GEORGIA
WATER PLANNING

Altamaha Regional Water Planning Council

WATER & WASTEWATER FORECASTING TECHNICAL MEMORANDUM

Supplemental Material | Altamaha Regional Water Plan

MARCH 2024

Little Ocmulgee State Park
Photo courtesy of the Georgia Department of Industry, Trade & Tourism

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Section 1
Introduction

Municipal and Industrial Water and Wastewater Forecasts were originally developed for the Altamaha Regional Water Planning Council as part of the Georgia Comprehensive Statewide Water Management Plan (CSWMP) in 2011. Agricultural and Energy water needs were also identified and forecasted during the 2011 planning process. As part of the first 5-year review and revision of that plan, all of these forecasts, with the exception of the Industrial water and wastewater forecasts, were updated in 2017. In support of the 2023 plan update, the Agricultural, Energy, Municipal, and Industrial water and wastewater forecasts have been updated. This Technical Memorandum describes how the forecasts have been modified to account for changes in population and water use that have occurred since the 2017 forecasts were produced.

Throughout this report, the prior Regional Planning process that occurred in 2009 – 2011 is referred to as "Round 1" and the 2017 update is referred to as "Round 2". Thus, the current (2023) update is referred to as "Round 3".

The basic approach to updating the forecasts starts with the same methodology used in developing the Round 2 forecasts, which are described in various Technical Memoranda included as supplemental materials to the 2017 Altamaha Regional Water Plan[1]. The purpose of this Technical Memorandum is to describe where modifications to the Round 2 forecast methodology were made and to provide the revised forecast values.

1.1 General Methodology

The basic methodology for forecasting water demand is to estimate demand separately for each major water use sector. For each sector, water demand is estimated using a 'driver' multiplied by the 'rate of use'. The driver is defined as a countable unit that can be projected in future years, such as number of people, acres irrigated or megawatts of power. The rate of use is defined as the quantity of water used by the driving unit per unit of time, such as gallons per person per day, gallons per day per acre, or gallons per megawatt produced.

The planning process examines and forecasts water demand for four major sectors:

- **Municipal** – this sector includes domestic, commercial, and low water use industries
- **Industrial** – this sector includes higher water use industries

[1] See "Altamaha Regional Water Plan," dated September 2017 (available at https://waterplanning.georgia.gov/altamaha-regional-water-plan);

"Altamaha Water and Wastewater Forecasting Technical Memorandum", dated March 2017 (available at https://waterplanning.georgia.gov/altamaha-region-technical-information)

- **Agricultural** – this sector includes major crops such as cotton, corn, peanuts, soybean, pecans, specialty crops, and nursery and horticulture, and golf courses; a snapshot of major livestock water use and golf course water use
- **Energy** – this sector includes thermoelectric power generation

The total water demand forecast per sector is then divided between surface water and groundwater sources. Surface water withdrawals are further assigned to various surface water basins, while groundwater withdrawals are assigned to specific aquifers. During the current plan update a set of seven priority aquifers were utilized for aquifer assignments: Brunswick, Claiborne, Clayton, Cretaceous, Crystalline Rock, Floridan, and surficial. Other aquifer classifications per permits records were reassigned to one of these seven major aquifers. For the Altamaha Planning Region, any demands assigned to the Gordon aquifer were reclassified as Floridan and any Dublin aquifer demands were reclassified as Cretaceous.

1.2 Population Update

State and County population projections are provided by the Governor's Office of Planning and Budget (OPB). These projections are used consistently throughout the state for multiple purposes such as transportation planning and allocation of education funds. The Georgia Environmental Protection Division (EPD) is required to use these population projections in statewide water planning. The 2010 Census statewide population count was lower than had been projected for 2010 in the Round 1 projections, although this trend of lower population than projected does not hold true for all counties. The Round 1 forecast had the State's population growing at an annual rate of 1.83 percent while the current updated forecast grows at an annual rate of only 0.87 percent as shown in **Figure 1-1**.

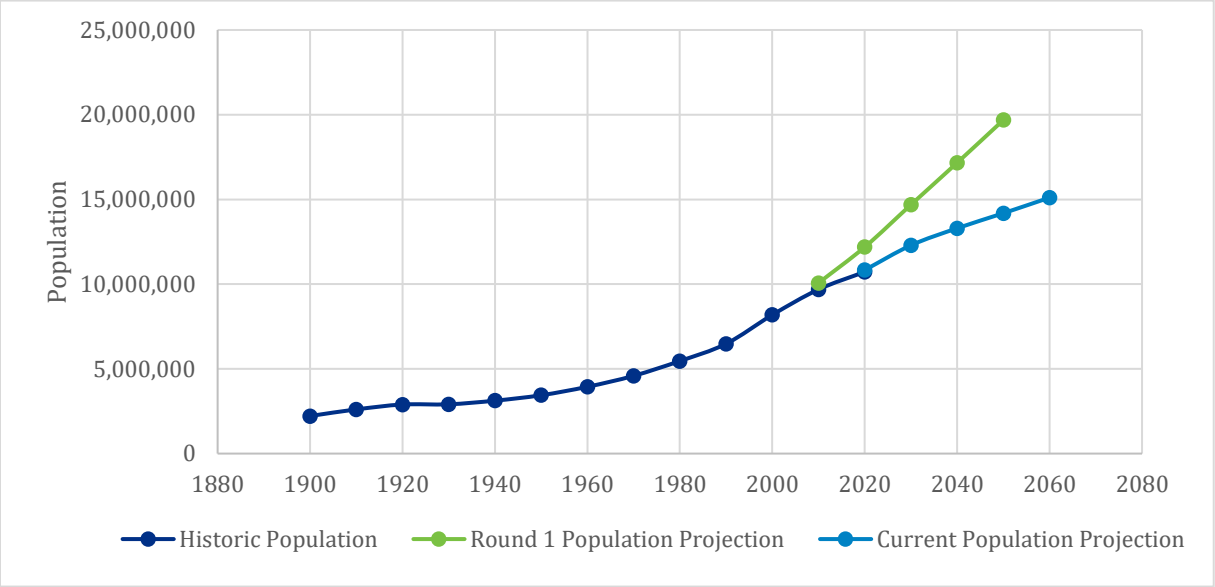


Figure 1-1
Georgia's Historic Population and Growth Projections

While the trend of a lower population in 2020 than originally projected was seen statewide, each county had its own individual trend. For the region as a whole, the population obtained from the 2019 OPB data was 12 percent lower than the Round 1 projection for 2020. In addition, lower growth rates moving forward are predicted leading to a projected population in 2050 that is 33 percent less than the Round 1 estimate as shown in **Figure 1-2**. The new population projections (OPB, 2019) by county are shown in **Table 1-1**.

It should be noted that during the plan update process, the Council indicated that a new state prison is planned in Tatnall County. The Georgia Department of Corrections (GDC) is closing the Georgia State Prison in Reidsville which houses approximately 1,530 inmates. As outlined in the Governor's Budget Report for Amended Fiscal Year 2022 and Fiscal Year 2023, the state budget proposal includes construction of a new 3,000 bed facility to house prisoners in Tatnall County. The Regional Water Plan will be updated accordingly as more information becomes available on the State's plan and its impact to the local population in Tatnall County in future plan updates. In addition, anecdotal information suggests a recent migration to rural and unincorporated areas since the 2020 census. This may affect assumptions in the municipal water demand forecast in future updates of the Regional Water Plan.

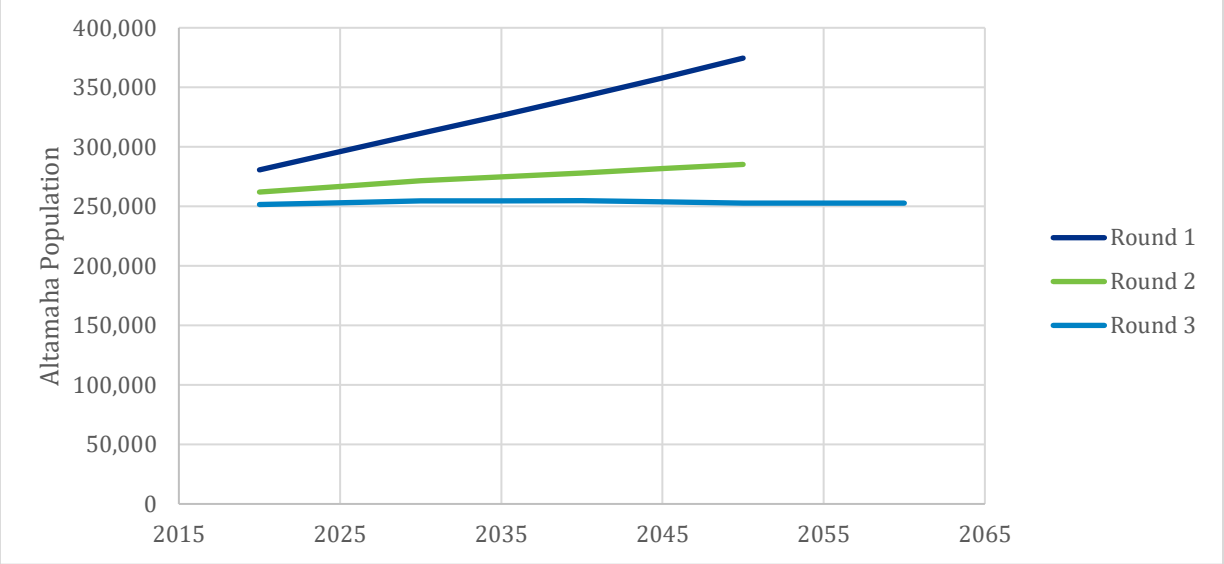


Figure 1-2
Altamaha Population Projections

Table 1-1 Population Projections per County

County	2020	2025	2030	2035	2040	2045	2050	2055	2060
Appling	18,561	18,954	19,346	19,600	19,853	19,996	20,138	20,358	20,577
Bleckley	12,838	13,041	13,243	13,410	13,576	13,683	13,789	13,937	14,084
Candler	10,837	10,969	11,101	11,148	11,194	11,236	11,278	11,384	11,489
Dodge	20,385	19,943	19,500	18,914	18,327	17,665	17,003	16,413	15,822
Emanuel	22,664	23,114	23,564	23,801	24,037	24,133	24,228	24,410	24,591
Evans	10,687	10,804	10,920	11,006	11,092	11,093	11,094	11,138	11,181
Jeff Davis	15,148	15,415	15,681	15,812	15,943	15,992	16,040	16,068	16,096
Johnson	9,661	9,580	9,499	9,390	9,280	9,183	9,085	9,065	9,045
Montgomery	9,224	9,299	9,374	9,376	9,378	9,355	9,332	9,332	9,332
Tattnall	25,411	25,501	25,591	25,526	25,460	25,231	25,001	24,821	24,641
Telfair	15,644	15,190	14,736	14,239	13,742	13,239	12,735	12,378	12,020
Toombs	26,983	27,230	27,477	27,492	27,507	27,339	27,171	26,996	26,821
Treutlen	6,829	6,873	6,917	6,944	6,970	6,974	6,978	7,037	7,096
Wayne	29,974	30,386	30,798	30,989	31,180	31,207	31,233	31,335	31,436
Wheeler	7,909	8,003	8,097	8,201	8,304	8,384	8,464	8,570	8,675
Wilcox	8,790	8,807	8,824	8,885	8,945	9,100	9,254	9,494	9,734
Total	**251,545**	**253,107**	**254,668**	**254,728**	**254,788**	**253,806**	**252,823**	**252,732**	**252,640**

Section 2
Municipal Water Forecasting

This section describes the methodology and results of municipal water demand forecasts for the Altamaha Planning Region.

2.1 Methodology

The county level municipal water demand includes both public-supplied (i.e., utility) water demand and self-supplied (i.e., private well) water demand. The self-supplied water is associated with groundwater use, while the public-supply water is associated with either surface water or groundwater use as indicated by active permit data. Each county has an average weighted per capita water use value that was derived from an analysis of all reporting utilities within each county. In Round 1, 2005 utility data was used to determine the gpcd average for each county. In round 2, the Round 1 gpcd values were adjusted based on the utility level data over the most recent four years. In Round 3, the county gpcd averages were based on utility water loss audits and then vetted through the regional councils. The following sections describe updates to the previous methodology used to produce the revised forecasts.

2.1.1 Percent Change in Gallons per Capita per Day

The Georgia EPD compiled and reviewed water loss audit data reported annually for water systems serving populations of 3,300 or more as mandated by the Georgia Water Stewardship Act (2011). The water supplied input value from the audit information was then divided by the population served from EPA's Safe Drinking Water Information System (SDWIS) database to calculate the total per capita water use of a system. A weighted average for counties with more than one system was developed using water loss audit data from 2015 to 2018. To account for treatment loss, three percent was added to counties that have a surface water treatment plant as these systems typically have an in-plant water use that offsets the water produced.

If no data were available to EPD, withdrawal information was divided by the population served value provided by the SDWIS database to calculate the per capita water use. Of the counties with available data, roughly one-half had a decrease in gpcd while the other half showed an increase in gpcd. Note that a decrease in gpcd could be due to conservation and water loss control efforts during this time period, or other factors such as an increase in population with less increase in water use, or a drop in water use (e.g., loss of industrial customer) with the same population. **Table 2-1** shows the Round 2 gpcd for each county in the region compared to the current updated gpcd.

The self-supplied value of 75 gpcd for each county remains unchanged from Round 1.

Table 2-1. Per Capita Demand Values by County, gpcd

County	Round 2 Per Capita	Updated Per Capita	% Change
Appling	133	129	-3.0%
Bleckley	113	136	20.4%
Candler	99	90	-9.1%
Dodge	176	136	-22.7%
Emanuel	161	132	-18.0%
Evans	92	124	34.8%
Jeff Davis	193	160	-17.1%
Johnson	122	140	14.8%
Montgomery	112	166	48.2%
Tattnall	118	152	28.8%
Telfair	141	178	26.2%
Toombs	146	151	3.4%
Treutlen	128	127	-0.8%
Wayne	164	120	-26.8%
Wheeler	143	111	-22.4%
Wilcox	133	147	10.5%

2.1.2 Plumbing Code Adjustment Factor

In Rounds 1 and 2, the gpcd for each county was reduced over time due to the effects of plumbing codes based upon the age of housing stock in each county. Over time, as new houses are built with more efficiency fixtures, the county average gpcd will decrease. Previously, a reduction (adjustment) was calculated for each county starting with zero in 2010 (the base year in Round 1) and increasing over time. For the current update, the plumbing code adjustment was extrapolated using the 2017 Regional Water Plan plumbing code adjustment. The revised plumbing code adjustment was then applied to both public-supplied and self-supplied municipal water demand. **Table 2-2** shows the municipal public-supplied gpcd value over time for each county.

Table 2-2. Adjusted Public-Supplied GPCD

County	2020	2025	2030	2035	2040	2045	2050	2055	2060
Appling	129.5	128.2	126.9	125.7	124.4	123.2	121.9	120.7	119.4
Bleckley	136.0	134.7	133.4	132.1	130.7	129.4	128.1	126.8	125.5
Candler	89.6	88.3	87.0	85.7	84.4	83.1	81.9	80.6	79.3
Dodge	136.1	134.8	133.4	132.1	130.8	129.4	128.1	126.7	125.4
Emanuel	131.6	130.2	128.8	127.4	125.9	124.5	123.1	121.7	120.2
Evans	124.0	122.8	121.5	120.3	119.0	117.8	116.5	115.3	114.0
Jeff Davis	159.6	158.3	157.0	155.7	154.4	153.1	151.8	150.5	149.2
Johnson	140.0	138.7	137.3	136.0	134.6	133.3	131.9	130.6	129.2
Montgomery	165.9	164.7	163.5	162.3	161.1	159.8	158.6	157.4	156.2
Tattnall	152.0	150.6	149.3	147.9	146.6	145.2	143.9	142.5	141.2
Telfair	177.8	176.4	175.0	173.6	172.1	170.7	169.3	167.9	166.5
Toombs	151.0	149.7	148.3	147.0	145.6	144.3	142.9	141.6	140.2
Treutlen	127.1	125.8	124.4	123.1	121.8	120.4	119.1	117.7	116.4
Wayne	120.3	119.1	117.8	116.6	115.3	114.1	112.8	111.6	110.3
Wheeler	111.0	109.7	108.4	107.1	105.7	104.4	103.1	101.8	100.5
Wilcox	147.2	145.8	144.5	143.1	141.8	140.4	139.0	137.7	136.3

2.2 Municipal Water Forecasting Results

Table 2-3 shows the forecasted municipal water demand in millions of gallons per day (MGD) (public-supplied and self-supplied) by county in the Altamaha region. The total regional demand is shown graphically in **Figure 2-1** along with a comparison of the Round 1 and Round 2 estimates. Region-wide the current municipal forecast is lower than in Round 1 and Round 2 due to the combination of lower population projections and generally lower per capita water use values.

Table 2-3 Average Annual Municipal Water Demand Forecast by County (MGD)

County	2020	2025	2030	2035	2040	2045	2050	2055	2060	% Change
Appling	1.73	1.74	1.75	1.75	1.75	1.74	1.72	1.72	1.71	-1.1%
Bleckley	1.35	1.35	1.36	1.35	1.35	1.35	1.34	1.33	1.33	-1.3%
Candler	0.91	0.91	0.90	0.89	0.88	0.87	0.86	0.85	0.85	-7.0%
Dodge	2.13	2.05	1.98	1.90	1.81	1.72	1.64	1.56	1.48	-30.4%
Emanuel	2.45	2.46	2.48	2.47	2.46	2.43	2.41	2.39	2.37	-2.9%
Evans	1.12	1.12	1.12	1.11	1.11	1.09	1.08	1.07	1.06	-5.3%
Jeff Davis	1.68	1.69	1.70	1.69	1.69	1.67	1.65	1.64	1.62	-3.6%
Johnson	1.00	0.98	0.96	0.93	0.91	0.89	0.87	0.85	0.84	-16.1%
Montgomery	1.05	1.05	1.05	1.04	1.03	1.01	1.00	0.99	0.98	-7.5%
Tattnall	2.76	2.74	2.71	2.67	2.63	2.57	2.51	2.46	2.41	-12.7%
Telfair	2.08	2.00	1.92	1.83	1.75	1.67	1.59	1.53	1.46	-29.7%
Toombs	3.41	3.40	3.40	3.36	3.33	3.27	3.21	3.16	3.10	-9.1%
Treutlen	0.64	0.64	0.63	0.62	0.62	0.61	0.60	0.60	0.59	-7.9%
Wayne	2.88	2.88	2.88	2.86	2.84	2.80	2.77	2.74	2.71	-6.0%
Wheeler	0.75	0.75	0.75	0.75	0.75	0.74	0.74	0.74	0.74	-2.4%
Wilcox	1.07	1.06	1.05	1.05	1.04	1.05	1.05	1.07	1.08	0.9%
Total	**27.01**	**26.83**	**26.64**	**26.29**	**25.94**	**25.49**	**25.04**	**24.68**	**24.32**	-10.0%

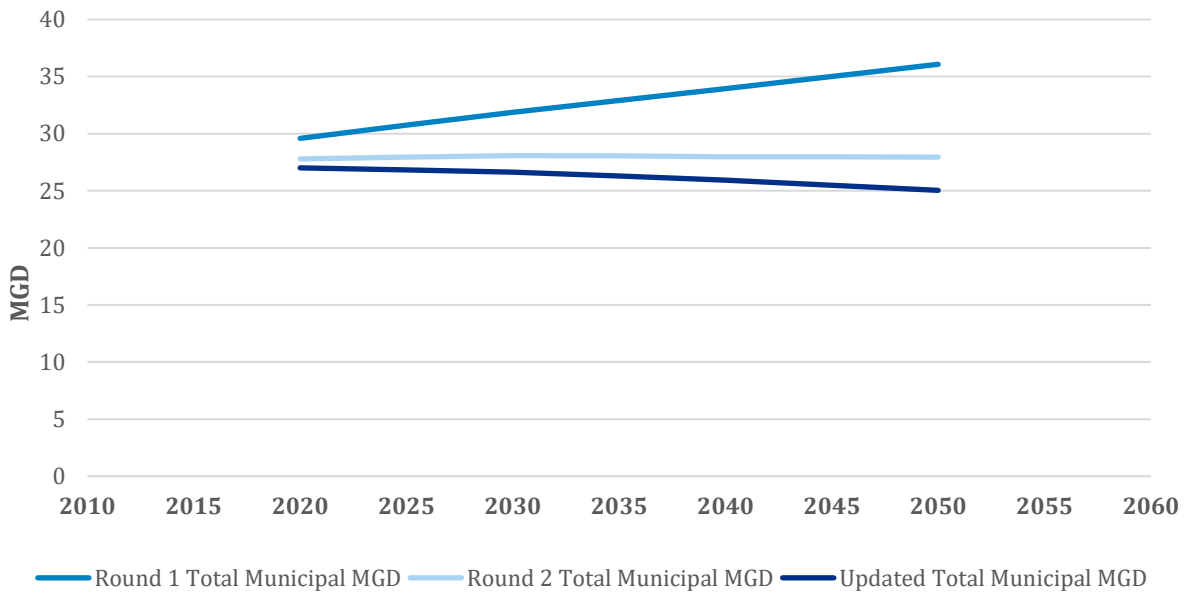


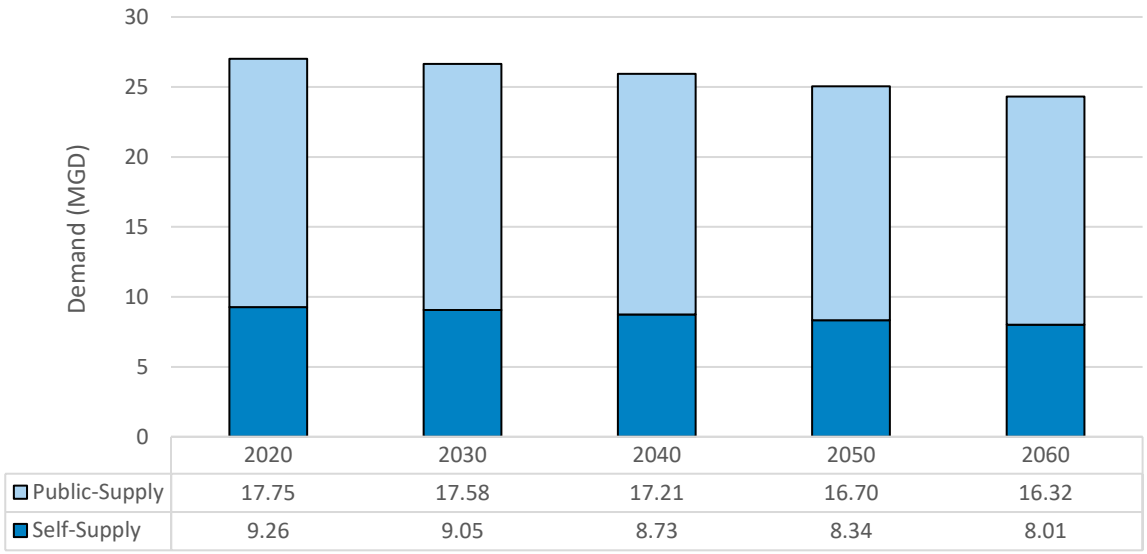
Figure 2-1
Forecasted Municipal Water Demand for Altamaha Planning Council

2.3 Municipal Water Forecast Allocations

As noted above, the municipal water demand for each county is the summation of the public-supplied and self-supplied water demand estimates for each county. The percent of county population that is public-supplied and self-supplied varies from Round 2 with the largest shifts of up to 20 percent in Wheeler and Candler counties. This split of county population was derived from 2015 USGS estimates and were vetted through the regional council and stakeholder review process. **Figure 2-2** shows the split between self-supply versus public-supply for the region.

As in the prior forecasts, it is assumed that all self-supplied (i.e., domestic residential) water use is from groundwater. The allocation of public-supplied municipal water among surface water and groundwater sources was originally determined in Round 1 by an analysis of surface water and groundwater permitted water withdrawals for municipal use by county. The percent of county public-supply municipal water by surface water and groundwater used to allocate the current county municipal water demand by sources was obtained from 2019 permitted withdrawals. The allocation of groundwater by aquifer (for the groundwater models) was also obtained from 2019 permitted withdrawals.

Thus, the current county municipal water demand forecasts are allocated among surface water basins and groundwater aquifers for analysis with other components of the state water plan update. Note that for the Altamaha region, all municipal water is groundwater, as shown in **Figure 2-3**.



	2020	2030	2040	2050	2060
Public-Supply	17.75	17.58	17.21	16.70	16.32
Self-Supply	9.26	9.05	8.73	8.34	8.01

Figure 2-2
Self-Supply Versus Public-Supply of Municipal Water Demand

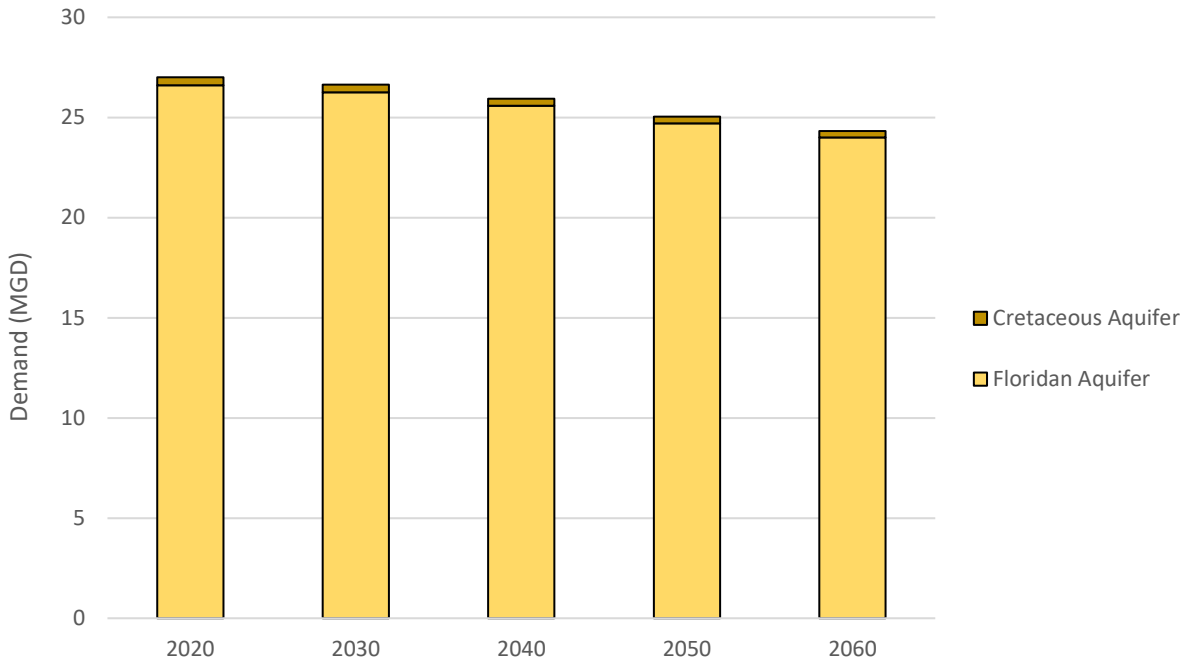


Figure 2-3
Municipal Water Demand for Altamaha Planning Council by Aquifer and Basin (MGD)
Note: Groundwater demand has been assigned to priority aquifers. Gordon aquifer demands were reclassified as Floridan and Dublin aquifer demands were reclassified as Cretaceous.

Section 3

Municipal Wastewater Forecasting

This section describes the methodology and results of the current municipal wastewater demand forecasts for the Altamaha Planning Region.

3.1 Methodology

Within the previous analyses (i.e., Round 1, Round 2), the municipal water demand served as the basis for estimating the municipal wastewater flows for each county with a portion of the water demand assumed to be indoor use that entered the centralized wastewater treatment system or septic systems. While self-supplied water demand was assumed to go to a septic system, public-supplied water in each county had a proportion going to septic and a portion to centralized treatment based on existing Georgia EPD permit data. Unlike the previous forecasts, a percentage was not added to centralized flows for inflow and infiltration (I/I) as I/I is accounted for in the reported discharge data. The centralized flow estimate was then allocated between point discharge (NPDES) and land application systems (LAS) based on reported discharges.

For the current update, the Georgia EPD provided an analysis of 2019 NPDES permitted discharges by county and a recommended methodology for the municipal wastewater forecast.

- The percent of county total wastewater flow that is septic was estimated based on Georgia Department of Public Health estimates of septic systems installed by county or based on percentage of septic households from 1990 census data.
- Future septic flow by county is estimated using 2019 discharge information by EPD multiplied by the percent change in county population 2019 and each planning year (2020, 2030, 2040, 2050, and 2060).
- The sum of annual average 2019 NPDES point discharges by county are increased/decreased over time with the rate of change in the new county population projections to derive the new point discharge forecast for the county. The percent of county that is septic/centralized remained constant over time.
- Industrial flows larger than 0.2 MGD that are treated at the municipal wastewater facilities were removed from current flow data and added to the 2060 municipal wastewater forecast.
- The sum of annual average 2015 - 2019 land application system (LAS) flows by county are combined with any 2015 - 2019 subsurface flows (if any), and increased/decreased over time with the rate of change in the new county population projections to derive the new LAS + subsurface forecast for the county.

- The current LAS + subsurface flow forecast for the county is allocated among watershed basins based on the permit locations of the 2015 - 2019 LAS (and subsurface) flows in the county.
- County centralized flow is the sum of the point source discharges and LAS + subsurface discharges.
- County total wastewater flow is the sum of the centralized and septic flows.

3.2 Results

Table 3-1 shows the forecasted municipal wastewater generated per County in the Altamaha region. The total regional wastewater generated is then shown graphically in **Figure 3-1** separated between septic treatment and centralized treatment that is discharged via a point source or land application. **Figure 3-2** gives a snapshot of how the generated wastewater is discharged per watershed for 2020.

Table 3-1 Municipal Wastewater Generated in Altamaha Planning Region per County (MGD)

County	2020	2030	2040	2050	2060	% Change 2020 to 2060
Appling	2.08	2.16	2.22	2.25	2.30	10.9%
Bleckley	1.30	1.34	1.37	1.39	1.42	9.7%
Candler	0.78	0.80	0.81	0.82	0.83	6.0%
Dodge	1.83	1.75	1.64	1.52	1.42	-22.4%
Emanuel	1.91	1.99	2.03	2.05	2.08	8.5%
Evans	0.63	0.65	0.66	0.66	0.66	4.6%
Jeff Davis	1.62	1.68	1.71	1.72	1.72	6.3%
Johnson	0.43	0.42	0.41	0.40	0.40	-6.4%
Montgomery	0.59	0.60	0.60	0.59	0.59	1.2%
Tattnall	3.20	3.22	3.21	3.15	3.10	-3.0%
Telfair	1.78	1.68	1.56	1.45	1.37	-23.2%
Toombs	3.58	3.65	3.65	3.61	3.56	-0.6%
Treutlen	0.59	0.60	0.60	0.60	0.62	3.9%
Wayne	2.79	2.86	2.90	2.90	2.92	4.9%
Wheeler	0.80	0.82	0.84	0.86	0.88	9.7%
Wilcox	0.73	0.73	0.74	0.77	0.80	10.7%
Total	**24.63**	**24.94**	**24.95**	**24.74**	**24.68**	**0.2%**

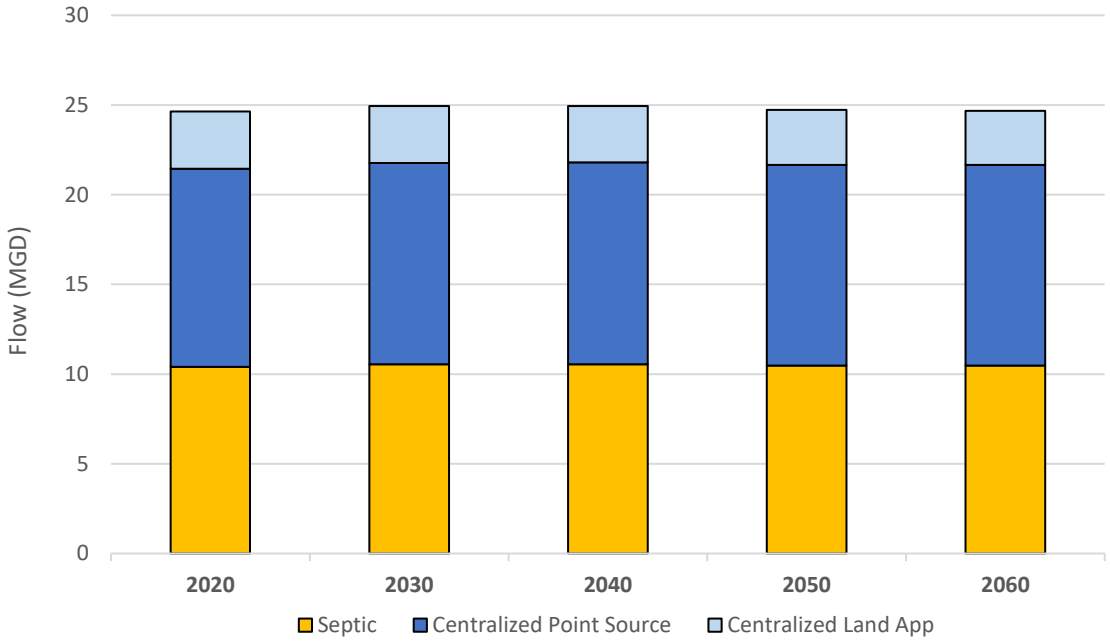


Figure 3-1
Municipal Wastewater Generated Altamaha Planning Region by Type

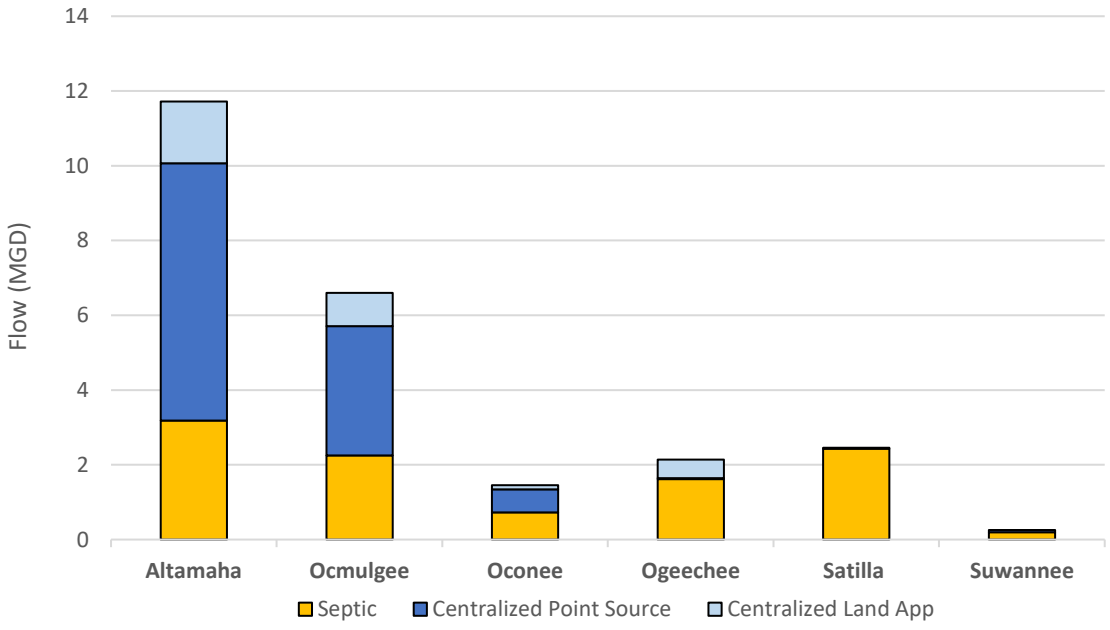


Figure 3-2
2020 Snapshot of Wastewater Discharge Type per Watershed

Section 4
Industrial Forecasting

This section describes the methodology and results of industrial water and wastewater demand forecasts for the Altamaha Planning Region.

4.1 Methodology

The original industrial water and wastewater forecast methodology was based on employment projections per industry with the 2010 water use multiplied by the expected employment growth rate into the future for that type of industry. The industrial wastewater flow was then estimated from a wastewater to water ratio developed for each industrial category. The original forecast was not updated during the 2017 forecast revision process.

In support of the current update, EPD identified industrial representatives throughout the State of Georgia to form an industrial water demand forecast stakeholder advisory group to represent the state's thirteen largest industrial water use sectors. It was then determined that employment projections were not a valid basis for estimating future water requirements of industries as water requirements are a function of production of which automation has reduced the number of employees per unit of production. Separate industrial sub-sector groups were subsequently formed to examine trends in water use for food processing, paper and forest products, mining, and manufacturing. The sub-sector advisory groups worked independently to review a variety of considerations for estimating future water demand and determined a variety of common and sector-specific conclusions.

Data was confidentially collected within the sub-sectors through trade association surveys and merged with EPD withdrawal data. The basis of projected water use for the majority of industrial facilities used the 10-year average water withdrawals from 2010 to 2019, however, there were some instances where data was limited to a 5-year average from 2015 or 2019 or reported water use for 2019.

It should be noted that information was shared between the industrial forecast team and the municipal forecast team to adjust for large industries supplied by municipal water systems. As a result, the municipal forecast excludes large industrial users from the municipal water use per capita and municipal water demand calculations.

4.2 Results

Table 4-1 shows the current (Round 3) industrial water demand by county as well as the percent increase in demand between 2020 and 2060. **Table 4-2** shows the same water demand broken down by industry with the majority of water demand occurring in the paper industrial classification category. All of the industrial water demand in the region currently comes from groundwater and is assumed to remain the same in the forecast estimates.

Table 4-3 provides the forecast of industrial wastewater generated per County while **Table 4-4** give the wastewater demand by discharge method. The majority of industrial wastewater in the Planning Region is discharged via a permitted point source for the industrial facility.

Table 4-1 Industrial Water Demand Forecast per County (MGD)

County	2020	2030	2040	2050	2060	% Change 2020 to 2060
Appling	0.00	0.00	0.00	0.00	0.00	0%
Bleckley	0.00	0.00	0.00	0.00	0.00	0%
Candler	0.00	0.00	0.00	0.00	0.00	0%
Dodge	0.02	0.02	0.02	0.02	0.02	0%
Emanuel	1.06	1.29	1.56	1.71	1.80	70%
Evans	1.74	2.13	2.57	2.82	2.96	70%
Jeff Davis	0.08	0.08	0.08	0.08	0.08	0%
Johnson	0.00	0.00	0.00	0.00	0.00	0%
Montgomery	0.00	0.00	0.00	0.00	0.00	0%
Tattnall	0.03	0.03	0.03	0.03	0.03	0%
Telfair	0.06	0.06	0.06	0.06	0.06	0%
Toombs	0.00	0.00	0.00	0.00	0.00	0%
Treutlen	0.00	0.00	0.00	0.00	0.00	0%
Wayne	57.89	57.89	57.89	57.89	57.89	0%
Wheeler	0.00	0.00	0.00	0.00	0.00	0%
Wilcox	0.02	0.02	0.02	0.02	0.02	0%
Total	**60.90**	**61.51**	**62.22**	**62.63**	**62.86**	**3%**

Table 4-2 Industrial Water Demand Forecast per Industry (MGD)

Industry	2020	2030	2040	2050	2060
Food	2.80	3.42	4.12	4.53	4.76
Manufacturing	0.16	0.16	0.16	0.16	0.16
Paper	57.94	57.94	57.94	57.94	57.94
TOTAL	**60.90**	**61.51**	**62.22**	**62.63**	**62.86**

Table 4-3 Industrial Wastewater Generation Forecast per County (MGD)

County	2020	2030	2040	2050	2060	% Change 2020 to 2060
Appling	0.00	0.00	0.00	0.00	0.00	0%
Bleckley	0.00	0.00	0.00	0.00	0.00	0%
Candler	0.00	0.00	0.00	0.00	0.00	0%
Dodge	0.00	0.00	0.00	0.00	0.00	0%
Emanuel	0.71	0.86	1.04	1.14	1.20	70%
Evans	1.64	2.00	2.41	2.65	2.78	70%
Jeff Davis	0.00	0.00	0.00	0.00	0.00	0%
Johnson	0.00	0.00	0.00	0.00	0.00	0%
Montgomery	0.00	0.00	0.00	0.00	0.00	0%
Tattnall	0.00	0.00	0.00	0.00	0.00	0%
Telfair	0.00	0.00	0.00	0.00	0.00	0%
Toombs	0.08	0.08	0.08	0.08	0.08	0%
Treutlen	0.00	0.00	0.00	0.00	0.00	0%
Wayne	57.89	57.89	57.89	57.89	57.89	0%
Wheeler	0.00	0.00	0.00	0.00	0.00	0%
Wilcox	0.00	0.00	0.00	0.00	0.00	0%
Total	**60.31**	**60.83**	**61.42**	**61.76**	**61.95**	**3%**

Table 4-4 Industrial Wastewater Generation Forecast by Discharge Method (MGD)

Discharge Method	2020	2025	2030	2035	2040	2045	2050	2055	2060
Industrial – Point Source	57.89	57.89	57.89	57.89	57.89	57.89	57.89	57.89	57.89
Industrial – LAS	2.43	2.67	2.94	3.24	3.53	3.71	3.87	3.97	4.07
Total Industrial Discharge	**60.31**	**60.56**	**60.83**	**61.12**	**61.42**	**61.59**	**61.76**	**61.86**	**61.95**

Section 5
Agricultural Water Forecasting

This section describes the methodology and results of agricultural water demand forecasting for the Altamaha Planning Region.

5.1 Methodology

Agricultural water demand forecasts were originally developed, and recently updated, by the Georgia Water Planning & Policy Center at Albany State University (GWPPC), with support from the University of Georgia's (UGA) College of Agricultural and Environmental Sciences. GWPPC was contracted by Georgia Environmental Protection Division (GAEPD) to prepare estimates of current and future use of water by the agricultural sector in Georgia. The basic methodology involved estimating the projected irrigated area for each crop type and multiplying that area by the predicted monthly irrigation need in inches per each crop type. The proportion of irrigation water derived from different water source types was also considered. The projections cover row and orchard crops as well as most vegetable and specialty crops accounting for more than 95 percent of Georgia's irrigated land. Additionally, estimates of current use are made for animal agriculture, horticultural nurseries and greenhouses, as well as golf courses. Golf courses with a water withdrawal permit are included in the estimates of crop irrigation water use, although the acreage is small in comparison to other crops. Some golf courses without withdrawal permits may be included with horticultural nurseries and greenhouses.

Field observations, aerial surveys, and remote sensing were used to identify the 2020 irrigated acres by county. USDA projections, the Southeast Model, Georgia Model and data trends were used by the project team to project crop acreage by county through 2060. The number of irrigated acres has increased from 2015 to 2020 in most counties. Therefore, the projected irrigated crop acreage for 2060 is higher than previous forecasts for most counties. Crop water needs estimates from 2015-2016 were reviewed and updated with data from recent crop metering data. Prior agricultural forecasts assumed that only 70 percent of surface water withdrawals were applied. This assumption was removed for the updated forecast. Estimates were developed for crop irrigation from groundwater and surface water from 2020 to 2060. Water use estimates for animals and horticulture were estimated by county for 2020 and held constant over time. Water use for animals and horticulture is assumed to be groundwater.

To address potential climate extremes, a range of agricultural demand scenarios were considered including wet, normal and dry years. The 75th percentile of water demand was selected to represent dry year conditions when higher irrigation demands are expected. For planning purposes, GWPPC used the 75th percentile values for each region to represent a more conservative scenario than the median value. It is the 75th percentile demands that are presented in this report.

5.2 Results

Table 5-1 shows the forecasted agricultural water needs by county in the Altamaha region. The Altamaha region as a whole is expected to see an increase of 30 percent in agricultural water demand by 2060. **Figure 5-1** shows the agricultural demands split by basin for surface water and aquifer for groundwater with the same data also provided in **Table 5-2**. Currently 68 percent of the agricultural demand in the Altamaha region is met from groundwater.

Table 5-1 Altamaha Agricultural Demand Forecast per County (MGD)

County	2020	2030	2040	2050	2060	Percent Increase 2020 to 2060
Appling	9.7	10.3	11.1	11.9	12.9	33%
Bleckley	16.8	17.7	19.0	20.3	21.9	30%
Candler	6.8	7.4	8.1	8.9	9.8	44%
Dodge	14.8	15.9	16.9	18.1	19.4	31%
Emanuel	6.0	6.2	6.5	6.7	7.0	17%
Evans	6.6	7.0	7.5	8.0	8.7	32%
Jeff Davis	8.2	8.6	9.0	9.5	9.8	19%
Johnson	3.8	3.9	4.0	4.2	4.3	13%
Montgomery	4.7	5.2	5.7	6.3	7.0	49%
Tattnall	20.4	21.8	23.6	25.6	28.2	38%
Telfair	11.9	12.7	13.6	14.7	15.7	32%
Toombs	13.8	14.4	15.0	15.7	16.6	20%
Treutlen	2.2	2.3	2.4	2.5	2.6	18%
Wayne	6.0	6.3	6.5	7.9	7.2	20%
Wheeler	4.3	4.5	4.8	5.0	5.3	23%
Wilcox	21.6	23.1	24.8	26.8	29.0	34%
Total	**157.6**	**167.3**	**178.5**	**192.1**	**205.4**	**30%**

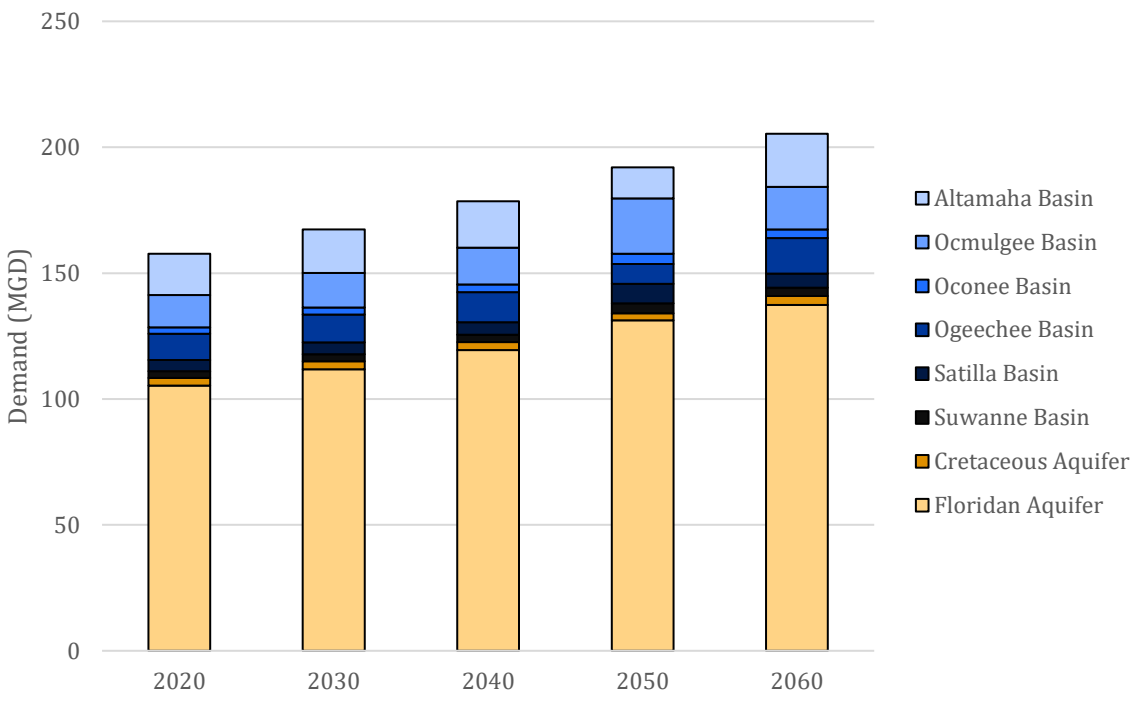


Figure 5-1
Agricultural Water Demand by Source Water Type
Note: Groundwater demand by aquifer shows preliminary information and will be updated when available.

Table 5-2 Altamaha Agricultural Demand Forecast per Source (MGD)

Source Water Type	Basin/Aquifer	2020	2030	2040	2050	2060	Percent Increase 2020 to 2060
Surface Water	Altamaha	16.3	17.3	18.4	12.3	21.2	30%
	Ocmulgee	12.8	13.7	14.6	22.0	16.9	32%
	Oconee	2.6	2.8	3.0	4.1	3.4	30%
	Ogeechee	10.3	11.1	11.9	7.8	14.1	36%
	Satilla	4.5	4.8	5.0	7.8	5.6	24%
	Suwannee	2.6	2.7	2.9	4.0	3.3	28%
	Sub Total	**49.2**	**52.3**	**55.9**	**58.0**	**64.5**	**31%**
Groundwater	Cretaceous	3.1	3.2	3.2	2.7	3.5	14%
	Floridan	105.3	111.8	119.4	131.3	137.4	30%
	Sub Total	**108.4**	**115.0**	**122.6**	**134.1**	**140.9**	**30%**
	Total	**157.6**	**167.3**	**178.5**	**192.1**	**205.4**	**30%**

Section 6
Energy Water Forecasting

This section describes the methodology and results of energy sector water demand for the Altamaha Planning Region.

6.1 Methodology

Demands forecasted in this section are associated with future energy sector utilities (NAICS 22) power generation. Water demands associated with power generation by facilities with other industry codes are captured as part of the municipal and industrial water demand forecasts discussed in previous sections.

The analysis covers both water withdrawal requirements and water consumption associated with energy generation. Information related to water withdrawals is an important consideration in planning for the water needed for energy production. However, water consumption is the more important element when assessing future resources because a large volume of water is typically returned to the environment following the energy production process.

Water requirements for thermoelectric power generation facilities are estimated based on future energy demands along with the water requirements and consumption rates in gallons per megawatt-hour (MWh) for different power generating configurations. For a full discussion of the original forecast methodology see the 2010 technical memorandum "Statewide Energy Sector Water Demand Forecast" or the "Update of GA Energy Needs & Generating Facilities" memorandum. The following modifications to the original methodology were incorporated into the current estimates:

- Projections of the statewide energy demand were updated using the new population projections to estimate "High Demand" and "Expected Demand" scenarios. Values of 10 MWh and 11 MWh per capita were assumed for the High Demand and Expected Demand scenarios, respectively.
- The list of existing facilities, facilities under construction, and planned and permitted new facilities was updated and reviewed by the stakeholder advisory group. In addition, some prior facilities were retired from service or converted from one generating configuration to another configuration. It was assumed that all coal-fired generating facilities in Georgia will be retired by 2040.
- The same water withdrawal and consumptive use factors (gallons per MWh) by generating configuration were maintained as previously developed.
- To meet the future energy demand, the energy generation of existing facilities is increased over time to a predetermined maximum sustainable generating capacity based on the generation configuration. As additional capacity is needed in the future, "new" capacity is added to the most likely to be developed generating configurations, which are assumed to

be provided by natural gas and renewable energy. The increase in natural gas generation was assigned geographically to locations in which natural gas generating facilities currently exist.

- The estimated future generating capacity of existing facilities, and associated water requirements, is allocated to regions based on the location of the existing facilities.

6.2 Results

The only current or planned facility that is in the Altamaha Planning Council is the Edwin I. Hatch Nuclear Power Plant. **Table 6-1** shows the projected expected scenario average annual daily withdrawal and consumption at this facility over the planning horizon.

Table 6-1 Altamaha Forecasted Energy Sector Demands (MGD)

Demand Type	2020	2030	2040	2050	2060
Withdrawals	79.2	79.2	79.2	79.2	79.2
Consumption	50.8	50.8	50.8	50.8	50.8

In the previous statewide analysis, the generating capacity of the existing and planned facilities was not able to meet the projected statewide power needs through 2050 and additional generating capacity was assumed to be developed beyond 2020. Projections for the need of new energy capacity are less than estimated previously. Under the current energy forecasting effort, it was determined that planned generation levels will be sufficient enough to meet the expected need up to 2036. Because coal-fired generation is expected to decline and be retired by 2040, renewable energy and natural gas-fired facilities will be increased to generate the additional energy required to meet the expected demand. Plant Hatch is assumed to provide steady power generation throughout the planning horizon.

Section 7
Regional Summary

This section summarizes the water and wastewater forecasts within the region for all the sectors combined.

7.1 Water Demand Summary

The full regional water demand including municipal, industrial, agricultural and energy uses are summarized in the figures and tables of this section. **Figure 7-1** shows the regional water demand per basin for surface water withdrawals and per aquifer for groundwater withdrawals while **Figure 7-2** shows the regional water demand per sector and **Figure 7-3** shows the sector breakdown by County for 2020. **Table 7-1** provides a breakdown of the demand types per County for the whole planning period.

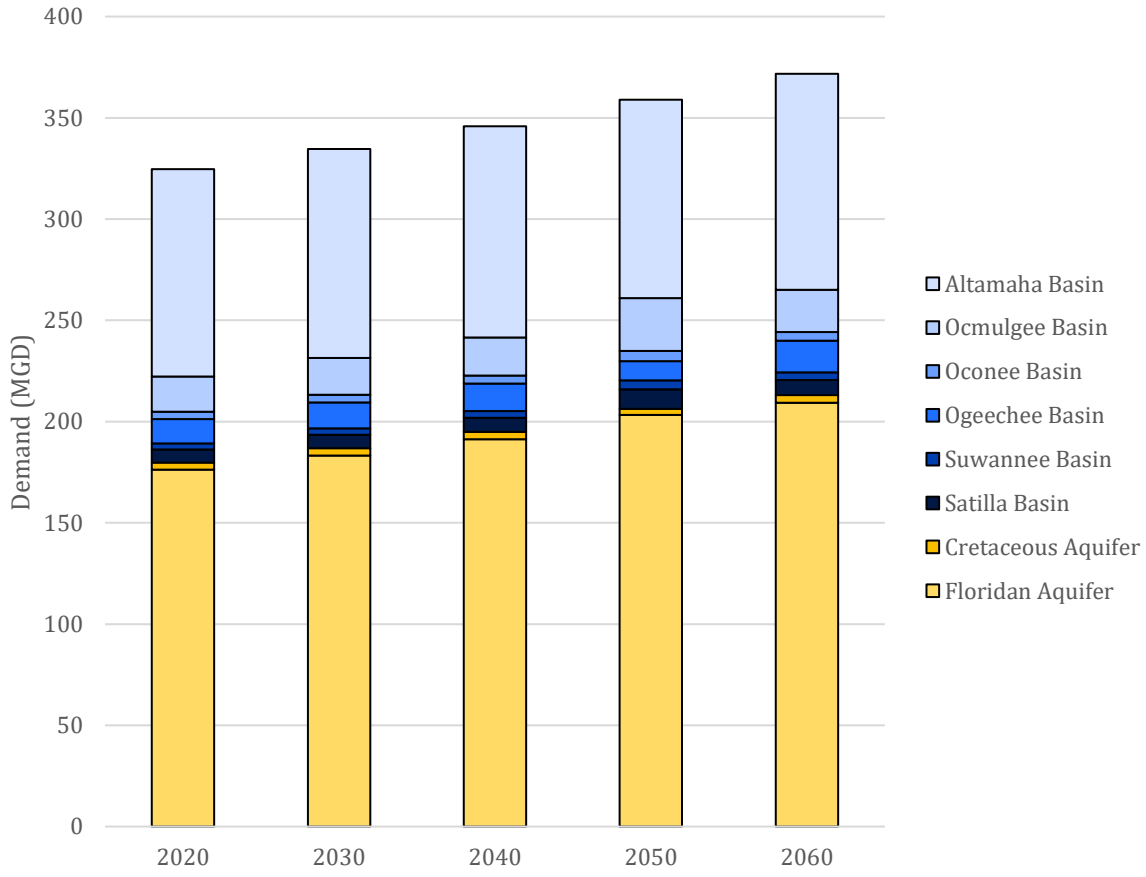


Figure 7-1
Regional Water Demand by Basin and Aquifer
Notes: Consumptive demand rather than total withdrawals from the energy sector included.
Groundwater demand has been assigned to priority aquifers. Gordon aquifer demands were reclassified as Floridan and Dublin aquifer demands were reclassified as Cretaceous.

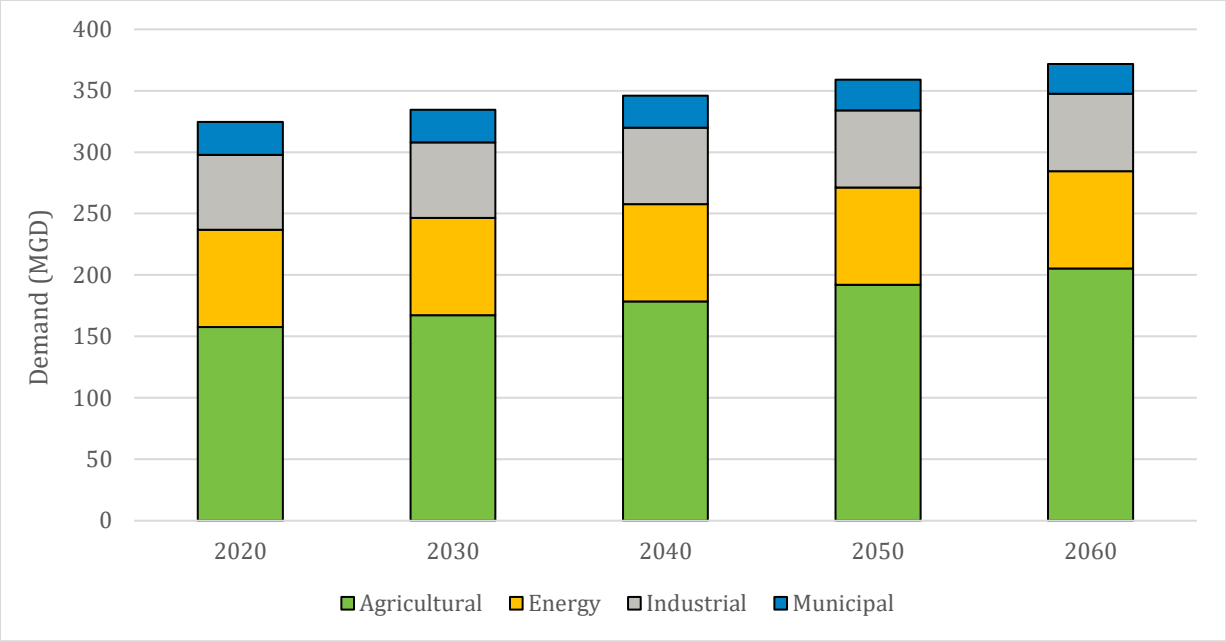


Figure 7-2
Regional Water Demand by Sector

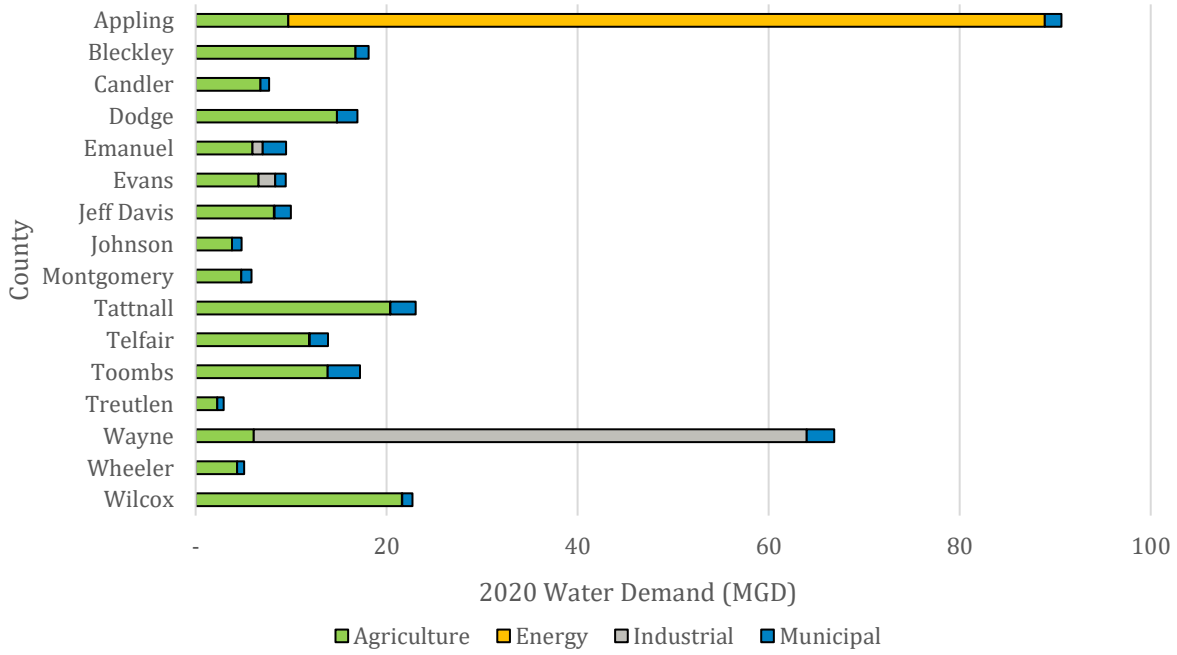


Figure 7-3
County Water Demand by Sector for 2020

Table 7-1 Summary of Water Demand per County (MGD)

County	Sector	2020	2030	2040	2050	2060
Appling	GW Agricultural	8.16	8.70	9.32	8.57	10.86
	GW Municipal Public Supply	0.80	0.82	0.82	0.82	0.82
	GW Municipal Self Supply	0.93	0.94	0.93	0.91	0.89
	Groundwater Total	9.89	10.45	11.07	10.30	12.57
	SW Agricultural	1.55	1.66	1.78	3.38	2.06
	SW Energy – Withdrawals	79.20	79.20	79.20	79.20	79.20
	Surface Water Total	80.75	80.86	80.98	82.58	81.26
	Total	**90.64**	**91.31**	**92.05**	**92.88**	**93.83**
Bleckley	GW Agricultural	12.31	12.91	13.66	13.40	15.48
	GW Municipal Public Supply	0.86	0.87	0.87	0.87	0.87
	GW Municipal Self Supply	0.49	0.49	0.48	0.47	0.46
	Groundwater Total	13.66	14.26	15.02	14.74	16.81
	SW Agricultural	4.44	4.79	5.25	6.90	6.41
	Total	**18.10**	**19.06**	**20.27**	**21.64**	**23.22**
Candler	GW Agricultural	3.01	3.25	3.55	5.97	4.29
	GW Municipal Public Supply	0.59	0.59	0.58	0.56	0.56
	GW Municipal Self Supply	0.32	0.31	0.30	0.29	0.29
	Groundwater Total	3.92	4.15	4.43	6.83	5.14
	SW Agricultural	3.78	4.10	4.49	2.96	5.47
	Total	**7.70**	**8.25**	**8.92**	**9.79**	**10.61**
Dodge	GW Agricultural	11.01	11.85	12.69	11.30	14.70
	GW Industrial	0.02	0.02	0.02	0.02	0.02
	GW Municipal Public Supply	1.33	1.25	1.15	1.04	0.95
	GW Municipal Self Supply	0.80	0.73	0.66	0.59	0.53
	Groundwater Total	13.16	13.85	14.52	12.95	16.20
	SW Agricultural	3.77	4.00	4.21	6.80	4.67
	Total	**16.93**	**17.86**	**18.73**	**19.75**	**20.87**
Emanuel	GW Agricultural	4.99	5.20	5.40	5.22	5.85
	GW Industrial	1.06	1.29	1.56	1.71	1.80
	GW Municipal Public Supply	1.74	1.77	1.76	1.74	1.72
	GW Municipal Self Supply	0.71	0.71	0.70	0.67	0.65
	Groundwater Total	8.50	8.97	9.42	9.34	10.03
	SW Agricultural	0.96	1.02	1.07	1.52	1.17
	Total	**9.46**	**9.99**	**10.49**	**10.86**	**11.20**
Evans	GW Agricultural	2.99	3.20	3.45	4.93	4.07
	GW Industrial	1.74	2.13	2.57	2.82	2.96
	GW Municipal Public Supply	0.80	0.80	0.80	0.78	0.77
	GW Municipal Self Supply	0.32	0.31	0.31	0.29	0.29
	Groundwater Total	5.85	6.44	7.12	8.83	8.09
	SW Agricultural	3.59	3.80	4.04	3.10	4.62
	Total	**9.44**	**10.25**	**11.17**	**11.93**	**12.71**
Jeff Davis	GW Agricultural	5.38	5.66	5.89	7.53	6.40
	GW Industrial	0.08	0.08	0.08	0.08	0.08
	GW Municipal Public Supply	1.03	1.04	1.04	1.03	1.02
	GW Municipal Self Supply	0.65	0.65	0.64	0.62	0.60
	Groundwater Total	7.14	7.44	7.66	9.27	8.10
	SW Agricultural	2.82	2.98	3.11	1.99	3.41
	Total	**9.96**	**10.41**	**10.77**	**11.25**	**11.52**

County	Sector	2020	2030	2040	2050	2060
Johnson	GW Agricultural	3.08	3.16	3.26	2.71	3.48
	GW Municipal Public Supply	0.60	0.57	0.55	0.53	0.51
	GW Municipal Self Supply	0.41	0.38	0.36	0.34	0.33
	Groundwater Total	4.08	4.12	4.17	3.58	4.32
	SW Agricultural	0.72	0.73	0.75	1.45	0.79
	Total	**4.80**	**4.85**	**4.92**	**5.03**	**5.11**
Montgomery	GW Agricultural	3.89	4.24	4.70	4.29	5.84
	GW Municipal Public Supply	0.66	0.66	0.65	0.64	0.63
	GW Municipal Self Supply	0.39	0.39	0.37	0.36	0.35
	Groundwater Total	4.94	5.29	5.72	5.29	6.82
	SW Agricultural	0.90	0.96	1.02	2.01	1.19
	Total	**5.84**	**6.25**	**6.75**	**7.30**	**8.00**
Tattnall	GW Agricultural	9.52	10.16	11.00	20.33	13.10
	GW Industrial	0.03	0.03	0.03	0.03	0.03
	GW Municipal Public Supply	1.69	1.67	1.63	1.57	1.52
	GW Municipal Self Supply	1.07	1.04	1.00	0.94	0.89
	Groundwater Total	12.32	12.91	13.66	22.88	15.54
	SW Agricultural	10.84	11.59	12.57	5.28	15.03
	Total	**23.15**	**24.50**	**26.23**	**28.16**	**30.57**
Telfair	GW Agricultural	9.73	10.40	11.13	9.94	12.89
	GW Industrial	0.06	0.06	0.06	0.06	0.06
	GW Municipal Public Supply	1.57	1.46	1.34	1.22	1.13
	GW Municipal Self Supply	0.51	0.46	0.41	0.37	0.33
	Groundwater Total	11.87	12.38	12.94	11.59	14.42
	SW Agricultural	2.14	2.29	2.45	4.79	2.84
	Total	**14.01**	**14.66**	**15.39**	**16.38**	**17.26**
Toombs	GW Agricultural	7.84	8.14	8.52	11.61	9.45
	GW Municipal Public Supply	2.75	2.76	2.71	2.63	2.54
	GW Municipal Self Supply	0.66	0.64	0.62	0.59	0.56
	Groundwater Total	11.25	11.54	11.85	14.83	12.55
	SW Agricultural	5.97	6.19	6.46	4.11	7.10
	Total	**17.22**	**17.73**	**18.32**	**18.94**	**19.65**
Treutlen	GW Agricultural	1.70	1.76	1.83	1.57	1.97
	GW Municipal Public Supply	0.32	0.31	0.31	0.30	0.30
	GW Municipal Self Supply	0.33	0.32	0.31	0.30	0.29
	Groundwater Total	2.34	2.39	2.45	2.17	2.56
	SW Agricultural	0.58	0.61	0.64	0.94	0.70
	Total	**2.91**	**3.00**	**3.08**	**3.11**	**3.26**
Wayne	GW Agricultural	5.64	5.83	6.10	4.85	6.73
	GW Industrial	57.89	57.89	57.89	57.89	57.89
	GW Municipal Public Supply	1.68	1.69	1.67	1.64	1.62
	GW Municipal Self Supply	1.20	1.19	1.17	1.13	1.09
	Groundwater Total	66.41	66.60	66.83	65.51	67.33
	SW Agricultural	0.46	0.47	0.49	3.07	0.53
	Total	**66.87**	**67.07**	**67.32**	**68.58**	**67.86**
Wheeler	GW Agricultural	2.79	2.96	3.12	3.39	3.49
	GW Municipal Public Supply	0.50	0.50	0.50	0.49	0.49
	GW Municipal Self Supply	0.26	0.25	0.25	0.25	0.24
	Groundwater Total	3.55	3.71	3.87	4.13	4.22
	SW Agricultural	1.54	1.63	1.70	1.68	1.88

County	Sector	2020	2030	2040	2050	2060
	Total	**5.08**	**5.34**	**5.57**	**5.81**	**6.10**
Wilcox	GW Agricultural	16.42	17.58	18.96	18.70	22.30
	GW Industrial	0.02	0.02	0.02	0.02	0.02
	GW Municipal Public Supply	0.84	0.83	0.82	0.83	0.86
	GW Municipal Self Supply	0.23	0.22	0.22	0.22	0.22
	Groundwater Total	17.52	18.65	20.02	19.77	23.40
	SW Agricultural	5.17	5.47	5.82	8.04	6.65
	Total	**22.69**	**24.13**	**25.85**	**27.81**	**30.05**
Planning Region Total Groundwater Demand		**196.38**	**203.16**	**210.75**	**221.99**	**228.09**
Planning Region Total Surface Water Demand		**128.43**	**131.51**	**135.07**	**137.23**	**143.70**
Planning Region Total Demand		**324.82**	**334.66**	**345.82**	**359.22**	**371.80**

7.2 Wastewater Summary

The full regional wastewater forecasts including municipal, industrial and energy discharges are summarized in the figures and tables of this section. **Figure 7-4** shows the wastewater discharges per basin while **Figure 7-5** shows the forecasted discharge per method. **Table 7-2** provides a summary of the discharge type per county.

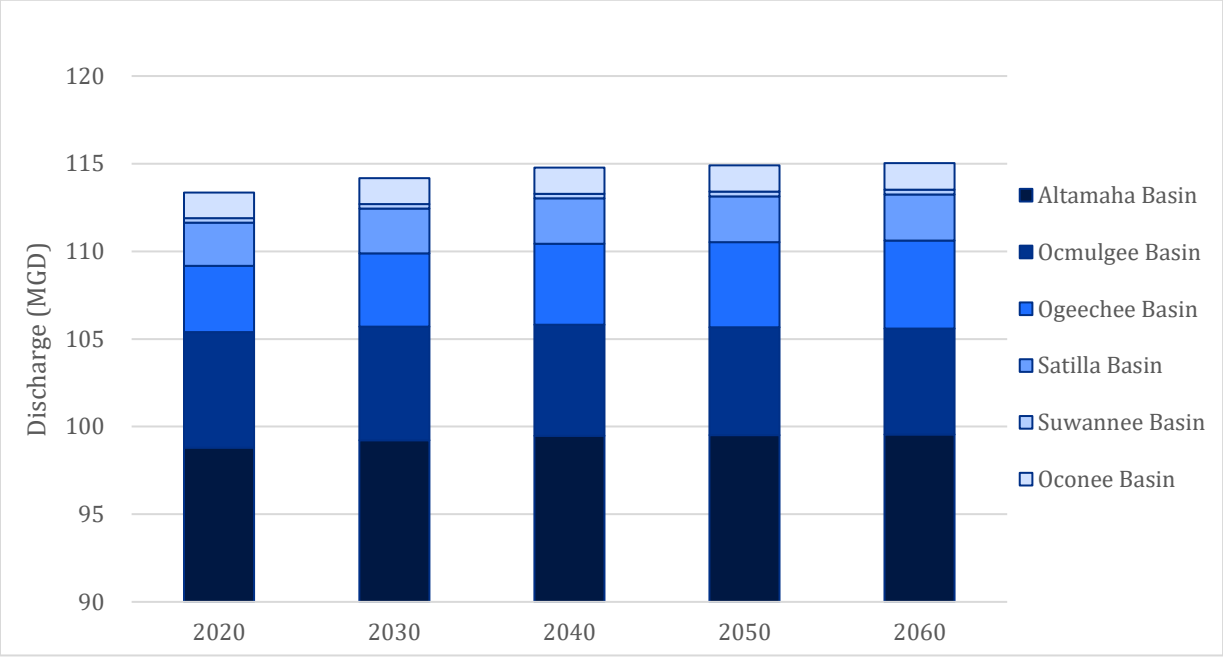


Figure 7-4
Regional Wastewater Discharge per Basin

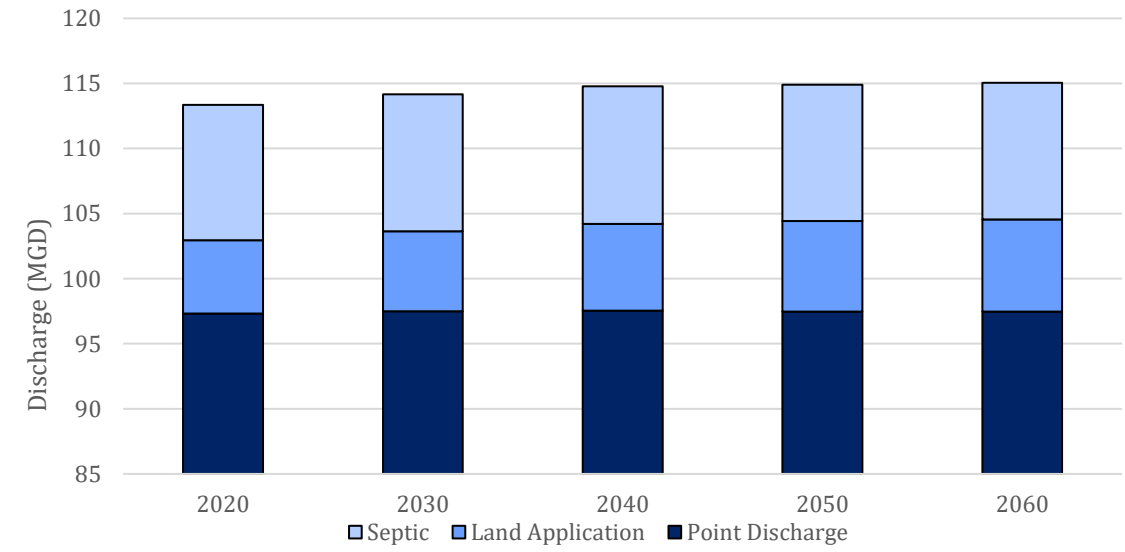


Figure 7-5
Regional Wastewater Discharge per Method

Table 7-2 Summary of Regional Wastewater Flows per County (MGD)

County	Discharge Type	2020	2030	2040	2050	2060
Appling	Point Discharge	29.68	29.74	29.77	29.79	29.82
	Septic	0.80	0.83	0.85	0.86	0.88
	Total	30.48	30.57	30.62	30.66	30.70
Bleckley	Point Discharge	0.69	0.71	0.73	0.74	0.76
	Septic	0.61	0.63	0.64	0.65	0.67
	Total	1.30	1.34	1.37	1.39	1.42
Candler	Land Application	0.40	0.41	0.41	0.42	0.42
	Septic	0.38	0.39	0.40	0.40	0.41
	Total	0.78	0.80	0.81	0.82	0.83
Dodge	Land Application	0.29	0.28	0.26	0.25	0.23
	Point Discharge	0.71	0.68	0.64	0.59	0.55
	Septic	0.82	0.79	0.74	0.68	0.64
	Total	1.83	1.75	1.64	1.52	1.42
Emanuel	Land Application	0.81	0.97	1.15	1.26	1.32
	Point Discharge	1.01	1.05	1.07	1.08	1.10
	Septic	0.80	0.83	0.85	0.85	0.87
	Total	2.62	2.85	3.07	3.19	3.28
Evans	Land Application	1.69	2.05	2.47	2.71	2.84
	Point Discharge	0.02	0.02	0.02	0.02	0.02
	Septic	0.56	0.57	0.58	0.58	0.58
	Total	2.27	2.64	3.07	3.31	3.45
Jeff Davis	Point Discharge	0.88	0.91	0.93	0.93	0.94
	Septic	0.74	0.77	0.78	0.79	0.79
	Total	1.62	1.68	1.71	1.72	1.72
Johnson	Point Discharge	0.00	0.00	0.00	0.00	0.00
	Septic	0.43	0.42	0.41	0.40	0.40
	Total	0.43	0.42	0.41	0.40	0.40
Montgomery	Land Application	0.03	0.03	0.03	0.03	0.03
	Point Discharge	0.23	0.23	0.23	0.23	0.23
	Septic	0.32	0.33	0.33	0.33	0.33
	Total	0.59	0.60	0.60	0.59	0.59

Table 7-2 Summary of Regional Wastewater Flows per County (MGD)

County	Discharge Type	2020	2030	2040	2050	2060
Tattnall	Land Application	0.32	0.32	0.32	0.31	0.31
	Point Discharge	1.71	1.72	1.71	1.68	1.66
	Septic	1.17	1.18	1.18	1.15	1.14
	Total	3.20	3.22	3.21	3.15	3.10
Telfair	Land Application	0.60	0.56	0.52	0.48	0.46
	Point Discharge	0.64	0.60	0.56	0.52	0.49
	Septic	0.54	0.51	0.48	0.44	0.42
	Total	1.78	1.68	1.56	1.45	1.37
Toombs	Land Application	1.28	1.30	1.31	1.29	1.28
	Point Discharge	1.23	1.25	1.25	1.24	1.22
	Septic	1.15	1.17	1.17	1.16	1.14
	Total	3.66	3.73	3.73	3.69	3.64
Treutlen	Point Source	0.36	0.36	0.37	0.37	0.37
	Septic	0.23	0.23	0.24	0.24	0.24
	Total	0.59	0.60	0.60	0.60	0.62
Wayne	Land Application	0.07	0.07	0.07	0.07	0.07
	Point Discharge	59.55	59.59	59.61	59.62	59.63
	Septic	1.06	1.08	1.10	1.10	1.11
	Total	60.67	60.75	60.78	60.79	60.81
Wheeler	Land Application	0.12	0.12	0.12	0.12	0.13
	Point Discharge	0.29	0.30	0.30	0.31	0.32
	Septic	0.40	0.41	0.42	0.42	0.44
	Total	0.80	0.82	0.84	0.86	0.88
Wilcox	Point Discharge	0.33	0.33	0.34	0.35	0.37
	Septic	0.40	0.40	0.40	0.42	0.44
	Total	0.73	0.73	0.74	0.77	0.80
Total	Land Application	5.62	5.86	6.13	6.41	6.67
	Point Discharge	97.33	97.42	97.51	97.55	97.54
	Septic	10.41	10.47	10.54	10.57	10.55
Grand Total		**113.35**	**114.17**	**114.77**	**114.90**	**115.04**

Section 8
References

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