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<thead>
<tr>
<th>Acronym</th>
<th>Definition</th>
</tr>
</thead>
<tbody>
<tr>
<td>ACF</td>
<td>Apalachicola-Chattahoochee-Flint</td>
</tr>
<tr>
<td>ASR</td>
<td>aquifer storage and recovery</td>
</tr>
<tr>
<td>AWWA</td>
<td>American Water Works Association</td>
</tr>
<tr>
<td>BMP</td>
<td>best management practice</td>
</tr>
<tr>
<td>cfs</td>
<td>cubic feet per second</td>
</tr>
<tr>
<td>CSO</td>
<td>combined sewer overflow</td>
</tr>
<tr>
<td>DCA</td>
<td>Department of Community Affairs</td>
</tr>
<tr>
<td>DM</td>
<td>demand management</td>
</tr>
<tr>
<td>DNR</td>
<td>Georgia Department of Natural Resources</td>
</tr>
<tr>
<td>DO</td>
<td>dissolved oxygen</td>
</tr>
<tr>
<td>EPA</td>
<td>U.S. Environmental Protection Agency</td>
</tr>
<tr>
<td>EPD</td>
<td>Georgia Environmental Protection Division</td>
</tr>
<tr>
<td>FDEP</td>
<td>Florida Department of Environmental Protection</td>
</tr>
<tr>
<td>FERC</td>
<td>Federal Energy Regulatory Commission</td>
</tr>
<tr>
<td>GEFA</td>
<td>Georgia Environmental Finance Authority</td>
</tr>
<tr>
<td>GFC</td>
<td>Georgia Forestry Commission</td>
</tr>
<tr>
<td>GSWCC</td>
<td>Georgia Soil and Water Conservation Commission</td>
</tr>
<tr>
<td>GWPPC</td>
<td>Georgia Water Planning and Policy Center</td>
</tr>
<tr>
<td>HCP</td>
<td>Habitat Conservation Plan</td>
</tr>
<tr>
<td>HUC</td>
<td>hydrologic unit code</td>
</tr>
<tr>
<td>IBT</td>
<td>interbasin transfer</td>
</tr>
<tr>
<td>I/I</td>
<td>inflow and infiltration</td>
</tr>
<tr>
<td>IWA</td>
<td>International Water Association</td>
</tr>
<tr>
<td>LAS</td>
<td>land application system</td>
</tr>
<tr>
<td>mgd</td>
<td>million gallons per day</td>
</tr>
<tr>
<td>Acronym</td>
<td>Definition</td>
</tr>
<tr>
<td>---------</td>
<td>------------</td>
</tr>
<tr>
<td>NAICS</td>
<td>North American Industry Classification System</td>
</tr>
<tr>
<td>NPDES</td>
<td>National Pollutant Discharge Elimination System</td>
</tr>
<tr>
<td>NRCS</td>
<td>Natural Resources Conservation Service (U.S. Department of Agriculture)</td>
</tr>
<tr>
<td>OCGA</td>
<td>Official Code of Georgia Annotated</td>
</tr>
<tr>
<td>OPB</td>
<td>Governor’s Office of Planning and Budget (Georgia)</td>
</tr>
<tr>
<td>SF</td>
<td>supply management and flow augmentation</td>
</tr>
<tr>
<td>TMDL</td>
<td>total maximum daily load</td>
</tr>
<tr>
<td>USACE</td>
<td>U.S. Army Corps of Engineers</td>
</tr>
<tr>
<td>USGS</td>
<td>U.S. Geological Survey</td>
</tr>
<tr>
<td>WQ</td>
<td>water quality</td>
</tr>
<tr>
<td>WRD</td>
<td>Wildlife Resources Division (Georgia)</td>
</tr>
<tr>
<td>7Q10</td>
<td>lowest seven day average flow in a 10-year period</td>
</tr>
</tbody>
</table>
Acknowledgements

This Regional Water Plan reflects the commitment and contributions of the members of the Lower Flint-Ochlockonee Water Planning Council. The Council members volunteered their time, expertise, and talents before, during, and after numerous council meetings, joint council meetings, committee meetings, and conference calls during the review and revision of this Regional Water Plan.

Richard Royal, Chairman
Hal Haddock, Vice Chairman (deceased)
Jimmy Webb, Vice Chairman
Lucius Adkins
Steve Bailey
Jimmy Champion
Terry Clark
Casey Cox
David Dixon
Vince Falcione
Dan Hammack
John A. Heath
Josh G. Herring
Connie Hobbs
Huddy Hudgens, Jr.
Hank Jester
Jerry Lee
Chuck E. Lingle
Phil Long
Elaine Mays
George C. McIntosh
Mike Newberry
Calvin Perry
Dan Ponder
Ray Prince
Jim Quinn
Steve Singletary
Bill Yearta
Senator Dean Burke (Ex-Officio)
Representative Gerald Greene (Ex-Officio)

Camilla
Damascus
Leary
Elmodel
Donalsonville
Sylvester
Moultrie
Camilla
Leesburg
Albany
Edison
Dawson
Boston
Leary
Albany
Bainbridge
Thomasville
Albany
Arlington
Moultrie
Donalsonville
Cairo
Leesburg
Blakely
Sylvester
The Council gratefully acknowledges Gail Cowie and Jennifer Welte of the Georgia Environmental Protection Division and the Black & Veatch/Georgia Water Planning & Policy Center team for their efforts to support the Council.

The Council members remember with great fondness and admiration Vice Chairman Hal Haddock, who passed away in January 2017. For decades, he worked to ensure that the region’s water resources will provide for the needs and enjoyment of future generations.
Executive Summary

Lower Flint-Ochlockonee Regional Water Plan

This document is the revised Regional Water Plan of the Lower Flint-Ochlockonee Regional Water Planning Council (the Council). The original Regional Water Plan of the Council was adopted in 2011, and this revision was adopted in 2017. This Plan was developed by the Council and approved by the Georgia Environmental Protection Division (EPD). The Plan provides a roadmap to guide long-term use of this water planning region’s water resources and is to be implemented by water users in the region along with state agencies and other partners. This Plan will also help guide state agency decisions on water permitting and grants and loans for water and wastewater-related projects.

Regional Water Plans in Georgia are developed in accordance with the Georgia Comprehensive State-wide Water Management Plan (State Water Plan), which was adopted by the General Assembly in January 2008. The State Water Plan establishes ten water planning regions across the State, each guided by a regional water planning council. The State Water Plan also guides regional water planning by the Metropolitan North Georgia Water Planning District, which was created by the Metropolitan North Georgia Water Planning District Act of 2001.

Lower Flint-Ochlockonee Council, June 2017
Executive Summary

The State Water Plan requires the preparation of regional water development and conservation plans (Regional Water Plans) to manage water resources in a sustainable manner through 2050. The State Water Plan provides a framework for regional planning consistent with the policy statement that “Georgia manages water resources in a sustainable manner to support the state’s economy, to protect public health and natural systems, and to enhance the quality of life for all citizens.”

The Lower Flint-Ochlockonee Water Planning Council was charged with developing this Regional Water Plan. The Council includes up to 30 members from throughout the water planning region, which includes 14 counties and 50 towns and cities. Members are appointed by the Governor, the Lieutenant Governor, and the Speaker of the House. The Council has been active since 2009, when it initiated the development of the first version of this Plan. The Council completed review and revision of this Plan during 2016 and 2017.

Vision and Goals

The Lower Flint-Ochlockonee Water Planning Council adopted the following statement to describe its vision for the future of this water planning region’s water resources:

*The Lower Flint-Ochlockonee Water Planning Council will manage water resources in a sustainable manner to support the region’s economy, to protect public health and natural systems, and to enhance the quality of life for the region’s citizens.*

The Council adopted the following goals to support its vision:

1. Ensure access to water resources for existing and future water users in the Lower Flint-Ochlockonee Water Planning Region.

2. Sustain the region's aquifers, the Floridan, the Claiborne, the Clayton, and the Cretaceous, in a healthy condition that will continue to support the natural systems and economic activities of the Lower Flint-Ochlockonee Water Planning Region.

3. Maintain the production-agriculture-based economy of the Lower Flint-Ochlockonee Water Planning Region.


The regional vision and goals were used by the Council to guide the development of this Plan.
Planning Process

The Lower Flint-Ochlockonee Water Planning Council has been active since 2009. It developed its original regional water plan between 2009 and 2011. Between 2011 and 2015, the Council focused on implementation and preparation for review and revision of this Plan. The Council conducted its review and revision of this Plan during 2016 and 2017. During this time, Council members participated in Council meetings, committee work and teleconferences, and joint council meetings to review and revise this Plan. The Council gathered information from a variety of sources to provide a foundation for sound decision-making. Often, the Council found information gaps or significant uncertainties that affected its ability to plan. The Council proceeded based on the best information available and made recommendations to address information gaps and improve water planning and policies.

Since its inception, the Lower Flint-Ochlockonee Water Planning Council has sought input from a variety of stakeholders and implemented a public participation plan that provided many opportunities for public input into the Council’s planning process. The Council has interacted with state and federal agencies and local governments from throughout the region, and it has also coordinated with neighboring regional water councils, especially the Middle Chattahoochee and the Upper Flint Water Planning Councils and the Metropolitan North Georgia Water Planning District, through joint meetings with those councils. The Council uses a consensus-oriented approach in its decision-making.

Lower Flint-Ochlockonee Water Planning Region

Most of the Lower Flint-Ochlockonee Water Planning Region is located in the Apalachicola-Chattahoochee-Flint (ACF) River Basin. Part of the region is located in the Ochlockonee River Basin, and a small part of the region is located in the Suwannee River Basin. The Lower Flint-Ochlockonee Water Planning Region is largely rural with over 35% of the land in row crops and pasture and an additional 34% in forest. Although row crop and pasture cover has decreased slightly in the past few decades, and low-intensity urban development has increased, this water planning region is expected to remain predominantly agricultural.

Water Use in the Region

Current water use in the Lower Flint-Ochlockonee Water Planning Region is approximately 858 million gallons per day (mgd). Water use in the region is projected to increase to 874 mgd in 2050. Currently, agriculture is the largest water using sector in this water planning region by a significant margin, and it is expected to remain the largest water user through 2050. As a result, much of the Council’s planning effort has been focused on the agricultural sector. The Council notes the importance of agriculture to the region’s economy in its goals. Wastewater flows in the region are currently approximately 270 mgd and expected to decrease to 193
mgd in 2050. Over 90% of the wastewater in the region is discharged through point sources.

**Water Resource Assessments**

To support the regional water planning process, EPD developed resource assessment models for surface water availability, groundwater availability, and water quality. The purpose of the resource assessments is to estimate the capacity of streams and aquifers to meet water consumption demands and the capacity of streams to meet wastewater discharge demands, within thresholds that indicate the potential for local or regional impacts. The resource assessments are modeling exercises that use several conservative assumptions. Results of the assessment models were compared against estimates of current and projected water use and wastewater flows. The assessment models identified potential gaps in the capacity of water resources to meet water supply and wastewater demands, within thresholds EPD selected to indicate potential local or regional impacts. The Lower Flint-Ochlockonee Water Planning Council considered the assessment model results, this water planning region’s water needs, and potential impacts on the water planning region, both environmental and economic. The Council developed the rest of this Plan to address potential gaps identified by the models and to meet the Council’s vision and goals for this water planning region. The results of the assessments and the Council’s approach to addressing the results are summarized in the table on the next page.

The Lower Flint-Ochlockonee Water Planning Council questions whether the criteria used to determine potential “gaps” for surface water flows are appropriate metrics by which to evaluate the impacts of consumptive water use on the region’s water resources. The potential “gaps” are not defined in terms of demonstrable environmental harm and could be interpreted as a need to severely limit reasonable use by lawfully permitted users. Closing the potential “gaps” could ultimately cause significant harm to the region’s economy and would be counter to the Council’s vision and goals. The Council recommends additional study to determine more appropriate flow targets that account for permitted reasonable use and demonstrable environmental impacts for use in future planning.

**Recommended Management Practices**

The Lower Flint-Ochlockonee Water Planning Council developed a set of seventeen management practices, including six Demand Management, six Supply Management and Flow Augmentation, and five Water Quality practices. From this set, the Council selected four high priority management practices, which are highlighted in the box on the next page. For each management practice, this Plan describes implementation steps, responsible parties, implementation schedules, cost estimates, and funding sources. The Plan also identifies benchmarks by which implementation can be evaluated.
Executive Summary

Table ES-1: Resource Assessment Results – Lower Flint-Ochlockonee Water Planning Region

<table>
<thead>
<tr>
<th>Resource Assessment</th>
<th>Summary of Model Results</th>
<th>Council Plan to Address Results</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Surface Water Availability</strong></td>
<td>The model identified potential gaps in surface water availability in the Flint River Basin at Bainbridge and in the Ochlockonee River Basin at Quincy and Concord under both current and forecast demands. Potential gaps were also identified by the model at Pinetta in the small part of the Suwannee River Basin that is in this water planning region.</td>
<td>Address the potential gaps with conservation and supply augmentation practices as much as possible, while also collecting better information to support more thorough evaluation of resource capacity and the impacts of potential gaps identified by the assessment models on in-stream and downstream uses.</td>
</tr>
<tr>
<td><strong>Groundwater Availability</strong></td>
<td>Groundwater use is below the sustainable yield range estimated by the model for the Claiborne Aquifer and the Upper Floridan Aquifer in South-Central Georgia. It is above the sustainable yield range estimated by the model for the Upper Floridan Aquifer in the Dougherty Plain. Aquifer use above the estimated sustainable yield range does not necessarily mean the aquifer is likely to be exhausted by use. Instead, management practices may be needed to meet long-term demands.</td>
<td>Use of the Claiborne Aquifer should be further evaluated to develop appropriate management strategies that address geographic and time-based variations in capacity and demands. In the Upper Floridan Aquifer in the Dougherty Plain, the impact of groundwater withdrawals on surface water flows in the Flint River Basin continues to be a determining factor in guiding the location and amount of groundwater use from this aquifer. Collect better and more geographically specific information on groundwater resource capacity, as needed to evaluate specific uses and management practices.</td>
</tr>
<tr>
<td><strong>Surface Water Quality</strong></td>
<td>Water quality model results indicated decreasing availability of assimilative capacity in some areas of the Flint River Basin as discharge flows increase in the future. In other areas, expected improvements in wastewater treatment are projected to improve available assimilative capacity under future conditions.</td>
<td>Implement practices targeted especially toward nonpoint sources of pollutants to improve assimilative capacity and reduce nutrient loading in the region’s streams and lakes. It is expected that EPD will adjust point source permit limits over time as needed to address assimilative capacity constraints and nutrient criteria. Collect more complete information to confirm model results and to support the targeting of management practices for water quality in the future.</td>
</tr>
</tbody>
</table>
Other Recommendations from the Lower Flint-Ochlockonee Water Planning Council

This Regional Water Plan includes recommendations to the State and other entities to address information needs and water policy issues. The Lower Flint-Ochlockonee Water Planning Council emphasizes the need for information to support better water planning in the future. The Council believes that water planning should be based on data reflecting actual water use and conditions as much as possible. The Council seeks several improvements in the water resource assessments to support improved planning. It also recommends more detailed evaluation of some of its current management practices and study of potential future management practices. With respect to water policy, the Council urges the General Assembly to provide funding to continue the work of the regional water councils in the future. It requests that the General Assembly and implementing agencies explore all possible funding sources to support implementation of this Plan. The Council urges the state to seek a timely solution to interstate water issues in the Apalachicola-Chattahoochee-Flint River Basin. The Council also makes specific recommendations concerning drought management, interbasin transfers, imperiled species management, and coordination with other regional water planning councils and the Metropolitan North Georgia Water Planning District.

The Lower Flint-Ochlockonee Water Planning Council coordinated closely with neighboring water planning councils and developed a set of joint recommendations with the Middle Chattahoochee and Upper Flint Water Planning Councils to address shared concerns in the Apalachicola-Chattahoochee-Flint River System. These joint recommendations emphasize the need for more water storage capacity and more effective use of existing storage capacity in the ACF, continued improvement of the information base for water planning and management, and consideration of a new organization for coordinated interstate planning in the ACF.

High Priority Management Practices

**Demand Management:**
- Continue to improve agricultural water use efficiency through innovation and technology

**Supply Management and Flow Augmentation:**
- Evaluate reservoir storage options in the Flint River Basin, including better utilization of existing storage, that can provide for flow augmentation in dry periods
- Replace surface water withdrawals with groundwater withdrawals, where site specific evaluation indicates that this practice is practical and will not harm environmental resources

**Water Quality:**
- Improve enforcement of existing permits and regulations and implementation of existing plans and practices
Section 1. Introduction

1.1 The Significance of Water Resources in Georgia

Of all Georgia’s natural resources, none is more important to the future of our state than water. The wise use and management of water is critical to support the State’s economy, to protect public health and natural systems, and to enhance the quality of life for all citizens.

Georgia has abundant water resources, with 14 major river systems (see Figure 1-1) and multiple groundwater aquifer systems. These waters are shared natural resources. Streams and rivers run through many political jurisdictions. The rain that falls in one part of Georgia may replenish the aquifers used by communities many miles away. While water in Georgia is abundant, it is not an unlimited resource. It must be carefully managed to meet long-term water needs.

Since water resources, their conditions, and their uses vary greatly across the State, selection and implementation of management practices on the regional and local levels is the most effective way to ensure that current and future needs for water supply and assimilative capacity are met.

Therefore, the Georgia Comprehensive State-wide Water Management Plan (State Water Plan) calls for the preparation of regional water development and conservation plans (Regional Water Plans) for the ten water planning regions depicted in Figure 1-1, not including the Metropolitan North Georgia Water Planning District, which has a separate water planning process created by the Metropolitan North Georgia Water Planning District Act of 2001.¹

This Regional Water Plan (this Plan) was prepared for the Lower Flint-Ochlocknee Water Planning Region by the Lower Flint-Ochlocknee Water Planning Council (the Council). It describes the regionally appropriate water management practices to be employed in Georgia’s Lower Flint-Ochlocknee Water Planning Region over the next several decades.

¹The plans of the regional water planning councils can be found on the Georgia regional water planning website. The plans of the Metropolitan North Georgia Water Planning District can be found on the District’s website: http://www.northgeorgiawater.org/
1. Introduction

Figure 1-1: River Basins and Water Planning Regions of Georgia
1.2 State and Regional Water Planning Process

The State Water Plan calls for the preparation of Regional Water Plans designed to manage water resources in a sustainable manner through 2050. It establishes ten regional water planning councils and provides a framework for regional planning consistent with the policy statement that “Georgia manages water resources in a sustainable manner to support the state’s economy, to protect public health and natural systems, and to enhance the quality of life for all citizens.”

This Regional Water Plan has been prepared following the planning process illustrated in Figure 1-2. As detailed in the Lower Flint-Ochlockonee Water Planning Council’s Memorandum of Understanding with the Georgia Environmental Protection Division (EPD) and the Department of Community Affairs (DCA), as well as the Council’s Public Involvement Plan, the process required and benefited from the input of local governments, other regional water planning councils, and the public.²

Figure 1-2: Water Planning Process

²The Lower Flint-Ochlockonee Water Planning Council’s Memorandum of Agreement, updated in 2016, can be found on the Council’s website. The Council’s Public Participation Technical Memorandum (2011) is available as Supplemental Document 2 on the Council’s website.
The Lower Flint-Ochlockonee Water Planning Council developed the first Regional Water Plan for the Lower Flint-Ochlockonee Water Planning Region between 2009 and 2011. The first Regional Water Plan was adopted by the Council and approved by EPD in 2011. The Council met on a continuing basis during the implementation phase for that Plan between 2011 and 2015. In 2016 and 2017, the Council reviewed and revised the Regional Water Plan that was adopted in 2011. The Council met multiple times during that period in Council meetings, committee teleconferences, and joint meetings with other regional water planning councils. The revised Regional Water Plan was adopted by the Council in June 2017, after a public review and comment period, and approved by EPD.

1.3 The Lower Flint-Ochlockonee Water Planning Council’s Vision and Goals

In 2009, the Lower Flint-Ochlockonee Water Planning Council adopted the following statement to describe its vision for the future of the planning region’s water resources:

_The Lower Flint-Ochlockonee Water Planning Council will manage water resources in a sustainable manner to support the region’s economy, to protect public health and natural systems, and to enhance the quality of life for the region’s citizens._

At the same time, the Council adopted the following goals to support its vision:

1. Ensure access to water resources for existing and future water users in the Lower Flint-Ochlockonee Water Planning Region.

2. Sustain the region’s aquifers, the Floridan, the Claiborne, the Clayton, and the Cretaceous, in a healthy condition that will continue to support the natural systems and economic activities of the Lower Flint-Ochlockonee Water Planning Region.

3. Maintain the production-agriculture-based economy of the Lower Flint-Ochlockonee Water Planning Region.


In 2017, the Council reviewed its vision and goals and determined that no revisions were needed. The Council’s vision and goals were adopted to guide the Council in developing this Regional Water Plan. While the Council does not directly manage water resources in the region, the vision and goals address resource management in order to describe the Council’s priorities and inform Council decision-making in its planning process. The vision and goals were used by the Council to guide the selection of water management practices and recommendations, which are discussed in Sections 6 and 7.4.

---

3 Meeting summaries for the Lower Flint-Ochlockonee Water Planning Council meetings are available on the Council’s website.
2. The Lower Flint-Ochlockonee Water Planning Region

2.1 History and Geography

The Lower Flint-Ochlockonee Water Planning Region (Figure 2-1) encompasses over 6,014 square miles in southwest Georgia and includes 14 counties (Baker, Calhoun, Colquitt, Decatur, Dougherty, Early, Grady, Lee, Miller, Mitchell, Seminole, Terrell, Thomas and Worth counties) and 50 towns and cities partially or wholly within these counties. Major river basins in the region include the Chattahoochee, Flint, Ochlockonee, and Suwannee.

Agriculture is the leading economic sector and water user in this water planning region. According to the University of Georgia’s 2014 Georgia Farm Gate Value Report, the counties of the Lower Flint-Ochlockonee Water Planning Region generated agricultural production with a value of $2.3 billion.\(^1\) In the 19th century, agricultural development in southwest Georgia was driven by the development of the cotton gin, and major crop diversification began in the 1930’s due to farm mechanization advances, New Deal policies, and cotton yield reductions caused by the Boll Weevil. Widespread use of irrigation began to develop in Southwest Georgia in the 1970’s.

2.2 Characteristics of this Water Planning Region

The Lower Flint-Ochlockonee Water Planning Region is largely rural with 35% of the land in row crops and pasture and an additional 34% in forest. Although row crop and pasture cover has decreased slightly in the past few decades, and low-intensity urban development has increased, this water planning region is expected to remain predominantly agricultural. However, recent land use trends may signal an increasing presence of industrial and commercial development. Land cover in this water planning region, based on data derived from the 2011 National Land Cover Data, is illustrated in Figure 2-2.\(^2\)

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Figure 2-1: Lower Flint-Ochlockonee Water Planning Region

Natural features in the Lower Flint-Ochlockonee Water Planning Region provide habitat for an abundance of flora and fauna as well as areas critical for recharging the region’s aquifers.3 This water planning region is located in Georgia’s Coastal Plain physiographic region, south of the fall line. The Coastal Plain “is underlain by relatively soft, weakly consolidated rocks and unconsolidated sediments deposited by the sea or streams when the shoreline was at or near the fall line between 80 and 100 million years ago.”4 Aquifers in this water planning region include the Clayton, Claiborne, and Floridan aquifer systems. A large area of the Floridan aquifer in this region is in hydraulic connection with the Flint River. In this area, known as Subarea 4, surface water streams receive or lose water to the aquifer depending on the head difference between the streams and the aquifer. The major mechanisms of transfer include diffusion through streambeds or stream banks and discharge from in-channel springs, commonly known as blue-springs, which can discharge on the order of tens of millions of gallons per day. Subarea 4 includes the Flint River Basin south of Dooly County, part of the lower Chattahoochee River Basin, and a narrow strip on the eastern side of the Ochlockonee and Suwannee River Basins.5

3 A Georgia Geologic Survey map of aquifer recharge areas in Georgia is available as Supplemental Document 4 on the Council’s website.
5 A map of Subarea 4 of the Floridan Aquifer is available as Supplemental Document 5 on the Council’s website.
At the southern end of the Lower Flint-Ochlockonee Water Planning Region, Lake Seminole affects groundwater levels on a localized scale. A 2004 U.S. Geological Survey (USGS) hydrologic model mimicked pre- and post-impoundment, during drought conditions, to determine differences in the potentiometric surface and flow direction of the Floridan aquifer associated with Lake Seminole. The impoundment was shown to increase groundwater levels surrounding the lake by as much as 26 feet, but the overall impact was relatively localized, with groundwater level increases of “less than 2 feet beyond linear distances from Jim Woodruff Lock and Dam of about 35 miles along the Chattahoochee and Flint Rivers, and 20 miles along the Alapachicola River.”

2.3 Policy Context for this Regional Water Plan

The Lower Flint-Ochlockonee Water Planning Region is subject to several overlapping layers of water resource management by state and federal agencies. State permitting programs for water withdrawals and wastewater dischargers affect all water users (OCGA §§12-5-32, 12-5-30(a), 12-5-30(b), 12-5-96, 12-5-105; Georgia Department of Natural Resources (DNR) Rules 391-3-6-.06, 391-3-6-.07, 391-3-2-.03). In this region, the following laws, regulations, and related issues are also directly relevant to water management:

- The Flint River Water Development and Conservation Plan of 2006 serves as guidance for the Georgia Environmental Protection Division for agricultural water use permit issuance. The 2006 Flint River Water Development and Conservation Plan was developed under the authority of the Water Quality Act (OCGA § 12-5-31(h)) and Groundwater Use Act (OCGA § 12-5-96(e)) in response to a prolonged drought, increased agricultural irrigation in southwest Georgia since the 1970’s, and scientific studies that predicted severe impacts on streamflow in the Flint River Basin due to withdrawals from area streams and the Floridan Aquifer (Flint River Water Development and Conservation Plan, 2006). The Lower Flint-Ochlockonee Regional Water Plan builds on the existing 2006 plan for the Flint River Basin. The 2006 plan provides a scientific and policy foundation for water resources planning in the Flint River Basin, and this Plan will be implemented in concert with it.

- The Flint River Drought Protection Act (OCGA § 12-5-540) and its implementing rules (DNR Rule 391-3-28) provide for demand management.

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7 A detailed discussion of existing water related laws, policies, regulations, and plans affecting the region is provided in Supplemental Document 6 - Existing Regulatory and Local Plan Summary, available on the Council’s website.
2. The Lower Flint-Ochlockonee Water Planning Region

through agricultural irrigation suspension in times of drought. The Act was amended in 2014. Among other things, the amended law sets requirements for agricultural irrigation efficiency to be met by 2020 (OCGA § 12-5-546.1).

- Federal Energy Regulatory Commission (FERC) licensing requirements for privately-owned hydroelectric impoundments apply to Lake Chehaw in the Lower Flint-Ochlockonee Water Planning Region.

- The Florida Department of Environmental Protection (FDEP), with approval from the Environmental Protection Agency, adopted new nutrient criteria for free-flowing streams and lakes in Florida in 2013. These criteria may impact water quality management in this water planning region and other water planning regions with river systems that cross into Florida. Over the next several years, Georgia will develop a strategy that is likely to include point source discharge limits and nonpoint source management to address these criteria. At this time, Georgia is monitoring water quality to support strategy development.\(^9\)

- Under the federal Endangered Species Act, six species of freshwater mussels have been listed as endangered or threatened in the Lower Flint-Ochlockonee Water Planning Region:

  - **Endangered**: Shinyrayed pocketbook, Gulf moccasinshell, Ochlockonee moccasinshell, Oval pigtoe, Fat threeridge

  - **Threatened**: Purple bankclimber

  Additionally, the Gulf sturgeon is listed as threatened, and flow requirements for the Gulf sturgeon affect the management of the Apalachicola-Chattahoochee-Flint System as a whole. The Endangered Species Act prohibits takings of these species and sets requirements for the protection of their critical habitats.\(^10\)

- The U.S. Army Corps of Engineers (USACE) operates five federal reservoir projects on the Chattahoochee River (Lake Sidney Lanier, West Point Lake, Walter F. George Lake, George W. Andrews Lake, and Lake Seminole). The operation of these projects affects the parts of the Lower Flint-Ochlockonee Water Planning Region that are within the Chattahoochee Basin, and it also affects this water planning region as a key component of water management in the Apalachicola-Chattahoochee-Flint (ACF) Basin as a whole. The Master

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\(^9\) More information on Florida’s nutrient criteria is available on-line: https://www.epa.gov/sites/production/files/documents/factsheet-12-03-12_0.pdf, http://www.dep.state.fl.us/water/wqsp/nutrients/.

\(^10\) Section 6.1 discusses how the Endangered Species Act affected the development of this Plan, and Section 7.4 includes a recommendation from the Council to address the region’s Endangered Species Act concerns in the future. More information on federally listed endangered and threatened species of freshwater mussels in the region can be found on the following U.S. Fish and Wildlife Service website: http://www.fws.gov/panamacity/mussels.html. Information on gulf sturgeon can be found on the following U.S. Fish and Wildlife Service website: http://www.fws.gov/panamacity/gulfsturgeon.html.
2. The Lower Flint-Ochlockonee Water Planning Region

Water Control Manual for the ACF has been subject to an update process for the past several years. On March 30, 2017, the updated Water Control Manual was issued by the USACE. 11

- Additionally, the ACF Basin is the subject of protracted litigation over the management and allocation of water resources among Florida, Georgia, and Alabama and other interested parties. In 2013, Florida filed a suit against Georgia in the U.S. Supreme Court in a case of original jurisdiction. Florida asked the court to impose equitable apportionment in the ACF. The litigation has proceeded under the oversight of a Special Master, who issued a recommendation to the court on the suit in February 2017. The Special Master’s report recommends that the Court deny Florida’s request for relief. He concluded that without being able to bind the U.S. Army Corps of Engineers, the Court could not address any injury Florida claimed through equitable apportionment. Although the Special Master has issued a recommendation, the final outcome is uncertain. A final decision from the Supreme Court is expected in late 2017 or early 2018. The Council expects to be able to revise this Plan, if necessary, pending the outcome of this decision. 12

11 Information on the updated ACF Master Water Control Manual can be found on the following USACE website: http://www.sam.usace.army.mil/Missions/Planning-Environmental/ACF-Master-Water-Control-Manual-Update/

12 Docket filings for the suit, including the Special Master’s report, can be found on-line at: http://www.pierceatwood.com/floridavgeorgia142original.
Section 3. Current Assessment of Water Resources of the Lower Flint-Ochlockonee Water Planning Region

3.1 Major Water Uses in this Water Planning Region

The current water use information presented here for the Lower Flint-Ochlockonee Water Planning Region is based on data compiled by the USGS.¹ These estimates provide a snapshot that describes water use in that year (2010) by multiple sectors in this water planning region. The major water use categories addressed in this section include municipal, industrial, energy, and agriculture.

- **Municipal** - water withdrawn by public and private water supplier and delivered for a variety of uses (e.g., residential, commercial, light industrial)

- **Industrial** - water withdrawn for fabrication, processing, washing, and cooling for facilities that manufacture products, including steel, chemical and allied products, paper, and mining

- **Energy** - water withdrawn primarily for cooling purposes in the production of electricity at thermoelectric plants (Hydroelectric energy uses water to produce energy, but because this use is nonconsumptive, hydroelectric water use is not included.)

- **Agriculture** - includes row and orchard crops as well as most vegetable and specialty crops (Nursery, animal livestock, and golf course irrigation water use estimates are also included.)

As shown in Figure 3-1, groundwater is the predominant source of water in the Lower Flint-Ochlockonee Water Planning Region. Figures 3-2 and 3-3 show that the use of surface water is roughly equal for industry, energy, and agriculture in the region, while most groundwater use is for agriculture. The leading method for treating wastewater is by treatment facilities with point source discharges. Over 80% of these discharges are from power generating and industrial facilities.

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For planning purposes, it is important to understand the amount of water that is returned to the hydrologic system after it is used. Consumptive use is the difference between the total amount of water withdrawn from a defined hydrologic system and the total amount of the withdrawn water that is returned to the same hydrologic system. The assessments for this Plan are particularly concerned with the amount of water that is returned in a time frame that makes it available to support other uses. Consumptive use can be difficult to measure when returns to instream flows are not through a point source discharge. As a result, in this planning process, on-site
sewage treatment and land application systems are considered to be 100 percent consumptive. Similarly, agricultural water use for irrigation is considered to be 100 percent consumptive. These conservative assumptions do not mean that none of this water is ever returned to the hydrologic system, but for the purposes of this assessment, they are treated as 100 percent consumptive.

Many members of the Lower Flint-Ochlockonee Water Planning Council expressed concern over the resource assessment model assumption that agricultural water use for irrigation is 100 percent consumptive. This assumption was applied in the surface water availability model (see Section 3.2 below). In the previous planning cycle, the Council and its Technical Ad Hoc Committee discussed this issue in detail. The following points summarize their conclusions:

- The level of consumptive use by agricultural irrigation varies widely depending on field and other conditions.
- Timing of returns to the stream is important for the surface water availability model. While more water is returned over a longer period of time, for this effort, a shorter time frame must be evaluated.
- Without additional studies or information, the selection of an alternative estimate of consumptive use for agriculture would be arbitrary.

Based on the recommendation of the Technical Ad Hoc Committee, the Council decided to proceed based on the 100 percent consumptive use assumption for irrigated agriculture for this Plan. However, the Council notes concern that the assumption of 100 percent consumptive use by irrigated agriculture led to modeling results in the Flint River Basin, described below, that are more extreme than would result if the assumption were less than 100 percent. The Council also notes that great improvements in agricultural irrigation efficiency have been made in recent years. While efficiency gains can decrease the amount of water used, they also decrease the percentage of return flow from agriculture. Therefore, they also increase the level of consumptive use (as a percent of water withdrawn), because a greater proportion of the irrigation water is used by the plant and unavailable to return to the hydrologic system.

### 3.2 Current Conditions Resource Assessments

For this planning process, EPD developed three resource assessments for the State’s water resources: **surface water availability, groundwater availability, and surface water quality.** These assessments used models to analyze the capacity of streams and aquifers to meet water consumption demands and of streams to meet wastewater discharge demands within thresholds selected by EPD to indicate the potential for local or regional impacts. The assessments were conducted on a resource basis (i.e., river basins and aquifers). The results of these assessments for current conditions are summarized in this section, as they relate to the Lower Flint-
Ochlockonee Water Planning Region. Section 5 describes the future conditions projected by the resource assessment models. Full details of each resource assessment can be found in the resource assessment reports, which are available on the Council’s website.

3.2.1 Surface Water Availability

The surface water availability resource assessment modeled the response of surface water bodies (streams and lakes) as demands for current and forecast consumptive water use were met. Consumptive water demands included municipal, industrial, agricultural, and thermal power uses. Modeling was done to evaluate how often, and for how long, consumptive demands and dry conditions might cause stream flows or lake storage to fall below thresholds selected by EPD. Thresholds were selected as indicators of the potential for local or regional impacts. When modeled conditions fell below a threshold, a potential gap was identified. Potential gaps were analyzed in terms of both magnitude (i.e., the amount) and duration (i.e., the number of days below the threshold).

Modeled responses of water bodies were evaluated at selected points in a river basin. Evaluation points, called planning nodes, were located at stream gages where the effect on stream flows of cumulative upstream consumptive uses of water (i.e., withdrawals minus returns) and authorized reservoir operations could be evaluated (Figure 2-1). Critical inputs for the model included: desired flow of the river system, expected return of treated wastewater to the system, and water supply demands.

Responses of water bodies were evaluated for each day in a 73-year period of record (1939-2011). The period of record used in the model was selected to represent the longest and most complete range of historical stream flow data available in Georgia and the range of stream hydrology likely to be experienced throughout the planning horizon. For current conditions, the assessment used the water demand measured in 2011, an extremely dry year, to represent current water supply demands. The use of this water demand data supports a conservative approach that supports assessment of the availability of resources to meet demands when water is needed most.

In unregulated portions of a basin (i.e., portions without large reservoirs), the threshold used for the assessment was a flow regime defined by the State’s Interim Instream Flow Protection Policy. The monthly 7Q10 (lowest seven-day average flow in a ten-year period) or natural inflow, whichever was lower, was selected as the target flow regime for each day in the modeled period, because it is an indicator of the potential for water consumption to impact instream uses such as fishing, boating, and habitat for aquatic life. In regulated portions of a basin, thresholds for flows were set only where an explicit flow requirement was specified by federal requirements, such as by the U.S. Army Corps of Engineers. In these regulated basins, the ability
to meet demands was evaluated relative to the availability of storage to meet both consumptive demands for water and any downstream flow criteria.

Most of the Lower Flint-Ochlockonee Water Planning Region occurs within the Flint River Basin, which has three unregulated nodes: Carsonville, Montezuma and Bainbridge (Figure 2-1). Both Carsonville and Montezuma are located in the Upper Flint Water Planning Region, and Bainbridge is located in the Lower Flint-Ochlockonee Water Planning Region. Bainbridge is close to the southern boundary of the Lower Flint-Ochlockonee Water Planning Region, but Carsonville and Montezuma are above the southern border of the Upper Flint Water Planning Region. Therefore, parts of the Upper Flint Water Planning Region, including all of Webster and Sumter Counties and portions of Marion, Macon, Dooly, Schley, and Crisp Counties, occur in the area evaluated at the Bainbridge planning node.

To be conservative, the resource assessment model evaluated how consumptive water use (and reservoir operations, where applicable) would impact water availability at the planning nodes if water use was the same in each year of the modeled period. Assessment results identified days in the modeled period when a potential gap occurred in meeting the flow threshold, assuming consumptive use and hydrologic conditions. The results in this section concern current conditions. As noted above, the current water use data that were modeled were based on the observed monthly net water use aggregated across all use categories in 2011. Since 2011 was a year of extreme drought, water use data recorded in this year reflect one of the highest consumptive use years. Using this data set in the modeling simulation for each of the 73 years, regardless of hydrology, represents a conservative approach.

The model results for the Flint and Ochlockonee Rivers, for current conditions, are shown in Table 3-1. Assuming 2011 water use in the Flint River Basin, the model indicated that at both the Carsonville and Montezuma nodes, water demands can be fully met without a potential gap in surface water availability. At Bainbridge, however, the model identified a potential gap on 12% of the days in the modeled period. The average potential gap was 372 cfs (240 mgd). These results are not observed gaps, but come from a modeling exercise that was based on conservative assumptions, including water use during an extreme drought year.

The Bainbridge node results were affected by the modeled use of surface water and groundwater in Subarea 4 of the Upper Floridan Aquifer in the Dougherty Plain, where interconnection of the aquifer with the surface water is high. Subarea 4 includes the Flint River Basin south of Dooly County, part of the lower Chattahoochee River Basin, and a narrow strip on the eastern side of the Ochlockonee and Suwannee River Basins.

In this planning cycle, EPD extended the surface water availability resource assessment to evaluate the potential impacts of ponds used for irrigation on the potential gaps. To support this analysis, EPD collected data on the bathymetry of a
set of farm ponds in south Georgia and gathered input from farmers on how farm ponds are managed. This information was limited in scope, but it provided enough data to support a preliminary analysis. When the model was run with farm pond estimates in the analysis, the results indicated that the length of the potential gaps at the Bainbridge node was essentially the same, but the size of the potential gaps decreased.

In the Ochlockonee River Basin at Concord, the model indicated a potential gap on 8% of the days in the modeled period. On those modeled days, the average potential gap was 23 cfs. At Quincy, the model indicated a potential gap on 7% of days in the modeled period. The average potential gap in the model results at this node was 4 cfs. As with the Flint River Basin analysis, these are not observed results, but results from a modeling exercise based on the assumptions described above.

Part of the Lower Flint-Ochlockonee Water Planning Region falls in the Chattahoochee River Basin (see Figure 2-1). In the resource assessment model, the Chattahoochee River Basin had several regulated nodes. The model results showed that consumptive demand and instream flow targets could be met over the modeled period. Downstream needs for water use and flow were met in the model by using available conservation storage in the system’s reservoirs. The model results estimated the amount of conservation storage remaining when storage reached its lowest in the modeled period. Table 3-2 shows the lowest conservation storage remaining in the basin’s reservoirs under modeled current conditions.

### Table 3-1: Summary of Surface Water Availability Resource Assessment Results: Flint and Ochlockonee Rivers (Current Conditions)

<table>
<thead>
<tr>
<th>Node</th>
<th>Length of Potential Gap (% of Time)</th>
<th>Average Potential Gap (cfs)</th>
<th>Long-Term Average Flow (cfs)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Carsonville</td>
<td>0%</td>
<td>0</td>
<td>2,138 (1,382 mgd)</td>
</tr>
<tr>
<td>Montezuma</td>
<td>0%</td>
<td>0</td>
<td>3,321 (2,146 mgd)</td>
</tr>
<tr>
<td>Bainbridge</td>
<td>12%</td>
<td>372 (240 mgd)</td>
<td>7,866 (5,084 mgd)</td>
</tr>
<tr>
<td>Concord</td>
<td>8%</td>
<td>23 (15 mgd)</td>
<td>1,094 (707 mgd)</td>
</tr>
<tr>
<td>Quincy</td>
<td>7%</td>
<td>4 (3 mgd)</td>
<td>259 (167 mgd)</td>
</tr>
</tbody>
</table>

A small portion of the Lower Flint-Ochlockonee Water Planning Region is located in the Suwannee River Basin. Results for this basin are not included in this report, but can be found in the Suwannee-Satilla Regional Water Plan. The Lower Flint-Ochlockonee Water Planning Council will continue to communicate with the Suwannee Satilla Water Planning Council in evaluating assessment results to support coordination in their respective Regional Water Plans.

### Table 3-2: Summary of Surface Water Availability Resource Assessment Results: Chattahoochee River (Current Conditions)

| Reservoir | Modeled Minimum Reservoir Conservation Storage (acre-feet) | Modeled Minimum Percentage Reservoir Conservation Storage | Potential Basinwide Flow Requirement Gap
<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Whitesburg</td>
<td>454,119</td>
<td>42%</td>
<td>None</td>
</tr>
<tr>
<td>Columbus</td>
<td>15,807</td>
<td>5%</td>
<td>None</td>
</tr>
<tr>
<td>Columbia</td>
<td>15,693</td>
<td>6%</td>
<td>None</td>
</tr>
<tr>
<td>Woodruff</td>
<td>505,189</td>
<td>31%</td>
<td>None</td>
</tr>
</tbody>
</table>


**Notes:**

1) The following planning nodes (shown in Figure 2-1) were used to assess conservation storage in these reservoirs:
   - Lake Lanier: Whitesburg
   - West Point Lake: Columbus
   - Lake Walter F. George: Columbia
   - Lake Seminole/Composite Storage of Lanier, West Point, and W.F. George: Woodruff

2) Values are the single day minimum seen in the modeled period.

3) In the modeling, consumptive demand at 2011 levels and explicit flow requirements in federal permits and operating plans were fully met over the modeled period without any potential gaps. This included both at-site and basinwide flow requirements.

### 3.2.2 Groundwater Availability

The groundwater availability resource assessment estimated the sustainable yield for prioritized groundwater resources based on existing data. Sustainable yield, a term describing groundwater availability, was evaluated in a modeling assessment that looked at the amount of water that can be withdrawn without reaching specific thresholds that indicate the potential for local or regional impacts. The assessment...
estimated a range of yield that can be withdrawn from each aquifer before specific thresholds were reached in the modeling. EPD prioritized aquifers for assessment based on the characteristics of the aquifer, evidence of negative effects, anticipated negative impacts, and other considerations.

The groundwater assessment modeled responses of aquifers to different levels of water use and compared results with specific indicators of potential local or regional impacts. Indicators of impact include limiting use of neighboring wells (drawdown), reducing groundwater contributions to stream baseflows, and permanent reduction of aquifer levels. Sustainable yield estimates were determined by simulating withdrawals from existing wells and, where applicable, simulated new wells, until a threshold for one of these potential impacts was reached.

Model results are shown in Table 3-3. The sustainable yield results in Table 3-3 indicate the levels of use at which a threshold was exceeded in model simulations. Sustainable yield was estimated as a range for each aquifer based on multiple model runs with different assumptions about aquifer use. These assumptions varied for different aquifers. The results reflect modeled aquifer responses to specific baseline conditions and specific pumping scenarios. The minimum value is not necessarily the level at which impacts will be seen. Aquifer responses in the future will depend on

<table>
<thead>
<tr>
<th>Aquifer</th>
<th>Estimated 2015 Groundwater Withdrawal (mgd)</th>
<th>Estimated Sustainable Yield of Individual Aquifer (Min-Max, mgd)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Claiborne Aquifer</td>
<td>103</td>
<td>140 – 635</td>
</tr>
<tr>
<td>South-Central Georgia Upper Floridan</td>
<td>362</td>
<td>622 – 836</td>
</tr>
<tr>
<td>Upper Floridan Aquifer in the Dougherty Plain</td>
<td>452</td>
<td>237 – 328</td>
</tr>
</tbody>
</table>


2 For more detail on the groundwater availability resource assessment and results, see the March 2010 Synopsis Report: Groundwater Availability Resource assessment and the March 2017 Synopsis Report: Groundwater Availability Assessment Updates; both are available on the state water planning website.
how pumping is ultimately configured – where wells are located and how much pumping is applied at each location.

In Table 3-3, estimates of current aquifer use levels are given for comparison to the sustainable yield model results. Current aquifer use is estimated for the year 2015 and incorporates municipal, industrial, and energy sector groundwater use, as well as agricultural use during dry year conditions (see Section 4 for details on estimated 2015 water use).

The Lower Flint-Ochlockonee Water Planning Region includes the Claiborne, the Upper Floridan Aquifer in the Dougherty Plain, and the South-Central Georgia Upper Floridan Aquifers. The results in Table 3-3 indicate that estimated 2015 use is below the estimated sustainable yield range in the Claiborne and South-Central Georgia Upper Floridan, but it is above the estimated sustainable yield range for the Upper Floridan in the Dougherty Plain.

In these sustainable yield model results, if aquifer use is higher than the level at which a threshold was exceeded in the modeling (i.e., if it is within or above the range of modeled sustainable yields), this does not necessarily mean that the aquifer is likely to be exhausted by use. Instead, management practices may be needed to address potential impacts, and the Council considered these results in selecting the management practices and recommendations to the State presented in this Plan.

Results for the Claiborne Aquifer show a relatively wide range in estimated sustainable yield. The sustainable yield model results for each aquifer were expressed as a range to encompass two model scenarios with different assumptions about groundwater use. The lower end of the range was defined by a model scenario assuming that groundwater use will increase uniformly across the aquifer from existing well locations. The upper end of the range was defined based on a model scenario assuming that groundwater use will increase in a non-uniform manner geographically. The non-uniform assumption allowed for greater use because withdrawals could be held constant in areas where adverse impacts were a concern and increased in other areas where impacts did not approach thresholds that indicate local or regional impacts. The model results indicate that effects of use on this aquifer are dependent upon the location of withdrawals. The results indicate that some areas of the aquifer may have additional amounts of water that can be used sustainably, while other parts may show potential adverse impacts of use. These results indicate the need for caution in the management of withdrawals from the Claiborne Aquifer and the need for more specific analysis, based on the location of withdrawals, directed at preventing future adverse impacts.

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3 A map of the assessed aquifers is included as Supplemental Document 11 on the Council’s website.

4 These results are corroborated by those of a GEFA-funded study on characteristics of the Claiborne Aquifer (CDM Smith, Claiborne Aquifer Specific Capacity and Transmissivity Analysis Draft Report, December 2016).
As noted above, the sustainable yield model results estimate the volume of groundwater that can be used without crossing modeled thresholds that indicate the potential for local or regional impacts. In the model, aquifer use was increased until one of the thresholds that indicate these impacts was met. While most of the potential impacts relate to the health of the aquifer directly, the impact on groundwater contributions to stream baseflows was also evaluated where interconnection between surface water and groundwater is present. In the case of the Upper Floridan Aquifer in the Dougherty Plain, the sustainable yield results were limited by the modeled impact of groundwater withdrawals on groundwater contributions to stream baseflows.\(^5\) In the resource assessment model runs for this aquifer, localized thresholds for groundwater contributions to stream baseflows were reached when impacts on the aquifer itself were minimal (i.e., drawdown of the aquifer was less than five feet at modeled use levels). Therefore, the results of the groundwater assessment for this aquifer were considered together with those for the surface water availability assessment at the Bainbridge node as the Council developed its management practices and recommendations to the State.

### 3.2.3 Surface Water Quality

The water quality assessment modeled the capacity of Georgia’s surface waters to absorb pollutants without unacceptable degradation of water quality. The term assimilative capacity refers to the ability of a water body to naturally absorb pollutants via chemical and biological processes without exceeding state water quality standards or harming aquatic life.

The water quality assessment focused on available assimilative capacity for oxygen consuming wastes (affecting dissolved oxygen(DO)), nutrients (specifically total nitrogen and total phosphorus), and chlorophyll-a (a green pigment found in algae; the concentration of chlorophyll-a is used to assess lake water quality). Assessment of the ability to assimilate oxygen consuming wastes is important because aquatic life is dependent upon the amount of residual dissolved oxygen available in a stream. Two water quality model evaluations were performed:

1. **River Model (Dissolved Oxygen Modeling)** – This model evaluated dissolved oxygen due to existing point discharges under low-flow, high-temperature critical conditions. For the Flint River, a dynamic model was used that reflects varying conditions and also incorporated potential effects from nonpoint source stormwater runoff based on varying land uses.

2. **Lake and Watershed Models (Nutrient Modeling)** – These models evaluated the impacts of nutrient loading from point and nonpoint

\(^5\)Unlike the other aquifer units that were evaluated, where change in baseflow contribution to streams was evaluated for the whole aquifer unit, estimates of sustainable yield for the Upper Floridan Aquifer in the Dougherty Plain were determined by changes in baseflow to streams that were evaluated on a reach by reach basis. This finer-scale analysis represents a more conservative approach to the analysis.
sources, nutrient levels (specifically total nitrogen and total phosphorus), and chlorophyll-\(a\). The watershed and lake models accounted for nutrient sources from both wastewater discharges and nonpoint source stormwater runoff based on various land uses.

The water quality assessment is not the same as the 303(d) list of impaired waters for two reasons. First, this assessment only looked at dissolved oxygen and nutrients; the 303(d) list includes stream reaches listed as impaired on the basis of dissolved oxygen and other parameters, such as metals, bacteria, and biota. Second, the 303(d) list is based on analytical results from stream monitoring, while the water quality assessment is based on model results. Waters in the Lower Flint-Ochlockonee Water Planning Region that are included on the 303(d) list of impaired waters are discussed in Section 3.3.1.

Determining assimilative capacity requires information on the stream flow, in-stream water quality, wastewater discharges, water withdrawals, land application systems, weather information, land use, stream hydrology, topography, and state water quality standards. The water quality models were developed to show the status of the available assimilative capacity based on wastewater discharges at currently permitted levels. They were also used to evaluate future conditions (see Section 5.3).

**Dissolved Oxygen Modeling**

Figure 3-5 shows the in-stream dissolved oxygen model results for current discharges given critical low flow (7Q10), high temperature conditions. The current conditions assimilative capacity analysis incorporated municipal and industrial wastewater facilities operating at their full permitted discharge levels (flow and effluent discharge limits as of 2014). Stream segments that were predicted by the model to exceed the available assimilative capacity are shown in red. Streams that are at the allowable DO levels are shown in pink, and those predicted to have very good DO levels relative to state water quality standards are shown in blue.

It is important to note that some streams are naturally low in DO, but these streams cannot necessarily be discerned in Figure 3-5 because the map indicates the effects of discharges as well as natural conditions for all streams. Assimilative capacity appears to be available in most stream reaches in the Lower Flint-Ochlockonee Water Planning Region based on dissolved oxygen modeling results. The number of stream miles where model results showed assimilative capacity as exceeded or unavailable under current conditions in the model was 95.2 miles in the Flint River Basin (as a whole) and 11.1 miles in the Ochlockonee River Basin.

**Nutrient Modeling**

Watershed and lake models were run assuming current levels of water use and wastewater disposal and current land use profiles as inputs. These inputs accounted
for nutrient loading from the contributing watershed over twelve years of recently observed hydrology. The model results indicated that in the Flint River Basin, nonpoint sources currently contribute more total nitrogen than point sources, whereas point sources currently contribute more total phosphorus.

The lake models estimated the algal response, in terms of chlorophyll-a levels, to nutrient loading at current conditions over a multi-year modeling period. Three lakes in the Lower Flint-Ochlockonee Water Planning Region were modeled: Blackshear, Chehaw, and Seminole. However, nutrient standards have not been established for these lakes. The results indicated that in all three lakes, current total phosphorus loading is primarily from point sources, whereas current total nitrogen loading is primarily from nonpoint sources. While the lake model results cannot be compared against nutrient standards for these three lakes, the results do indicate how nutrient control efforts should be directed to manage current and future nutrient loading.6

3.3 Ecosystem Conditions and In-stream Uses

3.3.1 303(d) List and TMDLs

The State of Georgia assesses its water bodies for compliance with water quality standards, as required by the federal Clean Water Act. Waters of the State are monitored by EPD, USGS, and local authorities contracted by EPD. If an assessed water body is found not to meet standards, then it is considered “not supporting” its designated uses, and it is included on a list of impaired waters (303(d) list). Impairments must be addressed through the development of a Total Maximum Daily Load (TMDL), which sets a pollutant load and outlines a strategy for corrective action. Several stream reaches in the Lower Flint-Ochlockonee Water Planning Region are on the State’s list of impaired waters. A summary of impaired waters in this water planning region is provided in Figure 3-6.

3.3.2 Fisheries, Wildlife, and Recreational Resources

The Georgia Wildlife Resources Division (WRD) developed a broadly focused strategy that indicates areas of the State in which resources should be concentrated to facilitate the conservation of Georgia’s animals, plants, and natural communities in the Georgia State Wildlife Action Plan.7 High priority species and habitats were identified and summarized at the ecoregion level, and a total of five ecoregions were designated for the State. Portions of the Lower Flint-Ochlockonee Water Planning Region fall within the Southeastern Plains Ecoregion, with the remainder in the Piedmont Ecoregion. The WRD plan identified 145 high priority animal species in the

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6 See Section 5.3 for a discussion of future water quality modeling results.
Southeastern Plains Ecoregion. These included 22 birds, 7 mammals, 11 reptiles, 10 amphibians, 13 mollusks, 22 fish, 9 aquatic arthropods, and 57 terrestrial arthropods.

Critical habitat areas have been identified for federally listed endangered and threatened species of freshwater mussels in the region; more information can be found on the following U.S. Fish and Wildlife Service website: http://www.fws.gov/panamacity/mussels.html.

The Lower Flint-Ochlockonee Water Planning Region provides boaters, fishermen, and other outdoor enthusiasts with a diverse and easily accessible river environment. Lake Blackshear offers boating and fishing opportunities. The crystal blue springs of the lower part of the region are a unique recreational resource. Camping, hunting, and hiking trails are recreational options across the region. Important recreational fisheries in the region include shoal bass, Gulf striped bass, and black bass. The Department of Natural Resources manages State Parks and Historic Sites, Public Fishing Areas, boat ramps, fish hatcheries, and Wildlife Management Areas throughout the Lower Flint-Ochlockonee Water Planning Region.
Figure 3-5: Assimilative Capacity Results from Dissolved Oxygen Assessment: Flint and Ochlockonee Basins (Current)

Flint Basin - Available Assimilative Capacity (Total Mileage)

<table>
<thead>
<tr>
<th>Model Run</th>
<th>Very Good</th>
<th>Good</th>
<th>Moderate</th>
<th>Limited</th>
<th>At Assimilative Capacity</th>
<th>Exceeded</th>
</tr>
</thead>
<tbody>
<tr>
<td>Current</td>
<td>548.38</td>
<td>251.34</td>
<td>79.83</td>
<td>25.15</td>
<td>0.00</td>
<td>95.19</td>
</tr>
</tbody>
</table>

Ochlockonee Basin - Available Assimilative Capacity (Total Mileage)

<table>
<thead>
<tr>
<th>Model Run</th>
<th>Very Good</th>
<th>Good</th>
<th>Moderate</th>
<th>Limited</th>
<th>At Assimilative Capacity</th>
<th>Exceeded</th>
</tr>
</thead>
<tbody>
<tr>
<td>Current</td>
<td>76.13</td>
<td>24.54</td>
<td>17.85</td>
<td>9.25</td>
<td>0.00</td>
<td>11.14</td>
</tr>
</tbody>
</table>

Figure 3-6: Summary of Impaired Waters in the Lower Flint-Ochlockonee Water Planning Region

Legend
Stream Water Quality Category
- 1
- 3
- 4a
- 4a,4b
- 4b
- 4b,4a
- 4a,5
- 5

Rivers/Streams
Lake Water Quality Category
- 1
- 3
- 4a
- 5

Water Bodies
Water Planning Regions
County Boundaries
State Boundaries

Category Definitions:
1 - Waters meeting designated use(s).
2 - Waters having more than 1 designated use and data indicate at least one is being met, but there is insufficient evidence to determine that all uses are being met.
3 - Insufficient data or other information to make a determination as to whether or not the designated use(s) is being met.
4a - Data indicate that at least one designated use is not being met, but TMDL(s) have been completed for the parameter(s) that are causing impairment.
4b - Data indicate that at least one designated use is not being met, but there are actions in place (other than a TMDL) that are predicated to lead to compliance with water quality standards.
4c - Data indicate that no designated use is not being met, but the impairment is not caused by a pollutant.
5 - Data indicate that at least one designated use is not being met and TMDL(s) need to be completed for one or more pollutants.

<table>
<thead>
<tr>
<th>River Basin</th>
<th>Total River Miles Impaired in the Lower Flint-Ochlockonee Region</th>
</tr>
</thead>
<tbody>
<tr>
<td>Chattahoochee</td>
<td>16</td>
</tr>
<tr>
<td>Flint</td>
<td>16</td>
</tr>
<tr>
<td>Ochlocknee</td>
<td>64</td>
</tr>
<tr>
<td>Suwannee</td>
<td>116</td>
</tr>
<tr>
<td>Criterion Violated</td>
<td>DO</td>
</tr>
</tbody>
</table>

Note: Stream reaches may have more than one criterion violated, i.e. the sum of DO, Fecal Coliforms, Metals, and Other may be greater than the total number of stream miles listed as impaired. Metals includes mercury trophic-weighted residue value and fish consumptive guidance.

Source: EPD, Water Quality in Georgia 2012-2013
Section 4. Forecasting Future Water Resource Needs

Water and wastewater demand forecasts, along with the resource assessments (Sections 3 and 5), form the foundation for water planning in the Lower Flint–Ochlockonee Water Planning Region and serve as the basis for the selection of water management practices (Section 6). The tables and graphics in this section present the regional water and wastewater forecasts from 2015 through 2050 for four water use sectors: municipal, industrial, agriculture, and thermoelectric power generation. These forecasts provide conservative estimates of baseline levels of water use in the region and illustrate how those levels are expected to change over the planning horizon. More details on the water demand forecasts can be found in the following document, which is available on the Council’s website: Lower Flint-Ochlockonee Water Planning Region: Water and Wastewater Forecasting Technical Memorandum (2017).

4.1 Municipal Forecasts

The residential and commercial water demand and demands of small (non-major water using) industries were projected as one combined category and referred to as the municipal demand. Demands for major water using industries were projected separately and are discussed in Section 4.2.

4.1.1 Municipal Water Forecasts

Municipal water and wastewater forecasts were based on population projections that were developed by the Governor’s Office of Planning and Budget (OPB). In summary, the projections show that population in the Lower Flint-Ochlockonee Water Planning Region is expected to increase by 8.5% from 357,619 in 2015 to 387,904 in 2050. The population forecasts for this planning cycle showed a much lower growth rate than projected in the previous planning cycle. The Lower Flint-Ochlockonee Water Planning Council notes concern that planning for a lower growth rate, which may change again in future planning cycles, could limit economic opportunities in this region. Therefore, the Council urges caution in interpretation of future water needs for the region and consideration of the need for water resources to support the regional economy. County-level population projections for the region are available in
the water demand forecasting technical memorandum, which is cited above and available on the Council’s website.

The municipal water forecasts were calculated by multiplying an updated estimate of per capita water use by the population to be served. The per capita use estimates from the previous planning cycle were updated and adjusted based on an analysis of withdrawals from 2010 to 2014 and estimated population served, which are reported to EPD by permitted municipal water systems. The per capita use rates also reflect adjustment for expected water savings over time from the transition to ultra low flow toilets (1.28 gallons per flush maximum), as required by the Water Stewardship Act as of 2010. Additional details regarding development of the municipal water forecasts, including the per capita use rate, plumbing code savings, and results, are provided in the forecasting technical memorandum, which is cited above.

The resulting municipal water forecasts project that demand for municipal water in the Lower Flint-Ochlockonee Water Planning Region (including publicly-supplied and self-supplied demand) is expected to decrease from 49 mgd (76 cfs) in 2015 to 48 mgd (74 cfs) in 2050. Of these amounts, the forecasts estimate water sources as follows in 2050: 81% from groundwater by municipal systems and 19% from groundwater by private wells (self-supply). None is expected to be withdrawn from surface water.

4.1.2 Municipal Wastewater Forecasts

Wastewater may be treated by one of three major disposal systems: municipal wastewater treatment plant to point source discharge, municipal wastewater treatment to land application system, or onsite sanitary sewage system, also called septic systems. Historical data provided by EPD for 2014 was utilized for forecasting future municipal wastewater flows by county. The percent change between the updated population projection base year (2015) and each planning year (2020, 2030, 2040, and 2050) was applied to the municipal wastewater discharge totals from 2014 for each county to obtain estimated total county municipal wastewater discharge flows for each planning year. The ratio of point source flows to land application system flows was held proportionate to the 2014 flow conditions. Any known (permitted) facility expansion plans were also considered. To calculate the projected wastewater flow to be treated by septic systems, the forecasts for treatment by septic systems for each planning year from the forecasting efforts of the previous planning cycle were multiplied by the percentage change in population projections between the two rounds of forecasting. Further detail can be found in the forecasting technical memorandum, which is cited above and can be found on the Council’s website.

The demand for municipal wastewater treatment in the Lower Flint-Ochlockonee Water Planning Region is projected to increase from 56 mgd (87 cfs) in 2015 to 58 mgd (90 cfs) in 2050 in the region. For these amounts, disposal of treated wastewater is expected to be as follows in 2050: 6% by land application systems, 62% by systems with point source discharges, and 32% by septic systems.
4.2 Industrial Forecasts

Industrial water and wastewater demand forecasts anticipate the future needs for industries in this water planning region. Industries require water for use in their production processes, sanitation, cooling, as well as employee use and consumption. The industrial forecasts were not updated for this planning cycle and remain the same as they were in the previous planning cycle. The forecasts presented in this section were based upon estimates, made in the previous planning cycle, of the rate of growth in employment for specific industrial sectors, estimates of the rate of growth in the units of production for specific industrial sectors, or other relevant information provided by specific industrial water users. The industrial forecasts include major industrial water users and wastewater generators that supply their own water and/or treat their own wastewater. Some industries rely on municipal systems for water supply and wastewater treatment. Where data were available, municipally supplied or treated industrial water use was included in the industrial water and wastewater forecast. Other municipally-served industrial users, generally with lesser demands, are serviced by municipal water and wastewater systems and were accounted for in the municipal forecasts.

4.2.1 Industrial Water Forecasts

In the previous planning cycle, the industrial water demand forecasts were calculated using information and data specific to each of the major water using industries. For industries where information was available on water use per unit of production, water forecasts were based on production. For industries where production-based forecasts were not possible, industry-specific workforce projections were assumed to reflect the anticipated growth in water use within the industry. In the previous planning cycle, the University of Georgia provided industry-specific rates of growth for employment, which were used to calculate the future water needs for specific industries in this water planning region. The employment projections for the Lower Flint-Ochlockonee Water Planning Region indicated that overall employment in major water-using industries is expected to increase by 25% between 2010 and 2050. This projection was maintained for this planning cycle.

Industrial demand for water in the Lower Flint-Ochlockonee Water Planning Region is forecast to increase from 131 mgd (203 cfs) in 2010 to 133 mgd (206 cfs) in 2050. The forecast estimated water sources for industry in the region as follows in 2050: 83% from surface water and 17% from groundwater.¹ This is a slight change from the ratio for 2015, which was projected at 84% surface water and 16% groundwater.

¹ Employment projections and more information on the industrial water and wastewater forecasts are included in forecasting technical memorandum cited at the beginning of Section 4 and available on the Council’s website.
4.2.2 Industrial Wastewater Forecasts

Industrial wastewater forecasts were calculated in the previous planning cycle for each sector by multiplying the industrial water demand forecast by the ratio of wastewater generated to water used for that industrial sector. The primary mechanism for deriving the wastewater to water ratios was through a statewide analysis of multiple years of actual annual average water return and withdrawal data for permitted users. Default ratios were then averaged by industry type and applied to the forecasted water volumes to generate a wastewater forecast. Information provided by industrial stakeholder groups was also used to adjust ratios within a region or industry, as appropriate. The forecasts project that industrial wastewater treatment will increase from 127 mgd (196 cfs) in 2015 to 129 mgd (200 cfs) in 2050 in the Lower Flint-Ochlockonee Water Planning Region. Of these amounts (current and future), wastewater treatment is expected as follows: 2% treated by land application systems and 98% treated by systems with point source discharges.

4.3 Agricultural Water Demand Forecasts

For this planning cycle, agricultural water demands were prepared by the Georgia Water Planning & Policy Center at Albany State University (GWPPC), with support from the University of Georgia's College of Agricultural and Environmental Sciences. GWPPC was contracted by EPD to prepare estimates of water use by the agricultural sector in Georgia. The projections cover irrigation for row and orchard crops as well as most vegetable and specialty crops and account for more than 95% of Georgia's irrigated land. Additionally, estimates of current use were made for animal agriculture, horticultural nurseries, and greenhouses.

Estimates of current agricultural demand were calculated from data collected through the Agricultural Water Metering Program administered by EPD. Agricultural water demand, both annual and monthly, was calculated using metered observations from the 2010 to 2013 growing seasons. In addition, agricultural irrigation water demand was projected for groundwater and for surface water sources for the years 2015, 2020, 2030, 2040, and 2050 using methods consistent with the previous round of regional water planning. Each year's projection included a wet year, a normal year, and a dry year to simulate a range of weather conditions. Irrigated areas for each crop were projected from the baseline of year 2015 acres using economic models. Water withdrawal quantities were computed as the product of the projected irrigated area for a crop (acres), the predicted monthly irrigation application depth (inches), and the proportion of irrigation water derived from a source (fraction). For planning purposes, it was decided to use dry year values (75th percentile) for each water planning region since they represent a more conservative scenario than the normal (50th percentile) value.

In summary, the agricultural water use forecasts project that dry year agricultural water use in the Lower Flint-Ochlockonee Water Planning Region will increase by
4. Forecasting Future Water Resource Needs

16% from 2015 to 2050. The forecasts for agricultural water use for this water
planning region by source type, including animal and horticultural operations as well
as irrigation row crops, are as follows:

- 2015 Annual Average Dry Year Use (75th Percentile) = 590 mgd (913 cfs)
  Groundwater Use = 504 mgd (780 cfs)
  Surface Water Use = 86 mgd (133 cfs)

- 2050 Annual Average Dry Year Use (75th Percentile) = 687 mgd (1,063 cfs)
  Groundwater Use = 594 mgd (919 cfs)
  Surface Water Use = 92 mgd (142 cfs)

4.4 Thermoelectric Power Production Water Demand Forecasts

Water demands forecasts 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 forecasts for this sector address both water withdrawal requirements and water
consumption. Information related to water withdrawals is an important consideration
in planning for the water needed for energy production. Water consumption is
important to consider in assessment of net impacts on instream flows. Many power
facilities that withdraw large volumes of water also return large portions of those
withdrawals to the sources from which they were withdrawn.

The following factors were updated for the revised forecasts for water demand for
thermoelectric power: statewide energy demand; existing facilities; facilities under
construction; planned and permitted new facilities; facilities recently or to be retired;
and changes in generating configuration. The water withdrawal and consumptive use
factors that were estimated for each generating configuration were maintained from
the previous planning cycle. A full discussion of the water demands forecast
methodology for this sector is provided in two documents: "Statewide Energy Sector
Water Demand Forecast," which is a technical memorandum from the previous
planning cycle, and "Update of GA Energy Needs & Generating Facilities," which is a
2017 technical memorandum from this planning cycle. Both documents are available
on the state water planning website.

In the Lower Flint-Ochlockonee Water Planning Region, there are three
thermoelectric power facilities considered in the forecasts. Of these, Plant Mitchell in
Dougherty County is being decommissioned, and therefore, it does not have future
water needs in the forecasts. The other two facilities are Gum Power Plant in Mitchell
County and Crisp County Power Commission Plant in Worth County, and the
forecasts address the water needs for these facilities. The current withdrawal for
these facilities in 2015 was 85 to 87 mgd (158 to 162 cfs). In 2050, water withdrawals are projected to be 5 to 6 mgd (9 to 11), which reflects a significant decrease due to the final decommissioning of Plant Mitchell. Consumptive use by thermoelectric power facilities in the Lower Flint-Ochlockonee Water Planning Region is zero for current and future use estimates.

4.5 Total Water Demand Forecasts

In the Lower Flint-Ochlockonee Water Planning Region, estimated total 2015 water use is 858 mgd (1,327 cfs), and total 2050 water use is projected to increase to 874 mgd (1,352 cfs) in 2050. As shown in Figure 4-1, agricultural water use accounts for the largest proportion of 2015 water use by a significant margin, and it is expected to continue to be the largest future water use in this water planning region. As a result, much of the Council’s planning effort has been focused on the agricultural sector. The Council notes the importance of agriculture to the region’s economy in its goals (Section 1.3). Access to water has made the region attractive for the development of the agricultural economy. Recent periods of drought have led to the need to better understand water use impacts and to plan for meeting the needs of water users and the natural system.

As shown in Figure 4-2, the forecasts project that wastewater flows in the Lower Flint-Ochlockonee Water Planning Region will decrease from 270 mgd (418 cfs) in 2015 to 193 mgd (299 cfs) in 2050, primarily due to the retirement of Plant Mitchell. With the decommissioning of this plant, wastewater flow projections immediately decrease and slowly increase through the remainder of the planning period. Figure 4-3 details the source categories for current and forecasted water demand and the treatment methods for current and forecasted wastewater flows.
4. Forecasting Future Water Resource Needs

**Figure 4-1: Water Demand in 2015 and 2050**

- **2015**
  - Municipal, 49 MGD, 6%
  - Industrial, 131 MGD, 15%
  - Energy, 87 MGD, 10%
  - Agriculture, 590 MGD, 69%
  - TOTAL = 858 MGD

- **2050**
  - Municipal, 48 MGD, 5%
  - Industrial, 133 MGD, 15%
  - Energy, 6 MGD, 1%
  - Agriculture, 687 MGD, 79%
  - TOTAL = 874 MGD

**Figure 4-2: Wastewater Flow in 2015 and 2050**

- **2015**
  - Municipal, 56 MGD, 21%
  - Energy, 87 MGD, 32%
  - Industrial, 127 MGD, 47%
  - TOTAL = 270 MGD

- **2050**
  - Municipal, 58 MGD, 30%
  - Energy, 6 MGD, 3%
  - Industrial, 129 MGD, 67%
  - TOTAL = 193 MGD

*Note: Values are totals for the entire Lower Flint-Ochlocknee Water Planning Region, which includes portions of several watersheds.*
**Figure 4-3: Total Water and Wastewater Forecasts**

- **Values**: Totals for entire water planning region, which includes portions of several watersheds.
- **Conversion**: From mgd to cfs, use the formula: $cfs = mgd \times 1.5472$.
Section 5. Comparison of Water Resource Capacities and Future Needs

This section discusses the results of the future resource assessments, which modeled how the forecasts of water and wastewater needs in the Lower Flint-Ochlockonee Water Planning Region (Section 4) compare with the capacities of the region’s water resources. The model results provided the Lower Flint-Ochlockonee Water Planning Council with information on resources to address with management practices by indicating potential gaps between water resource needs and capacities. They supported the Council in selecting appropriate management practices (Section 6) that will help the region to meet its future water needs, protect water resources, and meet the Council’s vision and goals for this water planning region. Where potential gaps were identified by the resource assessment models, the Council considered the potential adverse impacts, both environmental and economic, of the potential gaps and how to address them. Management practice selection was guided by the Council’s understanding of the modeling results and potential gaps, as well as by the Council’s vision and goals for the region (see Section 1.3).

5.1 Surface Water Availability Comparisons

To assess future conditions, the surface water availability assessment model described in Section 3.2.1 was run using the updated 2050 forecast water demands presented in Section 4. Table 5-1 summarizes the resource assessment results for planning nodes in the Flint and Ochlockonee River Basins. The results for 2050 were similar to those modeled under current demand conditions (which were based on 2011 water use, as discussed in Section 3.2.1).

In the Flint River Basin, at Carsonville and Montezuma, the resource assessment model did not identify any potential gaps in surface water availability in 2050. At Bainbridge, the model results indicate a potential gap in surface water availability under 2050 conditions. The potential gap at Bainbridge occurred 9% of the time in the modeled period, and the average potential gap on those days was 290 cfs (187 mgd). Table 5-2 analyzes the occurrences of potential gaps at Bainbridge in the 2050 conditions model results with respect to their frequency, length, and magnitude.
5. Comparison of Water Resource Capacities and Future Needs

At the Bainbridge node, the potential gap identified by the resource assessment model was affected, in part, by modeled use of surface water and groundwater in Subarea 4 of the Upper Floridan Aquifer in the Dougherty Plain, where interconnection with the surface water is high. Subarea 4 includes the Flint River Basin south of Dooly County, part of the lower Chattahoochee River Basin, and a narrow strip on the eastern side of the Ochlockonee and Suwannee River Basins.¹

In the Ochlockonee River Basin, the model results indicated potential gaps in surface water availability at Concord and Quincy under 2050 conditions, as well as current conditions. The occurrences of potential gaps at Concord and Quincy in the model run results with respect to their frequency, length, and magnitude can also be found in Table 5-2.

<table>
<thead>
<tr>
<th>Node</th>
<th>Length of Potential Gap (% of Time)</th>
<th>Average Potential Gap (cfs)</th>
<th>Long-Term Average Flow (cfs)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Carsonville</td>
<td>0%</td>
<td>0</td>
<td>2,138 (1,382 mgd)</td>
</tr>
<tr>
<td>Montezuma</td>
<td>0%</td>
<td>0</td>
<td>3,321 (2,146 mgd)</td>
</tr>
<tr>
<td>Bainbridge</td>
<td>9%</td>
<td>290 (187 mgd)</td>
<td>7,993 (5,166 mgd)</td>
</tr>
<tr>
<td>Concord</td>
<td>6%</td>
<td>26 (17 mgd)</td>
<td>1,110 (717 mgd)</td>
</tr>
<tr>
<td>Quincy</td>
<td>7%</td>
<td>4 (2.6 mgd)</td>
<td>259 (167 mgd)</td>
</tr>
</tbody>
</table>


It is not surprising that the results of the resource assessments of current and future conditions would be similar, or even that the future assessments might show smaller potential gaps in some areas, because the current conditions assessment was based on water demand in an extreme drought year (2011 or approximately 90th percentile), while the future conditions assessment was based on water demand in dry years (75th percentile). In addition, the recent decrease in acreage irrigated by surface water in some parts of this water planning region set a lower starting point for projections of future water demand.

¹ A map of Subarea 4 of the Floridan Aquifer is available as Supplemental Document 5 on the Council’s website.
As noted, the quantification and frequency of the modeled potential gaps are provided in Table 5-2. It is important to note that the majority of the modeled potential gaps were shorter in duration (1 to 7 day and 8 to 14 day potential gaps events). The more infrequent and severe potential gaps are indicative of drought conditions and will most likely be addressed through drought management measures.

As noted in Section 3.2.1, part of the Lower Flint-Ochlockonee Water Planning Region falls in the Chattahoochee watershed. In the Chattahoochee under 2050 demand conditions, the model results indicate consumptive demands and instream flow targets could be met over the modeled period (i.e., the model did not indicate any potential gaps in surface water availability). However, in the modeled results, conservation storage levels in some basin reservoirs fell lower to meet in-stream needs and demands than under 2011 demand conditions. The model results estimated the amount of conservation storage remaining when storage reached its lowest in the period of record. The lowest level of aggregate conservation storage in the system’s major reservoirs was 31% of available conservation storage (which was the same as when modeled for current conditions with 2011 water demands; see Table 3-2). Chattahoochee River Basin model results for 2050 conditions are summarized in Table 5-3.

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2 As described in Section 3, small portions of the Lower Flint-Ochlockonee Water Planning Region occur in the Suwannee and Chattahoochee River Basins. Chattahoochee resource assessment results are summarized in this Plan. Results for the Suwannee are not included in this Plan, but can be found in the Regional Water Plan for the Suwannee-Satilla Water Planning Council. The Lower Flint-Ochlockonee Water Planning Council will continue to communicate with the Suwannee Satilla Water Planning Council in evaluating assessment results to support coordination in their respective Regional Water Plans.
### Table 5-2: Characteristics of Modeled 2050 Potential Surface Water Gaps

<table>
<thead>
<tr>
<th>Length of Gap Event</th>
<th>Number of Gap Events (% of Total Gap Events)</th>
<th>Total Number of Gap Days in Each Category, 1939-2013 (% of Total Days)</th>
<th>Average Daily Flow Deficit Per Gap Event (cfs)</th>
<th>Average Cumulative Flow Deficit Per Event (cfsd)</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Bainbridge Node</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1 – 7 days</td>
<td>225 (72.1%)</td>
<td>670 (2.5%)</td>
<td>139</td>
<td>518</td>
</tr>
<tr>
<td>8 – 14 days</td>
<td>48 (15.4%)</td>
<td>482 (1.8%)</td>
<td>258</td>
<td>2,567</td>
</tr>
<tr>
<td>15 – 30 days</td>
<td>21 (6.7%)</td>
<td>464 (1.7%)</td>
<td>324</td>
<td>7,159</td>
</tr>
<tr>
<td>&gt; 30 days</td>
<td>18 (5.8%)</td>
<td>850 (3.2%)</td>
<td>387</td>
<td>18,070</td>
</tr>
<tr>
<td><strong>Totals</strong></td>
<td>312 (100%)</td>
<td>2466 (9.2%)</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Concord Node</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1 – 7 days</td>
<td>75 (54%)</td>
<td>249 (0.9%)</td>
<td>11</td>
<td>47</td>
</tr>
<tr>
<td>8 – 14 days</td>
<td>33 (24%)</td>
<td>354 (1.3%)</td>
<td>21</td>
<td>224</td>
</tr>
<tr>
<td>15 – 30 days</td>
<td>18 (13%)</td>
<td>387 (1.4%)</td>
<td>23</td>
<td>477</td>
</tr>
<tr>
<td>&gt; 30 days</td>
<td>13 (9%)</td>
<td>706 (2.6%)</td>
<td>33</td>
<td>1,864</td>
</tr>
<tr>
<td><strong>Totals</strong></td>
<td>139 (100%)</td>
<td>1,696 (6.2%)</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Quincy Node</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1 – 7 days</td>
<td>106 (60%)</td>
<td>328 (1.2%)</td>
<td>2</td>
<td>9</td>
</tr>
<tr>
<td>8 – 14 days</td>
<td>38 (21%)</td>
<td>391 (1.4%)</td>
<td>4</td>
<td>42</td>
</tr>
<tr>
<td>15 – 30 days</td>
<td>22 (12%)</td>
<td>477 (1.7%)</td>
<td>3</td>
<td>64</td>
</tr>
<tr>
<td>&gt; 30 days</td>
<td>12 (7%)</td>
<td>679 (2.5%)</td>
<td>6</td>
<td>358</td>
</tr>
<tr>
<td><strong>Totals</strong></td>
<td>178 (100%)</td>
<td>1,875 (6.8%)</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

### 5. Comparison of Water Resource Capacities and Future Needs

#### Table 5-3: Summary of Surface Water Availability Resource Assessment Results – Chattahoochee River (Future Conditions, 2050)

<table>
<thead>
<tr>
<th>Reservoir</th>
<th>Modeled Minimum Reservoir Conservation Storage (acre-feet)</th>
<th>Modeled Minimum Percentage Reservoir Conservation Storage</th>
<th>Potential Basinwide Flow Requirement Gap</th>
</tr>
</thead>
<tbody>
<tr>
<td>Whitesburg</td>
<td>389,703</td>
<td>36%</td>
<td>None</td>
</tr>
<tr>
<td>Columbus</td>
<td>15,807</td>
<td>5%</td>
<td>None</td>
</tr>
<tr>
<td>Columbia</td>
<td>18,648</td>
<td>8%</td>
<td>None</td>
</tr>
<tr>
<td>Woodruff</td>
<td>509,834</td>
<td>31%</td>
<td>None</td>
</tr>
</tbody>
</table>


Notes:
1) The following planning nodes (shown in Figure 2-1) were used to assess conservation storage in these reservoirs:
   - Lake Lanier: Whitesburg
   - West Point Lake: Columbus
   - Lake Walter F. George: Columbia
   - Lake Seminole/Composite Storage of Lanier, West Point, and W.F. George: Woodruff

2) Values are the single day minimum seen in the modeled period.

3) In the modeling, consumptive demand at 2050 levels and explicit flow requirements in federal permits and operating plans were fully met over the modeled period without any potential gaps. This included both at-site and basinwide flow requirements.

#### 5.2 Groundwater Availability Comparisons

Section 3.2.2 discusses the groundwater resource assessment, estimated sustainable yield results, and current use of assessed aquifers. Table 5-4 compares the estimated sustainable yield results to 2050 forecast demands for those aquifers. As discussed in Section 3, the groundwater availability assessment model evaluated the effects of increasing levels of aquifer use and compared the results against thresholds that indicate the potential for local or regional impacts. Table 5-4 indicates that in the Upper Floridan Aquifer in the Dougherty Plain, forecasted 2050 use will be above the estimated sustainable yield range for the aquifer. More detail on the methods and results of the groundwater availability resource assessment can be found in the Synopsis Report: Groundwater Availability Assessment (EPD, 2010) and Synopsis Report – Groundwater Availability Assessment Updates (EPD, 2017), both of which are available on the state water planning website.
As noted in Section 3.2.2., aquifer use higher than the modeled sustainable yield range does not necessarily mean that the aquifer is likely to be exhausted by use. Instead, management practices may be needed to address potential impacts, and the Council considered these results in selecting the management practices and recommendations to the State presented in this Plan.

As also discussed in Section 3.2.2, in the Upper Floridan Aquifer in the Dougherty Plain, the estimated sustainable yield results were determined based upon the impact of groundwater withdrawals on groundwater contributions to stream baseflows, rather than drawdown in the aquifer itself. Therefore, these results were considered together with those observed in the surface water availability assessment at the Bainbridge node as the Council developed its management practices and recommendations to the State.³

For the Claiborne Aquifer, projected 2050 use during dry years is below the lower end of the estimated sustainable yield range for that aquifer. Due to increasing interest in use of the Claiborne Aquifer as an alternative water supply, EPD conducted additional studies of the aquifer over the past several years and collected data on specific capacity at a number of locations. These studies indicate that specific capacity of the aquifer is variable. Some areas of the aquifer may be more likely to support large withdrawals than others. In all areas, availability of groundwater from this aquifer will be limited by other users. These results indicate the need for caution in the management of withdrawals.

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³ As noted in Section 3.2.2, for analysis of sustainable yield for the Upper Floridan Aquifer in the Dougherty Plain, changes in baseflow to streams were evaluated on a reach by reach basis, which is a relatively conservative approach to the analysis.
from this aquifer and the need for more specific analysis, based on the location of withdrawals, directed at preventing future adverse impacts.

EPD is currently evaluating the Claiborne Aquifer’s time-varying response to withdrawals. The resource assessment modeling done during the first round of planning assumed steady state conditions. Evaluating use of the aquifer for additional irrigation demand, which is seasonal, will be more effective if time-varying effects can be considered. The model results, once completed, will be available for future consideration by the Council.

5.3 Surface Water Quality Comparisons

In Section 3, Figure 3-5 shows the water quality model results related to the availability of assimilative capacity under current conditions for flow and oxygen consuming wastes that affect levels of dissolved oxygen. This section shows water quality model results regarding the availability of assimilative capacity for oxygen-consuming wastes under future (2050) conditions. For the future conditions modeling, areas that had shown limited or no assimilative capacity for dissolved oxygen in the current conditions modeling needed to be addressed. To do this, EPD incorporated some assumptions regarding future (2050) permitted flows and modifications to permit effluent limits in the future conditions modeling. Since EPD cannot issue permits that will violate water quality standards, EPD will continue to evaluate and modify future permit requests and adjust permit limits to avoid potential DO violations.

Figure 5-1 shows the modeled assimilative capacity at assumed future (2050) permitted flow and effluent limits. Water quality model results indicate that while permit limits can address limitations on assimilative capacity, some streams are projected to experience decreasing availability of assimilative capacity in the Flint River Basin as discharge flows increase in the future. In other areas, expected improvements in wastewater treatment are projected to improve available assimilative capacity under future conditions. The number of stream miles in the Flint River Basin where assimilative capacity is projected by the model to be exceeded or unavailable will decrease from 95.2 miles under current conditions to 0 miles by 2050, based on modeling assumptions. More information regarding the type of assumptions made under future conditions modeling is provided in the Synopsis Report, Surface Water Quality (Assimilative Capacity) Resource Assessment (May 2017), which is available on the state water planning website.

Watershed and lake models were also run at future conditions (2050). The model results indicated that in the Flint River Basin, while nonpoint sources currently contribute more total nitrogen than point sources, future increases in total nitrogen loading will come more from point sources than nonpoint sources. The lake model results indicated that in Lakes Blackshear and Chehaw, total phosphorus loading in the future will be primarily from point sources, as it is under current conditions. In Lake Seminole, the model results indicated that future increases in nutrient loadings will be primarily point source related. As noted in Section 3.3, these lakes do not have established nutrient standards, and
therefore, the lake model results cannot be compared against standards for these lakes. However, the model results are useful as an indication of where management practices should be directed to control nutrient loading.

Water quality is also assessed by compliance with state water quality standards. Impaired waters where water quality standards are not met are discussed in Section 3.3.1.
5. Comparison of Water Resource Capacities and Future Needs

Figure 5-1: Assimilative Capacity Results from Dissolved Oxygen Assessment: Flint and Ochlockonee Basins (2050)

<table>
<thead>
<tr>
<th>Model Run</th>
<th>Very Good</th>
<th>Good</th>
<th>Moderate</th>
<th>Limited</th>
<th>At Assimilative Capacity</th>
<th>Exceeded</th>
</tr>
</thead>
<tbody>
<tr>
<td>2050</td>
<td>595.73</td>
<td>262.83</td>
<td>107.93</td>
<td>33.4</td>
<td>0.00</td>
<td>0.00</td>
</tr>
</tbody>
</table>

Legend

- **Very Good ≥ 1 mg/L DO available**
- **Good 0.5 mg/L to < 1 mg/L DO available**
- **Moderate 0.2 mg/L to < 0.5 mg/L DO available**
- **Limited > 0 mg/L to < 0.2 mg/L DO available**
- **At Assimilative Capacity 0 mg/L DO available**

5.4 Summary of Potential Gaps Between Resource Capacities and Future Needs

The resource assessment model results discussed in this section identified the following as potential gaps between resource capacities and water needs in the Lower Flint-Ochlockonee Water Planning Region:

- The model identified potential gaps in surface water availability in the Flint River Basin at Bainbridge and in the Ochlockonee River Basin at Quincy and Concord under both current and forecasted demands.
- Groundwater use is below the estimated sustainable yield range identified by the model for the Claiborne Aquifer and for the Upper Floridan Aquifer in South-Central Georgia. It is above the estimated sustainable yield range identified by the model for the Upper Floridan Aquifer in the Dougherty Plain.
- Water quality model results indicated decreasing availability of assimilative capacity in streams in some areas of the Flint River Basin as discharge flows increase in the future. In other areas, expected improvements in wastewater treatment are projected to improve availability of assimilative capacity under future conditions.

The Lower Flint-Ochlockonee Water Planning Council has considered these potential gaps and their potential adverse impacts on this water planning region, both environmental and economical. In order to meet the Council's vision and goals for the region and given the results considered in this section, the Council developed this Regional Water Plan to address these potential gaps as follows:

- **Surface water availability**: Address potential gaps with conservation and supply augmentation practices as much as possible, while also collecting better information to support more thorough evaluation of resource capacity and the impacts of potential gaps identified by the assessment models on in-stream and downstream uses.
- **Groundwater availability**: Use of the Claiborne Aquifer should be further evaluated in order to develop appropriate management strategies that address geographic and time-based variations in capacity and demands. In the Upper Floridan Aquifer in the Dougherty Plain, the impact of groundwater withdrawals on surface water flows in the Flint River Basin continues to be a determining factor in guiding the location and amount of groundwater use from this aquifer. Collect better and more geographically specific information on groundwater resource capacity, as needed to evaluate specific uses and management practices.
- **Surface water quality**: Implement practices targeted especially toward nonpoint source of pollutants to improve assimilative capacity and reduce
nutrient loading in the region’s streams and lakes. It is expected that EPD will adjust point source permit limits over time as needed to address assimilative capacity constraints and nutrient criteria. More nonpoint source controls may be needed to address nutrient criteria. Collect more complete information to support the targeting of management practices for water quality in the future.

The Lower Flint-Ochlockonee Water Planning Council questions whether the criteria used to determine potential "gaps" for surface water flows (as defined in the resource assessment models) are appropriate metrics by which to evaluate the impacts of consumptive water use on the state’s water resources. The potential “gaps” are not defined in terms of demonstrable environmental harm and could be interpreted as a need to severely limit reasonable use by lawfully permitted users. The Council disagrees with the approach to identifying potential “gaps” used in this planning process because:

(a) A potential gap is not defined by impacts on aquatic health or downstream users;

(b) It is not clear what the impacts of a potential gap are;

(c) Potential gaps occur as a result of use that has already been legally permitted in this water planning region; and

(d) The maximum potential gap cannot be closed through demand management even with complete cessation of consumptive water use when a potential gap occurs.

Closing the potential “gaps” could ultimately cause significant harm to this water planning region’s economy and would be counter to the Council’s vision and goals (i.e., supporting the region’s economy, ensuring access to water resources for existing and future water users, maintaining the production agriculture-based economy of the region, and supporting sustainable economic growth in the region). The Council recommends additional study to determine more appropriate flow targets that account for permitted reasonable use and demonstrable environmental impacts for use in future planning. The Council commits to working with EPD to improve the metrics used in the resource assessment models for future water planning.
Section 6. Addressing Water Needs and Regional Goals

6.1 Identifying Water Management Practices

The Lower Flint-Ochlockonee Water Planning Council considered the following as it selected management practices for this Regional Water Plan:

- Existing plans and practices
- Potential gaps identified by the resource assessment models in the comparison of resource needs and resource capacities (see Sections 3 & 5)
- Council’s vision and goals (see Section 1)
- Public input
- Coordination with local governments, neighboring water planning councils, and the Metropolitan North Georgia Water Planning District

The Council’s decision-making process to adopt management practices and recommendations was consensus-based, where possible, according to the Council’s Operating Procedures and Rules for Meetings. In cases where consensus could not be reached, decisions were approved by voting. In order to coordinate beyond the water planning region, Council members met with representatives of neighboring water planning councils and the Metropolitan North Georgia Water Planning District to discuss shared resources. In these meetings, the Council worked with its neighbors toward adoption of coordinated or complementary management practices. Within the region, the Council sought to coordinate with local governments and build support for this plan through implementation of the Council’s Public Involvement Plan.

The Council identified several uncertainties that could impact implementation of this Regional Water Plan, including:

- Outcome of litigation in Florida v. Georgia No.142 by the U.S. Supreme Court: A decision by the Supreme Court is expected in late

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1 These documents are available with the Council’s Memorandum of Agreement on the Council’s website.
2 Available as Supplemental Document 2 on the Council’s website.
2017 or early 2018. The outcome of the case could have substantial implications for ACF management and implementation of Regional Water Plans. Although the Special Master’s recommendation is known, the final outcome of the case is still uncertain. The Council expects to be able to revise this Plan, if necessary, pending the outcome of this decision.

- **Endangered Species Act concerns in Critical Habitat for Endangered and Threatened freshwater mussels**: Critical habitat has been designated for federally listed endangered and threatened freshwater mussels in streams in the Lower Flint-Ochlockonee Water Planning Region. Local flow regimes needed to support these species have not yet been fully defined, and until a clear plan to resolve potential conflicts between water users and imperiled aquatic species is developed, concern about potential future enforcement or litigation over listed species creates uncertainty for water users over future water access in this water planning region. Because the resource assessments conducted for this Plan focused at the regional level, they were not intended to address sub-regional habitat concerns for listed species. However, through its work on this Plan, the Lower Flint-Ochlockonee Water Planning Council identified a need for more localized assessments in some areas to support future planning. For more information on listed freshwater mussels in the region, see: [http://www.fws.gov/panamacity/mussels.html](http://www.fws.gov/panamacity/mussels.html)

- **Implementation of numeric nutrient criteria for Florida’s lakes and flowing waters**: These water quality criteria have implications for water quality dischargers and other stakeholders in Georgia. Over the next several years, Georgia will implement a strategy that is likely to include point source discharge limits and nonpoint source management to address these criteria. At this time, Georgia is monitoring water quality to support strategy development and will coordinate with stakeholders in affected watersheds as the strategy is developed. More information on the nutrient criteria is available on the following website: [https://www.epa.gov/fl/epas-approval-floridas-numeric-nutrient-criteria-rules](https://www.epa.gov/fl/epas-approval-floridas-numeric-nutrient-criteria-rules)

- **Information needs to support improved water quality and quantity management**: The limits of available information constrain planning decisions, and the Lower Flint-Ochlockonee Water Planning Council has identified numerous information needs to support improved future planning and management. For more detail on recommendations to address information needs, see Section 7.4.

Despite uncertainties, the Council proceeded with plan development based on the best information currently available. The Council intends that future revisions of this Plan will improve upon the current plan when possible, as conditions change and
new information becomes available, and better promote the attainment of the Council’s vision and goals for this water planning region.

Several supplemental documents were developed for the previous planning cycle to provide supporting information and analysis and inform the Council in management practice selection. These documents were included as supplemental documents for the 2011 version of this Plan. While the documents are several years old, they still provide information that supported plan review and revision. These documents include the following, which can be found on the Council’s website:

- Public Participation Technical Memorandum
- Existing Regulatory and Local Plan Summary
- Agricultural Water Use Technical Memorandum
- EPD Technical Memorandum Flow Gap Analysis
- Management Practice Selection Technical Memorandum
- Water Conservation Technical Memorandum
- EPD Technical Memorandum Summary Future Resource Assessment in ACF River Basins

### 6.2 Selected Water Management Practices for the Lower Flint-Ochlockonee Water Planning Region

The management practices selected by the Lower Flint-Ochlockonee Water Planning Council are summarized in Table 6-1. The table is organized by the type of practice: Demand Management (DM), Supply Management and Flow Augmentation (SF), and Water Quality (WQ). Four management practices were selected by the Council as most important to fulfilling the Council’s vision and goals and addressing potential gaps identified by the resource assessment models. These practices are marked as “high priority” practices. A discussion of the management practices follows the table.
### Table 6-1: Water Management Practices Selected for the Lower Flint-Ochlockonee Water Planning Region

<table>
<thead>
<tr>
<th>Management Practice</th>
<th>Description/Definition of Action</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>DEMAND MANAGEMENT (DM)</strong></td>
<td></td>
</tr>
<tr>
<td><strong>Issues Addressed</strong></td>
<td><strong>Surface water and groundwater availability</strong></td>
</tr>
<tr>
<td><strong>Potential Gaps Addressed</strong></td>
<td><strong>Surface water availability potential gaps at Bainbridge (Flint), Pinetta (Suwannee), and Quincy and Concord (Ochlockonee); groundwater availability potential gap in Upper Floridan Aquifer in the Dougherty Plain</strong></td>
</tr>
<tr>
<td><strong>Council Goals Addressed</strong></td>
<td><strong>1, 2, 3, 4</strong></td>
</tr>
</tbody>
</table>

**DM1: Continue to improve agricultural water use efficiency through innovation and technology**

- Irrigation efficiency has greatly improved over the past several decades as a result of the implementation of innovations in equipment and practices. For example, field verification of irrigation systems in the Lower Flint-Ochlockonee Water Planning Region completed between 2013 and 2015 confirmed that over 90% of center pivot irrigation systems utilize low pressure or low-pressure, drop nozzle technology.
- This trend is expected to continue and economic, environmental, and regulatory pressures are expected to drive further innovation in water conservation for agriculture.
- This management practice addresses not only hardware and software technology in these investigations, but also ‘softer’ technologies involving crop choice, crop genetics, rotational practices, tillage practices, and voluntary or incentivized land-use practices, such as crop conversions and land-cover conversions.
- While the benefits of specific innovations cannot be predicted at this time, the Council expects that the future benefits of innovation will be substantial.

**DM2: Implement non-farm water conservation practices in the Lower Flint-Ochlockonee Water Planning Region**

- State laws and regulations address the following water conservation practices:
  - Submittal of water conservation plans by water withdrawal permittees and demonstration by water withdrawal permittees of progress toward water conservation goals or water efficiency standards (Ga. Comp. R. & Regs R. 391-3-6-.07(4) and 391-3-2-.04(11))
  - Landscape irrigation limits based on Drought Response Level and as required by Ga. Comp. R. & Regs R. 391-3-30-.03 (with exemptions)
Table 6-1: Water Management Practices Selected for the Lower Flint-Ochlockonee Water Planning Region

<table>
<thead>
<tr>
<th>Management Practice</th>
<th>Description/Definition of Action</th>
</tr>
</thead>
<tbody>
<tr>
<td>• Even-odd watering restrictions for non-irrigation outdoor water uses during Drought Response Level 2 and 3 (Ga. Comp. R. &amp; Regs R. 391-3-30)</td>
<td></td>
</tr>
<tr>
<td>• Car wash facility best management practices and certification requirements (Ga. Comp. R. &amp; Regs R. 391-31-.03)</td>
<td></td>
</tr>
<tr>
<td>• Water loss auditing requirements for public water systems (serving more than 3,300 individuals), according to IWA/AWWA Water Audit Method³ (Ga. Comp. R. &amp; Regs R. 391-3-33, OCGA §12-5-4.1)</td>
<td></td>
</tr>
<tr>
<td>• Installation of submeters in multi-unit residential buildings and certain retail and light industrial buildings granted permits for construction after July 1, 2012 (OCGA 12-5-180.1)</td>
<td></td>
</tr>
<tr>
<td>• Building code standards for high efficiency plumbing fixtures in new construction after July 1, 2012 (OCGA 8-2-3)</td>
<td></td>
</tr>
<tr>
<td>• Building code standards for high efficiency cooling towers in new construction permitted after July 1, 2012 (OCGA 8-2-23)</td>
<td></td>
</tr>
</tbody>
</table>

Additionally, the Council supports and encourages the adoption of voluntary water conservation measures. Utilize existing incentive programs to support the use of these practices.

DM3: Implement agricultural water conservation practices in the Lower Flint-Ochlockonee Water Planning Region

Agricultural water conservation practices required by existing law include:

- Implementation of conservation requirements under the Flint River Basin Water Development and Conservation Plan (2006); see Management Practice DM5
- Agricultural irrigation efficiency requirements and schedule (OCGA § 12-5-546.1)
- Compliance with the Water Stewardship Act of 2010 (OCGA §12-5-31) regarding active, inactive, and unused permits

The efficiency requirements adopted by OCGA 12-5-546.1 reflect benchmarks recommended by the Council in its 2011 plan, with some modifications. A focus on a desired performance outcome will support increased conservation while allowing

6. Addressing Water Needs and Regional Goals

Table 6-1: Water Management Practices Selected for the Lower Flint-Ochlockonee Water Planning Region

<table>
<thead>
<tr>
<th>Management Practice</th>
<th>Description/Definition of Action</th>
</tr>
</thead>
</table>
| DM4: Implement voluntary agricultural water conservation practices in the Lower Flint-Ochlockonee Water Planning Region with the support of incentive programs | - Field verification of irrigation systems in the Lower Flint-Ochlockonee Water Planning Region completed between 2013 and 2015 confirmed that approximately 90% of center pivot irrigation systems (accounting for 93% of irrigated acreage in the region) utilize low pressure or low-pressure, drop nozzle technology. Adoption of this hardware helps a permit holder meet the agricultural irrigation requirement for 2020 that is incorporated into state law (OCGA § 12-5-546.1).  
- Continued implementation of voluntary agricultural water conservation practices should be supported with incentive funding, which is available from federal programs (Natural Resources Conservation Service), Soil and Water Conservation Districts, and the Georgia Soil and Water Conservation Commission (GSWCC).  
- State funding should continue to be pursued to provide support for conservation practice implementation.  
- Soil and Water Conservation Districts should continue and expand public outreach to support and promote conservation practice implementation by farmers. Encourage farmers to access Natural Resources Conservation Service (NRCS) programs that provide funding to support adoption of conservation practices.  
- Quantitative data collection on voluntary conservation practice adoption by farmers should be expanded to the rest of the Flint and Chattahoochee River Basins. Additionally, implementation data should be collected on other water conservation practices (in addition to hardware adoption). This information will help to identify areas where incentive funding or implementation assistance can have the most impact. |
### Table 6-1: Water Management Practices Selected for the Lower Flint-Ochlockonee Water Planning Region

<table>
<thead>
<tr>
<th>Management Practice</th>
<th>Description/Definition of Action</th>
</tr>
</thead>
</table>
| **DM5:** Manage agricultural water withdrawal permits in the Flint River Basin      | At this time, there is a moratorium on new or expanded agricultural surface water withdrawal permits in the Lower Flint River Basin and groundwater withdrawal permits in Subarea 4 of the Upper Floridan Aquifer in the Dougherty Plain. If the moratorium is lifted, new and expanded permits should continue to be subject to the conservation provisions in existing law and regulation based on the 2006 Flint River Basin Water Development and Conservation Plan and the 2014 amendments to the Flint River Drought Protection Act. The 2006 plan limited new agricultural withdrawal permits based on expected impact on nearby wells and streams. The 2006 plan applied the following requirements to new agricultural water withdrawal permits in the Flint River Basin:  
  - New permits require mandatory conservation measures, such as end-gun shut off switches and leak prevention and repair, as a condition of the permit.  
  - New surface water permits in Ichawaynochaway and Spring Creek sub-basins must suspend use when streamflow drops below 25% Average Annual Discharge instead of 7Q10.  
  - New permits in the Flint River Basin require a $250 application fee and are valid for 25 years. The 2014 amendments to the Flint River Drought Protection Act require all irrigation systems in the Flint River Basin to meet efficiency requirements by 2020 (OCGA § 12-5-546.1). |
| **DM6:** Research new tools for agricultural water demand management to determine their feasibility, costs, and benefits for Georgia | More study is needed to determine if alternative withdrawal permit and/or irrigation management structures would be appropriate and beneficial for water users and water resources in Georgia.                                                                                       |

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4 The moratorium announcement, including a map of the affected area, can be found at the following link: [http://www.georgiawaterplanning.org/documents/20120730_Flint_Suspension_Announcement.pdf](http://www.georgiawaterplanning.org/documents/20120730_Flint_Suspension_Announcement.pdf).
### Table 6-1: Water Management Practices Selected for the Lower Flint-Ochlockonee Water Planning Region

<table>
<thead>
<tr>
<th>Management Practice</th>
<th>Description/Definition of Action</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>SUPPLY MANAGEMENT AND FLOW AUGMENTATION (SF)</strong></td>
<td></td>
</tr>
<tr>
<td><strong>Issues Addressed</strong></td>
<td><strong>Surface water and groundwater availability</strong></td>
</tr>
<tr>
<td><strong>Potential Gaps Addressed</strong></td>
<td><strong>Surface water availability potential gaps at Bainbridge (Flint), Pinetta (Suwannee), and Quincy and Concord (Ochlockonee); groundwater availability potential gaps in Upper Floridan Aquifer in the Dougherty Plain</strong></td>
</tr>
<tr>
<td><strong>Council Goals Addressed</strong></td>
<td><strong>1, 2, 3, 4</strong></td>
</tr>
<tr>
<td><strong>SF1: Evaluate reservoir storage options in the Flint River Basin, including better utilization of existing storage, that can provide for flow augmentation in dry periods</strong></td>
<td><strong>HIGH PRIORITY</strong> MANAGEMENT PRACTICE</td>
</tr>
<tr>
<td></td>
<td>• Eliminating the potential gap for surface water availability at Bainbridge would require the addition of storage that can be used to augment supply and flows in the Flint River Basin.</td>
</tr>
<tr>
<td></td>
<td>• The evaluation of reservoir options for the Flint River Basin should include assessment of feasibility, siting, costs, benefits, and environmental and economic impacts.</td>
</tr>
<tr>
<td></td>
<td>• Release guidelines for existing reservoirs in the Flint River Basin should be evaluated to support potential increases in instream flows.</td>
</tr>
<tr>
<td><strong>SF2: Replace surface water withdrawals with groundwater withdrawals, where site specific evaluation indicates that this practice is practical and will not harm environmental resources</strong></td>
<td><strong>HIGH PRIORITY</strong> MANAGEMENT PRACTICE</td>
</tr>
<tr>
<td></td>
<td>• This practice could support increased in-stream flows in some places in this water planning region.</td>
</tr>
<tr>
<td></td>
<td>• The cost of this practice is high for individual farmers, and costs may limit its feasibility. The Council recommends that this practice be implemented with incentives.</td>
</tr>
<tr>
<td></td>
<td>• The practice should only be used where it will not adversely impact other environmental resources, especially groundwater. The resource assessment results indicate possible opportunities for application in the Claiborne Aquifer, but the potential for site-specific and transient impacts requires further evaluation.</td>
</tr>
<tr>
<td></td>
<td>• The Council recommends that for permittees that implement this practice, the affected permits will maintain their status prior to conversion; grandfathered surface water withdrawal permits would be converted to groundwater withdrawal permits with the same regulatory status as before conversion with respect to conservation requirements, seniority, and potential interruption.</td>
</tr>
<tr>
<td></td>
<td>• The Council acknowledges efforts by the State to evaluate</td>
</tr>
</tbody>
</table>
6. Addressing Water Needs and Regional Goals

Table 6-1: Water Management Practices Selected for the Lower Flint-Ochlockonee Water Planning Region

<table>
<thead>
<tr>
<th>Management Practice</th>
<th>Description/Definition of Action</th>
</tr>
</thead>
<tbody>
<tr>
<td>Groundwater development as an alternative water source in the past six years. These studies provide an important base of information, but do not support a comprehensive strategy for such groundwater development. The Council recommends continued efforts to support implementation of this management practice and the development of a comprehensive strategy for groundwater development as an alternative agricultural water supply.</td>
<td></td>
</tr>
<tr>
<td>• A key feature of successfully implementing this strategy will be to make sure that the sustainable yield of groundwater sources is better understood and not overallocated. Connectivity between overlying and underlying aquifers should also be addressed. The most up to date aquifer models should be utilized and peer reviewed.</td>
<td></td>
</tr>
</tbody>
</table>

**SF3**: Evaluate streamflow augmentation via direct pumping from aquifers in order to support in-stream flows in dry periods

<table>
<thead>
<tr>
<th>SF3: Evaluate streamflow augmentation via direct pumping from aquifers in order to support in-stream flows in dry periods</th>
<th>• In dry periods, streamflow might be augmented through direct pumping of groundwater into surface water streams.</th>
</tr>
</thead>
<tbody>
<tr>
<td>• Several factors could limit the potential use of this practice, including: groundwater yields, water quality, cost, aquifer impacts, and streamflow impacts of aquifer pumping.</td>
<td></td>
</tr>
<tr>
<td>• Implementation of this practice could be beneficial, but requires thorough evaluation to ensure that adverse environmental impacts are avoided and implementation is cost-effective.</td>
<td></td>
</tr>
<tr>
<td>• A pilot project for streamflow augmentation is being implemented in the Lower Flint River Basin and continued evaluation of this project should inform future implementation of this management practice.</td>
<td></td>
</tr>
<tr>
<td>• Recent revisions to the Flint River Drought Protection Act address the conservation of flows from state funded augmentation projects and require notification of downstream water withdrawal permittees regarding preservation of such flows (OCGA § 12-5-546.2).</td>
<td></td>
</tr>
</tbody>
</table>

**SF4**: Continue to evaluate and consider Aquifer Storage and Recovery (ASR) with thorough evaluation of potential impacts

<table>
<thead>
<tr>
<th>SF4: Continue to evaluate and consider Aquifer Storage and Recovery (ASR) with thorough evaluation of potential impacts</th>
<th>• ASR could be a tool for use at specific sites in this water planning region where it might benefit flow augmentation. It could be used to withdraw and store surface water during periods of high flow and provide augmentation for flows in dry periods.</th>
</tr>
</thead>
<tbody>
<tr>
<td>• The feasibility of ASR projects can vary greatly depending on location, condition of the receiving aquifer and water</td>
<td></td>
</tr>
</tbody>
</table>
### Table 6-1: Water Management Practices Selected for the Lower Flint-Ochlockonee Water Planning Region

<table>
<thead>
<tr>
<th>Management Practice</th>
<th>Description/Definition of Action</th>
</tr>
</thead>
</table>
| **SF5: Continue** <br>**development of farm ponds in the Lower Flint-Ochlockonee Water Planning Region** | • On-farm water storage that is filled in periods of high flow can replace or reduce direct pumping for irrigation from surface streams or wells during drought periods.  
• Implementation of this management practice would be greatly enhanced if funds were available for farm pond development.  
• Impacts on flows through intercepted drainage and evaporative loss should be considered to minimize adverse impacts on surface water availability.  
• Future permits for farm pond withdrawals should include low flow protection requirements similar to those required in the Flint River Basin Water Development and Conservation Plan of 2006.  
• EPD has advanced the understanding of how farm ponds are used in Georgia and how to incorporate them into the surface water availability resource assessment. However, better understanding of farm pond operation and impacts is needed to support more thorough evaluation. |
| **SF6: Restrict the**<br>**development of new land application systems (LAS) for municipal and industrial wastewater treatment** | • A preference for treatment systems that discharge to surface water over land application of wastewater supports increased return flows to the surface water.  
• The Council recommends that new Land Application Systems be used only as an option of last resort.  
• Treatment by land application systems currently accounts for 3.5 mgd or 6.3% of the total treated wastewater volume in the Lower Flint-Ochlockonee Water Planning Region. In Section 4.1.2, this proportion was held constant in the
6. Addressing Water Needs and Regional Goals

Table 6-1: Water Management Practices Selected for the Lower Flint-Ochlockonee Water Planning Region

<table>
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</thead>
<tbody>
<tr>
<td>wastewater treatment forecast. This management practice would seek to reduce the proportion treated by land application systems in the future. <em>The Council recommends a feasibility study on the retirement of land application systems. The study should address flow restoration estimates and funding needs.</em></td>
<td></td>
</tr>
</tbody>
</table>

**WATER QUALITY (WQ)**

<table>
<thead>
<tr>
<th>Issues Addressed</th>
<th>Point and nonpoint source water pollution</th>
</tr>
</thead>
<tbody>
<tr>
<td>Potential Gaps Addressed</td>
<td>Water quality violations</td>
</tr>
<tr>
<td>Council Goals Addressed</td>
<td>1, 4</td>
</tr>
</tbody>
</table>

WQ1: Improve enforcement of existing permits and regulations and implementation of existing plans and practices

**HIGH PRIORITY**

**MANAGEMENT PRACTICE**

The Council recommends the following:
- Continue enforcement of existing discharge permits.
- Ensure continued enforcement of erosion and sediment control regulations.
- Continued implementation of existing management plans and practices, such as the TMDL plans for specific stream reaches to address specific parameters.
- Raise awareness of anticipated changes in nutrient standards among the regulated community. Develop new nutrient standards through a process with substantial stakeholder engagement and input.
- Accelerate efforts to address the combined sewer overflow (CSO) in Albany with a goal of zero discharge as a result of the CSO. Direct state funding toward improvements needed to attain this goal. The Council requests regular updates on implementation of the long-term control plan for the Albany CSO. Increase the frequency of monitoring of the Albany CSO outfalls.
- Advocate for a study of methods for coordinating and applying existing state resources to comprehensively address water quality.

WQ2: Improve implementation of nonpoint source controls

The Council recommends the following:
- Encourage adoption of the Georgia Stormwater Management Manual by local municipalities.
6. Addressing Water Needs and Regional Goals

Table 6-1: Water Management Practices Selected for the Lower Flint-Ochlockonee Water Planning Region

<table>
<thead>
<tr>
<th>Management Practice</th>
<th>Description/Definition of Action</th>
</tr>
</thead>
<tbody>
<tr>
<td>• Increase implementation of best management practices throughout this water planning region by all industries.</td>
<td></td>
</tr>
<tr>
<td>• Improve documentation of best management practices throughout this water planning region for all industries.</td>
<td></td>
</tr>
<tr>
<td>• Advocate for an assessment of agricultural Best Management Practice (BMP) implementation.</td>
<td></td>
</tr>
<tr>
<td>• Encourage agricultural landowners to adopt water quality BMPs with a priority focus on nutrient removal. Encourage farmers to participate in NRCS programs such as the Conservation Stewardship Program and to complete farm conservation plans, which may include on-farm nutrient management. Encourage adoption of practices including nutrient management planning, cover crops, and animal waste management.</td>
<td></td>
</tr>
<tr>
<td>• Encourage delegation of erosion and sediment control review and inspection to local municipalities supported by professional engineering resources.</td>
<td></td>
</tr>
<tr>
<td>• Create a complaint response program, similar to that of the Georgia Forestry Commission for the silvicultural industry, to provide for the resolution of water quality concerns from agricultural sources through coordination, cooperation, and technical assistance with agricultural landowners.</td>
<td></td>
</tr>
<tr>
<td>• Raise awareness of anticipated changes in nutrient standards among sectors that are sources of nonpoint source nutrient loading. Develop new nutrient standards through process with substantial stakeholder engagement and input.</td>
<td></td>
</tr>
</tbody>
</table>

Georgia’s Best Management Practices for Forestry (http://www.gatrees.org/forest-management/water-quality/bmps/BMPManualGA0609.pdf) describes benchmark BMP guidelines for Streamside Management Zones (SMZs), Forest Roads, Stream Crossings, Timber Harvesting, Site Preparation, Reforestation and all other forestry related practices. The Georgia Forestry Commission (GFC) conducts a biennial statewide BMP implementation survey in accordance with the Southern Group of State Foresters protocol. Randomly selected forestry operations are selected statewide and evaluated for appropriate BMP implementation. In 2015, the GFC evaluated 213 sites totaling 32,932 acres statewide. Forestry BMPs were properly implemented at a rate of 91.2%. In the Lower Flint-Ochlockonee Water Planning Region, 13 sites evaluated, and a 96.8% implementation rate was observed. The GFC also investigates forest water quality complaints and works with landowners, timber buyers and loggers to correct any issues of non-compliance with forestry BMPs. In calendar year 2016, complaint cases investigated by the GFC resulted in a 15% increase in the BMP implementation with a final overall average implementation of 95.6%. A total of 28 water quality risks were initially identified and 100% eliminated due to GFC involvement. In cases where the GFC cannot get satisfactory compliance, the case is turned over to EPD for enforcement. GFC’s forestry BMP monitoring is documented and provided to the forest industry as an update on current BMP compliance. GFC’s Forest Water Quality Program accomplishments are reported to EPD quarterly.
6. Addressing Water Needs and Regional Goals

Table 6-1: Water Management Practices Selected for the Lower Flint-Ochlockonee Water Planning Region

<table>
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<tr>
<th>Management Practice</th>
<th>Description/Definition of Action</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>WQ3:</strong> Increase implementation of pollution prevention</td>
<td>Encourage industries to utilize the service of pollution prevention assistance programs, including resources available from the University of Georgia College of Agricultural and Environmental Sciences and other state and federal programs.</td>
</tr>
<tr>
<td><strong>WQ4:</strong> Continue to fund and implement water quality monitoring</td>
<td>Maintain water quality monitoring in this water planning region to support resource assessments, planning, and management.</td>
</tr>
<tr>
<td><strong>WQ5:</strong> Apply coordinated state resources to address water quality</td>
<td>Coordinate implementation across agencies (regional, state, and federal) to improve program implementation.</td>
</tr>
</tbody>
</table>

The Lower Flint-Ochlockonee Water Planning Council selected these management practices to apply to the whole Lower Flint-Ochlockonee Water Planning Region. Although the water planning region’s boundaries encompass multiple surface water and groundwater resources, the Council believes that the management practices will benefit all of these resources.

The selected management practices were adopted by the Council because they address potential gaps identified by the resource assessment models between resource needs and resource capacities, discussed in Sections 3, 4, and 5. The practices were also selected to fulfill the Council’s vision and goals for this water planning region (see Section 1.3).

The Council has extensively discussed the potential gaps identified by the surface water availability and groundwater availability assessment models. The model results indicated potential gaps for these resources in the Flint and Ochlockonee River Basins and in the Upper Floridan Aquifer in the Dougherty Plain. The potential gaps, including that in the Upper Floridan Aquifer in the Dougherty Plain, relate to the depletion of surface water flows in drought periods, as a result of consumptive use of surface water and groundwater. At many points in the period of record, the potential gaps identified by the surface water availability model are sufficiently large (especially the potential surface water availability gap at Bainbridge) that they could not be eliminated from the model results without suspension of consumptive water use, construction of large-scale storage, or both.
The potential gap identified by the groundwater availability assessment model in Upper Floridan Aquifer in the Dougherty Plain resulted from the impact of groundwater use on groundwater contributions to stream baseflows and does not reflect an adverse impact of groundwater use on aquifer levels. The model predicted drawdown in the aquifer of less than five feet. Moreover, the Upper Floridan Aquifer in this area is known to recover quickly as a result of recharge.

In 2010, the Lower Flint-Ochlockonee Water Planning Council and neighboring water planning councils (Upper Flint and Middle Chattahoochee) requested additional modeling from EPD to determine the scale of storage that would be needed to offset the potential gap at Bainbridge identified by the 2010 surface water availability resource assessment. The Council did not make this modeling request with the intention of proposing storage as the only management practice to address the potential gap, but rather it made this request to aid Council members and others in understanding the magnitude of the potential gap and the potential management practices (storage or otherwise) needed to address it.

The resource assessment model was run with this objective, and it was determined that the amount of storage needed to completely offset potential gaps identified by model in the 2010 resource assessment at Bainbridge is 162,223 acre-feet. The resource assessment model was updated in 2017, and the model indicates different results for potential gaps at Bainbridge, but in amounts of similar magnitude to the gap analysis from the 2010 resource assessment.

This storage offset estimate accounts only for the volume needed to offset the potential gap. It does not include additional volume that would be necessary (e.g., to offset evaporation, seepage, and other loss factors) or that might be added to provide for additional purposes (e.g., recreation). According to the model results, in 2007, a reservoir of 162,223 acre-feet would have been emptied completely to address the potential gap at the Bainbridge node. Furthermore, it would not have completely offset the potential gap as a result of evaporation and seepage losses. Therefore, this estimate is not a design estimate for a reservoir. It does, however, indicate that a reservoir, or reservoirs, of significant size would be needed to fully offset the potential gap identified by the resource assessment model at Bainbridge.7

As described above, the Lower Flint-Ochlockonee Water Planning Council selected management practices to address its vision and goals and potential gaps identified by the resource assessment models. However, the implications of the potential gaps for other users, in-stream needs, and aquifer health are not fully understood; evaluation is needed to delineate and quantify the impacts of the potential gaps. Without a more complete understanding of severity of these impacts, the Council would violate its own vision and goals if it were to recommend complete closing of

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7 The results of the storage estimate model run for the Bainbridge node are described in Supplemental Document 16 - EPD Technical Memorandum - Summary Future (2050) Resource Assessment in ACF River Basins Scenario MidChat_SWFA0001 (2010), available on the Council’s website.
the potential gaps. The Council’s vision and goals call for sustainable management of water resources that ensures access for existing and future water uses, maintains the production agriculture based economy of the region, and supports sustainable economic growth, while also protecting public health, natural systems, and quality of life. Complete closure of the potential gaps would require complete cessation of water withdrawals by agriculture in dry periods unless and until offsetting storage or augmentation are implemented. The complete cessation of consumptive use would have severe economic impacts for water users in this water planning region, especially agriculture. It would be a major water policy shift with extraordinary implications for the region’s economy and quality of life. Such drastic action is not justified. Construction of large-scale storage or augmentation can help to address potential gaps, but these are high-cost options that require thorough evaluation to ensure environmental protection and cost-effectiveness. Moreover, implementation of storage or augmentation would require several years for permitting and development.

The resource assessments are designed to help the regional water planning councils identify areas where management practices might be needed to ensure that a region’s water resources can sustainably meet long-term demands for multiple uses. The assessments are designed to be highly conservative in identifying potential impacts. The modeling exercise that was completed to determine how to fully offset the potential gap informed the Council’s selection of management practices, but it did not determine management practice selection. The Council recognizes both the value and the limitations of the resource assessment model and relies on them as one input for guidance in planning.

The Lower Flint-Ochlockonee Water Planning Council included several demand management practices to address surface water and groundwater availability concerns. The Council recognizes and commends water users already practicing demand management in the region. Conservation is widely used in this water planning region by municipalities, farmers, industries, individuals, and others. The Council found that there is currently no comprehensive assessment of the extent of existing water conservation activities. Recent efforts to conduct field verification of conservation equipment adoption by farmers in the Lower Flint River Basin have initiated development of a baseline dataset. However, without a more comprehensive understanding of baseline implementation of water conservation, the ability to quantify the benefit of future conservation activities is substantially limited. The Council addresses the need for baseline conservation information in its recommendations to the state in Section 7.4.

The Council recognizes that water resource planning should follow an integrated approach. Planning must consider the full range of water needs on a basinwide scale and consider and address how water quantity and quality management are directly linked and interdependent. For example, flows levels affect water quality conditions, and wastewater treatment methods have important implications for return flows. The integrated nature of water resource management means that many of the Council’s
management practices have important implications for both water quantity and quality in this water planning region’s water systems. These interdependencies were considered by the Council in plan development and should be considered in implementation of this Plan.

As the regional water planning process evolves, the Lower Flint-Ochlockonee Water Planning Council recommends the development of more precise measures of the health of the State’s water resources. Moreover, the Council emphasizes that the resource assessment models developed and used for this plan are planning tools; they should not be relied upon as policy tools. The Council makes further recommendations about information needs and the resource assessment models in Section 7.4.
Section 7. Implementing Water Management Practices

This section presents the Lower Flint-Ochlockonee Water Planning Council’s roadmap for the implementation of the management practices identified in Section 6. It details schedules for implementation, responsible parties, and cost estimates for implementation. It also describes the alignment of this Regional Water Plan with other plans that address or relate to water resources in this water planning region. It ends with recommendations from the Council related to information needed to improve future planning and water policy changes that would facilitate attainment of the Council's vision and goals for the Lower Flint-Ochlockonee Water Planning Region.

7.1 Implementation Schedule and Responsible Parties

Table 7-1 details actions, identifies responsible parties, and provides timeframes for implementation of the management practices in Table 6-1. Short-term practices are those which will be implemented or encouraged over the five-year timeframe leading up to the next update of this Plan. Long-term management practices vary in duration and scope and will require further study and development to define time requirements. As noted in Section 6, the Council selected these management practices to apply to the whole Lower Flint-Ochlockonee Water Planning Region. Although the region’s boundaries encompass multiple surface water and groundwater resources, the Council believes that the management practices will benefit all water resources in this water planning region.
### Table 7-1: Implementation Schedule for Lower Flint-Ochlockonee Water Planning Region

<table>
<thead>
<tr>
<th>Management Practice</th>
<th>Short-term Actions</th>
<th>Long-term Actions</th>
<th>Responsible Parties</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>DEMAND MANAGEMENT (DM)</strong></td>
<td><strong>Issues Addressed</strong></td>
<td><strong>Potential Gaps Addressed</strong></td>
<td><strong>Council Goals Addressed</strong></td>
</tr>
<tr>
<td></td>
<td>Surface water and groundwater availability</td>
<td>Surface water and groundwater potential gaps at Bainbridge (Flint), Pinetta (Suwannee), and Quincy and Concord (Ochlockonee); groundwater availability potential gap in Upper Floridan Aquifer in the Dougherty Plain</td>
<td>1, 2, 3, 4</td>
</tr>
<tr>
<td></td>
<td>DM1: Continue to improve agricultural water use efficiency through innovation and technology <strong>HIGH PRIORITY MANAGEMENT PRACTICE</strong></td>
<td>Continue research of irrigation technology and methods and adopt new technology and methods (on-going)</td>
<td>Agricultural irrigators GSWCC Soil and Water Conservation Districts NRCS University researchers</td>
</tr>
<tr>
<td></td>
<td>DM2: Implement non-farm water conservation practices in the Lower Flint-Ochlockonee Water Planning Region</td>
<td>Continue compliance with and implementation and enforcement of regulations (on-going) Implement voluntary water conservation measures (on-going)</td>
<td>EPD Surface water and groundwater withdrawal permittees</td>
</tr>
<tr>
<td></td>
<td>DM3: Implement agricultural water conservation practices in the Lower Flint-Ochlockonee Water Planning Region</td>
<td>Continue compliance with and implementation and enforcement of regulations (on-going) Continue implementation of existing incentive programs and evaluate the need for new incentive programs (on-going)</td>
<td>EPD Agricultural irrigators Soil and Water Conservation Districts NRCS GSWCC</td>
</tr>
<tr>
<td></td>
<td>DM4: Implement voluntary agricultural water conservation practices in the Lower Flint-Ochlockonee Water Planning Region with the support of incentive programs</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
### Table 7-1: Implementation Schedule for Lower Flint-Ochlockonee Water Planning Region

<table>
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<tr>
<th>Management Practice</th>
<th>Short-term Actions</th>
<th>Long-term Actions</th>
<th>Responsible Parties</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>DM5:</strong> Manage agricultural water withdrawal permits in the Lower Flint-Ochlockonee Water Planning Region according to the 2006 Flint River Basin Water Development and Conservation Plan and other applicable state regulations and policy</td>
<td>Continue implementation of Flint River Basin Water Development and Conservation Plan (2006) and other applicable regulations</td>
<td>EPD Agricultural surface water and groundwater withdrawal permittees</td>
<td></td>
</tr>
<tr>
<td><strong>DM6:</strong> Research new tools for agricultural water demand management to determine their feasibility, costs, and benefits for Georgia</td>
<td>Conduct research into feasibility, costs and benefits of agricultural permit limit quantification and agricultural irrigation institutions Present results for consideration to Council and EPD</td>
<td>Implement recommendations from research as appropriate (pending availability of funding) University researchers EPD Permittees</td>
<td></td>
</tr>
</tbody>
</table>

**SUPPLY MANAGEMENT AND FLOW AUGMENTATION (SF)**

<table>
<thead>
<tr>
<th>Issues Addressed</th>
<th>Surface water and groundwater availability</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Potential Gaps Addressed</strong></td>
<td>Surface water availability potential gaps at Bainbridge (Flint), Pinetta (Suwannee), and Quincy and Concord (Ochlockonee); groundwater availability potential gap in Upper Floridan Aquifer in the Dougherty Plain</td>
</tr>
<tr>
<td><strong>Council Goals Addressed</strong></td>
<td>1, 2, 3, 4</td>
</tr>
</tbody>
</table>
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<tr>
<th>Management Practice</th>
<th>Short-term Actions</th>
<th>Long-term Actions</th>
<th>Responsible Parties</th>
</tr>
</thead>
</table>
| **SF1: Evaluate reservoir storage options in the Flint River Basin, including better utilization of existing storage, that can provide for flow augmentation in dry periods**
**HIGH PRIORITY MANAGEMENT PRACTICE** | Identify funding for evaluation, conduct studies, and report to Council, EPD and other policymakers by next planning cycle | Implement recommendations of study | Council EPD Neighboring councils University researchers Consulting firms Georgia Environmental Finance Authority (GEFA) |
| **SF2: Replace surface water withdrawals with groundwater withdrawals, where site specific evaluation indicates that this practice is practical and will not harm environmental resources**
**HIGH PRIORITY MANAGEMENT PRACTICE** | Continue to evaluate the feasibility of this practice and potential impacts on aquifers
Identify funding for conversion incentives | Implement if feasibility and impacts are found to be favorable
Provide incentives for conversions | EPD University researchers |
| **SF3: Evaluate streamflow augmentation via direct pumping from aquifers in order to support in-stream flows in dry periods** | Continue to evaluate augmentation pilot project on Spring Creek
Report to Council and EPD
Identify funding sources to support practice if pilot project findings are favorable | Implement practice in other locations if pilot project findings are favorable | University researchers EPD DNR |
### Table 7-1: Implementation Schedule for Lower Flint-Ochlockonee Water Planning Region

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<tr>
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<th>Long-term Actions</th>
<th>Responsible Parties</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>SF4</strong>: Continue to evaluate and consider Aquifer Storage and Recovery (ASR) with thorough evaluation of potential impacts</td>
<td>Evaluate potential impacts of any ASR proposal thoroughly</td>
<td></td>
<td>EPD\nUniversity researchers\nConsulting firms\nGEFA\nMunicipal and industrial water systems\nApplicants for permits associated with ASR projects</td>
</tr>
<tr>
<td><strong>SF5</strong>: Continue development of farm ponds in the Lower Flint-Ochlockonee Water Planning Region</td>
<td>Encourage farm pond development Continue to evaluate impacts of farm ponds and incorporation of farm ponds in the surface water availability assessment</td>
<td>Continue implementation (adjusted for assessment findings)</td>
<td>GSWCC\nEPD\nUniversity researchers\nAgricultural irrigators\nSoil and Water Conservation Districts</td>
</tr>
<tr>
<td><strong>SF6</strong>: Restrict the development of new land application systems for municipal and industrial wastewater treatment</td>
<td>Preference for return flows via discharge as opposed to land application should be considered in new and expanding permits for wastewater treatment facilities (on-going)</td>
<td></td>
<td>Wastewater treatment facilities (existing and planned)\nEPD</td>
</tr>
</tbody>
</table>

### WATER QUALITY (WQ)

<table>
<thead>
<tr>
<th>Issues Addressed</th>
<th>Point and nonpoint source water pollution</th>
</tr>
</thead>
<tbody>
<tr>
<td>Potential Gaps Addressed</td>
<td>Water quality violations</td>
</tr>
<tr>
<td>Council Goals Addressed</td>
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</tbody>
</table>
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<th>Short-term Actions</th>
<th>Long-term Actions</th>
<th>Responsible Parties</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>WQ1: Improve enforcement of existing permits and regulations and implementation of existing plans and practices</strong>&lt;br&gt; <strong>HIGH PRIORITY</strong>&lt;br&gt; MANAGEMENT PRACTICE</td>
<td>Continue implementation of programs and plans&lt;br&gt; Raise awareness of anticipated changes in nutrient standards among the regulated community&lt;br&gt; Develop new nutrient standards through process with substantial stakeholder input&lt;br&gt; Accelerate efforts to address the Albany CSO&lt;br&gt; Evaluate coordination in water quality program implementation by next planning cycle</td>
<td>Continue implementation of programs and plans&lt;br&gt; Progress toward zero discharge goal for Albany CSO&lt;br&gt; Implement improvements in program coordination (per results of evaluation)</td>
<td>EPD&lt;br&gt; Albany Utilities&lt;br&gt; GSWCC&lt;br&gt; GEFA&lt;br&gt; Wastewater discharge permittees</td>
</tr>
<tr>
<td><strong>WQ2: Improve implementation of nonpoint source controls</strong></td>
<td>Continue implementation of existing programs&lt;br&gt; Conduct baseline assessment of agricultural water quality BMPs and report results by next planning cycle&lt;br&gt; Raise awareness of the anticipated changes in nutrient standards and encourage adoption of nutrient management BMPs&lt;br&gt; Develop agricultural water quality complaint response program by next planning cycle</td>
<td>Continue implementation of existing programs (ongoing)</td>
<td>Local governments&lt;br&gt; Farmers&lt;br&gt; Foresters&lt;br&gt; Georgia Forestry Commission&lt;br&gt; NRCS&lt;br&gt; GSWCC&lt;br&gt; EPD</td>
</tr>
</tbody>
</table>
### Table 7-1: Implementation Schedule for Lower Flint-Ochlockonee Water Planning Region

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<th>Long-term Actions</th>
<th>Responsible Parties</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>cycle</strong></td>
<td>Encourage adoption of Revised Georgia Stormwater Management Manual and delegation of erosion and sediment control review and inspection to local authorities</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>WQ3: Increase implementation of pollution prevention</strong></td>
<td>Continue implementation of existing programs (on-going)</td>
<td></td>
<td>Wastewater treatment facilities Agricultural and forestry operations Local governments</td>
</tr>
<tr>
<td><strong>WQ4: Continue to fund and implement water quality monitoring</strong></td>
<td>Continue implementation of and funding for water quality monitoring (on-going)</td>
<td>Continue implementation of and funding for water quality monitoring (on-going)</td>
<td>EPD Wastewater discharge permittees</td>
</tr>
<tr>
<td><strong>WQ5: Apply coordinated state resources to address water quality</strong></td>
<td>Evaluate coordination in water quality program implementation by next planning cycle</td>
<td>Implement improvements in program coordination (per results of evaluation)</td>
<td>EPD GSWCC GEFA</td>
</tr>
</tbody>
</table>
7.2 Fiscal Implications of Selected Water Management Practices

Table 7-2 provides planning-level cost estimates for implementation of the management practices in this Regional Water Plan. Sources of potential funding are also listed. The cost information in Table 7-2 is based upon cost guidance prepared by EPD in April 2011. Neither the guidance nor the cost estimates shown in the following tables have been updated since 2011. Accordingly, the values shown below should only be used as a general guide. Specific costs should be further evaluated and updated before being relied upon.

The availability of funding is a critical determinant in the ability of the responsible parties to successfully implement the management practices identified in this Regional Water Plan. In general, sources of funding for individuals, such as farmers, include investment by these individuals and grant and incentive programs. Sources of funding for implementing management practices at the local government or utility level include revenues generated by water and wastewater providers, local government general funds raised through property taxes, and service fees charged by local governments to citizens. Local governments and utilities can also apply for loans and grants to finance implementation. Affected authorities and individuals in the water planning region will be responsible for determining the best method for funding and implementing applicable management practices.
## 7. Implementing Water Management Practices

### Table 7-2: Cost Estimates for Implementation Responsibilities

<table>
<thead>
<tr>
<th>Management Practice</th>
<th>Capital and Programmatic Costs&lt;sup&gt;a&lt;/sup&gt;</th>
<th>Potential Funding Sources</th>
<th>Notes and Sources</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>DEMAND MANAGEMENT (DM)</strong></td>
<td><strong>Issues Addressed</strong> Surface water and groundwater availability</td>
<td><strong>Potential Gaps Addressed</strong> Surface water availability potential gaps at Bainbridge (Flint), Pinetta (Suwannee), and Quincy and Concord (Ochlockonee); groundwater availability potential gap in Upper Floridan Aquifer in the Dougherty Plain</td>
<td><strong>Council Goals Addressed</strong> 1, 2, 3, 4</td>
</tr>
<tr>
<td><strong>DM1: Continue to improve agricultural water use efficiency through innovation and technology</strong> <strong>HIGH PRIORITY MANAGEMENT PRACTICE</strong>*</td>
<td>Variable</td>
<td>Federal and state agencies Private industry Nongovernmental organizations</td>
<td>Costs of continuing research on agricultural water use practices are variable; dependent upon the extent of research conducted</td>
</tr>
<tr>
<td><strong>DM2: Implement non-farm water conservation practices in the Lower Flint-Ochlockonee Water Planning Region</strong></td>
<td>$100 to $3,000 per million gallons&lt;sup&gt;b,c&lt;/sup&gt; (estimated costs for local utilities)</td>
<td>State agencies Water and wastewater revenues Individuals as required by law</td>
<td>Lower cost: Residential water audits, leak response, training, rate structure modifications Higher cost: Rebate programs, facility upgrades, water line replacement, water reuse, and programs targeting high water users&lt;sup&gt;c&lt;/sup&gt;</td>
</tr>
<tr>
<td><strong>DM3: Implement agricultural water conservation practices in the Lower Flint-Ochlockonee Water Planning Region</strong></td>
<td>$100-$4,000 per million gallons&lt;sup&gt;b,c&lt;/sup&gt;</td>
<td>State agencies Individual investment Incentive programs administered through GSWCC, Soil and Water Conservation Districts, and NRCS</td>
<td>Lower cost: Lower pressure irrigation retrofits Higher cost: Variable rate irrigation&lt;sup&gt;c&lt;/sup&gt;</td>
</tr>
<tr>
<td><strong>DM4: Implement voluntary agricultural water conservation practices in the Lower Flint-Ochlockonee Water Planning Region with the</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

<sup>a</sup> Dependent upon the extent of research conducted.
### Table 7-2: Cost Estimates for Implementation Responsibilities

<table>
<thead>
<tr>
<th>Management Practice</th>
<th>Capital and Programmatic Costs&lt;sup&gt;a&lt;/sup&gt;</th>
<th>Potential Funding Sources</th>
<th>Notes and Sources</th>
</tr>
</thead>
<tbody>
<tr>
<td>support of incentive programs</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>DM5: Manage agricultural water withdrawal permits in the region according to state regulations based on the 2006 Flint River Basin Water Development and Conservation Plan and other applicable state regulations and policy</td>
<td>No new costs associated with implementing existing permit program</td>
<td>EPD</td>
<td>Withdrawal permits issued after the 2006 Flint Plan have a $250 application fee.</td>
</tr>
<tr>
<td>DM6: Research new tools for agricultural water demand management to determine their feasibility, costs, and benefits for Georgia</td>
<td>Variable</td>
<td>Federal or state agencies</td>
<td>Costs of continuing research on agricultural water policy are variable and depend upon the extent of research conducted.</td>
</tr>
</tbody>
</table>

### SUPPLY MANAGEMENT AND FLOW AUGMENTATION (SF)

<table>
<thead>
<tr>
<th>Issues Addressed</th>
<th>Surface water and groundwater availability</th>
</tr>
</thead>
<tbody>
<tr>
<td>Potential Gaps Addressed</td>
<td>Surface water availability potential gaps at Bainbridge (Flint), Pinetta (Suwannee), and Quincy and Concord (Ochlockonee); groundwater availability potential gap in Upper Floridan Aquifer in the Dougherty Plain</td>
</tr>
<tr>
<td>Council Goals Addressed</td>
<td>1, 2, 3, 4</td>
</tr>
</tbody>
</table>

**SF1**: Evaluate reservoir storage options in the Flint River Basin, including better utilization of existing storage, that can provide for flow augmentation in dry periods

**HIGH PRIORITY** MANAGEMENT PRACTICE

- Cost of evaluation $0.5 to $3 million (dependent on scope)
- Cost estimate for new storage: $10,000 to $350,000 per million gallons (annual average yield)
- Cost estimate for increasing

- Municipal or industrial capital investment
- State and federal funding
- Private investment
- Water and wastewater revenues
- GEFA

Evaluation may include costs for (but not limited to): development of yield and performance criteria; site selection; property assessments and appraisals; and definition of permit requirements

Reservoir cost dependent on land value and costs of construction materials. Costs of
### Table 7-2: Cost Estimates for Implementation Responsibilities

<table>
<thead>
<tr>
<th>Management Practice</th>
<th>Capital and Programmatic Costs&lt;sup&gt;a&lt;/sup&gt;</th>
<th>Potential Funding Sources</th>
<th>Notes and Sources</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>SF2: Replace surface water withdrawals with groundwater withdrawals, where site specific evaluation indicates that this practice is practical and will not harm environmental resources</strong>&lt;br&gt;<strong>HIGH PRIORITY MANAGEMENT PRACTICE</strong></td>
<td>capacity of existing storage: $10,000 to $150,000 per million gallons (annual average yield)&lt;sup&gt;b,c&lt;/sup&gt;</td>
<td>Individual investment Incentive programs (GSWCC, Soil and Water Conservation Districts, NRCS) GEFA State agencies</td>
<td>piping, land acquisition, permitting, conveyance, and treatment not included in estimates.</td>
</tr>
<tr>
<td><strong>SF3: Evaluate streamflow augmentation via direct pumping from aquifers in order to support in-stream flows in dry periods</strong></td>
<td>$1,000 to $100,000 per million gallons annual yield&lt;sup&gt;b,c&lt;/sup&gt;</td>
<td>Federal or state agencies</td>
<td>See comments for SF2 above</td>
</tr>
<tr>
<td><strong>SF4: Continue to evaluate and consider Aquifer Storage and Recovery (ASR) with thorough evaluation of potential impacts</strong></td>
<td>$30,000 to $225,000 per million gallons annual yield&lt;sup&gt;b,c&lt;/sup&gt;</td>
<td>Municipal or industrial capital investment Water and wastewater revenues GEFA</td>
<td>Costs are dependent on well depth, soil conditions, piping distance, and number of pump stations.&lt;sup&gt;c&lt;/sup&gt; Costs of evaluation of impacts and feasibility should also be considered (not included in this estimate).</td>
</tr>
<tr>
<td><strong>SF5: Continue development of farm ponds</strong></td>
<td>$12.50 per cubic yard of earth</td>
<td>Individual investment</td>
<td>Estimated cost is for earth excavation and...</td>
</tr>
</tbody>
</table>
### Table 7-2: Cost Estimates for Implementation Responsibilities

<table>
<thead>
<tr>
<th>Management Practice</th>
<th>Capital and Programmatic Costsa</th>
<th>Potential Funding Sources</th>
<th>Notes and Sources</th>
</tr>
</thead>
<tbody>
<tr>
<td><em>in the Lower Flint-Ochlockonee Water Planning Region</em></td>
<td>excavation and grading</td>
<td>Prior incentive programs no longer available</td>
<td>grading. Estimate does not include pumping and piping costs.</td>
</tr>
<tr>
<td><strong>SF6:</strong> Restrict the development of new land application systems for municipal and industrial wastewater treatment</td>
<td>No new costs</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

#### WATER QUALITY (WQ)

<table>
<thead>
<tr>
<th>Issues Addressed</th>
<th>Point and nonpoint source water pollution</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Potential Gaps Addressed</strong></td>
<td><strong>Water quality violations</strong></td>
</tr>
<tr>
<td><strong>Council Goals Addressed</strong></td>
<td>1, 4</td>
</tr>
</tbody>
</table>

**WQ1:** Improve enforcement of existing permits and regulations and implementation of existing plans and practices

*HIGH PRIORITY MANAGEMENT PRACTICE*

- Costs to improve implementation and enforcement of existing programs are variable
- State and federal agencies Permit fees
- Need to evaluate whether implementation and enforcement can be improved without additional expenditures. Costs could include (but not limited to): site visits, training, and enhanced tools and practices for measuring and monitoring sediment loading.

**WQ2:** Improve implementation of nonpoint source controls

- $0 to $2 per capita<sup>c</sup>
- NRCS Soil and Water Conservation Districts 319(h) grants Other state and federal funding and incentive programs Private investment
- Costs could include (but not limited to): BMP installation and maintenance; public education; new ordinances<sup>c</sup>
### Table 7-2: Cost Estimates for Implementation Responsibilities

<table>
<thead>
<tr>
<th>Management Practice</th>
<th>Capital and Programmatic Costs&lt;sup&gt;a&lt;/sup&gt;</th>
<th>Potential Funding Sources</th>
<th>Notes and Sources</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>WQ3: Increased implementation of pollution prevention</strong></td>
<td>$1.50 to $3.00 per capita&lt;sup&gt;c&lt;/sup&gt;</td>
<td>State and federal funding and incentive programs Private investment</td>
<td></td>
</tr>
<tr>
<td><strong>WQ4: Improve water quality monitoring</strong></td>
<td>$4,000 to $8,000 per grab sample site $5,000 to $20,000 per habitat and benthos monitoring site&lt;sup&gt;c&lt;/sup&gt;</td>
<td>State agencies Wastewater rates</td>
<td>Grab sampling includes monitoring chemical water quality annually for fecal coliform bacteria and traditional stormwater parameters (no metals). Habitat and benthos monitoring includes monitoring biological water quality annually through assessment of habitat and macroinvertebrate populations&lt;sup&gt;c&lt;/sup&gt;</td>
</tr>
<tr>
<td><strong>WQ5: Apply coordinated state resources to address water quality</strong></td>
<td>&lt;$1 per capita&lt;sup&gt;c&lt;/sup&gt;</td>
<td>State agencies</td>
<td>Costs of coordination among agencies</td>
</tr>
</tbody>
</table>

**Notes and Sources:**

- <sup>a</sup> Programmatic costs will vary widely depending on the specific actions selected. Further study and data are needed to refine the evaluation of costs and benefits of selected practices. All values should be viewed as planning level numbers that before application for program planning or other purposes, will need updating through further study and data collection regarding the level of baseline implementation already in place and the corresponding water quantity and quality benefits achieved.
- <sup>b</sup> Cost per million gallons is a cost benefit metric, which is defined as the total 2010 costs divided by the total millions of gallons yielded or saved through conservation per year.

### 7.3 Alignment with Other Plans

The development of this Plan by the Lower Flint-Ochlockonee Water Planning Council builds upon a knowledge base developed in previous planning efforts by
state and local governments and authorities. In the last planning cycle, the Lower Flint-Ochlockonee Water Planning Council conducted a comprehensive review of existing local and regional plans and relevant related documents that concern water resources to frame the selection of management practices. A supplemental document entitled *Existing Regulatory and Local Plan Summary* (2011) summarizes this effort; it is available on the Council’s website. The Council considered known plan updates in the review and revision process for this Plan.

The Council also ensured alignment with other Regional Water Plans by coordinating with neighboring water planning councils and the Metropolitan North Georgia Water Planning District. The Council participated in a joint meeting with several other water planning councils, including the Upper Flint, Middle Chattahoochee, and Coosa-North Georgia Water Planning Councils and the Metropolitan North Georgia Water Planning District. In this meeting, council members discussed shared issues relating to resource availability, quality, policy, regulatory, and funding issues.

The Lower Flint-Ochlockonee Water Planning Council included joint recommendations with the Upper Flint and Middle Chattahoochee Water Planning Councils in its 2011 plan, and this revised plan updates the joint recommendations (see Section 7.4). The Council coordinated with these neighboring water planning councils with the support of the planning contractor to align the joint recommendations. Additionally, the Lower Flint-Ochlockonee Water Planning Council reviewed the draft water resources plan of the Metropolitan North Georgia Water Planning District and submitted comments to the District on the draft plan in February 2017. The Council’s water planning region also includes a small part of the Suwannee River Basin, and therefore, the planning contractor supported the Council in reviewing the Satilla-Suwannee Water Planning Council’s plan to ensure plan alignment for shared resources. Through these efforts, the Council has coordinated its plan with neighboring water planning councils and the Metropolitan North Georgia Water Planning District. No conflicts with these regional water plans have been identified. Alignment with the existing Flint River Basin Regional Water Development and Conservation Plan (2006) was considered by the Council. While the Council’s recommendations improve upon the 2006 plan, none of its recommendations conflict with that plan.¹

### 7.4 Recommendations to the State

The Lower Flint-Ochlockonee Water Planning Council has identified several recommended actions that would improve water resource management and planning in this water planning region and the State as a whole.

**Information Needs**

¹ The 2006 Flint River Basin Regional Water Development and Conservation Plan is described in Section 2.3 and available on the EPD website: [http://www1.gadnr.org/frbp/index.html](http://www1.gadnr.org/frbp/index.html).
Addressing the following information needs would support improved water resources management and future water planning. Implementation of research and assessments to fill these information needs will require funding (state, federal, other). Implementing agencies are not indicated here; if funding is identified, qualified researchers from state universities, institutions, and agencies, as well as private sector firms, can fulfill these information needs. As new information is developed, it should be incorporated into future cycles of the regional water planning process and used in the resource assessments that are a part of the regional water planning process.

- Evaluate the potential environmental and other impacts of low flow conditions seen in model results at the Bainbridge planning node; determine low flow thresholds below which adverse ecosystem impacts are predicted.

- Improve implementation of the agricultural water withdrawal metering program administered by EPD by:
  - Completing comprehensive installation of meters
  - Ensuring the meters are functioning properly through regular maintenance inspection
  - Increasing data collection on parameters including monthly use, crops, inputs
  - Continuing to report aggregate results annually to permittees and policymakers
  - Continuing to prepare collected data in a manner that will facilitate use in future resource assessments

- Complete a comprehensive assessment of baseline implementation of water conservation and water quality BMPs by agricultural producers. Recent efforts to conduct field verification of conservation equipment adoption by farmers in the Lower Flint River Basin have initiated development of a baseline dataset. The Council recommends that this survey be expanded to include a wider geographic range, including the entire Flint and Chattahoochee River Basins, and to assess implementation of more conservation practices. The lack of comprehensive information on current levels of implementation limits the ability to conduct effective regional water planning. Without a more thorough understanding of the baseline level of implementation, the benefits of future conservation activities cannot be accurately estimated. A comprehensive field survey of BMP implementation, for conservation and water quality practices would support estimation of potential benefits of future implementation, tracking of implementation progress, and BMP prioritization.

- Continue to evaluate implementation, adoption, and effectiveness of water conservation practices and to research innovative conservation practices. Water conservation is a priority focus of the management practices in this...
7. Implementing Water Management Practices

Plan, but there are currently several practical limitations to measuring progress and impact in conservation implementation, such as inconsistent terminology, lack of available data and the need to identify practical ways of collecting data. Periodically, it will be important to assess the progress and benefit of the water conservation program.

- Evaluate the impacts of farm ponds on stream flows through intercepted drainage and evaporative loss. Also continue to improve how farm pond withdrawals are incorporated into the resource assessment models.
- Evaluate the costs and benefits of reducing the minimum threshold at which permits are required for water withdrawals (surface water and groundwater).
- Promote additional studies that build on existing work related to drought, drought triggers and potential actions needed to maintain water quality in the Flint River Basin in dry periods.
- Evaluate alternative metrics for use as thresholds for potential gaps in the resource assessment models. For the surface water availability resource assessment, the Council should provide input to EPD on preferences, values, and possible metrics related to desired flows in the region’s surface waters.
- Evaluate changes in the recently updated Water Control Manual for U.S. Army Corps of Engineers management in the Chattahoochee River Basin to seek to enhance the capacity of the system to support all uses, including greater storage for water supply and flow augmentation.
- Verify water quality model assumptions in future resource assessments to reflect actual conditions through an interactive process between the regional water planning councils and EPD. In particular, check assumptions about the volumes treated by various wastewater treatment methods (e.g., land application, discharging facility). The assumption that current allocations among these methods will remain the same may not be accurate given in-stream flow concerns.
- Evaluate the effectiveness of water quality management and pollution prevention tools, including best management practices for nonpoint sources. Continue to develop data on nutrient loading to support the development of effective nutrient management strategies, especially in the Ochlocknee River Basin.
- Conduct periodic peer review on the resource assessment models used in regional water planning.

Water Policy Recommendations

The following recommendations urge the Georgia General Assembly and other policymakers (e.g., Georgia Board of Natural Resources) to pursue actions to
7. Implementing Water Management Practices

improve water resource management in the State and the Lower Flint-Ochlockonee Water Planning Region.

- The Council recommends that the General Assembly seek input from and consult with the regional water planning councils, including the Lower Flint-Ochlockonee Water Planning Council, in managing, planning, and providing oversight of water resources within each region around the state.

- The Council recommends that the Georgia General Assembly provide funding for continued planning by the regional water planning councils in order to ensure continued progress toward the vision and goals of the State Water Plan and Regional Water Plan. The Council also recommends that the General Assembly provide funding to support monitoring of plan implementation, data collection to support future planning by the regional water planning councils, and continued refinement of water resource assessments used in the development of the Regional Water Plans.

- The Council recommends that the Georgia General Assembly and implementing state and federal agencies, explore all possible funding sources to offset or pay for many of the management practices outlined in this Plan. Federal funding sources should be fully explored, particularly USDA funding for conservation research and implementation. Financial incentives and reimbursement for implementation of practices will expedite the progress needed to achieve the goals of this Plan.

- The Council urges the Georgia General Assembly and other state policymakers not to preclude interbasin transfer as an option for future water management in the region, as needed and following thorough scientific evaluation. Interbasin transfer (IBT) of water can provide supply or flows to a receiving basin where water is needed. IBTs are used in many places in Georgia at this time. However, the Council recommends against any new interbasin transfers from any basin in this region for which the surface water availability resource assessment model indicated a potential gap. Furthermore, the Council recommends that, where appropriate and reasonable to address instream flow concerns, existing IBTs be reversed to return water to its basin of origin.

- The Council recommends that any modifications to existing water withdrawal permitting practices should consider the updated surface water availability and groundwater availability resource assessment model results. For a more complete discussion of the Council’s concerns with the modeling approaches and results, please see Section 5.4.

- The Council urges the state to continue developing improved tools for drought management and to adopt legislation as needed for their implementation. The Council believes that additional tools beyond those provided in the Flint River Drought Protection Act (OCGA §12-5-40) are
needed to provide for an adequate remedy in periods of drought, and adequate funding should be provided for implementation.

- The Council recommends that the General Assembly provide funding and authority (or other mechanism) for the Council to work with the USFWS to resolve potential conflicts between agricultural water use and imperiled species in the region. The Council urges all appropriate state agencies to join in this process, including the EPD. A Habitat Conservation Plan (HCP) feasibility study was conducted between 2011 and 2014 in response to a request from the Council. It was led by the Georgia Water Planning and Policy Center and involved numerous agencies and stakeholders from this region. The project provided information that can be used to advance consideration of alternative approaches to address imperiled species concerns in the region. The Council supports continued consideration of a Habitat Conservation Plan as a tool that should be evaluated to provide for both habitat protection and irrigation supply needs in the region, while also reducing the liability and uncertainty associated with potential Endangered Species Act enforcement or litigation.

- The Council urges the State to seek a timely resolution of current interstate water issues that directly affect the Apalachicola-Chattahoochee-Flint Basin. The Council recommends the development of a tri-state framework designed to address interstate water issues in the future and the inclusion of the regional water councils within this framework. See below for a coordinated recommendation with neighboring councils regarding an ACF planning and management institution.

- The Council recommends continued coordination and cooperation among neighboring water councils. The Lower Flint-Ochlockonee Water Planning Council has worked closely with the Middle Chattahoochee and Upper Flint Water Planning Councils and the Metropolitan North Georgia Water Planning District, and our joint efforts will benefit our regions and the State as a whole.

**Coordinated Recommendations with Neighboring Councils**

Since the beginning of regional water planning in Georgia in 2009, the Lower Flint-Ochlockonee Water Planning Council has met several times with neighboring regional water planning councils to discuss shared water resources and topics of concern. The Lower Flint-Ochlockonee Water Planning Council met several times with the Upper Flint and Middle Chattahoochee Water Planning Councils and developed a collaborative relationship with these councils that led to their agreement on a set of joint recommendations in 2011. In this planning cycle, the three councils reviewed and revised their joint recommendations. In 2017, the following joint recommendations were approved by all three councils: Upper Flint, Lower Flint-Ochlockonee, and Middle Chattahoochee. The agreement among these councils on these recommendations indicates the importance of these recommendations to the
7. Implementing Water Management Practices

Apalachicola-Chattahoochee-Flint Basin, of which all three councils are a part, and to the State as a whole.

These joint recommendations overlap with some of the Lower Flint-Ochlockonee Water Planning Council’s own management practices and recommendations. Where overlap does occur, the Council does not see any conflict; the Council’s management practices and recommendations generally provide more detail than the joint recommendations. In all cases, the Council’s own regional water plan takes precedence over the joint recommendations.

The Lower Flint-Ochlockonee, Upper Flint, and Middle Chattahoochee Water Planning Councils:

- Recognize the critical need for better use of existing storage and for more storage in the Apalachicola-Chattahoochee-Flint (ACF) System and recommend that a plan for additional storage be developed and implemented and that it consider the following: better utilization of existing storage in the Chattahoochee River Basin, new storage in the Flint River Basin, and enhancement of existing storage capacity.

- Urge EPD and those involved in the resource assessment modeling to improve upon existing models for future regional water planning by further expanding use of actual and current data on water use and conditions and by continuing to refine assumptions that more closely approximate actual conditions.

- Consider the creation of a new coordinated, interstate planning organization for the ACF System. Membership in this organization to represent Georgia shall include, but not be limited to, members of the regional water planning councils with water planning regions that include parts of the ACF. Consider the recommendation of the ACF Stakeholders in its Sustainable Water Management Plan regarding an ACF transboundary water management institution as this organization is developed.²

Section 8. Monitoring and Reporting Progress

8.1 Benchmarks

The benchmarks listed in Table 8-1 below will be used to assess the effectiveness of this Regional Water Plan’s implementation and identify where revisions are needed. The Council selected both qualitative and quantitative benchmarks that will be used to assess whether the Plan’s management practices address potential gaps identified by the resource assessment models between resource capacity and demand over time and whether the Council’s vision and goals are being met (or progress is being made toward attainment). The benchmarks will be used to evaluate the effectiveness of this Plan at the next five-year plan review.

<table>
<thead>
<tr>
<th>Management Practice</th>
<th>Benchmark</th>
<th>Measurement Tools</th>
<th>Time Period</th>
</tr>
</thead>
<tbody>
<tr>
<td>All Management Practices</td>
<td>Revised resource assessments</td>
<td>Quantify the impacts of implemented management practices on the potential gaps identified by the resource assessment models for the Flint, Ochlockonee, Suwannee River Basins, the Upper Floridan Aquifer in the Dougherty Plain, and the Claiborne Aquifer</td>
<td>Next planning cycle (five years)</td>
</tr>
</tbody>
</table>
8. Monitoring and Reporting Progress

Table 8-1: Benchmarks for Lower Flint-Ochlockonee Regional Water Plan

<table>
<thead>
<tr>
<th>Management Practice</th>
<th>Benchmark</th>
<th>Measurement Tools</th>
<th>Time Period</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>DEMAND MANAGEMENT (DM)</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Issues Addressed</td>
<td>Surface water and groundwater availability</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Potential Gaps Addressed</td>
<td>Surface water availability potential gaps at Bainbridge (Flint), Pinetta (Suwannee), and Quincy and Concord (Ochlockonee); groundwater availability potential gap in Upper Floridan Aquifer in the Dougherty Plain</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Council Goals Addressed</td>
<td>1, 2, 3, 4</td>
<td></td>
<td></td>
</tr>
<tr>
<td>All Demand Management Practices (DM1 through DM6)</td>
<td>Per capita water use; agricultural water use (interpretation of benchmark requires adjustment for climate and crops)</td>
<td>Update of per capita use estimates for next iteration of Regional Water Plan; agricultural water meter readings</td>
<td>Per capita water use: every five years; agricultural water meter readings: annually</td>
</tr>
<tr>
<td>DM2</td>
<td>Compliance with permit requirements</td>
<td>Progress reporting required for permittees</td>
<td>Annual</td>
</tr>
<tr>
<td>DM3 and DM4</td>
<td>Compliance with permit requirements and efficiency requirements of OCGA § 12-5-546.1</td>
<td>Permit enforcement actions; incentive program implementation reporting; NRCS/Extension agent estimates of practice implementation; continued and expanded survey of baseline implementation with updates</td>
<td>Enforcement: on-going; practice implementation: summary report for next planning cycle (five years)</td>
</tr>
<tr>
<td>DM6</td>
<td>Completion of research; implementation of recommendations</td>
<td>Final research reports; assessment of implementation of recommendations</td>
<td>Research results would be most useful if available for next planning cycle (five years)</td>
</tr>
</tbody>
</table>
## Table 8-1: Benchmarks for Lower Flint-Ochlockonee Regional Water Plan

<table>
<thead>
<tr>
<th>Management Practice</th>
<th>Benchmark</th>
<th>Measurement Tools</th>
<th>Time Period</th>
</tr>
</thead>
<tbody>
<tr>
<td>SUPPLY MANAGEMENT AND FLOW AUGMENTATION (SF)</td>
<td><strong>Issues Addressed</strong> Surface water and groundwater availability</td>
<td><strong>Potential Gaps Addressed</strong> Surface water availability potential gaps at Bainbridge (Flint), Pinetta (Suwannee), and Quincy and Concord (Ochlockonee); groundwater availability potential gap in Upper Floridan Aquifer in the Dougherty Plain</td>
<td><strong>Council Goals Addressed</strong> 1, 2, 3, 4</td>
</tr>
<tr>
<td><strong>All Supply Management and Flow Augmentation Practices (SF1 through SF6)</strong></td>
<td>Implementation of management practices</td>
<td>Perform regional survey to quantify implementation; gather details regarding implementation challenges and roadblocks where applicable</td>
<td>Next planning cycle (five years)</td>
</tr>
<tr>
<td>SF1</td>
<td>Completion of feasibility study; implementation of recommendations</td>
<td>Feasibility study; reservoir permitting, construction and improvement</td>
<td>Complete feasibility report by next planning cycle (five years)</td>
</tr>
<tr>
<td>SF2</td>
<td>Number of surface water withdrawal conversions to groundwater withdrawals; evaluation of groundwater impacts; continued assessment of Claiborne Aquifer capacity to support this practice; cost estimates for conversions</td>
<td>Permit conversion records (EPD); groundwater availability resource assessment for next regional water planning cycle</td>
<td>Next planning cycle (five years)</td>
</tr>
</tbody>
</table>
### Table 8-1: Benchmarks for Lower Flint-Ochlockonee Regional Water Plan

<table>
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<tr>
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<th>Time Period</th>
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<tr>
<td><strong>WATER QUALITY (WQ)</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Issues Addressed</strong></td>
<td>Point and nonpoint source water pollution</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Potential Gaps Addressed</strong></td>
<td>Water quality violations</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Council Goals Addressed</strong></td>
<td>1, 4</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>All Water Quality Management Practices (WQ1 through WQ5)</strong></td>
<td>Implementation of recommended management practices</td>
<td>Perform regional survey to determine the level of implementation; survey to gather details regarding implementation challenges and roadblocks where applicable</td>
<td>Next planning cycle (five years)</td>
</tr>
<tr>
<td><strong>WQ1, WQ2, and WQ3</strong></td>
<td>De-listing of impaired streams</td>
<td>303d/305b report</td>
<td>Biennial for impaired streams listing</td>
</tr>
<tr>
<td><strong>WQ4</strong></td>
<td>Continued availability of monitoring results that can be used in planning</td>
<td>EPD status update on monitoring data available for resource assessments; available monitoring data</td>
<td>Next planning cycle (five years)</td>
</tr>
</tbody>
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1 EPD maintains a website with monitoring data and descriptions of monitoring programs: [http://epd.georgia.gov/monitoring](http://epd.georgia.gov/monitoring)
8.2 Plan Updates

Meeting current and future water needs will require periodic review and revision of this Regional Water Plan. The State Water Plan and associated rules provide that each Regional Water Plan will be subject to review by the appropriate regional water planning council every five years and in accordance with guidance provided by the Director of EPD, unless otherwise required by the Director for earlier review. These reviews and updates will allow an opportunity to adapt this Regional Water Plan based on changed circumstances and new information arising in the five years after adoption of this Plan by the Lower Flint-Ochlockonee Water Planning Council and the EPD Director.

8.3 Plan Amendments

Amendments to this Regional Water Plan may be necessary as water resource policy conditions change in the Lower Flint-Ochlockonee Water Planning Region. As noted in Section 6, the final decision in the Florida v. Georgia No. 142 case before the U.S. Supreme Court is expected in the next year, and the decision may create the need to revisit the contents of this Plan. Other circumstances may also affect implementation, and the Lower Flint-Ochlockonee Water Planning Council intends that this Plan will be modified as necessary to address significant changes in this water planning region.

8.4 Conclusion

In this Regional Water Plan, the Lower Flint-Ochlockonee Water Planning Council makes its recommendations to provide for a sustainable future for the Lower Flint-Ochlockonee Water Planning Region. While developing this Plan, the Council also identified many information and water policy needs to support improved water resources planning and management in the future. The Council urges policy makers to act on its recommendations.

The Council sees this Plan as a starting point. The Council emphasizes the need for continued regional water planning to ensure that the water resources of the Lower Flint-Ochlockonee Water Planning Region and the State as a whole are managed in a sustainable manner that supports public health, natural ecosystems, and the economy and enhances the quality of life for all citizens.
## Appendix A – Summary of Edits and Updates
### 2016-2017 Review and Revisions

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<tr>
<th>Section</th>
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| Executive Summary | Executive Summary | Text revisions and updates | - Updated to reflect changes in other parts of the Plan  
- Added text to update process description for this planning cycle  
- Updated land use data and forecasts in text  
- Updated summary and discussion of resource assessment results in text and table to reflect updated results  
- Updated management practices and recommendations summary to reflect changes in Sections 6 and 7.4 |
| 1 Section 1.1 | Minor text revisions | - Revised word choice and sentence structure  
- Updated references |
| 1 Section 1.2 | Text revisions | - Updated references  
- Updated the summary of the planning process to cover 2011 to 2017 |
| 1 Section 1.3 | Minor text revisions | - Revised word choice in several locations  
- Specified that vision and goals were reviewed by Council for 2017 review and revision process and no revisions resulted |
| 2 Section 2 (General) | Minor text revisions | - Updated references  
- Revised word choice in several locations |
| 2 Summary | Minor text revisions | - Summary statement updated to reflect revised content |
| 2 Section 2.1 | Minor text revisions  
Data update  
Figure 2-1 update | - Revised word choice in several locations  
- Updated Georgia Farm Gate Value Report information to 2014 information  
- Updated Figure 2-1 to add Carsonville node |
| 2 Section 2.2 | Minor text revisions  
Figure 2-2 update | - Revised word choice in several locations  
- Updated land use data in text and Figure 2-2 |
| 2 Section 2.3 | Text revisions | - Revised word choice in several locations  
- Added information to describe policy related changes since 2011 (Flint River Drought Protection Act, Florida numeric nutrient criteria, ACF Water Control Manual revision, inter-state ACF litigation)  
- Added statement that Council expects to be able to update the plan if necessary to respond to outcome of Florida v. Georgia 142 litigation |
| 3 Section 3.1 | Text updates  
Figures 3-1 to 3-4 updates | - Added introductory text regarding the source of the data presented in Section 3.1  
- Updated water use information using 2016 USGS Water Use in Georgia data in text and Figures 3-1 to 3-4  
- Revised consumptive use discussion to clarify assumptions and application in resource assessment  
- Updated references  
- Revised text revisions |
| 3 Section 3.2 | Minor text revisions and updates | - Clarified description of resource assessment  
- Updated references |
| 3 Section 3.2.1 | Text revisions and updates  
Tables 3-1 and 3-2 updates | - Revised description of the Surface Water Availability Resource Assessment to update and more accurately describe the approach, assumptions, and analysis  
- Described addition of Carsonville node  
- Updated resource assessment results in text and Tables 3-1 and 3-2  
- Described farm pond analysis that was added to this resource assessment and presented results  
- Updated references |
| 3 Section 3.2.2 | Text revisions and updates  
Table 3-3 update | - Revised description of the resource assessment to update and more accurately describe the approach, assumptions, and analysis  
- Updated results in text and Table 3-3  
- Revised word choice and sentence structure in several locations |
| 3 Section 3.2.3 | Text revisions and updates  
Figure 3-5 update | - Revised descriptions of the Surface Water Quality Resource Assessment to update and more accurately describe the approach, assumptions, and analysis  
- Updated results in text and Figure 3-5 |
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| 3       | Section 3.3 | Text revisions and updates              | - Revised word choice in several locations  
|         |          | Figure 3-6 update                       | - Updated references  
|         |          |                                         | - Updated with information from Georgia Wildlife Resources Division’s current State Wildlife Action Plan  
|         |          |                                         | - Updated impaired waters data in text and Figure 3-6 |
| 4       | Summary  | Summary update                          | - Updated text to reflect the revised forecasts |
| 4       | Section 4 | New text                                | - Added introductory text to provide context for this section |
| 4       | Section 4.1 | New text                               | - Added introductory text to provide context for this section |
| 4       | Section 4.1.1 | Text revisions and update               | - Updated population and demand forecast results in text  
|         |          |                                         | - Added statement to reflect Council's concern about possible impact of low growth projections  
|         |          |                                         | - Updated references |
| 4       | Section 4.1.2 | Text revisions and update               | - Revised text to reflect methodology for the Plan update  
|         |          |                                         | - Updated wastewater forecast results in text  
|         |          |                                         | - Revised word choice in several locations |
| 4       | Section 4.2 (and sub-sections) | Text revisions and updates             | - Revised text to reflect methodology for the Plan update  
|         |          |                                         | - Updated forecast results in text  
|         |          |                                         | - Revised word choice in several locations |
| 4       | Section 4.3 | Text revisions and updates              | - Revised text to reflect the updated agricultural demand forecast methods  
|         |          |                                         | - Updated forecast results in text  
|         |          |                                         | - Updated references |
| 4       | Section 4.4 | Text revisions and updates              | - Revised text to reflect the updated energy sector water demand forecast methods and results  
|         |          |                                         | - Updated references  
| 4       | Section 4.5 | Text revisions and updates              | - Updated summary results in text and Figures 4-1 to 4-3 |
| 5       | Summary   | Minor text revisions                    | - Revised word choice in several locations |
| 5       | Section 5 Introduction | Minor text revisions                   | - Revised word choice in several locations |
| 5       | Section 5.1 | Text revisions and updates              | - Revised word choice in several locations  
|         |          | Tables 5-1 and 5-3 updates             | - Revised text to include Carsonville node  
|         |          | New Table 5-2                          | - Updated results and discussion of results in text and Tables 5-1 and 5-3 (formerly Table 5-2) and added new Table 5-2 with more detailed results  
|         |          |                                         | - Updated references |
| 5       | Section 5.2 | Text revisions and updates              | - Revised word choice  
|         |          | Table 5-4 update                        | - Updated references  
|         |          |                                         | - Updated results and discussion of results in text and Table 5-4 (formerly Table 5-3)  
|         |          |                                         | - Added discussion of additional analyses completed and planned for Claiborne Aquifer |
| 5       | Section 5.3 | Text revisions and updates              | - Revised word choice in several locations  
|         |          | Figure 5-1 update                       | - Updated references  
|         |          |                                         | - Updated results and discussion of results in text and Figure 5-1 |
| 5       | Section 5.4 | Text revisions and updates              | - Revised word choice in several locations  
|         |          |                                         | - Revised results summary and discussion to reflect updated results of resource assessments  
|         |          |                                         | - Revised last paragraph to reflect Council discussion of revised results |
| 6       | Section 6 (General) | Minor text revisions and updates        | - Updated references |
| 6       | Section 6.1 | Text revisions and updates              | - Revised word choice  
|         |          |                                         | - Deleted reference to survey of Council members (not conducted in this planning cycle)  
|         |          |                                         | - Added reference to collaboration with Metro Water District |
## Appendix A – Summary of Edits and Updates
### 2016-2017 Review and Revisions

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| 6       | Table 6-1 | Table 6-1 update | - Revised discussion of uncertainties affecting planning to reflect current conditions  
- Added statement that Council expects to update the Plan if necessary to address outcome of Florida v. Georgia litigation  
- Added references to supplemental documents from prior planning cycle |
| 6       | Section 6-2 | Text revisions and updates | - Revised word choice in several locations  
- Updated references  
- Revised selected management practices to reflect Council consideration of updated information and current conditions  
- Updated Issues Addressed and Potential Gaps Addressed entries to reflect updated resource assessment results  
- DM1: Revised wording; added detail; expanded description to include a broader range of technologies and innovations  
- DM2: Combined with former DM3 and revised to clarify types of practices and recent policy changes; updated references  
- DM3 (formerly DM4): Revised for recent policy changes; added new text added regarding awareness and enforcement  
- DM4 (formerly DM5): Added new information on field verification of conservation equipment; recommended expansion of this data collection; added NRCS to list of incentive programs  
- DM5 (formerly DM6): Revised for recent policy changes  
- DM6: Modified description text based on Council deliberation  
- SF1: Added text regarding better utilization of existing storage and release guidelines from existing reservoirs  
- SF2: Added text to recognize cost of this practice; added detail regarding information needs; modified to address need for better understanding of aquifers and their sustainable yields  
- SF3: Added details to describe pilot project and recent policy changes  
- SF4: Modified ASR recommendations based on Council deliberations; updated to reflect results of demonstration project  
- SF5: Added language regarding funding; added description of farm pond analysis in updated resource assessment  
- SF6: Added new management practice based on Council deliberations  
- WQ1: Addressed awareness of nutrient management needs; recommended acceleration of Albany CSO mitigation  
- WQ2: Added new management practice based on Council deliberations; updated to reflect results of demonstration project  
- WQ3: Updated for availability of programs  
- WQ4: Changed to call for continuation rather than improvement of monitoring |
| 7       | Introduction | Text addition | - Added introductory text to provide context for this section |
| 7       | Section 7.1 | Minor text revisions/updates | - Revised word choice in several locations |
| 7       | Section 7-2 | Text additions | - Added text to explain source of cost information (which was not updated in this planning cycle) |
| 7       | Table 7-1 | Text revisions and updates | - Revised word choice in several locations  
- Updated Issues Addressed and Potential Gaps Addressed entries to reflect updated resource assessment results  
- Deleted Initial Implementation Steps column; combined with Short-term Actions Column  
- Updated management practices language to match revisions in Table 6-1  
- Revised Short-term Actions, Long-term Actions, and Responsible Parties as needed to reflect changes in management practices |
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| 7       | Table 7-2| Text revisions and updates | - Updated Issues Addressed and Potential Gaps Addressed entries to reflect updated resource assessment results  
- Updated management practices language to match revisions in Table 6-1  
- Revised cost estimates, potential funding sources, and notes as needed to reflect changes in management practices  
- Added additional funding sources to DM1, DM3/DM4, SF1, SF2, WQ2, and WQ4  
- Provided better Lower Cost example in Notes for DM3/DM4 |
| 7       | Section 7.4| Text revisions and updates | - Revised word choice in several locations  
- Changed some information items to recommend as continuation of activities rather than initiation of new activities (based on updated information)  
- Added description of efforts to conduct field verification of conservation equipment  
- Added recommendation to expand field verification efforts  
- Deleted recommendation regarding Woodruff Dam flow requirement because considered outdated and replaced by other recommendations  
- Added several new information items to address assessment of withdrawal permit threshold, drought management, alternative surface water availability metrics, BMP effectiveness, and peer review of resource assessments  
- Modified information need on water quality resource assessment to recommend interactive process between Council and EPD  
- Modified recommendation regarding Council role and authority  
- Added statement about exploring federal funding to implementation funding recommendation  
- Added recommendation to consider IBT reversal to broader recommendation regarding interbasin transfer  
- Modified recommendation regarding use of resource assessment results in permit decisions  
- Modified recommendation regarding drought management and Flint River Drought Protection Act  
- Updated recommendation regarding imperiled species management to reflect recent related project in region  
- Add recommendation regarding evaluation of changes in USACE management of ACF  
- Modified recommendation regarding Council role and authority  
- Modified recommendation regarding ACF to reflect Council’s discussion and modifications to joint recommendations  
- Modified recommendation regarding coordination to include Metro Water District  
- Modified joint recommendations to reflect changes adopted jointly with neighboring Council; minor wording modifications in first two recommendations; deleted recommendation regarding Woodruff Dam flow requirements; added recommendation regarding coordinated interstate planning in ACF |
| 8       | Section 8.1| Text revisions and updates | - Revised word choice in several locations  
- Updated Issues Addressed and Potential Gaps Addressed entries in Table 8-1 to reflect updated resource assessment results  
- Revised Table 8-1 content to address changes in Table 6-1 |
| 8       | Section 8.2| Minor text revisions | - Revised word choice in a few locations |
| 8       | Section 8.3| Minor text revisions/updates | - Revised word choice in a few locations  
- Revised to reflect current conditions |
| 8       | Section 8.4| Text revision/updates | - Revised word choice in a few locations |
| All     | General | Website references removed to the current State Water Plan or Council webpages | - Modified website links for State Water Plan and Council webpages; EPD is currently building a new Regional Water Planning website; link information will be added to the Plan when the new website is available |