,766	100%	64	5.68	1.37	7.06	8.11	5.25	5.41	**2040**
2041	28,841	100%	58	1.67	2.00	3.67	4.22	90,683	100%	64	5.80	1.42	7.22	8.30	5.00	5.15	**2041**
2042	28,987	100%	58	1.68	2.04	3.72	4.28	92,598	100%	64	5.93	1.46	7.39	8.49	5.00	5.15	**2042**
2043	29,133	100%	58	1.69	2.08	3.77	4.34	94,513	100%	64	6.05	1.50	7.55	8.69	5.00	5.15	**2043**
2044	29,280	100%	58	1.70	2.12	3.82	4.39	96,427	100%	64	6.17	1.55	7.72	8.88	5.00	5.15	**2044**
2045	29,428	100%	58	1.71	2.16	3.87	4.45	98,340	100%	64	6.29	1.60	7.89	9.07	5.00	5.15	**2045**
2046	29,576	100%	58	1.72	2.20	3.92	4.50	100,253	100%	64	6.42	1.64	8.06	9.27	5.00	5.15	**2046**
2047	29,726	100%	58	1.72	2.24	3.96	4.56	102,165	100%	64	6.54	1.69	8.23	9.47	5.00	5.15	**2047**
2048	29,876	100%	58	1.73	2.28	4.01	4.61	104,076	100%	64	6.66	1.75	8.41	9.67	5.00	5.15	**2048**
2049	30,026	100%	58	1.74	2.33	4.07	4.68	105,986	100%	64	6.78	1.80	8.58	9.87	5.00	5.15	**2049**
2050	30,178	100%	58	1.75	2.38	4.13	4.75	107,896	100%	64	6.91	1.85	8.76	10.07	*5.00*	*5.15*	**2050**

	Pike County (all)						Meriwether County (portion served)						Combined All Jurisdictions		
Year	Population	Population Served	Gal/cap /day	Metered Water (MGD)[4]	Total Metered Usage (MGD)	Total Pumped Water (MGD)	Population	Population Served	Gal/cap /day	Metered Residential Water (MGD)	Total Metered Usage (MGD)	Total Pumped Water (MGD)	Total Water Demand from WTPs (Average Day) MGD	Total Water Demand from WTPs (Maximum Day) MGD	Year
2005	15,115	10%	174	0.26	0.26	0.30	26,500	0%				0.00	8.15	12.22	**2005**
2006	15,705	10%	229	0.36	0.36	0.41	26,655	0%				0.00	9.42	14.14	**2006**
2007	16,295	10%	204	0.33	0.33	0.38	26,810	0%				0.00	9.67	14.51	**2007**
2008	16,884	10%	181	0.31	0.31	0.35	26,965	0%				0.00	9.37	14.05	**2008**
2009	17,474	10%	162	0.28	0.28	0.33	27,120	0%				0.00	8.38	12.56	**2009**
2010	18,064	10%	150	0.27	0.27	0.31	27,275	0%				0.00	8.44	12.67	**2010**
2011	18,520	11%	147	0.29	0.29	0.33	27,430	1%	75	0.02	0.02	0.02	8.86	13.28	**2011**
2012	18,976	11%	144	0.30	0.30	0.35	27,585	2%	76	0.03	0.03	0.04	9.39	14.08	**2012**
2013	19,431	12%	141	0.32	0.32	0.36	27,740	2%	76	0.05	0.05	0.06	9.92	14.88	**2013**
2014	19,887	12%	138	0.33	0.33	0.38	27,895	3%	77	0.06	0.06	0.07	10.45	15.68	**2014**
2015	20,343	13%	135	0.35	0.35	0.40	28,050	4%	77	0.08	0.08	0.09	11.00	16.49	**2015**
2016	20,861	13%	132	0.37	0.37	0.42	28,205	4%	78	0.09	0.09	0.11	11.60	17.40	**2016**
2017	21,378	14%	129	0.39	0.39	0.45	28,360	5%	78	0.11	0.11	0.12	12.21	18.32	**2017**
2018	21,896	15%	126	0.41	0.41	0.47	28,515	5%	79	0.12	0.12	0.14	12.83	19.24	**2018**
2019	22,413	16%	123	0.43	0.43	0.49	28,670	6%	79	0.14	0.14	0.16	13.44	20.16	**2019**
2020	22,931	16%	121	0.45	0.45	0.52	28,825	7%	80	0.15	0.15	0.17	14.07	21.11	**2020**
2021	23,519	17%	119	0.48	0.48	0.55	28,980	7%	80	0.17	0.17	0.19	14.72	22.08	**2021**
2022	24,108	18%	117	0.51	0.51	0.58	29,135	8%	81	0.18	0.18	0.21	15.38	23.06	**2022**
2023	24,696	19%	115	0.54	0.54	0.62	29,290	8%	81	0.20	0.20	0.23	16.03	24.05	**2023**
2024	25,285	20%	113	0.57	0.57	0.65	29,445	9%	82	0.21	0.21	0.25	16.70	25.05	**2024**
2025	25,873	21%	111	0.60	0.60	0.69	29,600	9%	82	0.23	0.23	0.26	17.42	26.13	**2025**
2026	26,461	22%	109	0.63	0.63	0.72	29,755	10%	82	0.24	0.24	0.28	17.70	26.55	**2026**
2027	27,049	23%	107	0.66	0.66	0.76	29,910	10%	82	0.25	0.25	0.28	17.98	26.97	**2027**
2028	27,637	24%	105	0.70	0.70	0.80	30,065	11%	82	0.27	0.27	0.31	18.29	27.44	**2028**
2029	28,225	25%	103	0.73	0.73	0.84	30,220	11%	82	0.27	0.27	0.31	18.57	27.86	**2029**
2030	28,815	27%	101	0.77	0.77	0.89	30,375	12%	82	0.30	0.30	0.34	18.90	28.35	**2030**
2031	29,417	28%	99	0.81	0.81	0.93	30,531	13%	82	0.32	0.32	0.36	19.21	28.81	**2031**
2032	30,032	29%	97	0.85	0.85	0.98	30,687	13%	82	0.33	0.33	0.38	19.24	28.86	**2032**
2033	30,660	31%	95	0.89	0.89	1.03	30,845	14%	82	0.35	0.35	0.40	19.27	28.91	**2033**
2034	31,301	32%	93	0.94	0.94	1.08	31,003	15%	82	0.37	0.37	0.43	19.31	28.97	**2034**
2035	31,955	34%	91	0.98	0.98	1.13	31,162	15%	82	0.39	0.39	0.45	19.36	29.04	**2035**
2036	32,623	36%	89	1.03	1.03	1.19	31,322	16%	82	0.41	0.41	0.47	19.42	29.13	**2036**
2037	33,305	37%	87	1.08	1.08	1.24	31,482	17%	82	0.44	0.44	0.50	19.48	29.22	**2037**
2038	34,001	39%	85	1.13	1.13	1.30	31,644	18%	82	0.46	0.46	0.53	19.55	29.33	**2038**
2039	34,712	41%	83	1.19	1.19	1.36	31,806	19%	82	0.49	0.49	0.56	19.63	29.44	**2039**
2040	35,438	43%	81	1.24	1.24	1.43	31,969	20%	82	0.51	0.51	0.59	19.71	29.56	**2040**
2041	36,178	45%	81	1.33	1.33	1.53	32,133	21%	82	0.54	0.54	0.62	19.83	29.74	**2041**
2042	36,935	48%	81	1.43	1.43	1.64	32,298	22%	82	0.57	0.57	0.66	20.22	30.33	**2042**
2043	37,707	50%	81	1.53	1.53	1.76	32,464	23%	82	0.60	0.60	0.69	20.62	30.93	**2043**
2044	38,495	53%	81	1.64	1.64	1.88	32,630	24%	82	0.64	0.64	0.73	21.03	31.55	**2044**
2045	39,300	55%	81	1.76	1.76	2.02	32,798	25%	82	0.67	0.67	0.77	21.46	32.19	**2045**
2046	40,121	58%	81	1.88	1.88	2.16	32,966	26%	82	0.71	0.71	0.81	21.90	32.85	**2046**
2047	40,960	61%	81	2.02	2.02	2.32	33,135	28%	82	0.75	0.75	0.86	22.36	33.53	**2047**
2048	41,816	64%	81	2.16	2.16	2.49	33,305	29%	82	0.79	0.79	0.91	22.83	34.24	**2048**
2049	42,690	67%	81	2.32	2.32	2.67	33,476	30%	82	0.83	0.83	0.96	23.32	34.99	**2049**
2050	43,582	70%	81	2.49	2.49	2.86	33,648	32%	82	0.88	0.88	1.01	23.84	35.76	**2050**

Notes:

1 The entries for Metered Residential Water are actual figures from 2005 through 2010. After 2010, demand is estimated using 58 gpcd.

2 Figures for gallons per capita per day are calculated values from 2005 through 2010.

3 The entries for Metered Commercial and Industrial Water are actual figures from 2005 through 2010. After 2011, demand is projected to increase at 5% annually.

4 The entries for Metered Water are actual figures from 2005 through 2010 for Zebulon, Williamson and Concord. After 2010, population served is estimated to increase 0.5% annually and use at 150 gpcd.

Table 4-1.
Capital Cost Comparison of Alternatives
(Million Dollars)

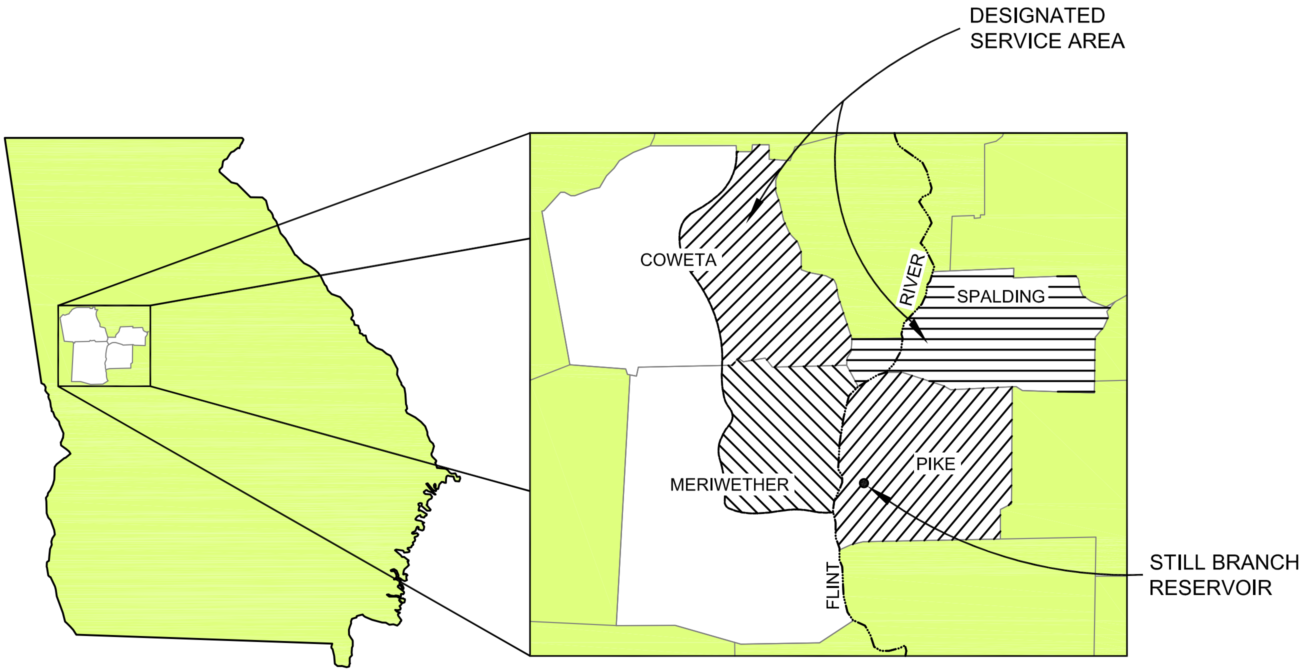
OPTION 1 - Expand Still Branch WTP Only					
Phase	Description	WTP Expansion	Transmission Main	Raw Water Main	Total Est. Capital Cost
1	By 2016, expand SB to 22 MGD and construct drinking water transmission mains	$25.5	$20.5		$46.0
2	By 2027, expand SB to 28 MGD and add transmission main along Hwy 19	$10.8	$13.6		$24.4
Total Option 1					**$70.4**

OPTION 2 - Increase Capacity of Heads Creek Reservoir and Expand Still Branch WTP					
Phase	Description	WTP Expansion	Transmission Main	Raw Water Main	Total Est. Capital Cost
1	By 2016, expand SB to 12 MGD and construct raw water main from SB to Heads Creek reservoir	$5.5		$19.8	$25.3
2	By 2023, expand SB to 20 MGD and construct transmission main on Caldwell Bridge Rd	$14.0	$7.4		$21.4
Total Option 2					**$46.7**

TABLE 5-1: CAPITAL EXPENDITURES - WATER											
Still Branch Reservoir, WTP and Pump Stations											
	Year										
Item	**2012**	**2013**	**2014**	**2015**	**2016-2020**	**2021 - 2025**	**2026 - 2030**	**2031-2035**	**2036-2040**	**2041-2045**	**2046-2050**
Pilot test/evaluation for plant exp.	$75,000										
Convert from chlorine gas to onsite hypochlorite generation				$1,725,000							
Plant expansion to 12 MGD			$300,000	$3,450,000							
Plant expansion to 18 MGD						$14,000,000					
Plant expansion to 24 MGD										$12,000,000	
Still Branch Total	**$75,000**	**$0**	**$300,000**	**$5,175,000**	**$0**	**$14,000,000**	**$0**	**$0**	**$0**	**$12,000,000**	**$0**
Simmons WTP, Heads Creek Reservoir and Flint River Intake											
	Year										
Item	**2012**	**2013**	**2014**	**2015**	**2016-2020**	**2021 - 2025**	**2026 - 2030**	**2031-2035**	**2036-2040**	**2041-2045**	**2046-2050**
Replace the 1929 Flint River Pump Station		$205,000	$1,849,000								
Remove siltation that occurs continually in Heads Creek Reservoir	$500,000	$500,000	$500,000	$500,000	$2,500,000	$2,500,000	$2,500,000	$2,500,000	$2,500,000	$2,500,000	$2,500,000
Simmons, Heads Creek Total	**$500,000**	**$705,000**	**$2,349,000**	**$500,000**	**$2,500,000**	**$2,500,000**	**$2,500,000**	**$2,500,000**	**$2,500,000**	**$2,500,000**	**$2,500,000**
Transmission and Distribution System											
	Year										
Item	**2012**	**2013**	**2014**	**2015**	**2016-2020**	**2021 - 2025**	**2026 - 2030**	**2031-2035**	**2036-2040**	**2041-2045**	**2046-2050**
Highway 16 Water Main Extension	$400,000										
24-inch water main Hollonville Rd from Line Creek Rd to Hwy 16					$1,600,000						
36-inch water main Caldwell Bridge Rd from Old Flat Shoals Rd to Hwy 362						$6,300,000					
30-inch water main from Still Branch to Heads Creek			$400,000	$19,367,000							
Transmission Total	**$400,000**	**$0**	**$400,000**	**$19,367,000**	**$1,600,000**	**$6,300,000**	**$0**	**$0**	**$0**	**$0**	**$0**
Water System Total	**$975,000**	**$705,000**	**$3,049,000**	**$25,042,000**	**$4,100,000**	**$22,800,000**	**$2,500,000**	**$2,500,000**	**$2,500,000**	**$14,500,000**	**$2,500,000**

Note: All costs are shown in 2010 dollars

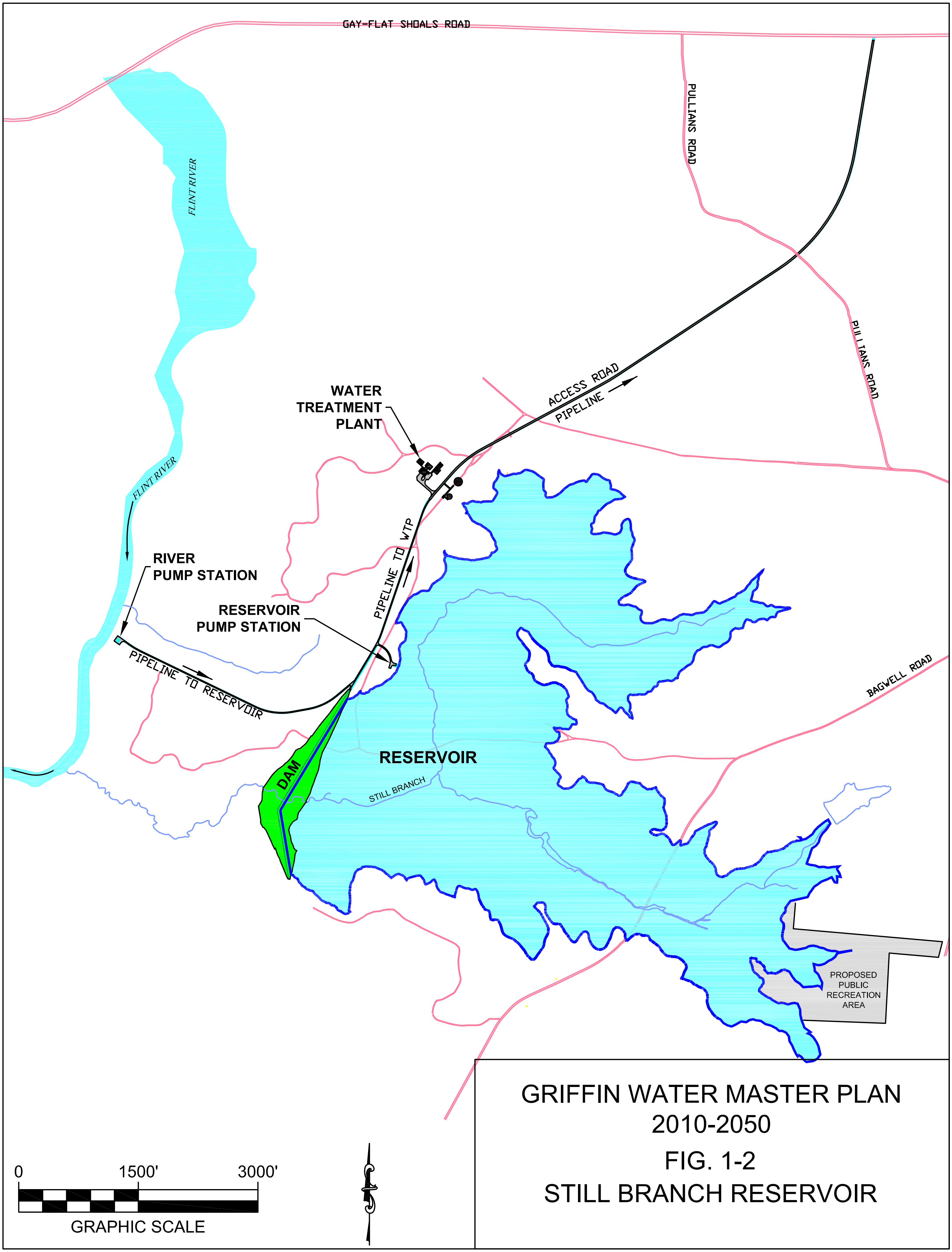
Figures



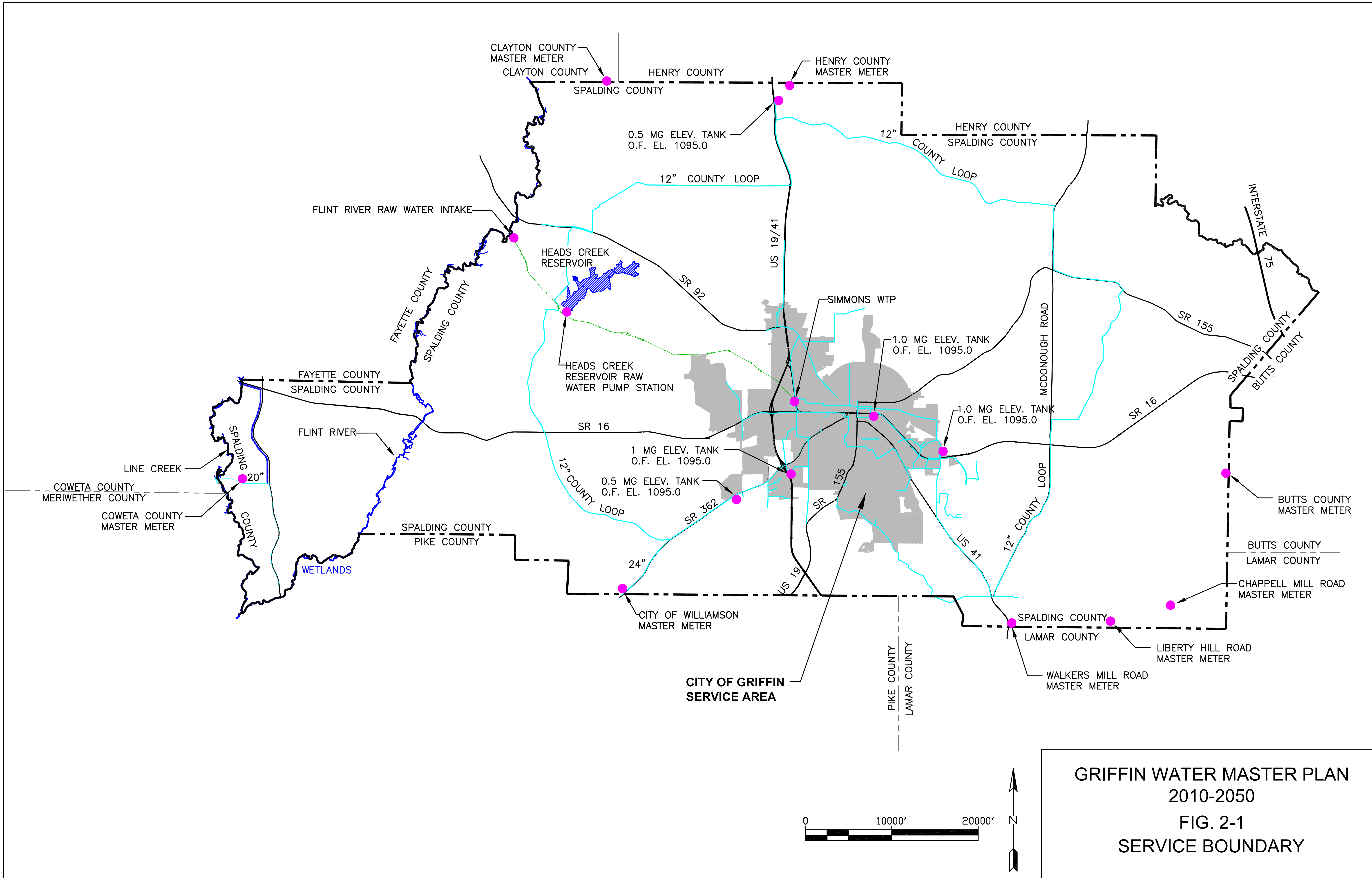
GRIFFIN WATER MASTER PLAN
2010-2050

FIG. 1-1

DESIGNATED SERVICE AREA
GRIFFIN REGIONAL
WATER SUPPLY PROJECT

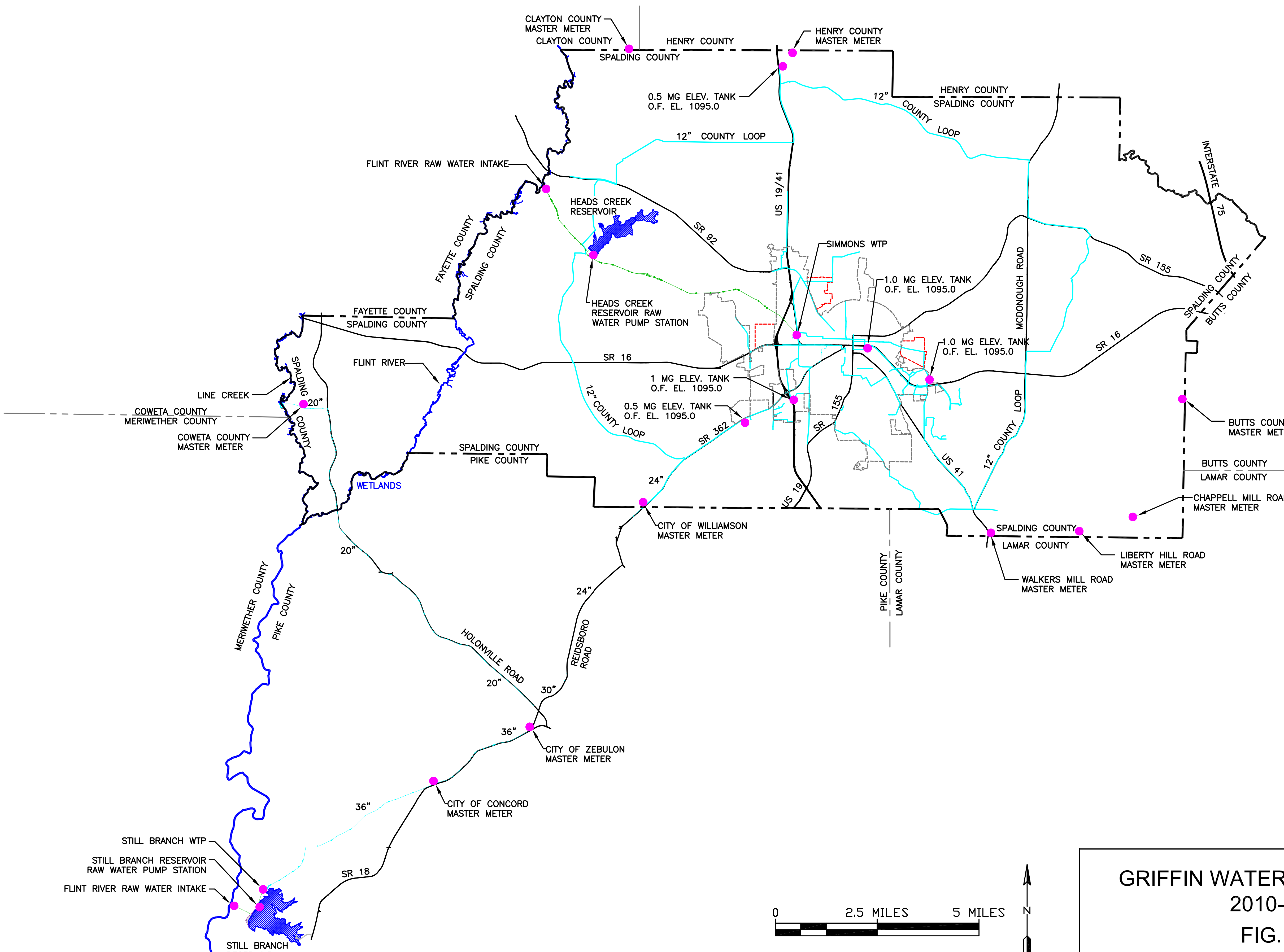


GRIFFIN WATER MASTER PLAN
2010-2050
FIG. 1-2
STILL BRANCH RESERVOIR



GRIFFIN WATER MASTER PLAN
2010-2050

FIG. 2-1
SERVICE BOUNDARY

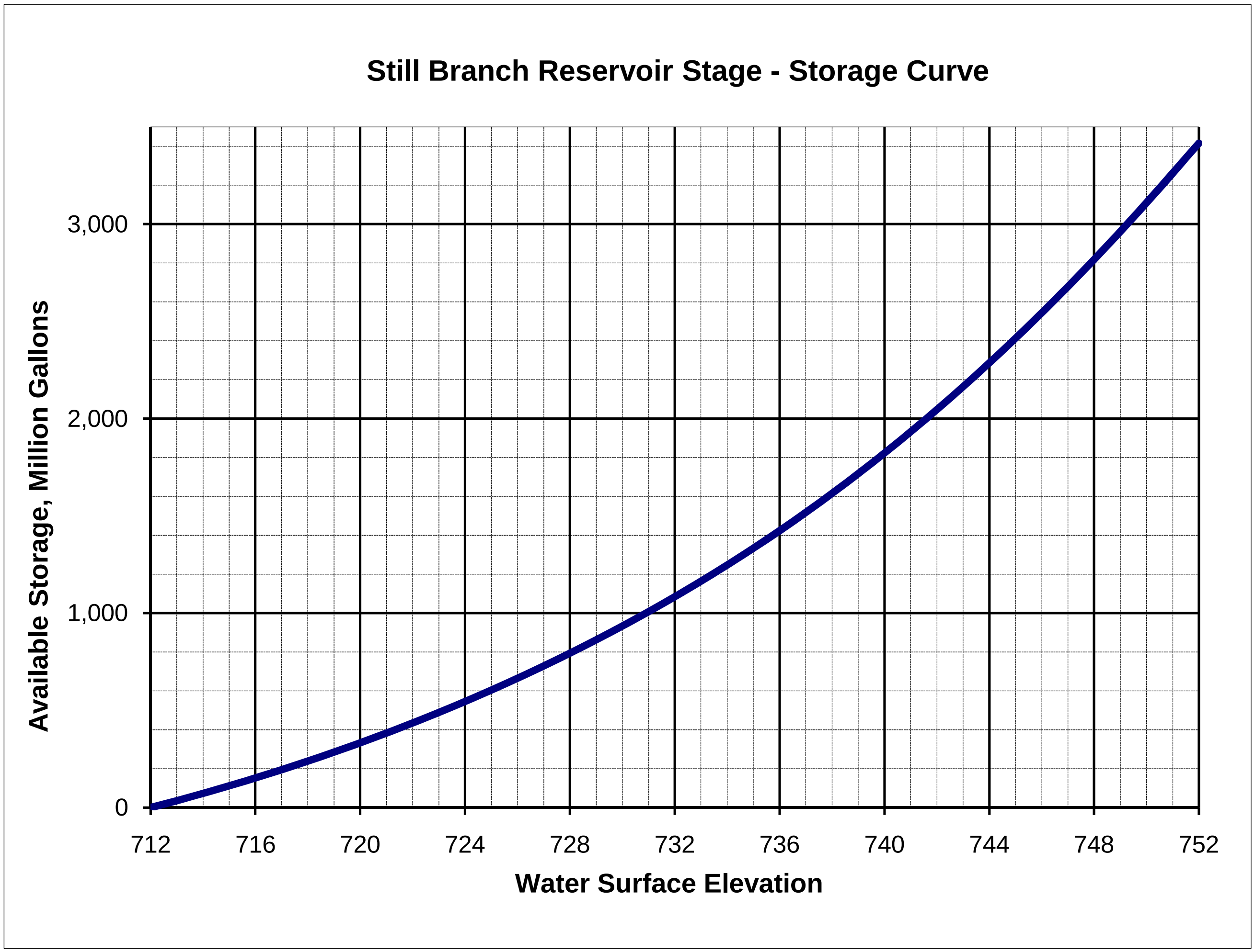


GRIFFIN WATER MASTER PLAN 2010-2050

FIG. 2-2

MAJOR FACILITIES

Figure 2-3. Stage-Storage Data for Still Branch Reservoir



Water Surface Elevation (Mean Sea Level)	Surface Area (Acres)	Available Storage Vol. (Mil Gal)	Percent of Full Volume
752	476	3,416	100%
750	463	3,110	91%
748	434	2,817	82%
746	408	2,543	74%
744	382	2,286	67%
742	356	2,045	60%
740	330	1,822	53%
738	305	1,615	47%
736	282	1,424	42%
734	261	1,247	37%
732	241	1,083	32%
730	221	933	27%
728	204	794	23%
726	190	666	19%
724	177	546	16%
722	164	435	13%
720	150	333	10%
718	138	239	7%
716	127	153	4%
714	117	73	2%
712	107	0	0%

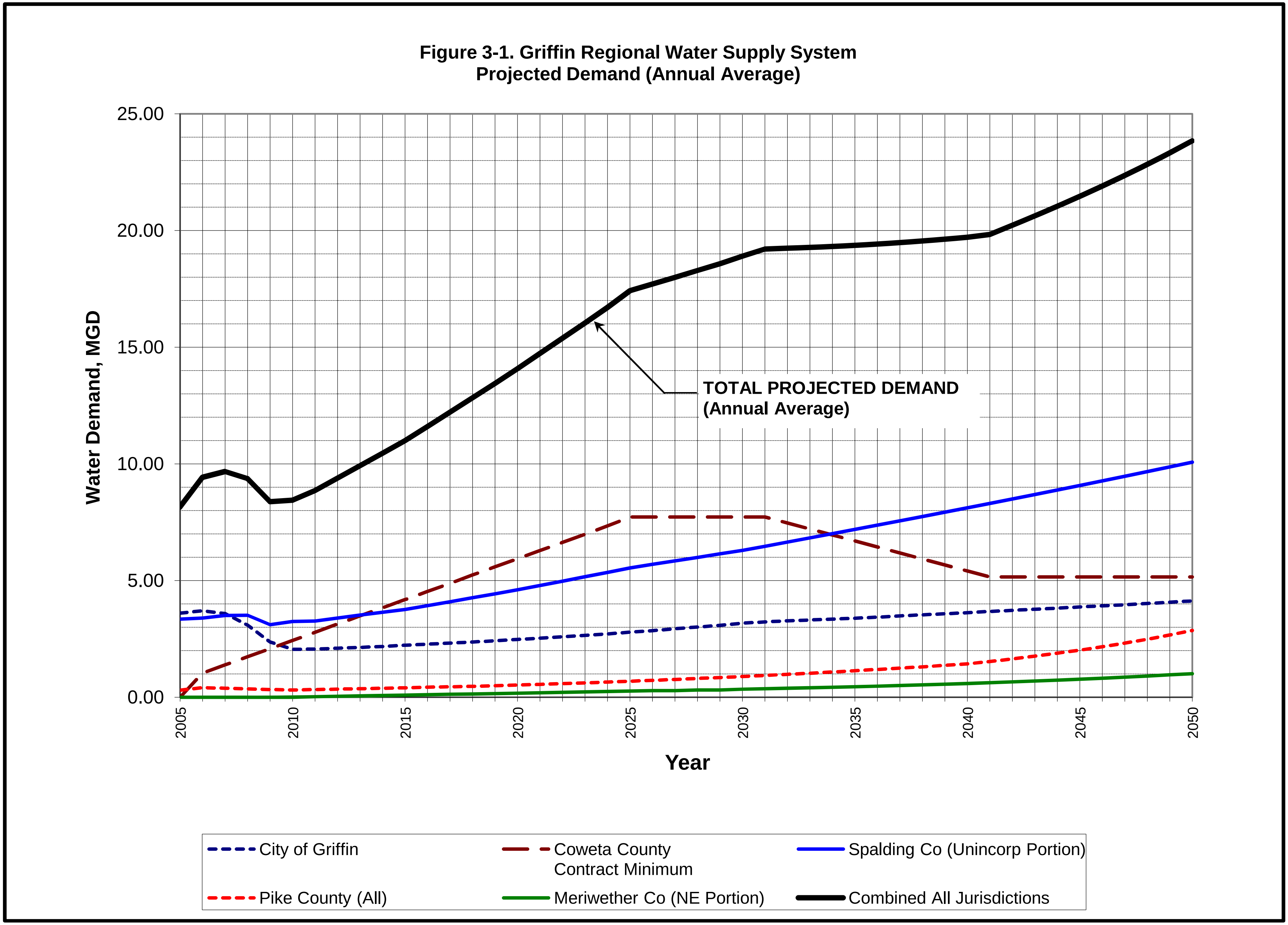


Figure 3-1. Griffin Regional Water Supply System
Projected Demand (Annual Average)
Water Demand, MGD
25.00
20.00
15.00
10.00
5.00
0.00
TOTAL PROJECTED DEMAND
(Annual Average)
2005
2010
2015
2020
2025
2030
2035
2040
2045
2050
Year
City of Griffin
Coweta County Contract Minimum
Spalding Co (Unincorp Portion)
Pike County (All)
Meriwether Co (NE Portion)
Combined All Jurisdictions

Figure 3-1

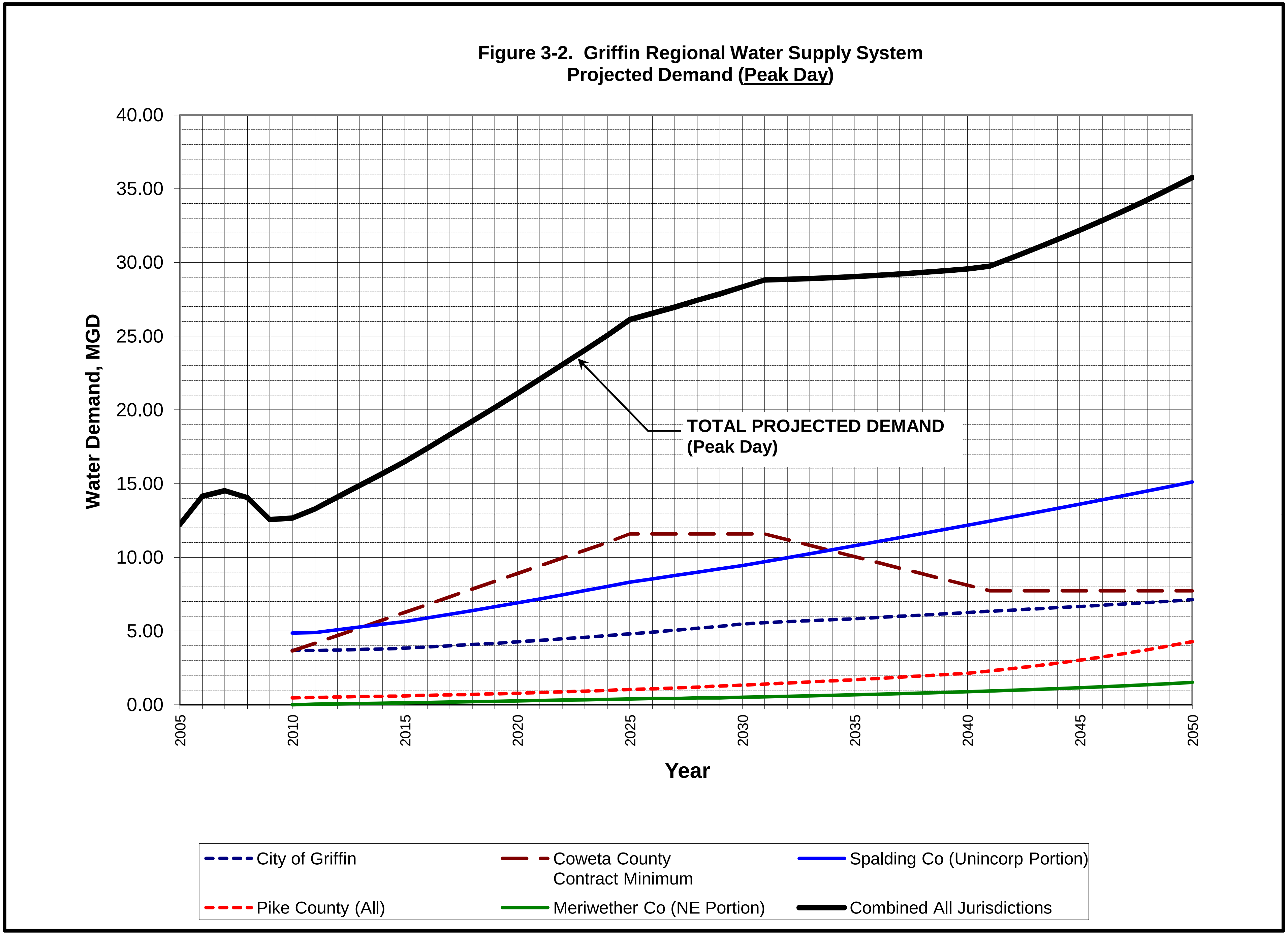


Figure 3-2. Griffin Regional Water Supply System
Projected Demand (Peak Day)
Water Demand, MGD
40.00
35.00
30.00
25.00
20.00
15.00
10.00
5.00
0.00
2005
2010
2015
2020
2025
2030
2035
2040
2045
2050
Year
TOTAL PROJECTED DEMAND
(Peak Day)
City of Griffin
Coweta County
Contract Minimum
Spalding Co (Unincorp Portion)
Pike County (All)
Meriwether Co (NE Portion)
Combined All Jurisdictions

Figure 3-2

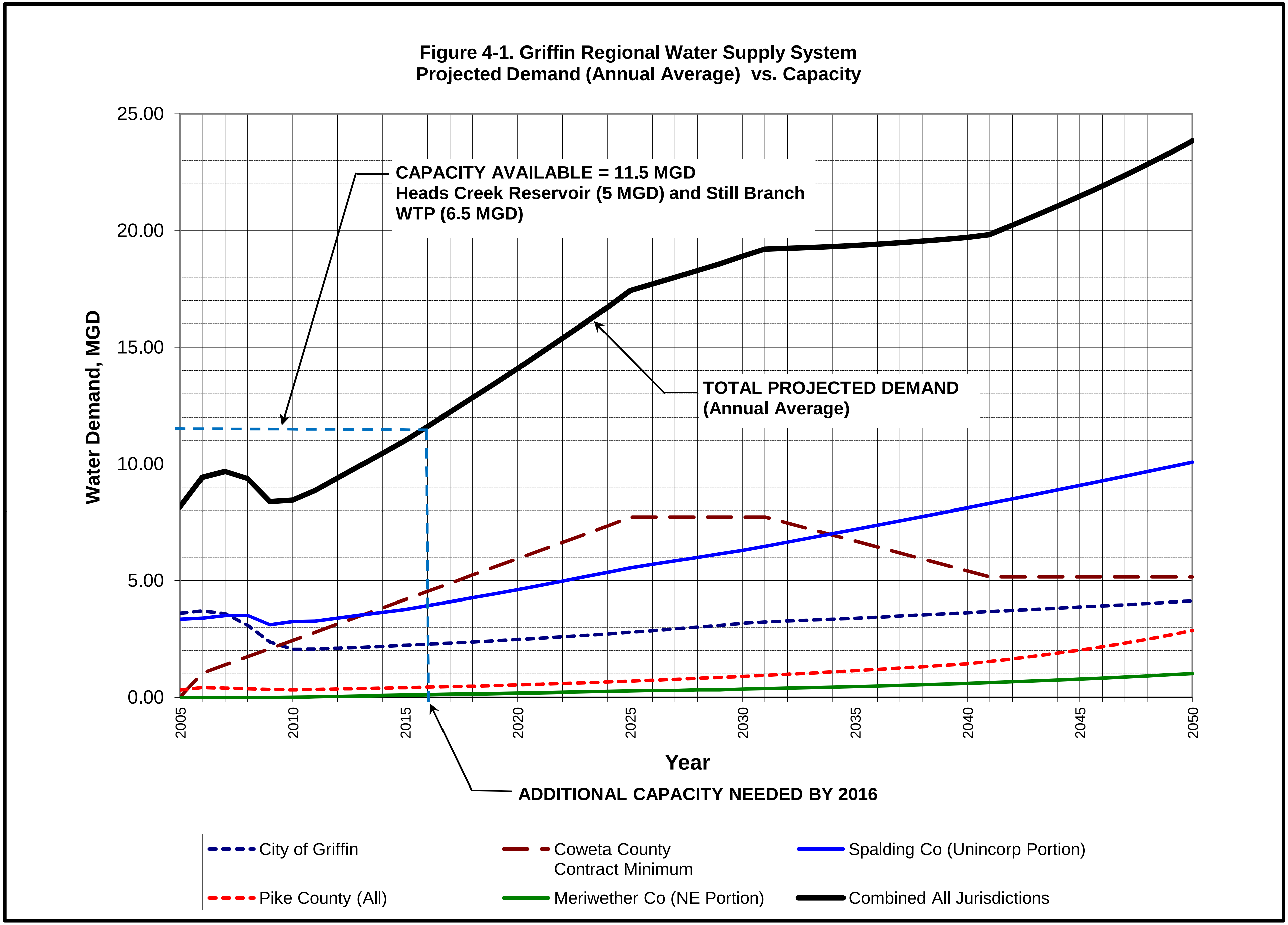


Figure 4-1. Griffin Regional Water Supply System
Projected Demand (Annual Average) vs. Capacity
CAPACITY AVAILABLE = 11.5 MGD
Heads Creek Reservoir (5 MGD) and Still Branch WTP (6.5 MGD)
TOTAL PROJECTED DEMAND
(Annual Average)
ADDITIONAL CAPACITY NEEDED BY 2016
Water Demand, MGD
Year
25.00
20.00
15.00
10.00
5.00
0.00
2005
2010
2015
2020
2025
2030
2035
2040
2045
2050
City of Griffin
Coweta County Contract Minimum
Spalding Co (Unincorp Portion)
Pike County (All)
Meriwether Co (NE Portion)
Combined All Jurisdictions

Figure 4-1

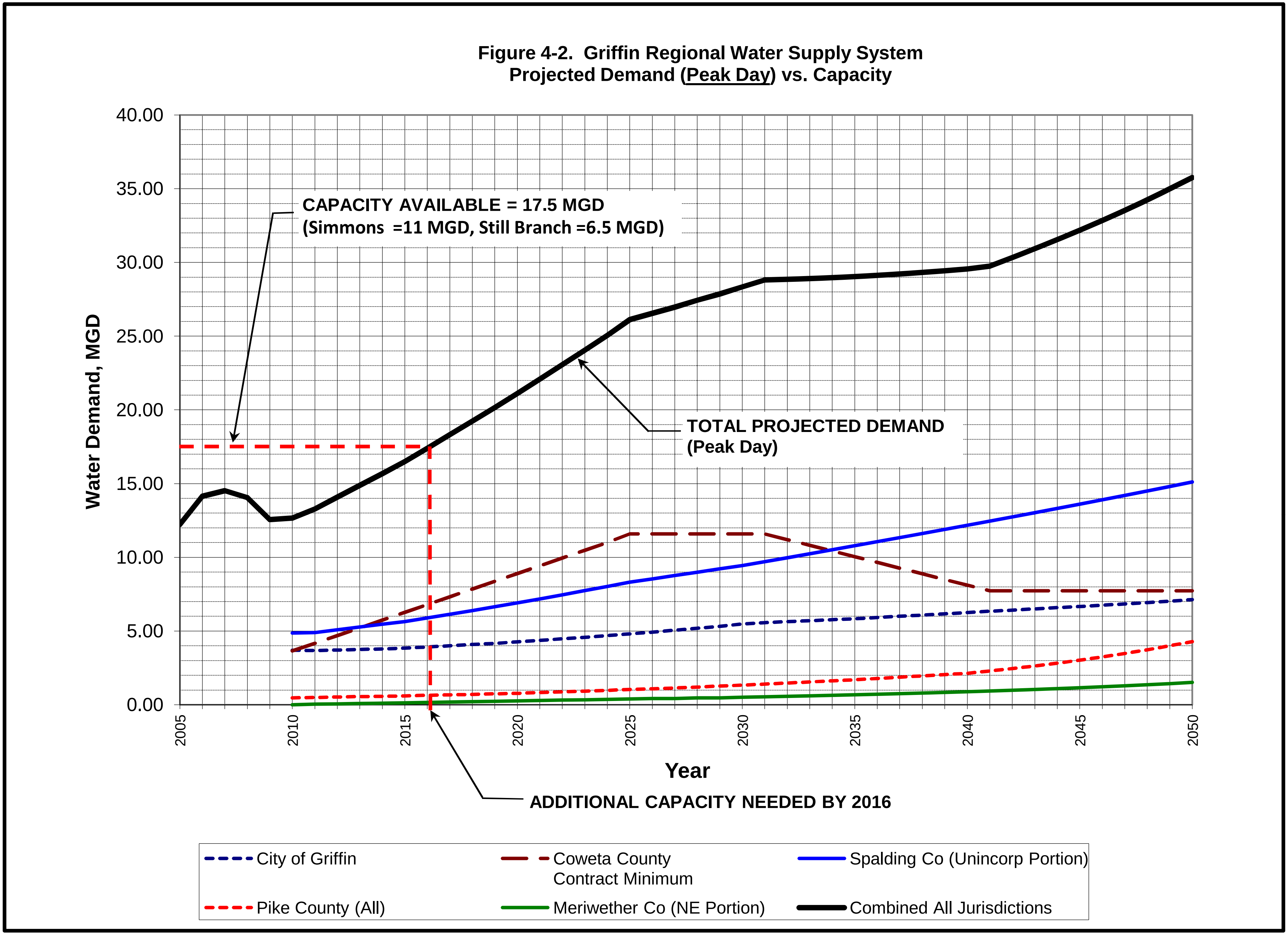
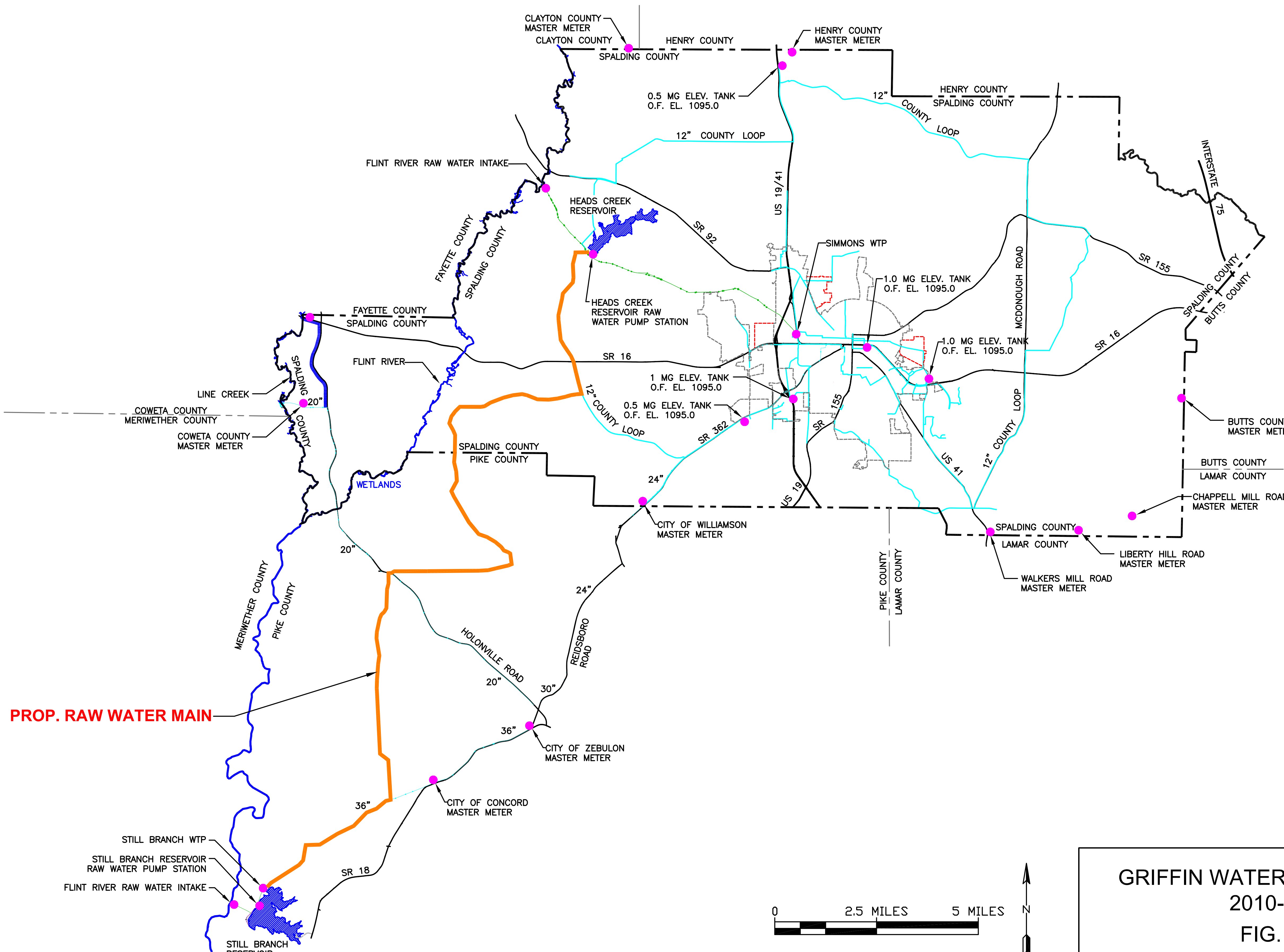
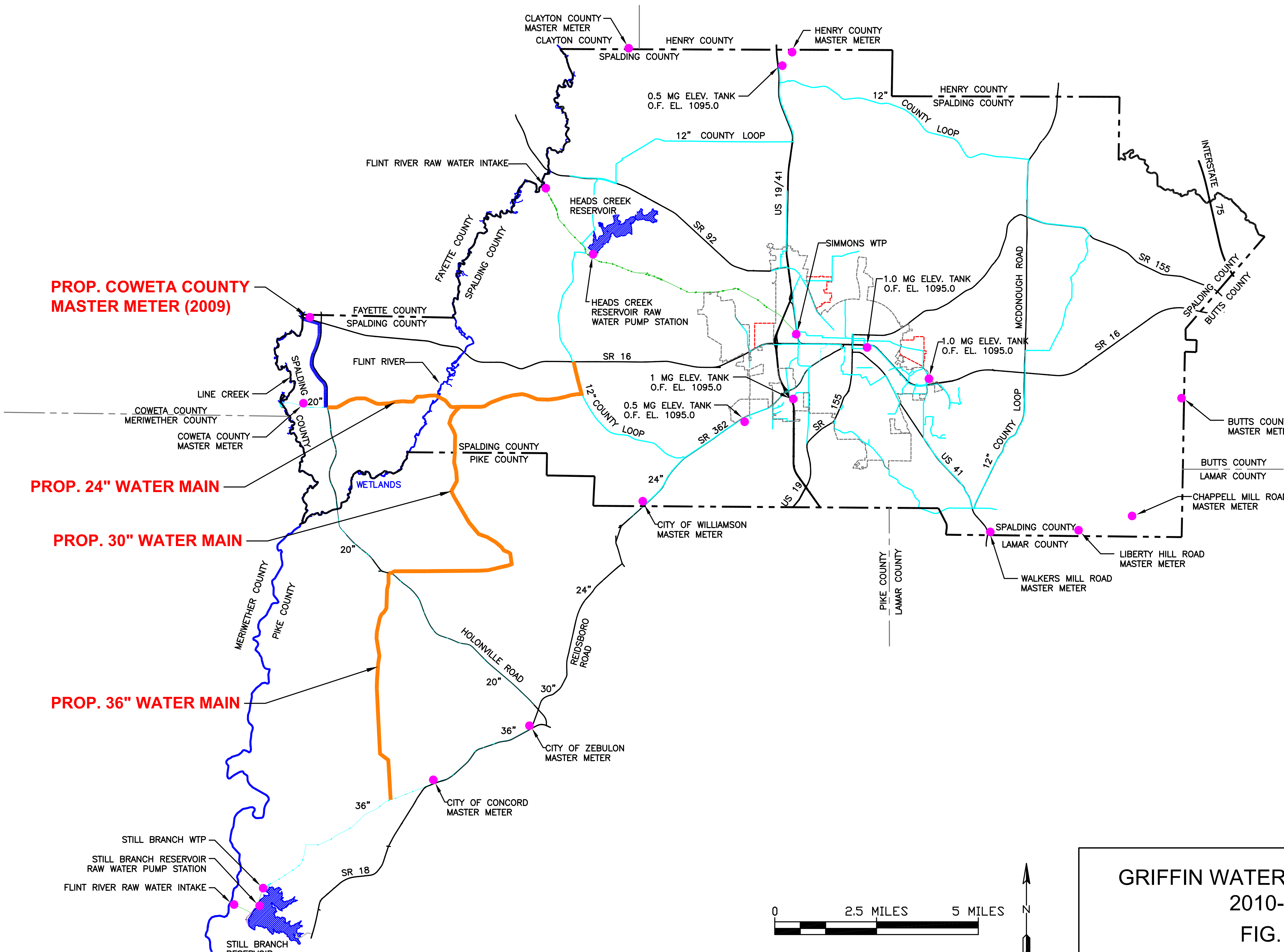


Figure 4-2. Griffin Regional Water Supply System
Projected Demand (Peak Day) vs. Capacity
40.00
35.00
30.00
25.00
20.00
15.00
10.00
5.00
0.00
Water Demand, MGD
CAPACITY AVAILABLE = 17.5 MGD
(Simmons =11 MGD, Still Branch =6.5 MGD)
TOTAL PROJECTED DEMAND
(Peak Day)
2005
2010
2015
2020
2025
2030
2035
2040
2045
2050
Year
ADDITIONAL CAPACITY NEEDED BY 2016
City of Griffin
Coweta County Contract Minimum
Spalding Co (Unincorp Portion)
Pike County (All)
Meriwether Co (NE Portion)
Combined All Jurisdictions

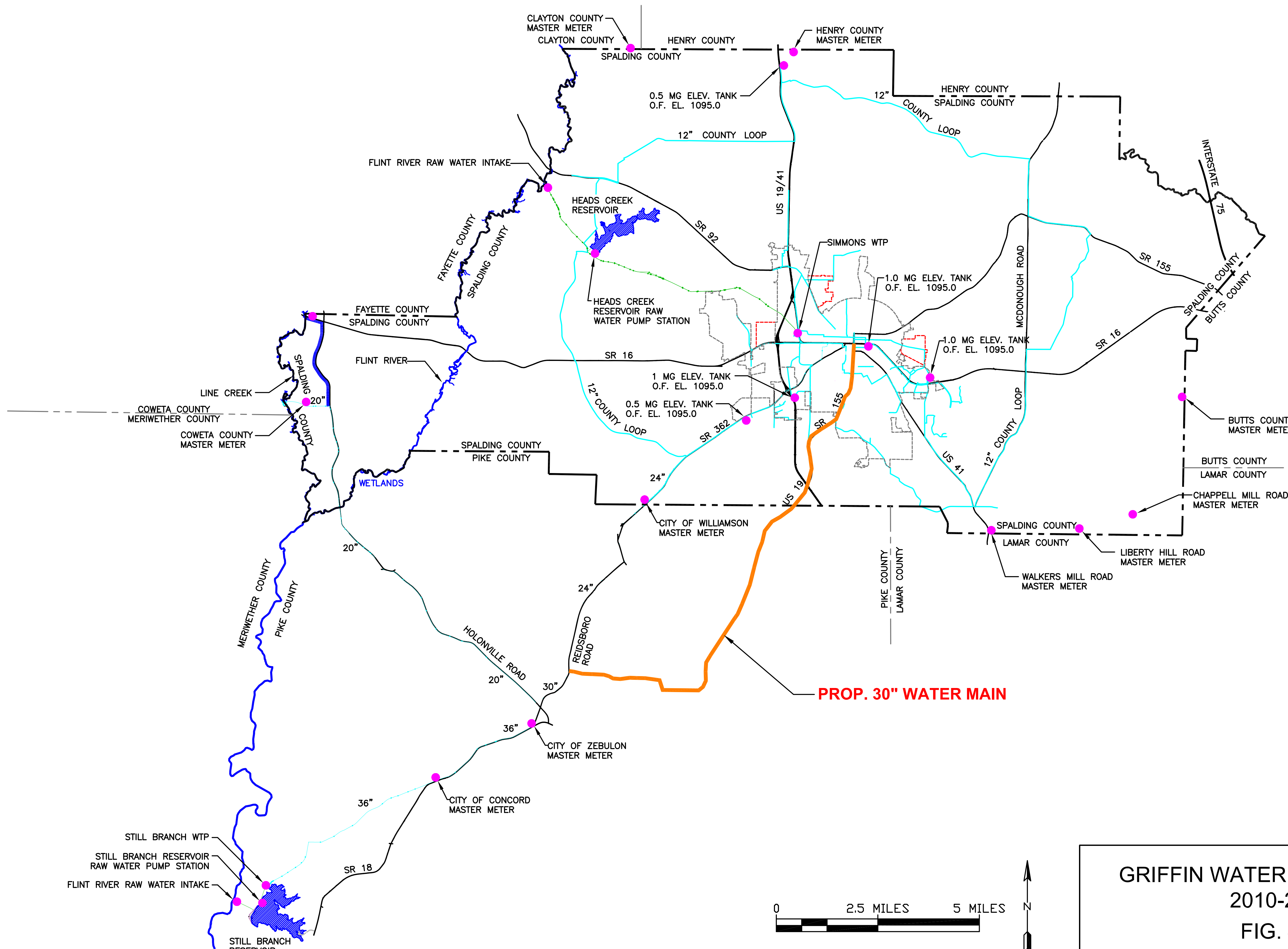
Figure 4-2



GRIFFIN WATER MASTER PLAN
2010-2050
FIG. 4-3
PROPOSED RAW WATER MAIN



GRIFFIN WATER MASTER PLAN
2010-2050
FIG. 4-4
OPTION 1 - PHASE 1



GRIFFIN WATER MASTER PLAN
2010-2050

FIG. 4-5

OPTION 1 - PHASE 2

Appendix A
Service Delivery Area
Spalding County

Appendix B
Withdrawal Permit
Flint River near
Still Branch

Appendix C
Withdrawal Permit
Still Branch Reservoir

Appendix D
Spalding County Demand Projection

Appendix E
404 Permit

Appendix F
Estimated Costs