Water and Wastewater Forecasting Technical Memorandum

Middle Ocmulgee Regional Water Planning Council

High Falls State Park, Monroe County

Supplemental Material

Middle Ocmulgee Regional Water Plan

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CDM Smith

High Falls State Park, Monroe County photo courtesy of the Georgia Department of Economic Development

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Section 1

Introduction

Municipal and Industrial Water and Wastewater Forecasts were originally developed for the Middle Ocmulgee 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 5-year review and revision of that plan, all of these forecasts, except Industrial water and wastewater forecasts, have been updated. This Technical Memorandum describes how the original forecasts have been updated to account for changes in population and water use that have occurred since the original forecasts were produced.

Throughout this report, the prior Regional Planning process that occurred in 2009 – 2011 is referred to as "Round 1." Thus, the current (2016) update is referred to as "Round 2".

The basic approach to updating the forecasts starts with the same methodology used in developing the original forecasts, which are described in various Technical Memoranda, which were included as supplemental materials to the 2011 Middle Ocmulgee Regional Water Plan.[1] The purpose of this Technical Memorandum is to describe where modifications to the original 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, number of employees in a business, 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
- **Agricultural** – this sector includes major crops such as cotton, corn, peanuts, soybean, pecans, specialty crops, and nursery and horticulture; a snapshot of major livestock water use and golf course water use

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[1] See "Water and Wastewater Forecasting Technical Memorandum," dated May 2011 (available at http://www.middleocmulgee.org/documents/SupSec4_Forecast_TM_MOC_May2011_FINAL.pdf);

"Statewide Energy Sector Water Demand Forecast" Technical Memorandum, dated October 29, 2010 (available at http://www.georgiawaterplanning.org/pages/forecasting/energy_water_use.php);

and Agricultural Water Use forecast prepared by Dr. Jim Hook et al. (available at http://www.georgiawaterplanning.org/pages/forecasting/agricultural_water_use.php).

- **Energy** – this sector includes thermoelectric power generation

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 prior forecast had the State's population growing at an annual rate of 1.69% while the new forecast grows at an annual rate of only 1.05% as shown in **Figure 1-1**.

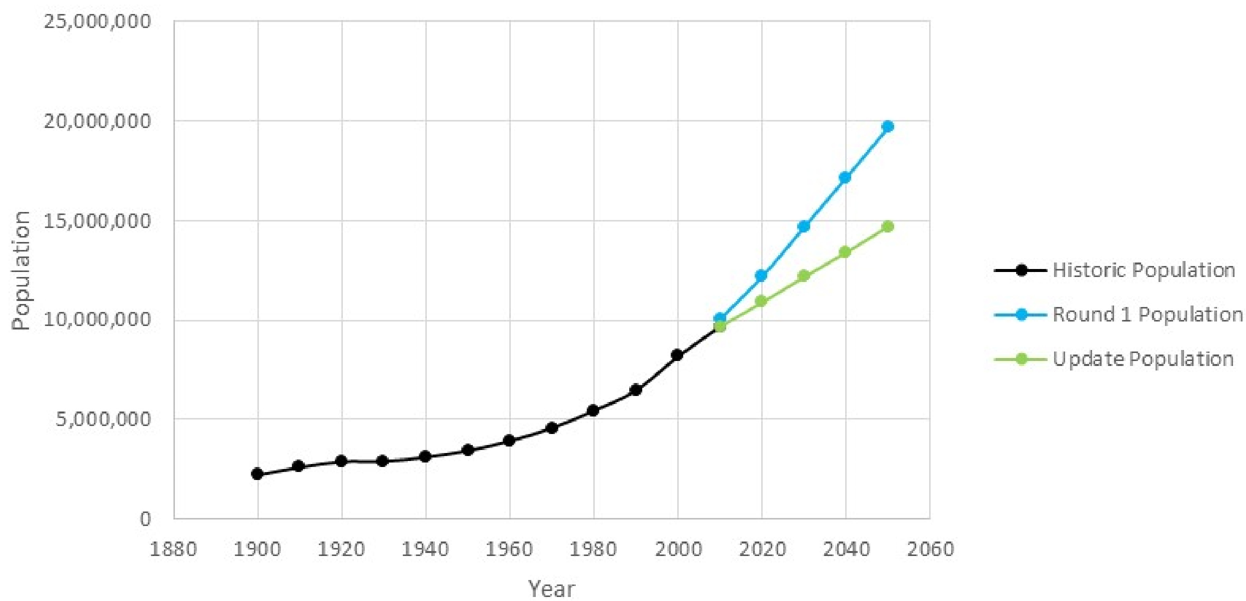
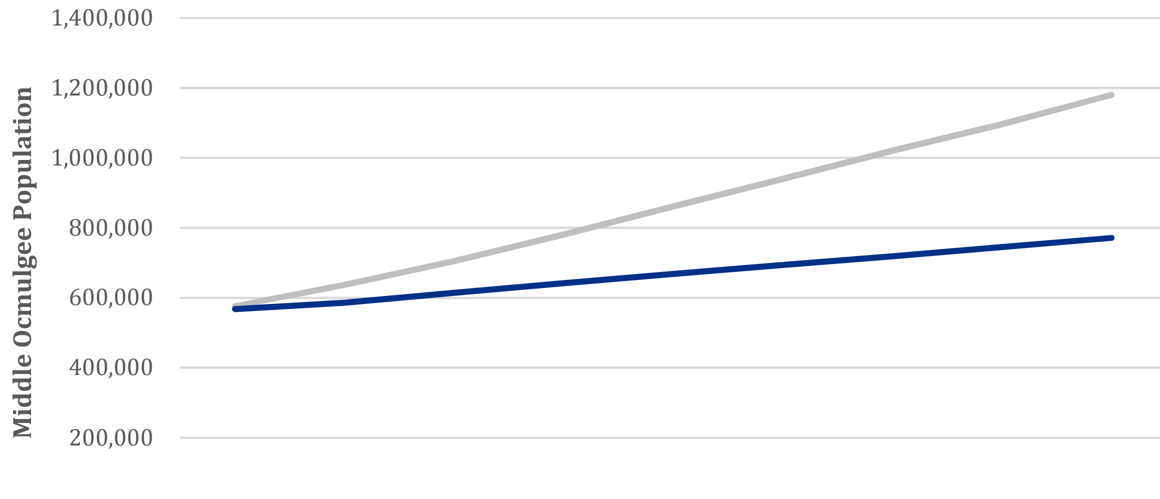


Figure 1-1
Georgia's Historic Population and Growth Projections

While the trend of a lower population in 2010 than projected was seen statewide, each county had its own individual trend. For the region as a whole, the population obtained from the 2010 Census data was 1.5 percent lower than previously projected. Combined with lower growth rates moving forward the projected population in 2050 is 34.7 percent less than the previous estimate as shown in **Figure 1-2**. The new population projections (OPB, 2015) by county are shown in **Table 1-1**.



	2010	2015	2020	2025	2030	2035	2040	2045	2050
Round 1	576,351	636,905	704,439	781,007	860,803	940,077	1,020,774	1,096,857	1,179,966
Update	567,728	586,189	614,206	641,222	668,237	693,559	718,881	744,922	770,963

Figure 1-2
Middle Ocmulgee Population Projections

Table 1-1 Population Projections per County

County	2015	2020	2025	2030	2035	2040	2045	2050
Bibb	155,778	158,072	159,289	160,506	160,516	160,526	159,825	159,124
Butts	23,718	24,600	25,337	26,073	26,554	27,034	27,458	27,881
Crawford	12,453	12,285	11,957	11,629	11,109	10,589	9,998	9,408
Houston	152,213	163,444	174,230	185,016	195,140	205,265	214,852	224,438
Jasper	13,759	14,144	14,454	14,764	14,929	15,093	15,277	15,460
Jones	29,024	30,141	31,112	32,084	32,673	33,262	33,761	34,259
Lamar	18,233	18,908	19,652	20,395	21,258	22,121	23,141	24,161
Monroe	27,516	28,888	30,306	31,725	33,071	34,417	35,935	37,452
Newton	106,470	116,855	128,475	140,095	153,004	165,913	180,616	195,320
Peach	27,214	27,611	27,850	28,090	28,287	28,484	28,611	28,738
Pulaski	11,475	11,304	11,104	10,903	10,655	10,406	10,227	10,049
Twiggs	8,337	7,953	7,455	6,957	6,364	5,771	5,222	4,672
Total	**586,189**	**614,206**	**641,222**	**668,237**	**693,559**	**718,881**	**744,922**	**770,963**

Section 2

Municipal Water Forecasting

This section describes the methodology and results of municipal water demand forecasts for the Middle Ocmulgee 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 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, and then vetted through the regional councils in Round 1. The following sections describe updates to the previous methodology used to produce the revised forecasts. The Council also provided input during their March 2016 Council meeting that helped inform several corrections that are reflected in the updated forecasts.

2.1.1 Percent Change in Gallons per Capita per Day

The Georgia EPD reviewed withdrawal data and estimated population served data reported by permitted municipal water systems from the years 2010 through 2014. GA EPD then calculated adjustment factors for each County's public-supplied municipal per capita water use rate. For each county, a per capita value for each year 2010-2014 was calculated based on actual withdrawal and estimated population served data for that county. The percent rate of change was calculated for each year interval (2010 to 2011, 2011 to 2012, 2012 to 2013, 2013 to 2014), and the average of those four values was calculated as the per capita water use adjustment factor.

These adjustment factors were applied to the gpcd values used in Round 1 to derive the 2015 gpcd values for each county. If no data were available to EPD, the prior gpcd value was used as the 2015 value. Of the counties with available data, roughly two-thirds had a decrease in gpcd while about one third 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 gpcd adjustment factor applied to the Round 1 gpcd for each county in the region.

The self-supplied value of 75 gpcd for each county (with 100 gpcd for Pulaski County) remains unchanged from Round 1.

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

County	Round 1 Per Capita	2015 Adjustment Factor	Round 2 Adjusted Per Capita
Bibb	177	-3.1%	171
Butts	117	1.9%	120
Crawford	101	5.1%	107
Houston	168	-1.1%	166
Jasper	138	0.4%	139
Jones	90	1.1%	91
Lamar	188	3.0%	193
Monroe	185	3.0%	191
Newton	121	1.1%	122
Peach	126	-1.2%	125
Pulaski	140	4.2%	146
Twiggs	125	-0.3%	125

2.1.2 Plumbing Code Adjustment Factor

In Round 1, 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 update, these plumbing code adjustments were reset to zero in 2015 with the difference in the adjustment factor between 2010 and 2014 subtracted from the adjustment factor for all remaining years. The revised plumbing code adjustment was then applied to both public-supplied and self-supplied 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	2015	2020	2025	2030	2035	2040	2045	2050
Bibb	171.1	169.7	168.3	166.9	165.5	164.1	162.7	161.3
Butts	119.5	118.5	117.5	116.5	115.5	114.5	113.5	112.5
Crawford	106.6	105.6	104.7	103.7	102.8	101.8	100.9	99.9
Houston	166.0	164.9	163.9	162.8	161.8	160.7	159.7	158.6
Jasper	138.6	137.6	136.6	135.5	134.5	133.5	132.4	131.4
Jones	91.1	90.0	88.9	87.8	86.7	85.6	84.5	83.4
Lamar	193.4	192.2	191.0	189.8	188.6	187.4	186.3	185.1
Monroe	191.1	190.0	188.9	187.9	186.8	185.7	184.7	183.6
Newton	121.9	121.1	120.3	119.5	118.7	117.9	117.1	116.3
Peach	124.7	123.5	122.3	121.2	120.0	118.8	117.7	116.5
Pulaski	145.6	144.2	142.9	141.5	140.2	138.9	137.5	136.2
Twiggs	124.6	123.3	122.1	120.9	119.6	118.4	117.1	115.9

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 Middle Ocmulgee region. The total regional demand is shown graphically in **Figure 2-1** along with a comparison of the Round 1 estimates. Region-wide the municipal forecast is lower than in Round 1 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	2015	2020	2025	2030	2035	2040	2045	2050	% Change
Bibb	25.8	26.0	26.0	25.9	25.7	25.5	25.1	24.8	-4%
Butts	2.7	2.8	2.8	2.9	3.0	3.0	3.0	3.1	15%
Crawford	1.0	1.0	1.0	0.9	0.9	0.8	0.8	0.7	-31%
Houston	24.9	26.6	28.1	29.7	31.1	32.5	33.8	35.1	41%
Jasper	1.4	1.4	1.4	1.4	1.4	1.4	1.4	1.4	4%
Jones	2.4	2.5	2.5	2.5	2.6	2.6	2.6	2.6	7%
Lamar	2.3	2.4	2.5	2.5	2.6	2.7	2.8	2.9	24%
Monroe	3.2	3.3	3.4	3.6	3.7	3.8	3.9	4.0	27%
Newton	11.6	12.7	14.1	15.4	16.9	18.4	20.1	21.8	89%
Peach	3.0	3.0	3.0	3.0	3.0	2.9	2.9	2.9	-2%
Pulaski	1.5	1.4	1.4	1.4	1.3	1.3	1.3	1.2	-16%
Twiggs	0.7	0.7	0.6	0.6	0.5	0.5	0.4	0.4	-50%
Total	**80.4**	**83.7**	**86.7**	**89.8**	**92.5**	**95.3**	**98.1**	**100.8**	**25%**

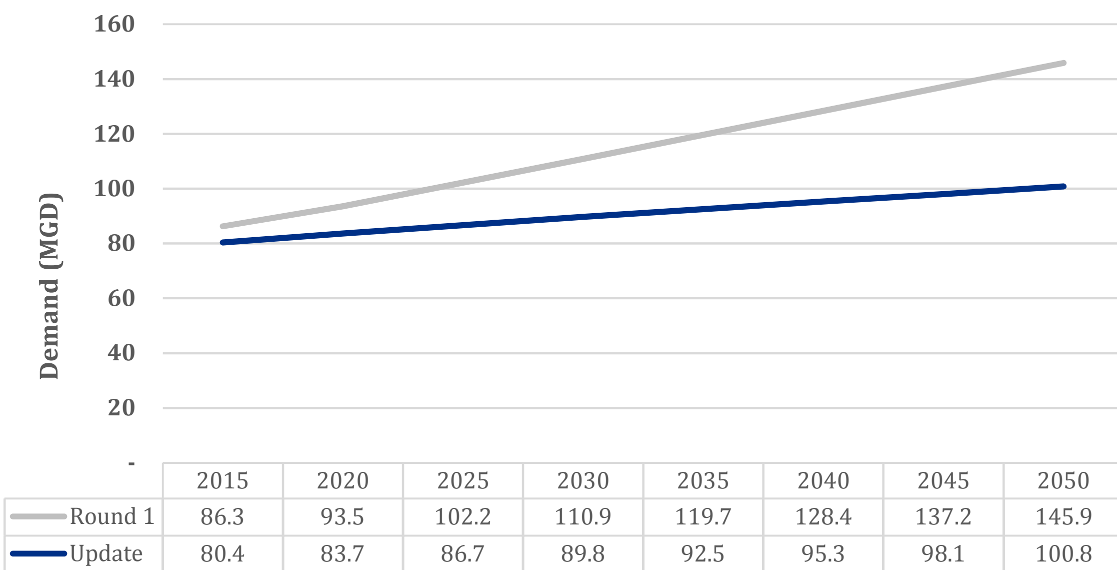


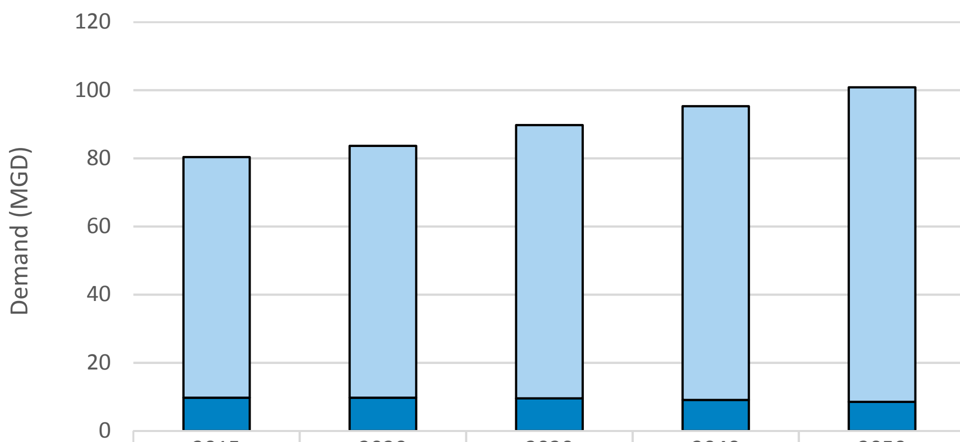
Figure 2-1
Forecasted Municipal Water Demand for Middle Ocmulgee Planning Council

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 remains the same from Round 1. This split of county population was derived from USGS estimates, and were vetted through the regional council review process. **Figure 2-2** shows the split between self-supply versus public-supply for the region.

As in Round 1, 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 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 are retained from Round 1 and used to allocate the updated county municipal water demand by sources. Furthermore, the allocation of surface water by stream node (for the surface water models) and groundwater by aquifer (for the groundwater models) maintains the same proportions as in Round 1.

Thus the updated county municipal water demand forecasts are allocated among surface water nodes and groundwater aquifers for analysis with other components of the state water plan update. For the Middle Ocmulgee region, municipal water is currently split about evenly between surface water and groundwater, as shown in **Figure 2-3**.



	2015	2020	2030	2040	2050
Public Supply	70.6	73.9	80.3	86.2	92.4
Self-Supply	9.7	9.7	9.5	9.1	8.5

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

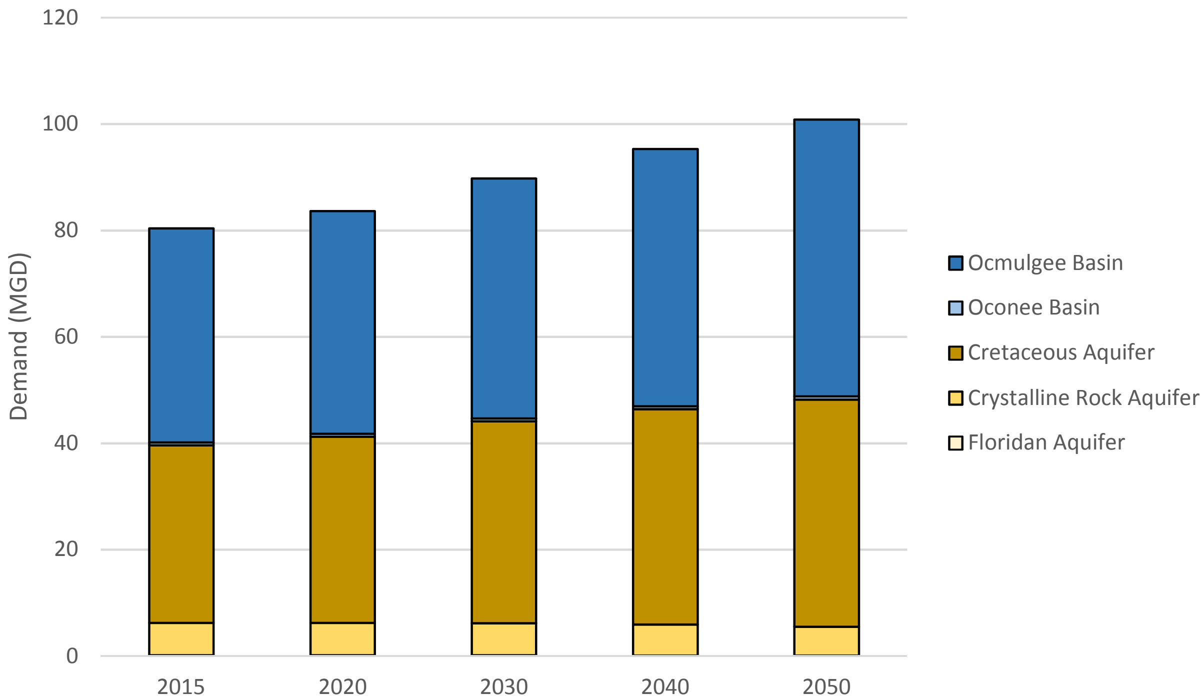


Figure 2-3
Municipal Water Demand for Middle Ocmulgee Planning Council by Aquifer and Basin

Section 3

Municipal Wastewater Forecasting

This section describes the methodology and results of the update of the municipal wastewater demand forecasts for the Middle Ocmulgee Planning Region.

3.1 Methodology

Within the previous analysis (i.e., Round 1), 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. 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. A percentage was then added to centralized flows for inflow and infiltration (I/I) that occurs on the way to the treatment facility. The centralized flow estimate was then allocated between point discharge (NPDES) and land application systems (LAS).

For the update, the Georgia EPD provided an analysis of 2014 NPDES permitted discharges by county and a recommended methodology for the municipal wastewater forecast update. The Council also provided input during their March 2016 Council meeting that helped inform several corrections that are reflected in the updated forecasts.

- The percent of county total wastewater flow that is septic is retained from Round 1. Any percentage change over time is from council member input in Round 1.
- Future septic flow by county is estimated from the Round 1 septic flow forecast times the percent change in county population between the Round 1 and Round 2 population projections for the county.
- Future septic flows are allocated to watersheds and stream nodes based on the same percent of county area in watersheds as in Round 1.
- The sum of annual average 2014 NPDES point discharges by county are adjusted by the change in percent of county that is septic/centralized over time (if applicable), and 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 updated point discharge for the county is allocated to watersheds and stream nodes based on the permit locations of the 2014 NPDES flows in the county.
- The sum of annual average 2014 land application system (LAS) flows by county are adjusted by the change in percent of county that is septic/centralized over time (if applicable), combined with any 2014 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 updated LAS + subsurface flow forecast for the county is allocated to watersheds and stream nodes based on the permit locations of the 2014 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 Middle Ocmulgee region. The total regional wastewater generated is then shown graphically in **Figure 3-1** broken down between septic treatment and centralized treatment that is discharged via a point source or land application. **Figure 3-2** gives a snapshot of the how the generated wastewater is discharged per watershed for 2015.

Table 3-1 Total Wastewater Generated in Middle Ocmulgee Planning Region per County (MGD)

County	2015	2020	2030	2040	2050	% Change 2015 to 2050
Bibb	33.0	33.6	34.2	34.2	33.9	2%
Butts	2.3	2.3	2.4	2.4	2.3	4%
Crawford	0.8	0.8	0.8	0.7	0.6	-27%
Houston	19.2	20.8	23.4	25.9	28.3	48%
Jasper	1.1	1.1	1.1	1.2	1.2	9%
Jones	1.9	1.9	2.0	2.1	2.1	14%
Lamar	1.6	1.7	1.8	1.9	2.1	29%
Monroe	2.5	2.7	2.9	3.1	3.4	33%
Newton	9.6	10.2	11.1	11.7	12.0	25%
Peach	2.5	2.5	2.5	2.5	2.5	4%
Pulaski	1.5	1.5	1.5	1.4	1.4	-9%
Twiggs	0.6	0.6	0.5	0.4	0.3	-46%
Total	**76.6**	**79.6**	**84.2**	**87.6**	**90.2**	**18%**

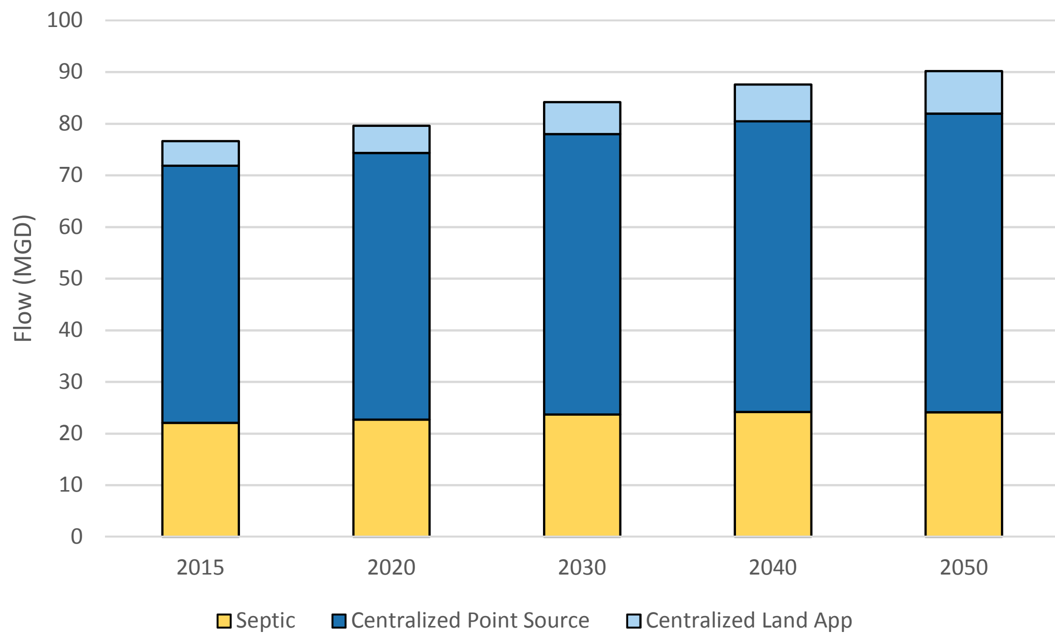


Figure 3-1
Total Wastewater Generated Middle Ocmulgee Planning Region by Type

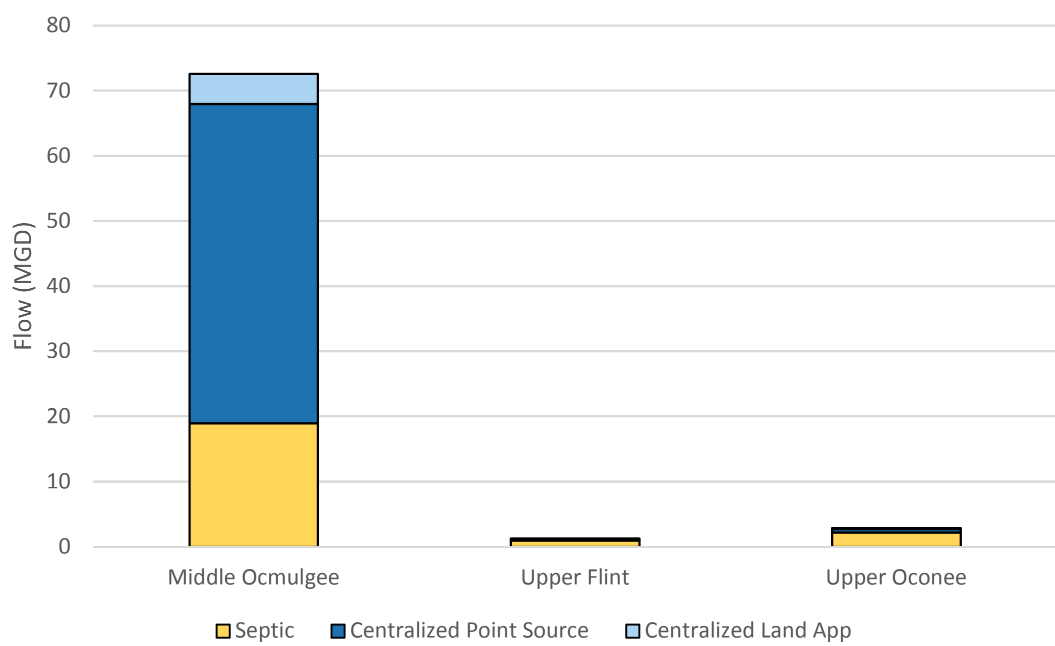


Figure 3-2
2015 Snapshot of Wastewater Discharge Type per Watershed

Section 4

Industrial Forecasting

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

4.1 Methodology

The industrial water and wastewater forecasts were not updated from those produced in Round 1 other than any significant issues or changes that individual Planning Councils believed should be incorporated. For the Middle Ocmulgee Planning Council, Kaolin industry growth as well as planned paper plant expansions were investigated. As noted below, a specific entry was included in Round 1 for expected growth in the stone and clay industry. It was decided not to update this estimate for this round but refinements to the growth of the Kaolin industry will be incorporated the following round. Similarly, no changes were made this round for specific paper plant expansion plans but will be revisited in later rounds.

The original methodology forecasted industrial water demand 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. In Round 1 an additional 26 mgd was added to the forecast over time for the stone and clay industry for the region. The increase in industrial demand was allocated to sources but not allocated to specific counties. The industrial wastewater flow was then estimated from a wastewater to water ratio developed for each industrial category.

4.2 Results

Table 4-1 shows the (Round 1) industrial water demand by industry. The majority of industrial water demand in the Middle Ocmulgee region is from the stone and clay as well as the paper industrial classification categories. Currently, 60 percent of the industrial water demand in the region comes from groundwater and the percentage is projected to increase as the majority of the future demand comes from groundwater as shown in **Figure 4-1**.

Table 4-2 provides the forecast of industrial wastewater generated per industry. The forecasted wastewater is higher than the forecasted water demand as estimates from the stone and clay industry include stormwater drainage from the facility site. All of the industrial wastewater in the Planning Region is discharged via permitted point sources for the industrial facilities.

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

Industry	2015	2020	2030	2040	2050
Mining	-	-	-	-	-
Food	2.10	2.10	2.13	2.18	2.23
Textiles	-	-	-	-	-
Apparel	-	-	-	-	-
Paper	16.47	16.77	17.13	17.51	17.97
Chemicals	-	-	-	-	-
Petroleum and Coal	-	-	-	-	-
Plastic and Rubber	-	-	-	-	-
Stone and Clay	23.90	27.46	34.58	41.70	41.70
Primary Metals	-	-	-	-	-
Fabricated Metal Products	-	-	-	-	-
Electrical Machinery	-	-	-	-	-
Automotive Manufacturing	-	-	-	-	-
Other	3.07	3.17	3.41	3.65	3.92
TOTAL	**45.5**	**49.5**	**57.3**	**65.0**	**65.8**

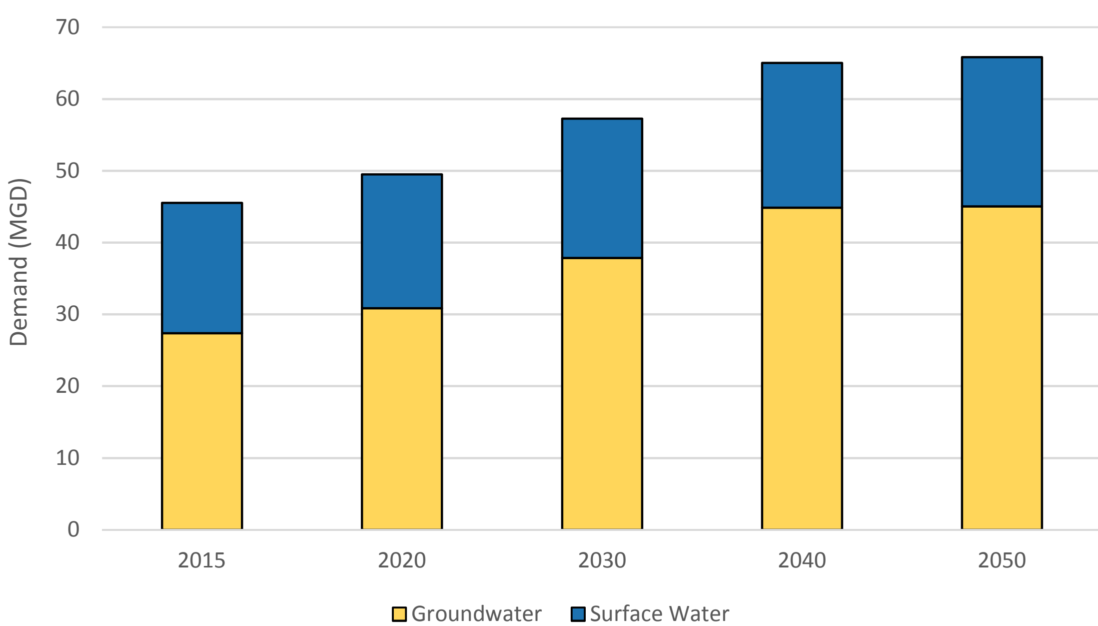


Figure 4-1
Industrial Water Demand by Source Water Type

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

Industry	2015	2020	2030	2040	2050
Mining	-	-	-	-	-
Food	1.89	1.89	1.92	1.96	2.01
Textiles	-	-	-	-	-
Apparel	-	-	-	-	-
Paper	15.56	16.77	17.13	17.51	17.97
Chemicals	-	-	-	-	-
Petroleum and Coal	-	-	-	-	-
Plastic and Rubber	-	-	-	-	-
Stone and Clay	30.83	35.42	44.61	53.79	53.79
Primary Metals	-	-	-	-	-
Fabricated Metal Products	-	-	-	-	-
Electrical Machinery	-	-	-	-	-
Automotive Manufacturing	-	-	-	-	-
Other	1.33	1.38	1.48	1.59	1.71
TOTAL	**49.6**	**55.5**	**65.1**	**74.9**	**75.5**

Section 5

Agricultural Water Forecasting

This section describes the methodology and results of agricultural water demand forecasting for the Middle Ocmulgee 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.

Metered observations were utilized from the 2010-2013 growing seasons and then projected into the future demand years using methods consistent with Round 1. To address potential climate extremes, a range of agricultural demand scenarios were considered. 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 Middle Ocmulgee region. The Middle Ocmulgee region as a whole is expected to see an increase of 43 percent in agricultural water demand by 2050. **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 93 percent of the agricultural demand in the Middle Ocmulgee region is met from groundwater.

Table 5-1 Middle Ocmulgee Agricultural Demand Forecast by County (MGD)

County	2015	2020	2030	2040	2050	Percent Increase 2015 to 2050
Bibb	0	0	0	0	0	0%
Butts	0.14	0.14	0.15	0.15	0.16	16%
Crawford	6.9	7.6	9.0	10.3	11.7	69%
Houston	17.2	18.3	20.6	22.7	24.8	44%
Jasper	0	0	0	0	0	0%
Jones	0	0	0	0	0	0%
Lamar	0.40	0.41	0.40	0.39	0.37	-7%
Monroe	0.067	0.069	0.074	0.076	0.079	17%
Newton	0.050	0.051	0.052	0.052	0.053	5%
Peach	24.5	26.8	31.3	35.8	40.3	65%
Pulaski	23.5	24.1	25.5	26.6	27.7	18%
Twiggs	2.4	2.4	2.5	2.6	2.6	9%
Total	75.1	79.9	89.5	98.7	107.8	43%

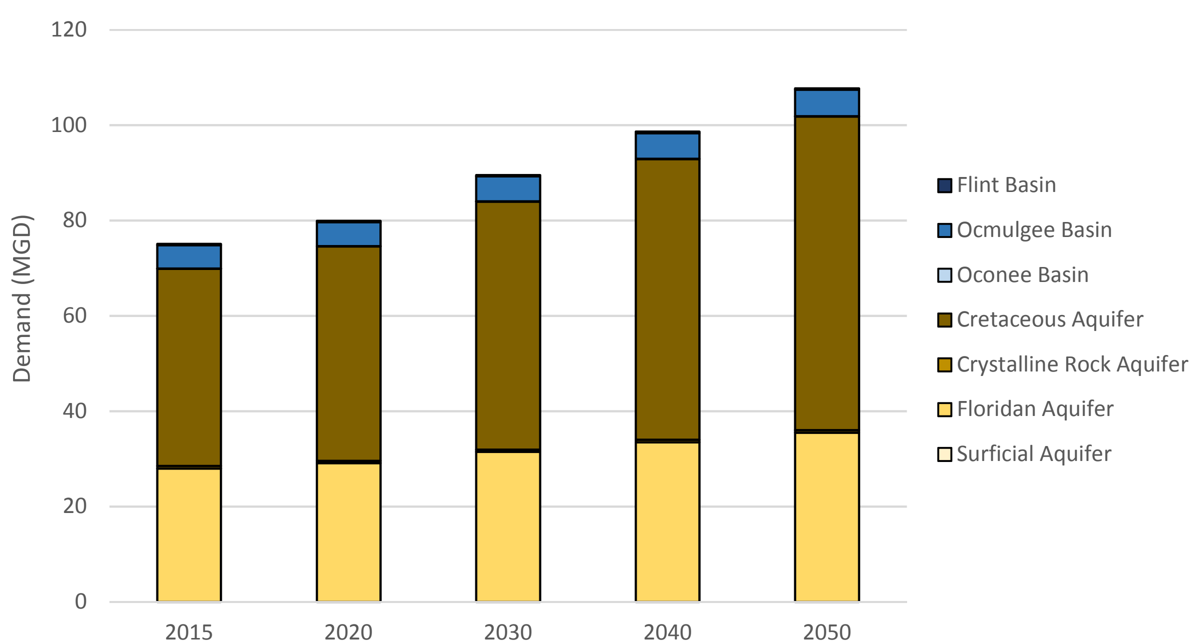


Figure 5-1
Agricultural Water Demand by Source Water Type

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

Source Water Type	Basin/Aquifer	2015	2020	2030	2040	2050	Percent Increase 2015 to 2050
Surface Water	Flint	0.24	0.25	0.27	0.29	0.31	30%
	Ocmulgee	4.9	5.0	5.2	5.4	5.6	13%
	Oconee	0.05	0.05	0.06	0.06	0.06	4%
	Sub Total	**5.2**	**5.3**	**5.6**	**5.7**	**5.9**	**14%**
Groundwater	Cretaceous	41.4	45.0	52.0	58.9	65.8	59%
	Crystalline Rock	0.51	0.52	0.52	0.51	0.51	-1%
	Floridan	28.0	29.1	31.4	33.5	35.5	27%
	Surficial	0.0056	0.0058	0.0061	0.0064	0.0066	17%
	Sub Total	**69.9**	**74.6**	**84.0**	**92.9**	**101.8**	**46%**
	Total	**75.1**	**79.9**	**89.5**	**98.7**	**107.8**	**43%**

Section 6

Energy Water Forecasting

This section describes the methodology and results of energy sector water demand for the Middle Ocmulgee 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 updates to the original methodology were incorporated into the current estimates:

- Projections of the statewide energy demand were updated using the new population projections with the relationship between population and energy demand the same as previously estimated.
- The list of existing facilities, facilities under construction, and planned and permitted new facilities was updated. In addition, some prior facilities were retired from service or converted from one generating configuration to another configuration.
- 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, but the “new” generating capacity is not assigned geographically to any specific region within the state.

- 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 explicitly part of the analysis in the Middle Ocmulgee Planning Council is Plant Scherer. **Table 6-1** shows the projected expected scenario average annual daily withdrawal and consumption at this facility over the planning horizon which is met via surface water in the Ocmulgee basin.

Table 6-1 Middle Ocmulgee Forecasted Energy Sector Demands (MGD)

Demand Type	2015	2020	2030	2040	2050
Withdrawals	48	49	57	62	63
Consumption	24	24	28	30	31

Within 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. Additional generating capacity may be needed to meet the statewide power need estimate. However, the water requirements associated with the potential new capacity are minimal; less than 20 MGD withdrawals and less than 10 MGD consumption, statewide. Thus, no future water demands for currently unassigned power generation facilities have been added to the estimates for the Middle Ocmulgee region within this update. Projections for the need of new energy capacity are less than estimated previously because: (a) population projections are lower, (b) high water-using facilities have been retired, and (c) the types of generating facilities likely to be constructed in the future to meet the additional need have lower water use requirements.

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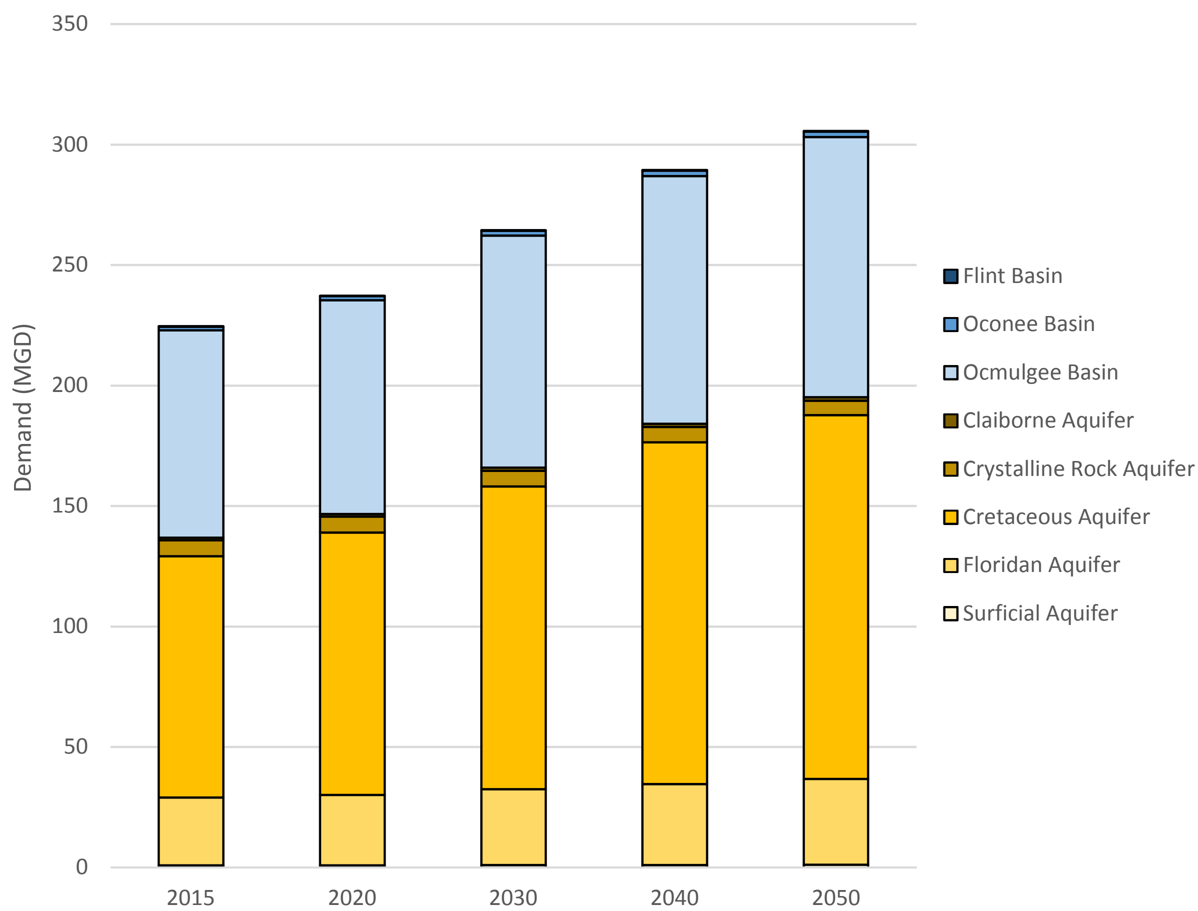
Section 7
Regional Summary

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. **Table 7-1** provides a breakdown of the demand types and withdrawal locations per County.



Note: Consumptive demand rather than total withdrawals from the energy sector included

Figure 7-1
Regional Water Demand by Basin and Aquifer

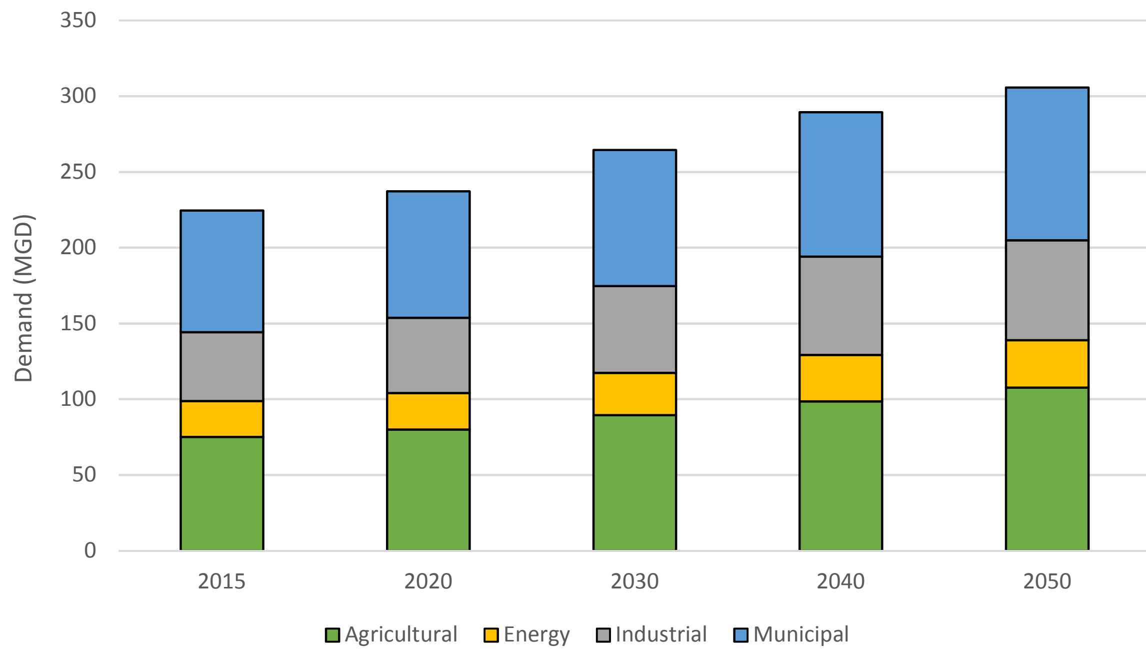


Figure 7-2
Regional Water Demand by Sector

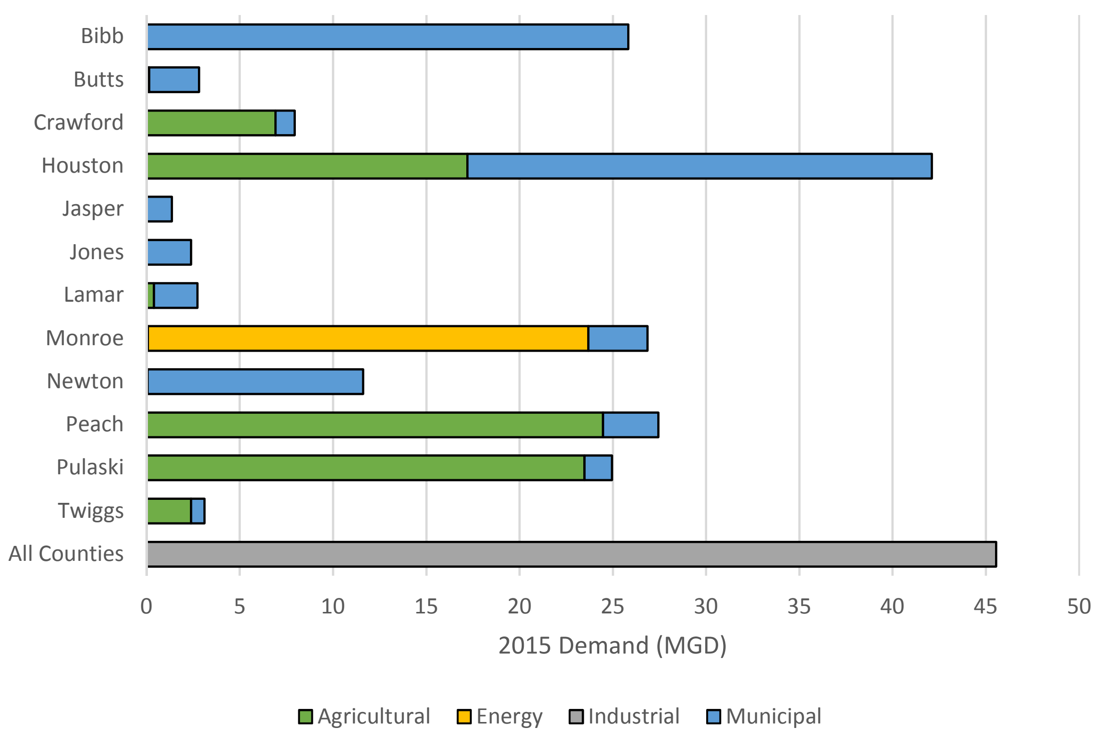


Figure 7-3
County Water Demand by Sector for 2015

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

County	Sector	Aquifer/Node	2015	2020	2030	2040	2050
Bibb	GW Municipal Self Supply	Cretaceous	0.6	0.6	0.6	0.6	0.6
	SW Municipal Public Supply	Macon	25.2	25.3	25.3	24.9	24.2
	Total		**25.8**	**26.0**	**25.9**	**25.5**	**24.8**
Butts	GW Agricultural	Crystalline Rock	0.1	0.1	0.1	0.2	0.2
	GW Municipal Self Supply	Crystalline Rock	0.3	0.3	0.2	0.2	0.1
	Groundwater Total		0.4	0.4	0.3	0.3	0.2
	SW Municipal Public Supply	Jackson	2.1	2.3	2.4	2.5	2.7
	SW Municipal Public Supply	Macon	0.2	0.3	0.3	0.3	0.3
	Surface Water Total		2.4	2.5	2.7	2.8	3.0
	Total		**2.8**	**2.9**	**3.1**	**3.1**	**3.2**
Crawford	GW Agricultural	Cretaceous	6.6	7.3	8.6	9.9	11.2
	GW Municipal Public Supply	Cretaceous	0.3	0.3	0.3	0.2	0.2
	GW Municipal Self Supply	Cretaceous	0.6	0.6	0.6	0.5	0.4
	GW Municipal Self Supply	Crystalline Rock	0.1	0.1	0.1	0.1	0.1
	Groundwater Total		7.7	8.3	9.5	10.7	11.9
	SW Agricultural	Lumber City, Montezuma	0.28	0.30	0.35	0.40	0.46
	Total		**7.9**	**8.6**	**9.9**	**11.1**	**12.4**
Houston	GW Agricultural	Cretaceous, Floridan	16.4	17.5	19.7	21.7	23.8
	GW Municipal Public Supply	Cretaceous	24.6	26.2	29.3	32.1	34.7
	GW Municipal Self Supply	Cretaceous	0.3	0.3	0.4	0.4	0.4
	Groundwater Total		41.3	44.0	49.3	54.2	58.8
	SW Agricultural	Lumber City, Albany	0.84	0.86	0.92	0.97	1.01
	Total		**42.1**	**44.9**	**50.3**	**55.2**	**59.9**
Jasper	GW Municipal Public Supply	Crystalline Rock	0.2	0.2	0.2	0.2	0.2
	GW Municipal Self Supply	Crystalline Rock	0.7	0.7	0.7	0.7	0.7
	Groundwater Total		0.8	0.8	0.8	0.8	0.8
	SW Municipal Public Supply	Milledgeville	0.5	0.5	0.6	0.6	0.6
	Total		**1.4**	**1.4**	**1.4**	**1.4**	**1.4**
Jones	GW Municipal Public Supply	Cretaceous	1.2	1.3	1.3	1.3	1.3
	GW Municipal Self Supply	Cretaceous	0.7	0.7	0.7	0.7	0.7
	GW Municipal Self Supply	Crystalline Rock	0.5	0.5	0.5	0.5	0.5
	Total		**2.4**	**2.5**	**2.5**	**2.6**	**2.6**

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

County	Sector	Aquifer/Node	2015	2020	2030	2040	2050
Lamar	GW Agricultural	Crystalline Rock	0.37	0.38	0.37	0.36	0.35
	GW Municipal Self Supply	Crystalline Rock	0.8	0.8	0.8	0.9	0.9
	Groundwater Total		1.1	1.2	1.2	1.2	1.2
	SW Agricultural	Lumber City	0.03	0.03	0.03	0.03	0.03
	SW Municipal Public Supply	Macon	1.6	1.6	1.7	1.8	2.0
	Surface Water Total		1.6	1.6	1.7	1.9	2.0
	Total		**2.7**	**2.8**	**2.9**	**3.1**	**3.3**
Monroe	GW Agricultural	Surficial	0.006	0.006	0.006	0.006	0.007
	GW Municipal Self Supply	Crystalline Rock	1.3	1.4	1.5	1.6	1.7
	Groundwater Total		1.4	1.4	1.5	1.6	1.7
	SW Agricultural	Montezuma, Lumber City	0.06	0.06	0.07	0.07	0.07
	SW Energy	Macon	23.6	24.2	27.9	30.5	31.2
	SW Municipal Public Supply	Lumber City	1.8	1.9	2.1	2.2	2.4
	Surface Water Total		25.5	26.2	30.1	32.8	33.7
	Total		**26.8**	**27.6**	**31.6**	**34.3**	**35.4**
Newton	GW Municipal Self Supply	Crystalline Rock	2.3	2.2	2.1	1.8	1.4
	SW Agricultural	Jackson	0.05	0.05	0.05	0.05	0.05
	SW Municipal Public Supply	Jackson	9.3	10.5	13.3	16.6	20.4
	Surface Water Total		9.3	10.5	13.3	16.6	20.5
	Total		**11.6**	**12.8**	**15.4**	**18.4**	**21.9**
Peach	GW Agricultural	Cretaceous	24.2	26.5	31.0	35.5	40.0
	GW Municipal Public Supply	Cretaceous	2.3	2.4	2.3	2.3	2.3
	GW Municipal Self Supply	Cretaceous	0.6	0.6	0.6	0.6	0.6
	Groundwater Total		27.2	29.5	34.0	38.5	42.9
	SW Agricultural	Lumber City, Montezuma	0.25	0.26	0.28	0.29	0.31
	Total		**27.4**	**29.8**	**34.3**	**38.8**	**43.2**
Pulaski	GW Agricultural	Floridan, Cretaceous	20.0	20.6	21.9	22.9	24.0
	GW Municipal Public Supply	Cretaceous	1.0	1.0	1.0	1.0	1.0
	GW Municipal Self Supply	Cretaceous	0.3	0.3	0.2	0.2	0.2
	GW Municipal Self Supply	Floridan	0.1	0.1	0.1	0.1	0.1
	Groundwater Total		21.5	22.0	23.2	24.2	25.2
	SW Agricultural	Lumber City	3.5	3.5	3.6	3.7	3.8
	Total		**24.9**	**25.6**	**26.9**	**27.9**	**29.0**

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

County	Sector	Aquifer/Node	2015	2020	2030	2040	2050
Twiggs	GW Agricultural	Cretaceous, Floridan	2.2	2.2	2.3	2.3	2.4
	GW Municipal Public Supply	Cretaceous	0.2	0.2	0.2	0.2	0.1
	GW Municipal Self Supply	Cretaceous	0.5	0.4	0.4	0.3	0.2
	Groundwater Total		2.9	2.9	2.9	2.8	2.7
	SW Agricultural	Lumber City, Mount Vernon, Baxley, Dublin	0.22	0.22	0.22	0.22	0.22
	Total		**3.1**	**3.1**	**3.1**	**3.0**	**3.0**
All Counties	GW Industrial	Cretaceous, Claiborne, Surficial	27.4	30.9	37.9	44.8	45.0
	SW Industrial	Lumber City, Jackson, Milledgeville, Macon	18.1	18.6	19.4	20.2	20.8
Planning Region Total Groundwater Demand			**136.9**	**146.7**	**166.0**	**184.2**	**195.1**
Planning Region Total Surface Water Demand			**87.7**	**90.6**	**98.6**	**105.3**	**110.6**
Planning Region Total Demand			**224.6**	**237.3**	**264.5**	**289.5**	**305.7**

7.2 Wastewater Summary

The full regional wastewater forecasts including municipal and industrial 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 watershed model node.

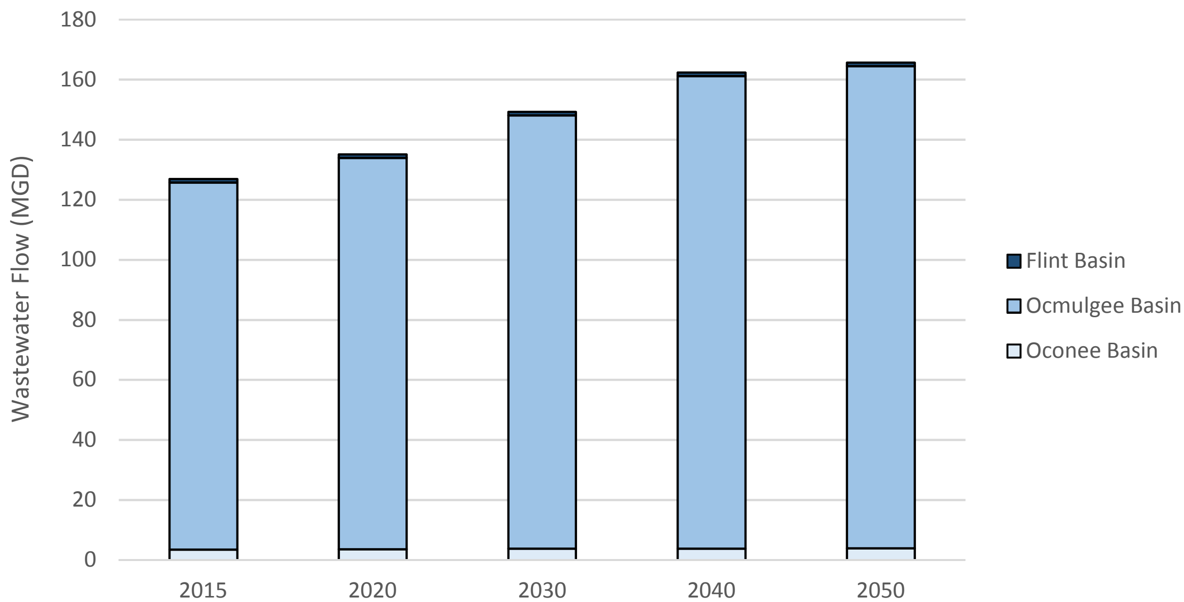


Figure 7-4
Regional Wastewater Flow per Basin

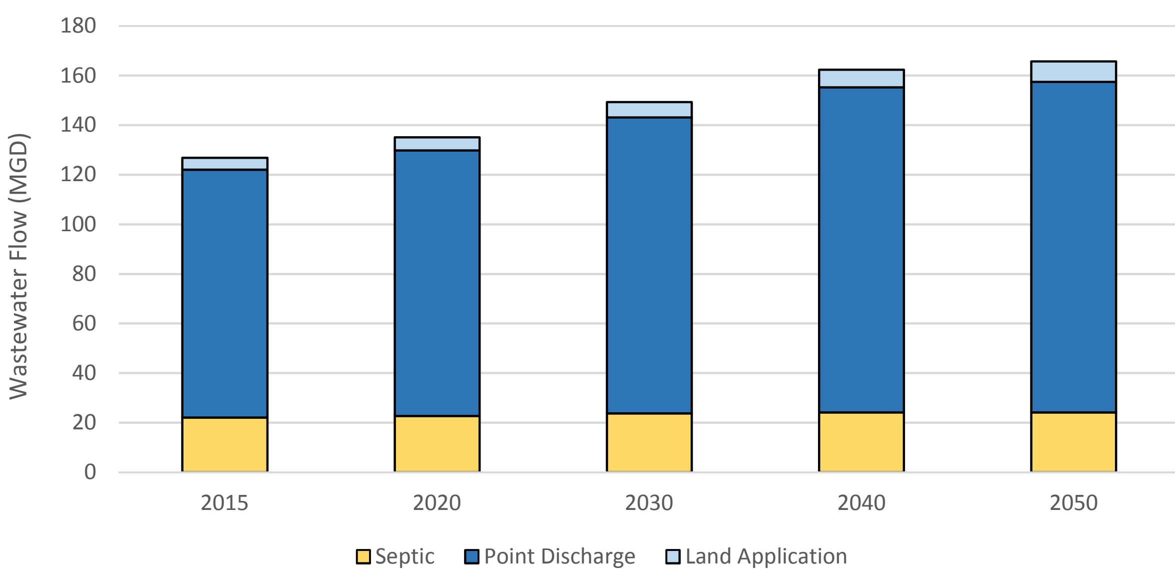


Figure 7-5
Regional Wastewater Flow per Discharge Method

Table 7-2 Summary of Regional Wastewater Flows at Applicable Nodes (MGD)

Node	Discharge Type	2015	2020	2030	2040	2050
Albany	Land Application	-	-	-	-	-
	Point Discharge	-	-	-	-	-
	Septic	0.14	0.15	0.17	0.18	0.20
	Total	0.14	0.15	0.17	0.18	0.20
Baxley	Land Application	-	-	-	-	-
	Point Discharge	-	-	-	-	-
	Septic	0.06	0.05	0.05	0.04	0.03
	Total	0.06	0.05	0.05	0.04	0.03
Dublin	Land Application	-	-	-	-	-
	Point Discharge	0.14	0.15	0.16	0.16	0.17
	Septic	0.42	0.43	0.45	0.46	0.46
	Total	0.56	0.58	0.61	0.62	0.63
Jackson	Land Application	3.87	4.33	5.19	6.14	7.23
	Point Discharge	0.00	0.30	0.35	0.39	0.43
	Septic	5.48	5.55	5.56	5.21	4.42
	Total	9.35	10.17	11.09	11.74	12.09
Lumber City	Land Application	0.07	0.07	0.08	0.09	0.09
	Point Discharge	96.11	102.62	114.27	125.31	127.25
	Septic	10.34	10.80	11.70	12.52	13.31
	Total	106.52	113.49	126.05	137.92	140.65
Macon	Land Application	0.68	0.72	0.76	0.79	0.81
	Point Discharge	2.39	2.64	3.13	3.61	3.75
	Septic	3.24	3.24	3.28	3.28	3.29
	Total	6.31	6.60	7.17	7.68	7.85
Milledgeville	Land Application	0.01	0.01	0.01	0.02	0.02
	Point Discharge	1.21	1.25	1.36	1.47	1.59
	Septic	1.59	1.62	1.66	1.64	1.56
	Total	2.81	2.89	3.04	3.12	3.17
Montezuma	Land Application	-	-	-	-	-
	Point Discharge	0.20	0.20	0.19	0.17	0.15
	Septic	0.83	0.84	0.84	0.84	0.85
	Total	1.03	1.04	1.03	1.01	1.00
Mount Vernon	Land Application	0.13	0.12	0.11	0.09	0.07
	Point Discharge	-	-	-	-	-
	Septic	-	-	-	-	-
	Total	0.13	0.12	0.11	0.09	0.07
Grand Total		**126.9**	**135.1**	**149.3**	**162.4**	**165.7**

Section 8

References

CDM. 2010. Statewide Energy Sector Water Demand Forecast; Technical Memorandum. http://www.georgiawaterplanning.org/documents/Energy_Tech_Memo_102910.pdf

Jacobs. 2011. Municipal and Industrial Water and Wastewater Forecasts. Section 4 Supplemental Document. Middle Ocmulgee Regional Water Plan. May 2011 http://www.middleocmulgee.org/pages/our_plan/Middle_Ocmulgee_Supplemental_Material.php

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