Georgia Water Supply Redundancy Study
Suwannee-Satilla Water Planning Region
Georgia Environmental Finance Authority (GEFA)

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Georgia Water Supply Redundancy Study

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Acronyms

ADD	Average Daily Demand
ASR	Aquifer Storage and Recovery
DIP	Ductile Iron Pipe
EPD	Environmental Protection Division
GEFA	Georgia Environmental Finance Authority
GSWCC	Georgia Soil and Water Conservation Commission
MGD	Million Gallon(s) Per Day
MNGWPD	Metropolitan North Georgia Water Planning District
QWS	Qualified Water System(s)
RWP	Regional Water Plan
USGS	U.S. Geological Survey
Wood	Wood Environment and Infrastructure Solutions, Inc.
WSIRRA	Water System Interconnection, Redundancy, and Reliability Act
WTP	Water Treatment Plant

1.0 Introduction

In May 2010, the Water System Interconnection, Redundancy, and Reliability Act (WSIRRA) was signed into law (Senate Bill 380). A main goal of the Act was to identify and increase interconnections and redundancies for the Metropolitan North Georgia Water Planning District (MNGWPD). With this Act, Georgia affirmed the importance of comprehensive water emergency planning and the value of effectively sharing our current water resources through well-considered redundancy and interconnection planning. While the Act did not apply to water planning regions outside of the MNGWPD, its concepts and framework are useful for emergency planning throughout Georgia.

The Georgia Environmental Finance Authority (GEFA), through the services of Wood Environment and Infrastructure Solutions, Inc. (Wood), conducted a study identifying opportunities for water supply redundancy for qualified water systems (QWS) located outside the MNGWPD. For the purposes of this report, a QWS is a public water system owned and operated by a city, county, or water authority that serves a total population (retail plus consecutive populations served) greater than 3,300 people. Some systems serving just below the population threshold of 3,300 are included as well. This report details the Suwannee-Satilla Water Planning Region, which consists of 18 counties in south-central Georgia, as shown in Figure 1-1. GEFA identified 17 QWS within the Suwannee-Satilla Planning Region, as shown in Figure 1-2.

1.1 Purpose

The purpose of the Water Supply Redundancy Study is to increase Georgia's water supply solvency and reliability. This study evaluates drinking water supply, demand, treatment, storage, distribution, and interconnectivity to identify redundant water supply sources capable of providing backup water supply for each QWS.

Emergency scenarios were evaluated consistent with similar emergency supply planning projects in the state, such as the GEFA Water System Interconnection, Redundancy and Reliability Act Emergency Supply Plan (CH2MHill, Jacobs, Lowe Engineers, 2011) for the MNGWPD. These emergency scenarios include:

- Failure of largest treatment facility within a planning region
- Short-term catastrophic failure of distribution system
- Short-term contamination of a raw water source
- Failure of an existing dam of a raw water source
- Water supply reduction due to drought

Potential interconnection and redundancy projects were identified and prioritized. Each planning-level potential project includes the steps required to modify a QWS's operation and infrastructure to share water with adjacent water providers. Wood developed a decision-based prioritization tool that summarizes the specific system deficiencies (in volumetric demand) for emergency situations and quantifies emergency supply goals. The prioritization tool highlights available emergency water supply and deficits under existing and future conditions. Potential projects were prioritized and recommended based on performance using weighted quantitative and qualitative criteria.

1.2 Study Approach

An overview of each step of the study approach is outlined below.

1.2.1 QWS Data Collection

A detailed questionnaire and data request list were developed to collect data from each QWS. The questionnaire included: general system data, water demand and usage, infrastructure and supply, and other planning information. QWS were contacted to conduct a follow-up interview. The results of the survey and interview were tabulated and reviewed. Study participation was optional. Some QWS opted not to participate or to partially participate. If data were unavailable or incomplete, professional reasoning was used to recommend a technically-sound approach for dealing with missing or incomplete data, including use of publicly available data.

1.2.2 Redundant Water Supply Sources

The collected survey data and additional information gathered from other sources, such as the Georgia Environmental Protection Division (EPD), regional water plans (RWPs), and the *GEFA Georgia Inventory and Survey of Feasible Sites for Water Supply Reservoirs* (MACTEC, 2008) report served as the foundation to evaluate sources of water supply capable of providing redundant supply for each QWS. Such water sources include raw and potable water sources, interconnections between systems, and excess capacity of current allocations. These identified water supply sources were pre-screened for their potential to serve regional or multi-jurisdictional water needs. Where sufficient information was available, quantitative screening criteria were used to compare sites and, where quantitative information was not readily available, qualitative evaluation and professional reasoning were used for the initial screening. These locations and other nearby stream networks were examined at a planning-level scale, taking into consideration issues such as current and future hydrographs, low-flow conditions, stream capacity, downstream non-depletable flow requirements, water quality, pumping and transmission requirements, permitting requirements, treatment requirements, and cost.

1.2.3 Emergency Planning Benchmarks

The QWS average daily demand (ADD) obtained from the data collection process was used to quantify tiered emergency supply goals within each system. This method highlights where full supply of demand may not be available during some emergency scenarios although reduced critical needs can be met by another system. For consistency with the MNGWPD study, the following reliability targets were used:

- 100% ADD
- 65% ADD
- 35% ADD

It is assumed that the 35% and 65% reliability targets correspond to estimated usage associated with essential water needs. GEFA has identified customers with essential water needs as: hospitals, nursing home/assisted living facilities, correctional facilities, critical industry, and schools.

1.2.4 Water Supply Risk Evaluations

To carry out the preliminary screening, specific system deficiencies (in volumetric demand) of the emergency scenarios and supply goals within the focus area were calculated. The purpose of this is to highlight available emergency supply and deficits under existing and future conditions. The reliability targets were applied to each QWS under specified emergency situations to evaluate the capability of a QWS to supply sufficient water during that emergency. Deficiencies (in volumetric demand) from emergency situations were quantified for each QWS. In addition, the maximum deficit (Critical Scenario Deficit) was determined for each QWS.

1.2.5 Evaluation of Potential Projects

Potential redundancy projects were conceptualized for each QWS. These projects may include: infrastructure redundancy, new interconnections, and upgrades to existing interconnections. Planning-level costs were estimated for potential redundancy projects based on the EPD *Supplemental Guidance for Planning Contractors: Water Management Practice Cost Comparison* that was developed to provide a state-wide reference tool for planning contractors to encourage consistency in relative cost estimates throughout the state and to support regional water planning council decision making (EPD, 2011).

1.2.6 Recommended Projects

Using a decision-based prioritization tool, absolute and weighted scores were calculated for each option. The options were then ranked using defined criteria (e.g., cost, environmental impacts). A sensitivity assessment was undertaken to test the influence of the category weightings on the rank outcome. Potential projects were then prioritized based on performance under these weighted quantitative and qualitative criteria.

2.0 QWS Data Collection

Detailed information about each QWS was obtained via a survey-based questionnaire, follow-up interviews, publicly available documents, information supplied by EPD, and data provided by the QWS.

2.1 Data Request

Each QWS was sent a standardized questionnaire approved by GEFA. The general categories are listed as follows:

- General system data (e.g., facility type, ownership type, and population served)
- Customer information (e.g., number of customers and critical facilities served)
- Water source information (e.g., source type and capacity, purchased water information, and water sales information)
- Permit conditions and limitations
- System infrastructure data (e.g., storage, treatment, and distribution system data)
- System interconnection data
- Future water supply planning considerations

Each QWS was also sent a data request list approved by GEFA, as follows:

- Master Plan
- Capital Improvement Plan
- Water Withdrawal Permits (both groundwater and surface water withdrawal)
- Public Water System Operating Permit(s)
- Surface Water and Groundwater Withdrawal Values (2015 through 2019)
- Sanitary Surveys (2015 through 2019)
- Water Sale Documents
- Emergency Planning Documents
- Mapping Information

2.2 Current and Future Conditions

For this study, 17 QWS in the Suwannee-Satilla Water Planning Region were surveyed. Agriculture, forestry, professional and business services, education, healthcare, manufacturing, public administration, and construction are the primary economic sectors in the Suwannee-Satilla Region. Land cover in the region is composed of approximately 38% forest, 29% wetland, 21% row crops/pasture, 6% urban, 1% open water, and 5% other (Suwannee-Satilla Water Planning Council, 2017).

2.2.1 General System Information

Table 2-1 shows key general information about the 17 QWS. The QWS in this region serve primarily municipal customers, and to a lesser extent, industrial customers. Water for agricultural purposes is almost exclusively obtained from private sources, such as private wells. The Hahira QWS serves the smallest total population and has three supply wells while the Valdosta QWS serves the largest total population and has 10 supply wells.

Findings from data collection include the following general information about the Suwannee-Satilla Region:

- All 17 QWS use groundwater as their drinking water source.
- Distribution systems range from approximately 28 years old to more than 100 years old, with 9 systems more than 70 years old. Three QWS are of an unknown system age.
- The largest system customers are typically industries, educational facilities, correctional facilities, or critical care facilities (e.g., hospitals).
- Three QWS reported regular water sales.
- One QWS regularly purchased water in 2015.
- 14 QWS have at least one backup power source/facility.
- Five systems reported current distribution system flow surplus capabilities.
- The following system interconnections, including emergency interconnections, were reported:
    - Valdosta is interconnected with Remerton, Lowndes County-North, and Lowndes County-Spring Creek.
    - Lowndes County-North is interconnected with Valdosta.
    - Lowndes County-South is interconnected with Lake Park.
    - Tifton is interconnected with a college.
    - Folkston is interconnected with Homeland Robin Lane.
    - Ashburn is interconnected with Sycamore.
    - Satilla Regional Water and Sewer Authority-East is interconnected with Waycross.
    - Satilla Regional Water and Sewer Authority is interconnected with Waycross-Ware County Industrial Park.
    - Waycross is interconnected with Satilla Regional Water and Sewer Authority-East.

Overall, data collected show that the QWS have a 2019 combined average treatment capacity of over 31 million gallons per day (MGD) and a 2019 combined peak operational capacity of over 53 MGD. The 17 QWS serve a total estimated direct population of approximately 200,000 people and a total estimated consecutive population of 2,000. For this report, a consecutive population is defined as the population benefited from a system's regular water sales to another water system. Note that combining the direct and consecutive population values may result in certain users being counted twice. For example, in 2015, Valdosta regularly sold water to Lowndes County – North.

2.2.2 Mapping Data

Mapping data were requested of the QWS. Specifically, information was requested related to drinking water infrastructure, such as: pumping and treatment facilities, storage tanks (ground and elevated), pipelines, booster pumps, distribution systems, hydrants, elevation values, etc. Digital mapping data (specifically GIS format) were preferred. However, hydraulic computer models and hard copy/PDF maps were also accepted. If hard copy/PDF maps were manually digitized, priority was given to digitizing water lines on the edges of the QWS distribution system because identifying potential interconnection opportunities was a main objective.

Table 2-2 shows mapping data received from the 17 QWS. One system provided GIS data. Hard copy/PDF maps were obtained from seven QWS. Hard copy maps were georeferenced and digitized based on known landmarks.

2.2.3 Reports and Documents

Several reports and documents were requested from each QWS, as detailed in Section 2.1.

Table 2-3 shows the reports and other documents received from the 17 QWS. The 17 QWS had documents available, with comprehensive plans, water loss audits, permits, and sanitary surveys being the most frequently provided documents. EPD supplied recent sanitary surveys and 2015 and 2019 water audits for many systems. The Georgia Department of Community Affairs website contained comprehensive plans for many QWS. Based on review of comprehensive plans and survey responses, future (post-2019) planned water infrastructure improvements include:

- Water meter upgrades for Adel
- Power augmentation, potentially using solar panels, at the water treatment plants for Blackshear and Valdosta
- New supply wells for Blackshear, Quitman, and Tifton
- New storage tanks for Blackshear, Douglas, Quitman, and Tifton-Tift County
- New generators for Blackshear, Satilla Regional Water and Sewer Authority (portable, to supply both QWS), and Valdosta
- Water line repair/replacement projects for Ashburn, Folkston, Tifton-Tift County, and Waycross
- Expanded distribution systems for Adel and Douglas,
- General maintenance for Adel, Blackshear, Douglas, Folkston, Tifton-Tift County, and Waycross
- Increased treatment capacity for Alma, Blackshear, Folkston, and Tifton-Tift County
- New pumps for Ashburn and Douglas
- Water treatment plant rehabilitation for Adel, Blackshear, Douglas, Folkston, Hahira, and Tifton-Tift County
- A new interconnection between Lowndes County-North and Lowndes County-South

3.0 Redundant Water Supply Sources

Water supply sources were evaluated for their potential ability to provide surplus water to a neighboring water system during an emergency. Such water sources include excess capacity of current permitted allocations, new water sources, and interconnections between systems. Factors potentially affecting source availability were also noted.

3.1 Excess Capacity from Existing Water Sources

Existing water source excess capacity was evaluated for availability during short-term, defined durations, which are often less than three days but no more than 120 days. Long-term, undefined durations, as detailed further in Section 5, do not apply to this region because this region does not obtain its raw water from the Allatoona Lake/Etowah River or Lake Lanier/Chattahoochee River systems. Therefore, existing water sources were only assessed for the 2015 and 2050 short-term, defined duration scenarios.

Table 3-1 presents the 2015 and 2050 peak day design capacity, ADD, and resultant excess capacity for each QWS, as well as current permitted withdrawal capacity. The ADD values exclude purchased water to portray the true net regional water need although, as noted previously, only Lowndes County-North regularly purchased water. Appendix A describes the peak day design capacity and ADD calculations.

Excess capacity for a short-term, defined duration emergency scenario was calculated by subtracting the ADD (water withdrawal only, not including purchased water) from the peak day design capacity. The excess capacity evaluation has a few key assumptions. It relies on readily available interconnections with the appropriate capacities. It also assumes that a QWS can increase to above-average production to supply water to another QWS experiencing an emergency. This assumption may not be appropriate if local needs of the supplying QWS are above average during the same emergency, resulting in less available excess capacity. In addition, because QWS data for this water planning region were collected in 2020, the self-reported 2015 peak day design capacity may reflect capital improvements that a QWS implemented between 2015 and the time the QWS was surveyed for this current analysis.

As Table 3-1 shows, there is sufficient excess capacity from existing sources for short-term, defined duration emergency scenarios for 2015 and 2050 demands for the 17 QWS. For 2015 demands, excess capacity is at least two times a given QWS's 2015 ADD for all QWS except Alma, Folkston, and Valdosta. The 2015 excess capacity values range from 1.2 MGD (Folkston) to 14.1 MGD (Tifton-Tift County).

For 2050 demands, excess capacity is at least two times a given QWS's 2050 ADD for all QWS except Fitzgerald, Folkston, Lowndes County-North, and Valdosta. The 2050 excess capacity values range from 1.2 MGD (Folkston) to 14.4 MGD (Tifton-Tift County). The QWS' capacities were scaled to allow for a comparison of excess capacities. Appendix A describes and shows the excess capacity index calculations and values. Valdosta's 2015 and 2050 scaled excess capacity sufficiency is the lowest relative to other Suwannee-Satilla QWS.

3.2 Potential Water Sources and Storage Options

Potential additional water supply sources include groundwater, surface water, and surface water impoundments (e.g., dammed reservoirs). The Suwannee-Satilla Region is in the Coastal Plain geologic region, which is characterized by sedimentary rocks with sandy soils.

3.2.1 Groundwater

Currently, the Suwannee-Satilla Region, as reported in their RWP, exclusively obtains its municipal water supply from groundwater. Groundwater sources accounted for 73% of the region's 2005 water supply, whereas surface water sources accounted for 27% of the region's 2005 water supply. The 2005 groundwater withdrawal by category is as follows: 55% agriculture, 28% municipal, 8% industrial, and 9% domestic/self-supply (Suwannee-Satilla Water Planning Council, 2017). Aquifer systems in the Suwannee-Satilla Region include the Floridan, Brunswick, and surficial. Figure 3-1 shows relevant aquifers in the Suwannee-Satilla Region.

The RWP noted that a groundwater availability resource assessment was performed by EPD for prioritized aquifers in the Suwannee-Satilla Region. Aquifer sustainable yield for the purposes of the resource assessment was defined as the volume of groundwater that can be withdrawn without reaching specific thresholds that indicate the potential for local or regional impacts. Impacts included localized aquifer drawdown, reduced stream baseflow, and long-term aquifer drawdown. Estimated sustainable yield for each aquifer was reported as a range, which reflects several computer model simulations with different assumptions. The Floridan aquifer is the primary aquifer in this region and water withdrawal from this aquifer is expected to increase from 2015 to 2050. The estimated sustainable yields for aquifers in the Suwannee-Satilla Region are greater than the 2015 and forecasted 2050 water demand. Therefore, no regional groundwater resource gaps have been identified. The RWP noted that local gaps may occur where there is a high well density and/or withdrawal volumes which exceed the sustainable yield. The RWP also noted that the resource assessment model boundary did not include southern Ware, southern Brantley, and Charlton Counties because these counties are included in a USGS Floridan Aquifer model (Suwannee-Satilla Regional Water Planning Council, 2017).

Five counties in the Suwannee-Satilla Region are part of the Coastal Georgia Water and Wastewater Permitting Plan for Managing Saltwater Intrusion, which applies to 24 Georgia counties. The focus of the management plan is to mitigate saltwater intrusion into the Upper Floridan Aquifer. As the five Suwannee-Satilla Region counties are in the "green zone," no pumping restrictions exist. However, conservation requirements do apply (Suwannee-Satilla Regional Water Planning Council, 2017).

Municipal groundwater withdrawals are entirely from the Floridan Aquifer (CDM Smith, 2017). Approximately two-thirds of the regional groundwater demand is driven by agricultural activities and these withdrawals are primarily from the Floridan Aquifer or Suwannee Basin (CDM Smith, 2017). Municipal water demand is projected to increase from 2015 (50.2 MGD) to 2050 (56.1 MGD), although the change in demand varies considerably by county (CDM Smith, 2017). Additional municipal supply wells, other than replacement wells, may be needed in the Suwannee-Satilla Region.

The RWP indicated that at this time, no regional groundwater resource gaps are expected to occur in the Suwannee-Satilla Region over the planning horizon. However, localized gaps could occur if well densities and/or withdrawal rates result in exceedance of sustainable yield metrics. The RWP further identified four counties that may need additional annual average withdrawal capacity if demand exceeds current permit limits. One of those counties, Pierce County, contains Blackshear (QWS). The projected, additional permitted capacity needed in 2050 for Pierce County is 0.13 MGD (Suwannee-Satilla Water Planning Regional Council, 2017).

Further, Table 3-1 demonstrates that some QWS 2050 ADD exceed or nearly meet their current permitted withdrawal. These QWS include Blackshear, Hahira, and the combined permit for Satilla Regional Water & Sewer Auth. and Satilla Regional Water & Sewer Auth.-East.

3.2.2 Surface Water

The 2005 surface water withdrawal by category is as follows: 2% industrial and 98% agriculture (Suwannee-Satilla Water Planning Council, 2017). The Suwannee-Satilla Region contains portions of the following major river basins: Suwannee River Basin in the western and south-central part of the region; Satilla River Basin in the eastern and north-central part of the region; Ocmulgee River Basin in the far northern part of the region; St. Mary's River Basin in the southeastern part of the region; and a small portion of the Ochlockonee River Basin in the far southwestern part of the region. Figure 3-2 shows relevant river basins in the Suwannee-Satilla Region. The major river systems include the Alapaha, Satilla, St. Marys, Suwannee, and Withlacoochee Rivers. No major reservoirs exist in this region. Notable surface water features include Banks Lake and the wetlands associated with Okefenokee Swamp. Future municipal water supply is not expected to be obtained from surface water sources.

Surface water availability resource assessment models were conducted by EPD to evaluate consumptive demand on stream flows in each river basin. Potential gaps in terms of magnitude and duration were identified when a model fell below a threshold. Model results for 2015 and 2050 in the Suwannee River Basin indicated that no potential gaps exist at the Fargo node, while potential gaps exist at the Statenville, Pinetta, and Jennings nodes. For context, the Fargo and Statenville nodes are in Georgia just north of the Georgia-Florida state line, while the Pinetta and Jennings nodes are in Florida just south of the Georgia-Florida state line. Model results for 2015 and 2050 in the Satilla River Basin indicated that potential gaps exist at the Atkinson node. For context, the Atkinson node is on the east side of Brantley County. Model results for 2015 and 2050 in the St. Marys River Basin indicated that no potential gaps exist at the Gross node. For context, the Gross node is along the Georgia-Florida state line just outside of St Marys, Georgia. Additional resource assessment modeling was performed to better understand the cause and magnitude of potential gaps identified during initial surface water availability modeling. Based on the results of additional modeling, the Council noted that the less severe and more frequent gaps can most likely be addressed by management practices, while the more infrequent and severe gaps can most likely be addressed through drought management measures. The Council identified management practices to address potential gaps, including water conservation and additional/alternate surface water supply sources. For example, Management Practices DCAR-1 through DCAR-10, WC-1 through WC-12, and ASWS-1 through ASWS-11. (Suwannee-Satilla Regional Water Planning Council, 2017)

3.2.3 New Reservoirs

Of all the potential water source and storage options, new reservoirs are the most environmentally sensitive, costly, and time-consuming (MACTEC, 2008). Specific new reservoirs were not identified by the Suwannee-Satilla Water Planning Council, although Management Practice ASWS-10 mentioned the potential for a multi-region reservoir to also serve the Upper Flint and/or Lower Flint-Ochlockonee Regions (Suwannee-Satilla Regional Water Planning Council, 2017).

3.2.4 Georgia Inventory and Survey of Feasible Sites for Water Supply Reservoirs

In the 2008 report *GEFA Georgia Inventory and Survey of Feasible Sites for Water Supply Reservoirs*, MACTEC Engineering and Consulting, Inc., now Wood, and other consultants inventoried and surveyed

drinking water supply reservoirs in Georgia (MACTEC, 2008). The effort focused on the potential to expand existing reservoirs via increasing dam heights and supplemental pumping from nearby streams. Existing reservoirs were screened, and 16 reservoirs were identified for potential expansion. The report focused on the 78 counties above the Georgia fall line, which separates the Piedmont geologic region from the Coastal Plain geologic region. Therefore, the MACTEC report does not identify potential drinking water supply reservoirs for the Suwannee-Satilla Region.

3.2.5 Georgia Soil and Water Conservation Commission Flood Control Dams

In the 2007 report *Inventory and Assessment of USDA/Soil and Water Conservation District Watershed Dams: Finding Report* the Georgia Soil and Water Conservation Commission (GSWCC), Natural Resource Conservation Service, EPD, and consultants assessed existing watershed flood control dams that could be potentially modified to serve as water supply reservoirs (GSWCC, 2007). After 357 watershed dams were assessed, 166 were prioritized for further evaluation based on environmental impacts, infrastructure impacts, and potential water supply yield. Twenty watershed dams were initially selected for more detailed studies. Eight additional watershed dams were evaluated in areas where "demand would exceed supply in the near future" (GSWCC, 2009).

The Suwannee-Satilla Region does not currently have a watershed flood control dam; therefore, watershed dams cannot be potential water supply reservoirs in this region.

3.2.6 Quarries

Abandoned rock quarries may serve as potential water supply storage reservoirs, particularly during emergency or drought scenarios. Quarry wall stability, rock permeability, and geographic proximity are important considerations for site selection. As this Water Planning Region is in the Coastal Plain geologic region, bedrock and soils are generally sedimentary in origin and permeable. Therefore, sand and gravel quarries are present in this region, as opposed to hard-rock (igneous or metamorphic) or mineral quarries.

A GIS investigation was performed to assess the availability of quarries as potential reservoirs. A 5-mile radius was drawn around QWS municipal boundaries. The water treatment plant (WTP) locations were used as the radius origin for County Authority or Regional Authority QWS. Aerial imagery was visually inspected to identify quarries. In addition, publicly available online quarry inventories were checked. In the Suwannee-Satilla Region, no potential quarries were identified. Small-scale surface mining operations may exist; however, they are unlikely future water storage reservoirs.

3.2.7 Aquifer Storage and Recovery

Aquifer Storage and Recovery (ASR) involves injecting treated water into an aquifer and later recovering the stored water for beneficial reuse, such as for drinking water supply. ASR offers a redundant water supply that can be accessed if aquifer storage is sufficient. EPD oversees the permitting and regulation of ASR projects, and to-date, EPD has not received ASR applications nor is aware of ASR projects in Georgia (EPD, 2021a). Therefore, each QWS should individually consider the feasibility of ASR.

3.3 Return Flow Reuse

There are two types of potable water reuse. Indirect potable reuse uses an environmental buffer, such as a lake, river, or a groundwater aquifer, before the water is treated at a drinking water treatment plant (EPD, 2021b). The *Indirect Potable Reuse Guidance Document* dated March 2021 describes the decision framework EPD uses to evaluate potential indirect potable reuse projects. Direct potable reuse involves

the treatment and distribution of water without an environmental buffer. Potable water reuse provides another option for expanding a region's water resource portfolio. As all QWS in this region are currently groundwater systems, indirect potable reuse was not evaluated as a redundant water supply.

Drinking water treatment and wastewater treatment typically occur in the same or nearby locations. When implementing direct potable reuse, the proximity of both wastewater and drinking water treatment may present considerable cost saving opportunities for municipalities. Some direct potable reuse systems may require additional water quality or process performance monitoring and/or an engineered storage buffer. In addition, because direct potable reuse has not been widely implemented, there is a lack of consensus in the scientific community about its safety. Therefore, each QWS should individually consider the feasibility of direct potable reuse.

The Suwannee-Satilla RWP identifies Management Practice ASWS-9 to incentivize greater wastewater return flows (Suwannee-Satilla Water Planning Council, 2017).

3.4 Current Interconnections Between Systems

As noted in Section 2.2.1, interconnections in the Suwannee-Satilla Region are few. One QWS, Tifton, indicated an emergency outgoing interconnection with a college. Two QWS indicated an emergency outgoing interconnection with a public water system while two QWS regularly sell water to small public water systems. The following systems have the potential to provide excess capacity during emergencies (Table 3-1):

- Valdosta's two-way interconnections, Lowndes County-Spring Creek and Lowndes County-North.
- Waycross's two-way interconnection with the Satilla Regional Water and Sewer Authority-East.
- Satilla Regional Water and Sewer Authority's two-way interconnection with Waycross-Ware County Industrial Park.

Details of the Lowndes County-South and Lake Park interconnection are unknown, although Lowndes County-South indicated that it is unlikely Lake Park could provide excess capacity.

Figure 3-3 displays the available mapping data for the water region.

3.5 Factors Affecting Availability of Water Supply

The viability of redundant water supply sources relies on certain factors, such as conveyance infrastructure, geographical barriers, permitting requirements, and source water quality compatibility.

3.5.1 Conveyance Factors

The feasibility of conveying water is a major consideration when assessing the practicality of using unused water sources to supply emergency water. Conveyance of water between two QWS or from new water sources would require construction of new pumping and piping infrastructure. The associated costs are key concerns and depend heavily on the proximity of the water source(s) to the QWS to be supplied. In addition, interconnections may be limited by natural obstructions, such as topography and surface water bodies, as well as man-made obstructions, such as roads, railroads, and buildings.

Municipal water systems are generally not interconnected in the Suwannee-Satilla Region due to the geographic distance between QWS. Therefore, municipalities historically have not had reasons to

interconnect. Although Table 3-1 shows that each QWS has excess capacity, conveyance of the excess capacity is currently hindered by lack of interconnections.

3.5.2 Water Withdrawal Permitting Factors

Any entity who withdraws, obtains, or utilizes groundwater in excess of 0.1 MGD must obtain a water withdrawal permit from EPD. The withdrawal permit identifies the permit expiration date, withdrawal purpose, withdrawal source, and standard conditions and special conditions for resource use. Table 3-1 shows the current monthly average permitted withdrawal limit for each QWS. For groundwater withdrawal permits, a daily peak can be above the permitted limit if the annual and monthly average withdrawals are below their respective permit limits. A short-term emergency water need met by excess capacity is likely to keep the QWS below their permitted values. If new water withdrawal sources are requested, they will be subject to EPD's permitting process and associated requirements, which will focus on the protection of both water quality and water quantity and take into consideration downstream impacts. The permit application may require a drought contingency plan, water conservation plan, a watershed protection plan, and/or reservoir management plan, where applicable. Therefore, water withdrawal permitting requirements should be a key consideration when proposing new or expanded water withdrawal.

3.5.3 Water Quality Factors

Factors that may affect surface water source quality include land use, potential pollutant sources, nutrient loading, and storm events within the water supply basin. Because this region does not currently have surface water reservoirs, these factors are not generally applicable.

Since all QWS in this region utilize groundwater sources, raw water treatment is similar, although certain differences exist. Within an individual aquifer, localized water chemistry and heterogeneity can be further responsible for raw water quality differences and, therefore, treatment differences.

Finished water quality should be accounted for when considering QWS interconnections such that blended water does not cause mineral precipitates, unpalatable water, or corrosion of the system infrastructure components. If interconnections are designed for water to flow in one direction, reverse flows can be another source of undesirable finished water quality as reverse flow may resuspend settled particles or dislodge pipe scale.

4.0 Emergency Planning Benchmarks

Total demand and reliability target values were calculated for current usage (2015, immediate reliability target) and future usage (2050, long-range reliability target). The total ADD was first calculated for each QWS based on the 2015 EPD-validated water audit values. In the event a QWS is not in that dataset, as identified in Table 2-3, QWS-provided values are reported. Then, tiered reliability targets were applied to each QWS's total demand to highlight where full supply of demand may not be available during some emergency scenarios. Redundant water supply may supplement existing water sources to meet demand during these scenarios.

4.1 Calculating Total Demand

Current total ADD was calculated as follows:

Total Demand = Raw Water Withdrawal
\+ Purchased Water (within county)
\+ Purchased Water (outside county)

The individual values were obtained through the data collection process identified in Section 2.1. Table 4-1 shows 2015 total demand and the values that sum to total demand, as well as 2050 total demand. Note that 2050 total demand is reported the same as 2050 ADD (Water Withdrawal Only) for QWS that do not purchase water. Section 3.1 and Appendix A describe the methodology for obtaining 2015 and 2050 ADD, which are presented in Table 3-1. Purchased water values were reported by QWS, and aggregate volumes were checked against the 2015 EPD-validated water loss audit, as available. Where available, total water used (including non-revenue water) is reported rather than billed water.

Total demand is counted for customers both internal and external (i.e., other QWS to which water is sold) to a QWS. For example, Valdosta withdrew 10.12 MGD in 2015, of which 0.49 MGD was sold to Lowndes County-North. This 0.49 MGD is also reported for Lowndes County-North, which is appropriate because both Valdosta and Lowndes County-North require that amount of water to meet their total demand.

4.2 Reliability Targets

The WSIRRA states that an emergency plan should "evaluate risks and, where feasible, plan for a district-wide interconnection reliability target for immediate implementation of approximately 35% of the ADD and long-range district-wide interconnection reliability planning goal of approximately 65% of the ADD (Senate Bill 380). These general targets provided preliminary benchmarks for emergency planning in the study and the current (i.e., year 2015) and long-range (i.e., year 2050) water demands that were calculated for each QWS. Therefore, for consistency with the MNGWPD study, the following reliability targets were used:

- 100% ADD (total demand)
- 65% ADD
- 35% ADD

The 35% and 65% reliability targets correspond to estimated usage associated with essential water needs. GEFA has identified customers with essential water needs as: hospitals, nursing home/assisted living facilities, correctional facilities, critical industries, and schools. It should be noted that demand includes both internal customers and external customers (i.e., other QWS to which water is sold).

Table 4-2 shows each reliability target applied to the 2015 and 2050 water demands. The reliability targets were not compared with actual QWS essential water needs; they were compared to the total ADD. QWS should verify what their essential water needs are as they may be less than the 35% and 65% reliability targets. If their essential water needs are greater than the 35% and 65% reliability targets, the QWS should plan to achieve higher targets for emergency scenarios.

5.0 Water Supply Risk Evaluations

Water supply risks and corresponding emergency scenarios were identified on a statewide basis. Therefore, not every risk and emergency scenario applies to the Suwannee-Satilla Region. To carry out the screening, specific system deficiencies (in volumetric demand) of the emergency scenarios and supply goals were calculated. Whereas Section 4 presented a general overview of the overall water availability under the reliability targets, Section 5 provides more specific information about how those reliability targets are applied to each QWS under emergency situations. The intent of Section 5 is to evaluate the capability of a QWS to supply sufficient water during a given emergency. Deficiencies from emergency situations were quantified for each QWS for current and future conditions. The maximum deficit (Critical Scenario Deficit) was determined for each QWS.

5.1 Emergency Scenarios

Table 5-1 shows the statewide water supply risks and emergency scenarios. Scenarios were assigned a duration and an evaluation selection criterion. Many of the QWS in the Suwannee-Satilla Region treat groundwater at each withdrawal well. For the purposes of this study, an individual well that receives water treatment is classified as a water treatment plant. Alternately, a groundwater QWS can be designed with two or more wells in parallel supplying raw water to one WTP, as is the case for Douglas, Lowndes County-South, Valdosta, and Waycross. Water supply Risks A, B, C, D, G, and H are short-term defined durations, meaning less than 120 days, and often less than 3 days. Risks E and F are long-term undefined durations, meaning greater than 365 days and potentially having an indefinite duration.

Risks A through D are more traditional emergencies that are often addressed in an emergency response plan. These risks apply to systems that own drinking water infrastructure assets, whether they are pumps, WTPs, or distribution systems. These criteria were met for the QWS in this region.

Risks E and F apply to QWS that receive water directly from the Allatoona Lake/Etowah River or Lake Lanier/Chattahoochee River systems. These two risks relate to the tri-state water litigation. Because the QWS in this region are not part of the specified lake/river systems, Risks E and F did not apply to QWS in this region.

Risk G applies to surface water QWS that have a raw water supply from a dammed reservoir. Because the QWS in this region utilize groundwater sources, Risk G did not apply to QWS in the Suwannee-Satilla Region.

Risk H was assessed for the most vulnerable surface water QWS during a drought scenario. Risk H is often addressed by local governments in a water conservation plan, which outlines consumer practices that are either encouraged (voluntary) or enforced. Further, EPD has drought management rules, consistent with rules and regulations of the State of Georgia Chapter 391-3-30, that require public water systems to follow drought response strategies and actions during specified levels of declared drought. It was assumed that available raw water supply for each QWS is 40% of ADD due to drought. Because the QWS in this region have groundwater sources and Risk H is a short-term, defined duration scenario, Risk H did not apply to QWS within the region.

5.2 Methodology

Water supply risk evaluations were performed to understand the capability of a QWS to supply sufficient water during a given emergency. WTP capacity and QWS demand values reported correspond to the values and concepts described in Sections 3 and 4. Note that the reliability target values were determined as described in Section 4.2. They are constants that do not depend on the emergency scenarios. The following process was performed for both 2015 and 2050 water supply risk evaluations.

Deficit was calculated as follows:

Deficit = Available Water Supply
- Reliability Target Demands

Where:

Available Water Supply = Peak Day Design Capacity
+ Maximum Possible Purchased Water Supply
+ Stored Water (Scenarios A1, B, D1, D2)
- Capacity Loss Due to Emergency

For a given QWS, each WTP peak day design capacity was identified as described in Section 3.1.1. The maximum possible purchased water supply (applicable to QWS with interconnections) and stored water (applicable only to Scenarios A1, B, D1, and D2) were then added. Other than water supply Risk C, each emergency scenario prescribes a situation that involves a QWS-wide capacity loss (e.g., critical asset failure). The available water supply is thus the capacity remaining after the loss was subtracted and the source, purchased, and stored water were added, as applicable.

The deficit for both 2015 and 2050 was then calculated by subtracting the reliability target demands from the available water supply. In the case of a negative deficit, meaning there is more available water supply than demand, the total demand deficit is reported as zero.

5.3 Key Assumptions

Table 5-1 presents key assumptions specific to each scenario. The following key assumptions apply to all scenarios and the corresponding deficit calculations:

- Only one QWS-wide emergency occurs at a time (i.e., Scenarios A1 and C do not occur simultaneously).
- Only one region-wide emergency occurs at a time (i.e., both Adel and Alma do not experience concurrent emergencies) except for Risk H (drought).
- The 2050 available water supply accounts for additional capacity due to planned capital improvements. (Blackshear and Quitman each provided an estimated increase in water capacity due to a proposed new well at each of those QWS.)
- Under an emergency scenario, QWS permit restrictions are followed. For groundwater withdrawal permits, a daily peak can be above the permitted limit if the annual and monthly average withdrawals are below their respective limits. Scenario A2 (30 days) is the only applicable scenario in which monthly average emergency withdrawals may approach permit limits. All groundwater QWS in this region have backup equipment available, rendering no capacity loss for Scenario A2. Therefore, permit limits are assumed to be followed.

- As applicable, a QWS indefinitely maintains its current infrastructure, backup power, and backup equipment.
- As applicable, a QWS indefinitely maintains its current permitted withdrawal limits and existing water sale/purchase contracts and interconnections.

5.4 Evaluation Results

Table 5-2 summarizes calculated deficits by QWS for 2015 and 2050. As noted above, only Risks A, B, C, and D apply to the Suwannee-Satilla Region. One QWS has a 2015 total demand deficit (i.e., 100% ADD): Valdosta. Valdosta's capacity loss caused a 65% ADD deficit. Two QWS had a 2050 total demand deficit: Lowndes County-South and Valdosta. Lowndes County-South's capacity loss did not cause 65% ADD or 35% ADD deficits, while Valdosta's capacity loss caused a 65% ADD deficit. Detailed available water supply and deficit calculations by QWS are provided in Appendix B. Figure 5-1 is a summary schematic of QWS 2050 ADD, deficits, and interconnections. This figure demonstrates QWS potential future water withdrawal and sharing.

QWS in the Suwannee-Satilla Region perform well when faced with the emergency scenarios because their multi-well, often multi-WTP design offers inherent redundancy. The overall flat topography of the region also allows for the QWS to have a systemwide distribution system positioned mainly within the city limits rather than across multiple pressure zones. This means that if one WTP fails, large portions of the system will not be without water. Another reason that QWS do not have deficits is because their ADD is relatively low compared to their available water supply, which is primarily driven by peak day design capacities.

For QWS experiencing more than one deficit, the highest deficit with the longest duration scenario and/or relative likelihood scenario, or the Critical Scenario Deficit, was selected for further evaluation. The Critical Scenario Deficit, if applicable, is highlighted in gray in Table 5-2. If a QWS does not have a Critical Scenario Deficit, the scenario rendering a given QWS with the least available water supply was selected for further evaluation.

6.0 Evaluation of Potential Projects

The water supply risk evaluations estimated the immediate and long-range potential emergency deficits for each QWS in the Suwannee-Satilla Region. As described in Section 5.4 and Table 5-2, two Suwannee-Satilla QWS have a 2050 deficit and the Critical Scenario Deficit was selected for further evaluation. If a QWS does not have a Critical Scenario Deficit, the scenario(s) rendering a given QWS with the least available water supply was/were further evaluated. Potential conceptual-level redundancy projects were developed for a QWS based on their reduced water supply, available information, cost of implementation, and other criteria. These projects may include, but are not limited to, internal infrastructure redundancy, new interconnections, and upgrades to existing interconnections.

6.1 Potential Projects

Emergency scenarios affecting QWS, as detailed in Appendix B, were evaluated for the feasibility of a potential project to address capacity losses. Beyond QWS with a Critical Scenario Deficit, if QWS 2050 available water supply was less than two times their 2050 total demand, a project was recommended. Thus, not all QWS have recommended projects. This was done to prioritize logical, implementable projects for QWS with less available water supply relative to other QWS. The starting point for identifying a potential project is deciding if it will be an interconnection project (new or upgrade to existing) or internal infrastructure redundancy project. For potential projects, the following considerations were taken, as applicable:

- Potential environmental impacts
- Withdrawal permit impacts
- Water quality impacts
- Community impacts

The above four considerations are applicable to interconnection projects. Interconnection projects can address emergency scenarios A1, A2, B, D1, D2, G, and H. Depending on the project, the above four considerations are sometimes applicable to internal infrastructure redundancy projects. Table 6-1 identifies certain internal infrastructure redundancy projects for certain emergency scenarios.

For the Suwannee-Satilla Region, one type of project was recommended: 1) new well and WTP to supply internal infrastructure redundancy. New well and WTP projects support three Suwannee-Satilla Water Planning Council Management Practices: 1) ASWS-3: Substitute Future Surface Water Use with Groundwater in Gap Areas; 2) MGWPC-1: Increase Municipal Groundwater Permit Capacity; and 3) GW-1: Sustainable Groundwater Development (Suwannee-Satilla Water Planning Council, 2017). Internal infrastructure redundancy projects highlight the potential for a future management practice: encourage public water systems to enhance their water supply redundancy and treatment/unit process redundancy. Table 6-2 shows the potential projects and provides the emergency scenarios addressed, maximum capacity added, and impact considerations.

Potential environmental impacts vary widely across project types. As this region has all groundwater QWS, surface water environmental impacts were not considered. Recall that the RWP indicated that at this time, no regional groundwater resource gaps are expected to occur in the Suwannee-Satilla Region over the planning horizon (Suwannee-Satilla Regional Water Planning Council, 2017). Local gaps may occur if withdrawal rates exceed aquifer or surface water sustainable yield. Therefore, stream-aquifer impacts due

to short-term municipal withdrawal increases during emergencies are not considered to be significant environmental impacts for this region. Designations by project type are detailed below.

- For new well and WTP projects, impacts due to drilling, regional groundwater resource gaps, and excavation (for pipelines) were considered, as applicable. A "medium-low" designation was applied as the baseline due to drilling/excavation-related activities. Designations were applied for regional resource gaps by aquifer: "medium-low" was applied if no gaps were identified; "medium-high" was applied if aquifer withdrawals are within the aquifer's estimated sustainable yield; "high" was applied if aquifer withdrawals are above the aquifer's estimated sustainable yield.
    - The new well and WTP projects considered for this region assume 175 feet of offsite excavation to tie-in to the distribution system. The potential environmental impacts of this length of offsite excavation are considered low.
    - The new well and WTP projects considered for this region include a backup generator. The potential environmental impacts of a backup generator include fuel storage, stormwater runoff control, and air permitting requirements. Cost and permitting requirements may increase depending on QWS-specific site conditions, electrical loading requirements, and electrical infrastructure layout.

Water withdrawal permit factors are described in Section 3.5.2. The QWS' 2050 ADD was compared to current monthly average permitted withdrawal limits (Table 3-1) to understand their ability to supply water to another QWS experiencing an emergency. Note that monthly average permitted withdrawal is higher than annual average permitted withdrawal for groundwater systems. Using monthly average values is appropriate because of the short-term, defined duration scenarios considered. A "low" designation was applied to a potential project if permit withdrawal limits would not limit the maximum capacity added. A "medium-low" designation was applied if permit withdrawal limits would limit the maximum capacity added by 1-49%, and a "medium-high" designation was applied if permit withdrawal limits would limit the maximum capacity added by 50-99%. A "high" designation was applied if permit withdrawal limits would completely limit the maximum capacity added.

Water quality factors are described in Section 3.5.3. A "low" designation was applied to a potential project if water treatment (e.g., treatment chemicals, chemistry, and processes) is compatible between QWS or the potential project serves internal infrastructure redundancy. Further designations were not considered because interconnection projects are not recommended for the Suwannee-Satilla Region.

Community impacts include excavation, easement/right of way acquisition, and multijurisdictional agreements. For the purposes of this project, easement/right of way considerations are included in approximated offsite excavation distances. A "low" designation was applied to a potential project if it occurs entirely on QWS property. A "medium-low" designation was applied if offsite excavation is less than 200 feet and/or a multijurisdictional agreement is needed. A "medium-high" designation was applied if offsite excavation is greater than 200 but less than 5,000 feet and/or a multijurisdictional agreement is needed. A "high" designation was applied if offsite excavation is more than 5,000 feet and/or a multijurisdictional agreement is needed.

6.1.1 Interconnections

Interconnection projects were not apparent for the Suwannee-Satilla Region, and therefore are not applicable.

6.1.2 Internal Infrastructure Redundancy

The four recommended potential projects for the Suwannee-Satilla Region are a new well and WTP to supply internal infrastructure redundancy. This project type can address emergency scenarios A1, A2, B, D1, D2, G, and H. QWS modifications for new well and WTP projects include the ability to site and manage a new well/WTP, connect treated water to the distribution system, and potentially increase permit limits. The maximum capacity added (in MGD) was estimated based on QWS-specific information. Because the four QWS considered for this potential project did not report owning a portable generator capable of powering the proposed new well/WTP, a generator was included in each potential project.

6.2 Planning-Level Costs

Planning-level costs were estimated for potential redundancy projects in one of three ways: RSMeans (a construction cost estimating software), manufacturer prices, or the EPD *Supplemental Guidance for Planning Contractors: Water Management Practice Cost Comparison*. Estimated unit prices represent rough order of magnitude project prices based on assumptions summarized in the following sections. A macro-level, approximate project timeframe in months was also scoped out for each project. For new well and WTP projects, it was assumed that procurement and permitting would take approximately 6 months, engineering design and hydraulic modeling would take approximately 4 months, and drilling and construction would take a minimum of 2 months. Planning-level costs and macro-level timeframes are presented in Table 6-3.

6.2.1 Interconnections

Interconnection projects were not apparent for the Suwannee-Satilla Region, and therefore are not applicable.

6.2.2 Internal Infrastructure Redundancy

New well and WTP costs were estimated from the EPD supplemental guidance document. The document provides unit costs for anticipated water management practices, of which "WS-3 New Groundwater Sources" and "WT-1 Water Treatment Plant (New)" were applicable (EPD, 2011). Based on the maximum capacity added, the middle-range cost was assumed to be representative for the proposed new well in Project 1, Project 2, and Project 4. The high-range cost was assumed to be representative for the proposed new well in Project 3. The low-range cost was assumed to be representative for each project's proposed new WTP because of the relatively fewer treatment components for groundwater QWS. The 2011 costs were brought to 2021 dollars using the Engineering News-Record's Construction Cost Index. The unit costs were multiplied by the number of units (0.50 MGD for the Project 1, Project 2, and Project 4 maximum capacity added; 2.45 MGD for the Project 3 maximum capacity added). The sum of the new groundwater well, new WTP, and new generator appears as the additional cost in Table 6-3. Applicable pipeline costs were also estimated for this project type.

The generators considered have a standby rating, meaning they can supply power for short-term, defined durations, as opposed to a prime rating, which is meant for power needs when a system is not regularly wired to the electrical grid. QWS-specific electrical loads and configurations are needed to accurately scale and cost a generator project. Therefore, a relationship between known QWS peak day design capacity and generator power was developed to estimate the generator power needed for a proposed project. Prices were then estimated based on generator power needed.

Pipeline costs were estimated per linear foot of pipe. Manufacturer prices were obtained for several standard ductile iron pipe (DIP) sizes between 4 and 60 inches. Prices were adjusted to include a 20% mark-up for taxes and contractor overhead and profit. RSMeans was used to estimate excavation, backfill, and installation costs. Erosion control, sediment control, site clearing, and site grading considerations were also included. Construction mark-ups, including mobilization, temporary facilities, quality control testing, administration, and oversight, were 23% and applied to the subtotal construction unit prices. Additional mark-ups, including engineering design, permitting, and overall contingency, were 31% and applied to the subtotal construction unit prices and construction mark-ups. These cost estimates do not include land acquisition costs.

7.0 Recommended Projects

Once potential projects were identified and planning-level costs were estimated, potential projects were then prioritized based on performance under weighted quantitative and qualitative criteria. Using a decision-based prioritization tool, absolute and weighted scores were calculated for each potential project. The options were then ranked using defined criteria (e.g., cost, potential environmental impacts). A sensitivity analysis was undertaken to test the influence of the criteria weightings on the project rank outcome. Ranking reflects projects that will most benefit the Suwannee-Satilla Water Planning Region as a whole.

7.1 Prioritization Approach

Potential project prioritization was done to compare complex information among QWS. Quantitative and qualitative scoring criteria and weighting were selected to reflect the objectives of the redundancy study. Table 7-1 presents the scoring criteria and their weighting.

Scores were assigned either 1, 2, 3, or 4. A score of 1 implies a lower overall benefit of a potential project (e.g., relatively low maximum capacity added, high cost, and high impacts), while a score of 4 implies a higher overall benefit of a potential project (e.g., relatively high maximum capacity added, low cost, and low impacts). For Criterion 7 (Potential System and Community Impacts), the assigned score was the average of the three sub-criteria. For example, Project 1 received a Withdrawal Permit Impacts score of 4, a Water Quality Impacts score of 4, and a Community Impacts score of 3. The assigned score was the average of these individual scores, resulting in a score of 3.7. For Criterion 3 (Critical Scenario Duration), if multiple scenarios are addressed, the highest day duration of the scenarios addressed was used to assign a score. Non-weighted values were summed and divided by the applicable number of criteria to obtain an absolute score. The larger the absolute score, the more beneficial the potential project.

Criterion weights were assigned either 1, 2, or 3, with 1 holding less decision weight and 3 holding the most decision weight. Initial weights were assigned based on professional judgement and later tested with a sensitivity analysis. Criterion scores were multiplied by criterion weights. Values were summed and divided by the applicable number of criteria to obtain a weighted score. The larger the weighted score, the more beneficial the potential project.

Table 7-2 shows each criterion metric and its corresponding assigned score for this region's potential projects, as well as their absolute and initial weighted scores. In addition, cost per 1 MGD yield and cost per individual supplied were calculated. Table 7-3 is a decision-making summary to present the decision metrics for each potential project. An initial manual rank was assigned to each potential project based on initial weighted scores.

7.2 Sensitivity Analysis

A sensitivity analysis was conducted to test the influence of criterion weightings on the initial manual rank outcome. First, all criteria were assigned the highest weight (3). The effect of this weighting adjustment is equivalent to the absolute score because although it amplified score values, the rank outcome was the same. In the case of a tie, such as the absolute scores for Project 2 and Project 4, the lower cost per individual supplied broke the tie. Second, one of the eight criteria was assigned the highest weight (3) with the remaining seven criteria assigned the lowest weight (1). The effects of these weighting variations

are described in Appendix C. The sensitivity analysis results demonstrate that each criterion is generally insensitive to weighting. Therefore, retaining their initial assigned weights is appropriate.

7.3 Recommended Projects

With weighting reasonably assigned, as demonstrated by the sensitivity analysis results, the final manual ranks equal the initial manual ranks, which appear in Table 7-3. It is recommended that decision making priority be given to potential projects with higher rank order because the order accounts for the foremost quantitative and qualitative criteria pertinent to water supply redundancy.

7.4 Conclusion

The purpose of the Water Supply Redundancy Study is to increase Georgia's water supply solvency and reliability. This study evaluated drinking water supply, demand, treatment, storage, distribution, and interconnectivity to identify redundant water supply sources capable of providing backup water supply for each QWS.

Seventeen QWS in the Suwannee-Satilla Water Planning Region were evaluated for water supply redundancy. QWS data were collected, summarized, and evaluated for current and future conditions. Redundant water supply sources were explored, and water supply risk evaluations were conducted. Potential redundancy projects were conceptualized and costed for QWS left with notably reduced water supply during an emergency scenario. Potential projects were scored via a decision-based prioritization tool using weighted quantitative and qualitative criteria and subsequently ranked. Table 7-4 presents the potential projects sorted by final rank order. This study illustrated opportunities for improved QWS water supply redundancy and resiliency when faced with potential emergencies in the Suwannee-Satilla Water Planning Region.

References

Black & Veatch, 2017. *Suwannee-Satilla Regional Water Planning Council: Water and Wastewater Forecasting Technical Memorandum*. March 2017.

CH2MHill, Jacobs, Lowe Engineers, 2011. *GEFA Water System Interconnection, Redundancy, and Reliability Act Emergency Supply Plan*. September 2011.

EPD, 2011. *Supplemental Guidance for Planning Contractors: Water Management Practice Cost Comparison*. April 2011.

EPD, 2021a. "Regulation of Aquifer Storage and Recovery." https://epd.georgia.gov/rules-laws-enforcement/existing-rules-and-corresponding-laws/regulation-aquifer-storage-and

EPD, 2021b. Indirect Potable Reuse Guidance Document. March 2021.

GSWCC, 2007. *Inventory and Assessment of USDA/Soil and Water Conservation District Watershed Dams: Finding Report*. Georgia Soil and Water Conservation Commission. December 27, 2007.

GSWCC, 2009. *Inventory and Assessment of USDA/Soil and Water Conservation District Watershed Dams: Summary Executive Report*. Georgia Soil and Water Conservation Commission. March 16, 2009.

MACTEC, 2008. *GEFA Georgia Inventory and Survey of Feasible Sites for Water Supply Reservoirs*. October 31, 2008.

Painter, 2019. *Estimated Use of Water in Georgia for 2015 and Water-Use Trends, 1985–2015*. U.S. Geological Survey Open-File Report 2019–1086.

Suwannee-Satilla Water Planning Council, 2017. *Suwannee-Satilla Regional Water Plan*. June 2017.

Senate Bill 380, Regular Session, Georgia, May 5, 2010.

TABLES

Table 2-1
Key General Information

County	Qualified Water System	Public Water System Identification Number	Estimated Population Directly Served[1]	Estimated Consecutive Population Served[2]	Raw Water Source(s)[3]	Regular Purchases 2015-2019[4]	Irregular / Emergency Purchases 2015-2019[4]	Regular Sales 2015-2019[4]	Irregular / Emergency Sales 2015-2019[4]
Cook	Adel	GA0750000	5,500	0	Groundwater Wells (5)	-	-	-	-
Bacon	Alma	GA0050000	4,700	0	Groundwater Wells (3)	-	-	-	-
Turner	Ashburn	GA2870000	4,600	0	Groundwater Wells (4)	-	-	-	-
Pierce	Blackshear	GA2290000	5,800	0	Groundwater Wells (3)	-	-	-	-
Coffee	Douglas	GA0690002	12,000	0	Groundwater Wells (6)	-	-	-	-
Ben Hill	Fitzgerald	GA0170000	13,500	0	Groundwater Wells (5)	-	-	-	-
Charlton	Folkston	GA0490000	4,800	900	Groundwater Wells (3)	-	-	Homeland Robin Lane	-
Lowndes	Hahira	GA1850000	3,100	0	Groundwater Wells (3)	-	-	-	-
Lowndes	Lowndes County - North	GA1850016	7,200	0	Groundwater Wells (4)	Valdosta (2015)	Valdosta (2016-2019)	-	-
Lowndes	Lowndes County - South	GA1850019	5,900	0	Groundwater Wells (2)	-	-	-	-
Berrien	Nashville	GA0190002	4,800	0	Groundwater Wells (2)	-	-	-	-
Brooks	Quitman	GA0270002	4,900	0	Groundwater Wells (3)	-	-	-	-
Ware	Satilla Regional Water & Sewer Auth. - East	GA2990051	5,300	0	Groundwater Wells (2)	-	-	-	-
Ware	Satilla Regional Water & Sewer Auth.	GA2990001	15,000	0	Groundwater Wells (3)	-	-	-	-
Tift	Tifton - Tift County	GA2770001	26,500	0	Groundwater Wells (8)	-	-	-	Abraham Baldwin Ag. College
Lowndes	Valdosta	GA1850002	56,500	1,100	Groundwater Wells (10)	-	-	Lowndes County - North (2015) Remerton	Lowndes County - North (2016-2019)
Ware	Waycross	GA2990002	19,900	0	Groundwater Wells (2)	-	-	-	-

Prepared by: LCT 12/10/20
Checked by: GJH 12/14/20

Notes:

1. The population that the system directly sells water to, rounded to the nearest 100.
2. The population benefited from the system's sale to another system, rounded to the nearest 100.
3. The value in parentheses indicates the number of sources.
4. Purchases/sales are from/to other water systems.

Table 2-2
Mapping Data Received

			Level of Mapping Data Received					
County	**Qualified Water System**	**Estimated Population Directly Served[1]**	**No Mapping Data**	**Hard Copy/PDF Maps**	**Digital Mapping Data - GIS**	**Digital Mapping Data - CAD**	**Digital Mapping Data - Google Earth**	**Hydraulic Computer Model**
Cook	Adel	5,500	◊					
Bacon	Alma	4,700	◊					
Turner	Ashburn	4,600	◊					
Pierce	Blackshear	5,800		◊				
Coffee	Douglas	12,000		◊				
Ben Hill	Fitzgerald	13,500		◊				
Charlton	Folkston	4,800	◊					
Lowndes	Hahira	3,100		◊				
Lowndes	Lowndes County - North	7,200	◊					
Lowndes	Lowndes County - South	5,900	◊					
Berrien	Nashville	4,800	◊					
Brooks	Quitman	4,900		◊				
Ware	Satilla Regional Water & Sewer Auth. - East	5,300	◊					
Ware	Satilla Regional Water & Sewer Auth.	15,000	◊					
Tift	Tifton - Tift County	26,500		◊	◊			
Lowndes	Valdosta	56,500		◊				
Ware	Waycross	19,900	◊					

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Notes:

1. The population that the system directly sells water to, rounded to the nearest 100.

Table 2-3
Reports and Documents Received

			Reports and Documents Received[3]								
County	**Qualified Water System**	**Estimated Population Directly Served[1]**	**Comprehensive / Capital Improvement Plan[2]**	**Permits**	**Sanitary Survey[4]**	**Water Sale / Purchase Agreements**	**Water Conservation Plan**	**Consumption / Withdrawal Reports**	**Insurance Services Office Report**	**2015 Water Loss Audit[4]**	**Emergency Response Plan**
Cook	Adel	5,500	◊	◊	◊					◊	
Bacon	Alma	4,700	◊	◊	◊					◊	
Turner	Ashburn	4,600	◊	◊	◊					◊	
Pierce	Blackshear	5,800	◊	◊	◊		◊			◊	
Coffee	Douglas	12,000	◊	◊	◊		◊			◊	
Ben Hill	Fitzgerald	13,500	◊	◊	◊		◊	◊		◊	
Charlton	Folkston	4,800	◊	◊	◊					◊	
Lowndes	Hahira	3,100	◊	◊	◊			◊			
Lowndes	Lowndes County - North	7,200	◊	◊	◊					◊	
Lowndes	Lowndes County - South	5,900	◊	◊	◊					◊	
Berrien	Nashville	4,800	◊	◊	◊					◊	
Brooks	Quitman	4,900	◊	◊	◊			◊		◊	
Ware	Satilla Regional Water & Sewer Auth. - East	5,300		◊	◊		◊				
Ware	Satilla Regional Water & Sewer Auth.	15,000		◊	◊		◊			◊	
Tift	Tifton - Tift County	26,500	◊	◊	◊		◊	◊		◊	
Lowndes	Valdosta	56,500	◊	◊	◊			◊		◊	
Ware	Waycross	19,900	◊	◊	◊					◊	

Prepared by: LCT 12/10/20

Checked by: GJH 12/14/20

Notes:

1. The population that the system directly sells water to, rounded to the nearest 100.
2. The Georgia Department of Community Affairs website contained comprehensive plans.
3. Some systems provided additional, potentially relevant documents.
4. EPD supplied recent sanitary surveys and 2015 water audits for many systems.

Table 3-1
Current and Future Excess Capacity

County	Qualified Water System (QWS)	Raw Water Source(s)[1]	2015 Peak Day Design Capacity (MGD)	2015 ADD (MGD) (Water Withdrawal Only)[2]	2015 Excess Capacity (MGD)	Current Permitted Withdrawal (MGD-Monthly Average)	2050 Peak Day Design Capacity (MGD)[5]	2050 ADD (MGD) (Water Withdrawal Only)[6]	2050 Excess Capacity (MGD)
Cook	Adel	Groundwater Wells (5)	8.2	0.8	7.4	4.312	8.2	0.7	7.5
Bacon	Alma	Groundwater Wells (3)	2.4	0.9	1.5	1.5	2.4	0.7	1.7
Turner	Ashburn	Groundwater Wells (4)	3.7	0.7	3.0	1.728	3.7	0.4	3.4
Pierce	Blackshear	Groundwater Wells (3)	3.4	0.3	3.1	0.75	4.7	0.9	3.8
Coffee	Douglas	Groundwater Wells (6)	10.7	3.3	7.4	6.0	10.7	2.0	8.7
Ben Hill	Fitzgerald	Groundwater Wells (5)	7.6	2.5	5.2	6.0	7.6	2.9	4.7
Charlton	Folkston	Groundwater Wells (3)	1.9	0.7	1.2	1.5	1.9	0.7	1.2
Lowndes	Hahira	Groundwater Wells (3)	4.3	0.2[(3)]	4.1	0.6	4.3	0.5	3.8
Lowndes	Lowndes Co.-North	Groundwater Wells (4)	2.8	0.5	2.3	2.5	2.8	1.2	1.6
Lowndes	Lowndes Co.-South	Groundwater Wells (2)	4.3	1.0	3.3	8.291	4.3	1.1	3.2
Berrien	Nashville	Groundwater Wells (2)	3.2	0.5	2.6	1.5	3.2	0.4	2.8
Brooks	Quitman	Groundwater Wells (3)	2.6	0.6	2.0	1.5	3.9	0.5	3.4
Ware	Satilla Regional Water & Sewer Auth. - East	Groundwater Wells (2)	3.2	0.3	2.9	-	3.2	0.6	2.6
Ware	Satilla Regional Water & Sewer Auth.	Groundwater Wells (3)	5.2	0.7	4.5	2.2[(4)]	5.2	1.6	3.6
Tift	Tifton-Tift County	Groundwater Wells (8)	18.7	4.6	14.1	11.0	18.7	4.3	14.4
Lowndes	Valdosta	Groundwater Wells (10)	19.1	10.1	9.0	19.1	19.1	10.7	8.4
Ware	Waycross	Groundwater Wells (2)	7.0	1.7	5.3	3.16	7.0	2.3	4.8
Totals			**108.4**	**29.4**	**79.0**	**71.6**	**110.9**	**31.5**	**79.4**

Prepared by: LCT 03/12/21
Checked by: GJH 03/25/21

Notes:
ADD - average daily demand
MGD - million gallons per day
1. The value in parentheses indicates the number of sources.
2. 2015 EPD-validated water loss audit values are reported. In the event a QWS is not in that dataset, as identified in Table 2-3, QWS-provided values are reported.
3. 2016 self-reported value is reported because the 2015 value not available.
4. Satilla Regional Water & Sewer Auth. has one withdrawal permit for both permitted systems GA2990001 & GA2990051 (East).
5. Blackshear and Quitman each indicated one potential new 1.25 MGD well.
6. Municipal and publicly-supplied industrial demand by county were allocated to each QWS.

Table 4-1
Total Water Demands

County	Qualified Water System	2015 ADD (MGD) (Water Withdrawal Only)	2015 Regular Purchased Volume - Outside County (MGD)[1]	2015 Regular Purchased Volume - Inside County (MGD)[1]	2015 Total Demand (MGD)	2050 Total Demand (MGD)
Cook	Adel	0.80	0.00	0.00	0.80	0.69
Bacon	Alma	0.90	0.00	0.00	0.90	0.74
Turner	Ashburn	0.71	0.00	0.00	0.71	0.37
Pierce	Blackshear	0.29	0.00	0.00	0.29	0.88
Coffee	Douglas	3.35	0.00	0.00	3.35	2.05
Ben Hill	Fitzgerald	2.46	0.00	0.00	2.46	2.91
Charlton	Folkston	0.70	0.00	0.00	0.70	0.68
Lowndes	Hahira	0.20	0.00	0.00	0.20	0.54
Lowndes	Lowndes Co.-North	0.54	0.00	0.49[(2)]	1.02	1.23
Lowndes	Lowndes Co.-South	0.99	0.00	0.00	0.99	1.09
Berrien	Nashville	0.53	0.00	0.00	0.53	0.41
Brooks	Quitman	0.61	0.00	0.00	0.61	0.45
Ware	Satilla Regional Water & Sewer Auth. - East	0.28	0.00	0.00	0.28	0.57
Ware	Satilla Regional Water & Sewer Auth.	0.71	0.00	0.00	0.71	1.60
Tift	Tifton-Tift County	4.57	0.00	0.00	4.57	4.26
Lowndes	Valdosta	10.12	0.00	0.00	10.12	10.75
Ware	Waycross	1.68	0.00	0.00	1.68	2.26
	Totals	**29.44**	**0.00**	**0.49**	**29.92**	**31.49**

Prepared by: LCT 03/12/21

Checked by: GJH 03/25/21

Notes:

ADD - average daily demand

MGD - million gallons per day

1. Values were reported by QWS, and aggregate volumes were verified with the 2015 EPD-validated water loss audit, as available.

2. These purchases became emergency-only purchases after 2015.

Table 4-2
Reliability Targets for Current and Future Demand

			2015 - Immediate Reliability Target			2050 - Long-Range Reliability Target		
County	**Qualified Water System**	**Public Water System Identification Number**	**Total Demand (MGD)[1]**	**65% ADD (MGD)**	**35% ADD (MGD)**	**Total Demand (MGD)[1]**	**65% ADD (MGD)**	**35% ADD (MGD)**
Cook	Adel	GA0750000	0.80	0.52	0.28	0.69	0.45	0.24
Bacon	Alma	GA0050000	0.90	0.59	0.32	0.74	0.48	0.26
Turner	Ashburn	GA2870000	0.71	0.46	0.25	0.37	0.24	0.13
Pierce	Blackshear	GA2290000	0.29	0.19	0.10	0.88	0.57	0.31
Coffee	Douglas	GA0690002	3.35	2.18	1.17	2.05	1.33	0.72
Ben Hill	Fitzgerald	GA0170000	2.46	1.60	0.86	2.91	1.89	1.02
Charlton	Folkston	GA0490000	0.70	0.46	0.25	0.68	0.44	0.24
Lowndes	Hahira	GA1850000	0.20	0.13	0.07	0.54	0.35	0.19
Lowndes	Lowndes Co.-North	GA1850016	1.02	0.66	0.36	1.23	0.80	0.43
Lowndes	Lowndes Co.-South	GA1850019	0.99	0.64	0.35	1.09	0.71	0.38
Berrien	Nashville	GA0190002	0.53	0.34	0.18	0.41	0.27	0.15
Brooks	Quitman	GA0270002	0.61	0.40	0.21	0.45	0.30	0.16
Ware	Satilla Regional Water & Sewer Auth. - East	GA2990051	0.28	0.18	0.10	0.57	0.37	0.20
Ware	Satilla Regional Water & Sewer Auth.	GA2990001	0.71	0.46	0.25	1.60	1.04	0.56
Tift	Tifton-Tift County	GA2770001	4.57	2.97	1.60	4.26	2.77	1.49
Lowndes	Valdosta	GA1850002	10.12	6.58	3.54	10.75	6.99	3.76
Ware	Waycross	GA2990002	1.68	1.09	0.59	2.26	1.47	0.79
Totals			**29.9**	**19.5**	**10.5**	**31.5**	**20.5**	**11.0**

Prepared by: LCT 03/12/21

Checked by: GJH 03/25/21

Notes:

ADD - average daily demand

MGD - million gallons per day

1. Total demand (withdrawal plus purchases) is defined the same as 100% annual average day demand.

Table 5-1
Water Supply Risks and Emergency Scenarios

Water Supply Risk	Emergency Scenario	Type	Duration (Days)	Evaluation Selection Criteria	Key Assumptions
A. Failure of largest water treatment plant (WTP)	A1. Power supply failure of largest WTP	Short-term Defined Duration	1	QWS that receive water from a system-owned WTP	- Treatment capacity is based on the backup generator's capacity, if available. Otherwise, 80% of peak treatment is assumed. - In the event a QWS has a portable generator, it is assumed that generator is used at the largest WTP, per this scenario - 60% of QWS treated water storage is available at the beginning of the emergency.
	A2. Critical asset failure at largest WTP (e.g., loss of clearwell, loss of chemical treatment)	Short-term Defined Duration	30		- The longer duration excludes the availability of water storage supply. - Each WTP was evaluated for unit process redundancy and the ability to operate at a higher rate. - Critical assets for groundwater QWS include chemical treatment. Backup chemical feed equipment is required for WTPs installed after 1/1/1998.
B. Short-term catastrophic failure of a water distribution system	Critical transmission main failure from largest WTP or interconnection	Short-term Defined Duration	1	QWS with a distribution system	- 60% of QWS treated water storage is available at the beginning of the emergency.
C. Short-term contamination of a water supply within distribution system	Contamination of distribution system triggers a boil water notice	Short-term Defined Duration	3	QWS with a distribution system	- No capacity is lost - Water is non-potable
D. Short-term contamination of a raw water source	D1. Biological contamination of largest raw water source	Short-term Defined Duration	1	QWS that pump from a raw water source	- In the case of groundwater QWS, the aquifer supplying the largest WTP is assumed to be locally contaminated. - 60% of QWS treated water storage is available at the beginning of the emergency. - 60% of QWS raw water storage and clearwell storage is available at the beginning of the emergency.
	D2. Chemical contamination of largest raw water source	Short-term Defined Duration	1		- In the case of groundwater QWS, the aquifer supplying the largest WTP is assumed to be locally contaminated. - 60% of QWS treated water storage is available at the beginning of the emergency. - 60% of QWS raw water storage and clearwell storage is available at the beginning of the emergency.
E. Full unavailability of major raw water sources due to federal or state government actions	--	Long-term Undefined Duration	>365	QWS that use Lake Lanier/Chattahoochee River or Allatoona Lake/Etowah River as a raw water source	- Not currently applicable
F. Limited or reduced availability of major raw water sources due to federal or state government actions	--	Long-term Undefined Duration	>365	QWS that use Lake Lanier/Chattahoochee River or Allatoona Lake/Etowah River as a raw water source	- Not currently applicable

Table 5-1
Water Supply Risks and Emergency Scenarios

Water Supply Risk	Emergency Scenario	Type	Duration (Days)	Evaluation Selection Criteria	Key Assumptions
G. Failure of an existing dam that impounds a raw water source	Dam failure for largest impoundment	Short-term Defined Duration	30	QWS that have a raw water supply from a dammed reservoir (not including Lake Lanier or Lake Allatoona)	- The longer duration excludes the availability of water storage supply.
H. Water supply reduction due to drought	Raw water supply available is 40% of ADD due to drought	Short-term Defined Duration	120	QWS with reservoirs in small watersheds and no direct withdrawal from a major river	- Available raw water supply for each QWS is 40% of ADD due to drought.

Prepared by: GJH 11/10/20
Checked by: LCT 11/19/20

Notes:
ADD - average daily demand
QWS - qualified water system
WTP - water treatment plant

Table 5-2
Deficit Summary

				2015 - Immediate Reliability Target			2015 - Deficits				2050 - Long-Range Reliability Target			2050 - Deficits		
County	**Qualified Water System**	**Scenario**	**2015 Available Water Supply (MGD)**	**Total Demand (MGD)[1]**	**65% ADD (MGD)**	**35% ADD (MGD)**	**Total Demand Deficit (MGD)**	**65% ADD Deficit (MGD)**	**35% ADD Deficit (MGD)**	**2050 Available Water Supply (MGD)**	**Total Demand (MGD)[1]**	**65% ADD (MGD)**	**35% ADD (MGD)**	**Total Demand Deficit (MGD)**	**65% ADD Deficit (MGD)**	**35% ADD Deficit (MGD)**
Cook	Adel	A1	8.3	0.8	0.5	0.3	0.0	0.0	0.0	8.3	0.7	0.4	0.2	0.0	0.0	0.0
		A2	8.2	0.8	0.5	0.3	0.0	0.0	0.0	8.2	0.7	0.4	0.2	0.0	0.0	0.0
		B	6.1	0.8	0.5	0.3	0.0	0.0	0.0	6.1	0.7	0.4	0.2	0.0	0.0	0.0
		C	8.2	0.8	0.5	0.3	0.0	0.0	0.0	8.2	0.7	0.4	0.2	0.0	0.0	0.0
		D1	6.1	0.8	0.5	0.3	0.0	0.0	0.0	6.1	0.7	0.4	0.2	0.0	0.0	0.0
		D2	6.1	0.8	0.5	0.3	0.0	0.0	0.0	6.1	0.7	0.4	0.2	0.0	0.0	0.0
		E	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
		F	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
		G	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
		H	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Bacon	Alma	A1	2.9	0.9	0.6	0.3	0.0	0.0	0.0	2.9	0.7	0.5	0.3	0.0	0.0	0.0
		A2	2.4	0.9	0.6	0.3	0.0	0.0	0.0	2.4	0.7	0.5	0.3	0.0	0.0	0.0
		B	2.0	0.9	0.6	0.3	0.0	0.0	0.0	2.0	0.7	0.5	0.3	0.0	0.0	0.0
		C	2.4	0.9	0.6	0.3	0.0	0.0	0.0	2.4	0.7	0.5	0.3	0.0	0.0	0.0
		D1	2.0	0.9	0.6	0.3	0.0	0.0	0.0	2.0	0.7	0.5	0.3	0.0	0.0	0.0
		D2	2.0	0.9	0.6	0.3	0.0	0.0	0.0	2.0	0.7	0.5	0.3	0.0	0.0	0.0
		E	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
		F	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
		G	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
		H	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Turner	Ashburn	A1	3.2	0.7	0.5	0.2	0.0	0.0	0.0	3.2	0.4	0.2	0.1	0.0	0.0	0.0
		A2	3.9	0.7	0.5	0.2	0.0	0.0	0.0	3.9	0.4	0.2	0.1	0.0	0.0	0.0
		B	3.2	0.7	0.5	0.2	0.0	0.0	0.0	3.2	0.4	0.2	0.1	0.0	0.0	0.0
		C	3.9	0.7	0.5	0.2	0.0	0.0	0.0	3.9	0.4	0.2	0.1	0.0	0.0	0.0
		D1	3.2	0.7	0.5	0.2	0.0	0.0	0.0	3.2	0.4	0.2	0.1	0.0	0.0	0.0
		D2	3.2	0.7	0.5	0.2	0.0	0.0	0.0	3.2	0.4	0.2	0.1	0.0	0.0	0.0
		E	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
		F	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
		G	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
		H	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA

Table 5-2
Deficit Summary

				2015 - Immediate Reliability Target			2015 - Deficits				2050 - Long-Range Reliability Target			2050 - Deficits		
County	**Qualified Water System**	**Scenario**	**2015 Available Water Supply (MGD)**	**Total Demand (MGD)[1]**	**65% ADD (MGD)**	**35% ADD (MGD)**	**Total Demand Deficit (MGD)**	**65% ADD Deficit (MGD)**	**35% ADD Deficit (MGD)**	**2050 Available Water Supply (MGD)**	**Total Demand (MGD)[1]**	**65% ADD (MGD)**	**35% ADD (MGD)**	**Total Demand Deficit (MGD)**	**65% ADD Deficit (MGD)**	**35% ADD Deficit (MGD)**
Pierce	Blackshear	A1	3.0	0.3	0.2	0.1	0.0	0.0	0.0	5.3	0.9	0.6	0.3	0.0	0.0	0.0
		A2	3.4	0.3	0.2	0.1	0.0	0.0	0.0	4.7	0.9	0.6	0.3	0.0	0.0	0.0
		B	3.0	0.3	0.2	0.1	0.0	0.0	0.0	4.3	0.9	0.6	0.3	0.0	0.0	0.0
		C	3.4	0.3	0.2	0.1	0.0	0.0	0.0	4.7	0.9	0.6	0.3	0.0	0.0	0.0
		D1	3.0	0.3	0.2	0.1	0.0	0.0	0.0	4.3	0.9	0.6	0.3	0.0	0.0	0.0
		D2	3.0	0.3	0.2	0.1	0.0	0.0	0.0	4.3	0.9	0.6	0.3	0.0	0.0	0.0
		E	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
		F	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
		G	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
		H	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Coffee	Douglas	A1	11.9	3.3	2.2	1.2	0.0	0.0	0.0	12.2	2.0	1.3	0.7	0.0	0.0	0.0
		A2	10.7	3.3	2.2	1.2	0.0	0.0	0.0	10.7	2.0	1.3	0.7	0.0	0.0	0.0
		B	9.4	3.3	2.2	1.2	0.0	0.0	0.0	9.7	2.0	1.3	0.7	0.0	0.0	0.0
		C	10.7	3.3	2.2	1.2	0.0	0.0	0.0	10.7	2.0	1.3	0.7	0.0	0.0	0.0
		D1	9.4	3.3	2.2	1.2	0.0	0.0	0.0	9.7	2.0	1.3	0.7	0.0	0.0	0.0
		D2	9.4	3.3	2.2	1.2	0.0	0.0	0.0	9.7	2.0	1.3	0.7	0.0	0.0	0.0
		E	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
		F	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
		G	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
		H	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Ben Hill	Fitzgerald	A1	6.8	2.5	1.6	0.9	0.0	0.0	0.0	6.8	2.9	1.9	1.0	0.0	0.0	0.0
		A2	7.6	2.5	1.6	0.9	0.0	0.0	0.0	7.6	2.9	1.9	1.0	0.0	0.0	0.0
		B	6.8	2.5	1.6	0.9	0.0	0.0	0.0	6.8	2.9	1.9	1.0	0.0	0.0	0.0
		C	7.6	2.5	1.6	0.9	0.0	0.0	0.0	7.6	2.9	1.9	1.0	0.0	0.0	0.0
		D1	6.8	2.5	1.6	0.9	0.0	0.0	0.0	6.8	2.9	1.9	1.0	0.0	0.0	0.0
		D2	6.8	2.5	1.6	0.9	0.0	0.0	0.0	6.8	2.9	1.9	1.0	0.0	0.0	0.0
		E	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
		F	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
		G	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
		H	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA

Table 5-2
Deficit Summary

				2015 - Immediate Reliability Target			2015 - Deficits				2050 - Long-Range Reliability Target			2050 - Deficits		
County	**Qualified Water System**	**Scenario**	**2015 Available Water Supply (MGD)**	**Total Demand (MGD)[1]**	**65% ADD (MGD)**	**35% ADD (MGD)**	**Total Demand Deficit (MGD)**	**65% ADD Deficit (MGD)**	**35% ADD Deficit (MGD)**	**2050 Available Water Supply (MGD)**	**Total Demand (MGD)[1]**	**65% ADD (MGD)**	**35% ADD (MGD)**	**Total Demand Deficit (MGD)**	**65% ADD Deficit (MGD)**	**35% ADD Deficit (MGD)**
Charlton	Folkston	A1	2.0	0.7	0.5	0.2	0.0	0.0	0.0	2.0	0.7	0.4	0.2	0.0	0.0	0.0
		A2	1.9	0.7	0.5	0.2	0.0	0.0	0.0	1.9	0.7	0.4	0.2	0.0	0.0	0.0
		B	1.2	0.7	0.5	0.2	0.0	0.0	0.0	1.2	0.7	0.4	0.2	0.0	0.0	0.0
		C	1.9	0.7	0.5	0.2	0.0	0.0	0.0	1.9	0.7	0.4	0.2	0.0	0.0	0.0
		D1	1.2	0.7	0.5	0.2	0.0	0.0	0.0	1.2	0.7	0.4	0.2	0.0	0.0	0.0
		D2	1.2	0.7	0.5	0.2	0.0	0.0	0.0	1.2	0.7	0.4	0.2	0.0	0.0	0.0
		E	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
		F	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
		G	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
		H	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Lowndes	Hahira	A1	4.6	0.2	0.1	0.1	0.0	0.0	0.0	4.6	0.5	0.3	0.2	0.0	0.0	0.0
		A2	4.3	0.2	0.1	0.1	0.0	0.0	0.0	4.3	0.5	0.3	0.2	0.0	0.0	0.0
		B	2.9	0.2	0.1	0.1	0.0	0.0	0.0	2.9	0.5	0.3	0.2	0.0	0.0	0.0
		C	4.3	0.2	0.1	0.1	0.0	0.0	0.0	4.3	0.5	0.3	0.2	0.0	0.0	0.0
		D1	2.9	0.2	0.1	0.1	0.0	0.0	0.0	2.9	0.5	0.3	0.2	0.0	0.0	0.0
		D2	2.9	0.2	0.1	0.1	0.0	0.0	0.0	2.9	0.5	0.3	0.2	0.0	0.0	0.0
		E	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
		F	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
		G	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
		H	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Lowndes	Lowndes Co. - North	A1	6.2	1.0	0.7	0.4	0.0	0.0	0.0	6.2	1.2	0.8	0.4	0.0	0.0	0.0
		A2	5.3	1.0	0.7	0.4	0.0	0.0	0.0	5.3	1.2	0.8	0.4	0.0	0.0	0.0
		B	4.5	1.0	0.7	0.4	0.0	0.0	0.0	4.5	1.2	0.8	0.4	0.0	0.0	0.0
		C	5.3	1.0	0.7	0.4	0.0	0.0	0.0	5.3	1.2	0.8	0.4	0.0	0.0	0.0
		D1	4.5	1.0	0.7	0.4	0.0	0.0	0.0	4.5	1.2	0.8	0.4	0.0	0.0	0.0
		D2	4.5	1.0	0.7	0.4	0.0	0.0	0.0	4.5	1.2	0.8	0.4	0.0	0.0	0.0
		E	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
		F	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
		G	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
		H	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA

Table 5-2
Deficit Summary

				2015 - Immediate Reliability Target			2015 - Deficits				2050 - Long-Range Reliability Target			2050 - Deficits		
County	**Qualified Water System**	**Scenario**	**2015 Available Water Supply (MGD)**	**Total Demand (MGD)[1]**	**65% ADD (MGD)**	**35% ADD (MGD)**	**Total Demand Deficit (MGD)**	**65% ADD Deficit (MGD)**	**35% ADD Deficit (MGD)**	**2050 Available Water Supply (MGD)**	**Total Demand (MGD)[1]**	**65% ADD (MGD)**	**35% ADD (MGD)**	**Total Demand Deficit (MGD)**	**65% ADD Deficit (MGD)**	**35% ADD Deficit (MGD)**
Lowndes	Lowndes Co. - South	A1	5.3	1.0	0.6	0.3	0.0	0.0	0.0	5.3	1.1	0.7	0.4	0.0	0.0	0.0
		A2	4.3	1.0	0.6	0.3	0.0	0.0	0.0	4.3	1.1	0.7	0.4	0.0	0.0	0.0
		B	1.0	1.0	0.6	0.3	0.0	0.0	0.0	1.0	1.1	0.7	0.4	0.1	0.0	0.0
		C	4.3	1.0	0.6	0.3	0.0	0.0	0.0	4.3	1.1	0.7	0.4	0.0	0.0	0.0
		D1	1.0	1.0	0.6	0.3	0.0	0.0	0.0	**1.0**	**1.1**	**0.7**	**0.4**	**0.1**	0.0	0.0
		D2	1.0	1.0	0.6	0.3	0.0	0.0	0.0	1.0	1.1	0.7	0.4	0.1	0.0	0.0
		E	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
		F	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
		G	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
		H	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Berrien	Nashville	A1	1.9	0.5	0.3	0.2	0.0	0.0	0.0	1.9	0.4	0.3	0.1	0.0	0.0	0.0
		A2	3.2	0.5	0.3	0.2	0.0	0.0	0.0	3.2	0.4	0.3	0.1	0.0	0.0	0.0
		B	1.9	0.5	0.3	0.2	0.0	0.0	0.0	1.9	0.4	0.3	0.1	0.0	0.0	0.0
		C	3.2	0.5	0.3	0.2	0.0	0.0	0.0	3.2	0.4	0.3	0.1	0.0	0.0	0.0
		D1	1.9	0.5	0.3	0.2	0.0	0.0	0.0	1.9	0.4	0.3	0.1	0.0	0.0	0.0
		D2	1.9	0.5	0.3	0.2	0.0	0.0	0.0	1.9	0.4	0.3	0.1	0.0	0.0	0.0
		E	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
		F	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
		G	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
		H	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Brooks	Quitman	A1	1.7	0.6	0.4	0.2	0.0	0.0	0.0	3.2	0.5	0.3	0.2	0.0	0.0	0.0
		A2	2.6	0.6	0.4	0.2	0.0	0.0	0.0	3.9	0.5	0.3	0.2	0.0	0.0	0.0
		B	1.7	0.6	0.4	0.2	0.0	0.0	0.0	3.2	0.5	0.3	0.2	0.0	0.0	0.0
		C	2.6	0.6	0.4	0.2	0.0	0.0	0.0	3.9	0.5	0.3	0.2	0.0	0.0	0.0
		D1	1.7	0.6	0.4	0.2	0.0	0.0	0.0	3.2	0.5	0.3	0.2	0.0	0.0	0.0
		D2	1.7	0.6	0.4	0.2	0.0	0.0	0.0	3.2	0.5	0.3	0.2	0.0	0.0	0.0
		E	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
		F	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
		G	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
		H	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA

Table 5-2
Deficit Summary

				2015 - Immediate Reliability Target			2015 - Deficits				2050 - Long-Range Reliability Target			2050 - Deficits		
County	**Qualified Water System**	**Scenario**	**2015 Available Water Supply (MGD)**	**Total Demand (MGD)[1]**	**65% ADD (MGD)**	**35% ADD (MGD)**	**Total Demand Deficit (MGD)**	**65% ADD Deficit (MGD)**	**35% ADD Deficit (MGD)**	**2050 Available Water Supply (MGD)**	**Total Demand (MGD)[1]**	**65% ADD (MGD)**	**35% ADD (MGD)**	**Total Demand Deficit (MGD)**	**65% ADD Deficit (MGD)**	**35% ADD Deficit (MGD)**
Ware	Satilla Regional Water & Sewer Auth. - East	A1	2.8	0.3	0.2	0.1	0.0	0.0	0.0	3.9	0.6	0.4	0.2	0.0	0.0	0.0
		A2	4.7	0.3	0.2	0.1	0.0	0.0	0.0	4.1	0.6	0.4	0.2	0.0	0.0	0.0
		B	2.8	0.3	0.2	0.1	0.0	0.0	0.0	2.2	0.6	0.4	0.2	0.0	0.0	0.0
		C	4.7	0.3	0.2	0.1	0.0	0.0	0.0	4.1	0.6	0.4	0.2	0.0	0.0	0.0
		D1	2.8	0.3	0.2	0.1	0.0	0.0	0.0	2.2	0.6	0.4	0.2	0.0	0.0	0.0
		D2	2.8	0.3	0.2	0.1	0.0	0.0	0.0	2.2	0.6	0.4	0.2	0.0	0.0	0.0
		E	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
		F	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
		G	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
		H	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Ware	Satilla Regional Water & Sewer Auth.	A1	4.5	0.7	0.5	0.2	0.0	0.0	0.0	6.2	1.6	1.0	0.6	0.0	0.0	0.0
		A2	5.8	0.7	0.5	0.2	0.0	0.0	0.0	5.8	1.6	1.0	0.6	0.0	0.0	0.0
		B	4.5	0.7	0.5	0.2	0.0	0.0	0.0	4.5	1.6	1.0	0.6	0.0	0.0	0.0
		C	5.8	0.7	0.5	0.2	0.0	0.0	0.0	5.8	1.6	1.0	0.6	0.0	0.0	0.0
		D1	4.5	0.7	0.5	0.2	0.0	0.0	0.0	4.5	1.6	1.0	0.6	0.0	0.0	0.0
		D2	4.5	0.7	0.5	0.2	0.0	0.0	0.0	4.5	1.6	1.0	0.6	0.0	0.0	0.0
		E	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
		F	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
		G	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
		H	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Tift	Tifton-Tift County	A1	17.0	4.6	3.0	1.6	0.0	0.0	0.0	17.0	4.3	2.8	1.5	0.0	0.0	0.0
		A2	18.7	4.6	3.0	1.6	0.0	0.0	0.0	18.7	4.3	2.8	1.5	0.0	0.0	0.0
		B	17.0	4.6	3.0	1.6	0.0	0.0	0.0	17.0	4.3	2.8	1.5	0.0	0.0	0.0
		C	18.7	4.6	3.0	1.6	0.0	0.0	0.0	18.7	4.3	2.8	1.5	0.0	0.0	0.0
		D1	17.0	4.6	3.0	1.6	0.0	0.0	0.0	17.0	4.3	2.8	1.5	0.0	0.0	0.0
		D2	17.0	4.6	3.0	1.6	0.0	0.0	0.0	17.0	4.3	2.8	1.5	0.0	0.0	0.0
		E	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
		F	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
		G	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
		H	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA

Table 5-2
Deficit Summary

				2015 - Immediate Reliability Target			2015 - Deficits				2050 - Long-Range Reliability Target			2050 - Deficits		
County	**Qualified Water System**	**Scenario**	**2015 Available Water Supply (MGD)**	**Total Demand (MGD)[1]**	**65% ADD (MGD)**	**35% ADD (MGD)**	**Total Demand Deficit (MGD)**	**65% ADD Deficit (MGD)**	**35% ADD Deficit (MGD)**	**2050 Available Water Supply (MGD)**	**Total Demand (MGD)[1]**	**65% ADD (MGD)**	**35% ADD (MGD)**	**Total Demand Deficit (MGD)**	**65% ADD Deficit (MGD)**	**35% ADD Deficit (MGD)**
Lowndes	Valdosta	A1	25.5	10.1	6.6	3.5	0.0	0.0	0.0	25.3	10.7	7.0	3.8	0.0	0.0	0.0
		A2	20.7	10.1	6.6	3.5	0.0	0.0	0.0	20.5	10.7	7.0	3.8	0.0	0.0	0.0
		B	6.4	10.1	6.6	3.5	3.7	0.2	0.0	6.2	10.7	7.0	3.8	4.5	0.8	0.0
		C	20.7	10.1	6.6	3.5	0.0	0.0	0.0	20.5	10.7	7.0	3.8	0.0	0.0	0.0
		D1	**6.4**	**10.1**	**6.6**	**3.5**	**3.7**	**0.2**	0.0	**6.2**	**10.7**	**7.0**	**3.8**	**4.5**	**0.8**	0.0
		D2	6.4	10.1	6.6	3.5	3.7	0.2	0.0	6.2	10.7	7.0	3.8	4.5	0.8	0.0
		E	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
		F	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
		G	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
		H	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Ware	Waycross	A1	10.6	1.7	1.1	0.6	0.0	0.0	0.0	10.3	2.3	1.5	0.8	0.0	0.0	0.0
		A2	8.9	1.7	1.1	0.6	0.0	0.0	0.0	8.7	2.3	1.5	0.8	0.0	0.0	0.0
		B	3.6	1.7	1.1	0.6	0.0	0.0	0.0	3.3	2.3	1.5	0.8	0.0	0.0	0.0
		C	8.9	1.7	1.1	0.6	0.0	0.0	0.0	8.7	2.3	1.5	0.8	0.0	0.0	0.0
		D1	4.2	1.7	1.1	0.6	0.0	0.0	0.0	3.9	2.3	1.5	0.8	0.0	0.0	0.0
		D2	4.2	1.7	1.1	0.6	0.0	0.0	0.0	3.9	2.3	1.5	0.8	0.0	0.0	0.0
		E	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
		F	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
		G	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
		H	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA

Prepared by: LCT 03/15/21
Checked by: GJH 03/31/21

Notes:
ADD - average daily demand
MGD - million gallons per day
NA - not applicable
QWS - qualified water system
WTP - water treatment plant
1. Total demand (withdrawal plus purchases) is defined the same as 100% ADD.
= Critical Scenario Deficit

Table 6-1
Emergency Scenarios and Potential Internal Infrastructure Redundancy Projects

Water Supply Risk	Emergency Scenario	Internal Infrastructure Redundancy Project	Relevant Considerations: Potential Environmental Impacts	Withdrawal Permit Impacts	Water Quality Impacts	Community Impacts
A. Failure of largest water treatment plant (WTP)	A1. Power supply failure of largest WTP	Backup Generator	◊	-	-	-
	A2. Critical asset failure at largest WTP (e.g., loss of clearwell, loss of chemical treatment)	Unit Process Redundancy	-	-	-	-
B. Short-term catastrophic failure of a water distribution system	Critical transmission main failure from largest WTP or interconnection	-	-	-	-	-
C. Short-term contamination of a water supply within distribution system	Contamination of distribution system triggers a boil water notice	-	-	-	-	-
D. Short-term contamination of a raw water source	D1. Biological contamination of largest raw water source	New Well New WTP New Surface Water Source	◊	◊	◊	◊
	D2. Chemical contamination of largest raw water source	New Well New WTP New Surface Water Source	◊	◊	◊	◊
G. Failure of an existing dam that impounds a raw water source	Dam failure for largest impoundment	New Well New WTP New Surface Water Source	◊	◊	◊	◊
H. Water supply reduction due to drought	Raw water supply available is 40% of ADD due to drought	-	-	-	-	-

Prepared by: GJH 02/11/21
Checked by: LCT 03/25/21

Notes:
ADD - average daily demand
WTP - water treatment plant

Table 6-2
Potential Projects and Details

							System Impacts		
County	**Qualified Water System**	**Project Number**	**Potential Project Description**	**Emergency Scenario(s) Addressed**	**Maximum Capacity Added (MGD)**	**Potential Environmental Impacts**	**Withdrawal Permit Impacts**	**Water Quality Impacts**	**Community Impacts**
Cook	Adel	-	No recommended project	-	-	-	-	-	-
Bacon	Alma	-	No recommended project	-	-	-	-	-	-
Turner	Ashburn	-	No recommended project	-	-	-	-	-	-
Pierce	Blackshear	-	No recommended project	-	-	-	-	-	-
Coffee	Douglas	-	No recommended project	-	-	-	-	-	-
Ben Hill	Fitzgerald	-	No recommended project	-	-	-	-	-	-
Charlton	Folkston	1	New Well and WTP	A1, A2, B, D1, D2	0.50[(1)]	Medium-low: less than 200 ft excavation; no regional groundwater resource gaps for Floridan Aquifer.	Low	Low	Medium-low: offsite excavation less than 200 feet
Lowndes	Hahira	-	No recommended project	-	-	-	-	-	-
Lowndes	Lowndes Co.-North	-	No recommended project	-	-	-	-	-	-
Lowndes	Lowndes Co.-South	2	New Well and WTP	A1, A2, B, D1, D2	0.50[(1)]	Medium-low: less than 200 ft excavation; no regional groundwater resource gaps for Floridan Aquifer.	Low	Low	Medium-low: offsite excavation less than 200 feet
Berrien	Nashville	-	No recommended project	-	-	-	-	-	-
Brooks	Quitman	-	No recommended project	-	-	-	-	-	-
Ware	Satilla Regional Water & Sewer Auth. - East	-	No recommended project	-	-	-	-	-	-
Ware	Satilla Regional Water & Sewer Auth.	-	No recommended project	-	-	-	-	-	-
Tift	Tifton-Tift County	-	No recommended project	-	-	-	-	-	-
Lowndes	Valdosta	3	New Well and WTP	A1, A2, B, D1, D2	2.45[(1)]	Medium-low: less than 200 ft excavation; no regional groundwater resource gaps for Floridan Aquifer.	Low	Low	Medium-low: offsite excavation less than 200 feet
Ware	Waycross	4	New Well and WTP	A1, A2, B, D1, D2	0.50[(1)]	Medium-low: less than 200 ft excavation; no regional groundwater resource gaps for Floridan Aquifer.	Low	Low	Medium-low: offsite excavation less than 200 feet

Prepared by: GJH 06/18/21
Checked by: LCT 07/02/21

Notes:
ft - feet
MGD - million gallons per day
NA - not applicable
WTP - water treatment plant
1. This value was estimated based on QWS-specific information.

Table 6-3
Planning-Level Costs for Potential Projects

Project Number	Qualified Water System(s) Benefitted	Potential Project Description	Maximum Capacity Added (MGD)	Length of Pipes (ft)	Project Specifics	Estimated Unit Cost ($)	Additional Cost Items	Additional Cost ($)	Total Estimated Cost ($)	Macro-Level Project Timeframe
1	Folkston	New Well and WTP	0.50	175	6-inch diameter DIP	$ 140	(1) new groundwater source (1) new WTP (1) 200 KW generator	$ 2,106,300	$ 2,130,800	12 months
2	Lowndes Co.-South	New Well and WTP	0.50	175	6-inch diameter DIP	$ 140	(1) new groundwater source (1) new WTP (1) 200 KW generator	$ 2,106,300	$ 2,130,800	12 months
3	Valdosta	New Well and WTP	2.45	175	12-inch diameter DIP	$ 240	(1) new groundwater source (1) new WTP (1) 300 KW generator	$ 10,194,900	$ 10,236,900	12 months
4	Waycross	New Well and WTP	0.50	175	6-inch diameter DIP	$ 140	(1) new groundwater source (1) new WTP (1) 200 KW generator	$ 2,106,300	$ 2,130,800	12 months

Prepared by: GJH 06/18/21
Checked by: LCT 07/02/21

Notes:
DIP - ductile iron pipe
ft - feet
HP - horsepower
KW - kilowatts
MGD - million gallons per day
WTP - water treatment plant

Table 7-1
Potential Project Scoring Criteria Matrix

		Assigned Score				
	Criterion	**1**	**2**	**3**	**4**	**Weighting**
1	Systems Benefitted	One (Internal Project)	Mutually Benefits One Non-QWS	Mutually Benefits Two or More Non-QWS	Mutually Benefits Another QWS	1
2	Population Benefitted	<5,000	5,000 - 15,000	15,000 - 25,000	>25,000	3
3	Critical Scenario Duration (days)	1	3	30	120	1
4	Added Capacity as a Percent of Total Demand (%)	0-25%	26-50%	50-76%	>76%	2
5	Cost ($)	> $2,000,000	$1,000,000 - $2,000,000	$150,000 - $1,000,000	< $150,000	3
6	Potential Environmental Impacts	High	Medium-high	Medium-low	Low	3
7	Potential System and Community Impacts	High	Medium-high	Medium-low	Low	3
8	Excess Capacity Index	Positive Excess Capacity >0.5	Positive Excess Capacity <0.5	Negative Excess Capacity	No Excess Capacity	2

Prepared by: GJH 02/04/21
Checked by: LCT 03/25/21

Notes:
QWS - qualified water system

Table 7-2
Potential Project Criteria Scores and Weight Calculations

			1: Systems Benefitted		2: Population Benefitted		3: Critical Scenario Duration	
Project Number	**Water System(s) Benefitted**	**Potential Project Description**	**Water System(s) Benefitted**	**Score: Systems Benefitted**	**Population Benefitted**	**Score: Population Benefitted**	**Emergency Scenario(s) Addressed**	**Score: Critical Scenario Duration**
1	Folkston	New Well and WTP	Folkston	1	5,700	2	A1, A2, B, D1, D2	3
2	Lowndes Co.-South	New Well and WTP	Lowndes Co.-South	1	5,900	2	A1, A2, B, D1, D2	3
3	Valdosta	New Well and WTP	Valdosta	1	57,600	4	A1, A2, B, D1, D2	3
4	Waycross	New Well and WTP	Waycross	1	19,900	3	A1, A2, B, D1, D2	3

Notes:
MGD - million gallons per day
WTP - water treatment plant

Table 7-2
Potential Project Criteria Scores and Weight Calculations

			4: Added Capacity as a Percent of Total Demand					5: Cost	
Project Number	**Water System(s) Benefitted**	**Potential Project Description**	**Maximum Capacity Added (MGD)**	**2050 Total Demand (MGD)**	**Capacity as a Percent of Total Demand (%)**	**Individual Scores**	**Score: Added Capacity as a Percent of Total Demand**	**Cost ($)**	**Score: Cost**
1	Folkston	New Well and WTP	0.50	0.68	74%	-	3	$ 2,130,800	1
2	Lowndes Co.-South	New Well and WTP	0.50	1.09	46%	-	2	$ 2,130,800	1
3	Valdosta	New Well and WTP	2.45	10.75	23%	-	1	$ 10,236,900	1
4	Waycross	New Well and WTP	0.50	2.26	22%	-	1	$ 2,130,800	1

Notes:
MGD - million gallons per day
WTP - water treatment plant

Table 7-2
Potential Project Criteria Scores and Weight Calculations

			6: Potential Environmental Impacts		7: Potential System and Community Impacts				
Project Number	**Water System(s) Benefitted**	**Potential Project Description**	**Potential Environmental Impacts**	**Score: Potential Environmental Impacts**	**Withdrawal Permit Impacts**	**Water Quality Impacts**	**Community Impacts**	**Individual Scores**	**Score: Community Impacts**
1	Folkston	New Well and WTP	Medium-low	3	Low	Low	Medium-low	Withdrawal: 4 Water Quality: 4 Community: 3	3.7
2	Lowndes Co.-South	New Well and WTP	Medium-low	3	Low	Low	Medium-low	Withdrawal: 4 Water Quality: 4 Community: 3	3.7
3	Valdosta	New Well and WTP	Medium-low	3	Low	Low	Medium-low	Withdrawal: 4 Water Quality: 4 Community: 3	3.7
4	Waycross	New Well and WTP	Medium-low	3	Low	Low	Medium-low	Withdrawal: 4 Water Quality: 4 Community: 3	3.7

Notes:
MGD - million gallons per day
WTP - water treatment plant

Table 7-2
Potential Project Criteria Scores and Weight Calculations

			8: Excess Capacity Index				Weighing Calculation								
Project Number	**Water System(s) Benefitted**	**Potential Project Description**	**2050 Excess Capacity Index**	**Individual Scores**	**Score: Excess Capacity Index**	**Absolute Score**	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**Weighted Score**
1	Folkston	New Well and WTP	(+) <0.5	-	2	2.33	1	6	3	6	3	9	11	4	5.38
2	Lowndes Co.-South	New Well and WTP	(+) >0.5	-	1	2.08	1	6	3	4	3	9	11	2	4.88
3	Valdosta	New Well and WTP	(-)	-	3	2.46	1	12	3	2	3	9	11	6	5.88
4	Waycross	New Well and WTP	(+) >0.5	-	1	2.08	1	9	3	2	3	9	11	2	5.00

Prepared by: GJH 06/18/21
Checked by: LCT 07/02/21

Notes:
MGD - million gallons per day
WTP - water treatment plant

Table 7-3
Potential Project Decision-Making Summary

Project Number	Qualified Water System(s) Benefitted	Potential Project Description	Cost Per 1 MGD Yield ($/MGD)	Cost Per Individual Supplied ($/capita)	Absolute Score	Weighted Score	Manual Rank
1	Folkston	New Well and WTP	$ 4,261,600	$ 373.82	2.33	5.38	2
2	Lowndes Co.-South	New Well and WTP	$ 4,261,600	$ 361.15	2.08	4.88	4
3	Valdosta	New Well and WTP	$ 4,178,327	$ 177.72	2.46	5.88	1
4	Waycross	New Well and WTP	$ 4,261,600	$ 107.08	2.08	5.00	3

Prepared by: GJH 06/18/21
Checked by: LCT 07/02/21

Notes:
WTP - water treatment plant

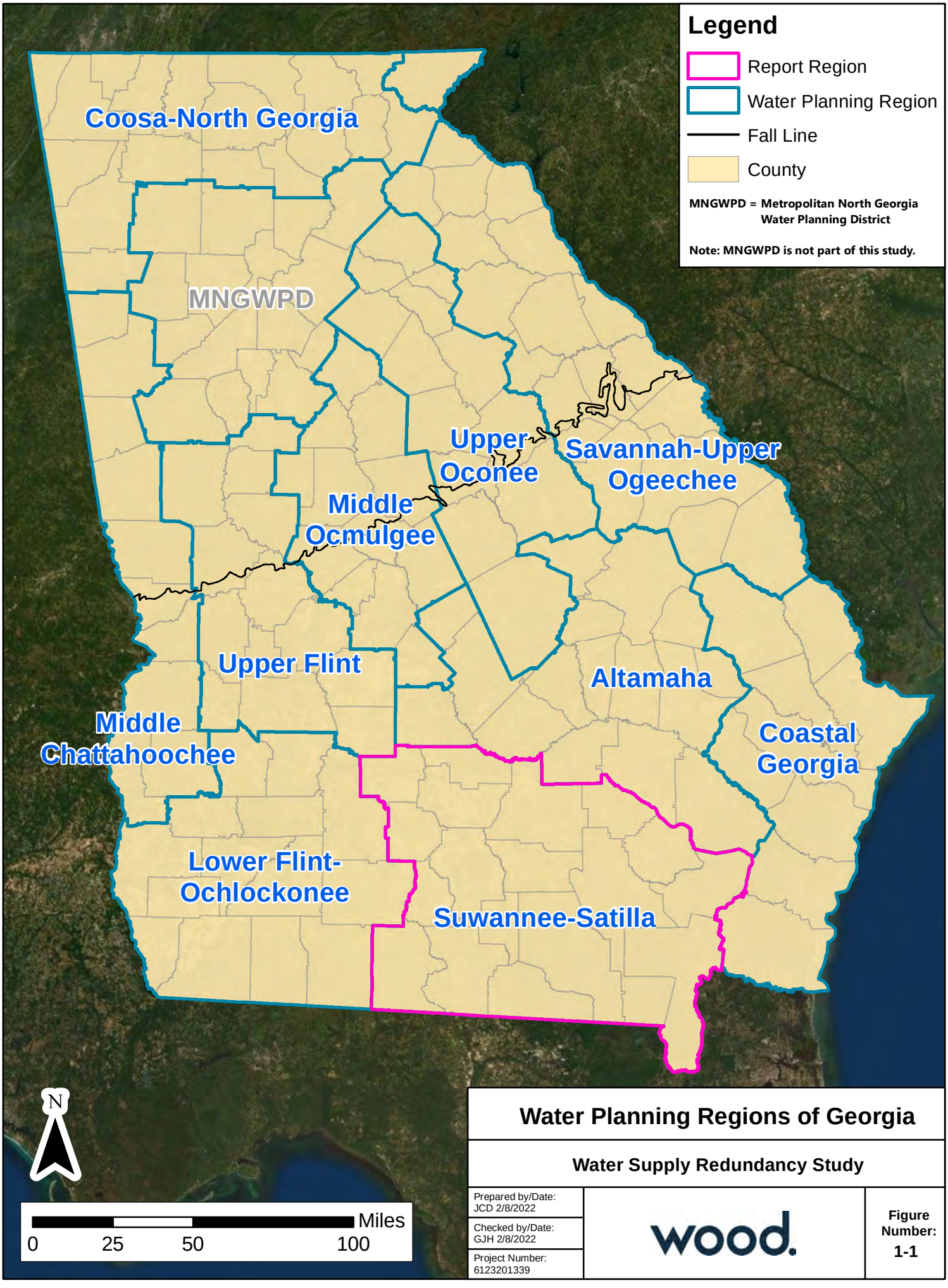
Table 7-4
Potential Projects Sorted by Final Rank Order

Project Number	Qualified Water System(s) Benefitted	Potential Project Description	Cost ($)	Final Rank
3	Valdosta	New Well and WTP	$ 10,236,900	1
1	Folkston	New Well and WTP	$ 2,130,800	2
4	Waycross	New Well and WTP	$ 2,130,800	3
2	Lowndes Co.-South	New Well and WTP	$ 2,130,800	4

Prepared by: GJH 06/18/21
Checked by: LCT 07/02/21

Notes:
WTP - water treatment plant

FIGURES

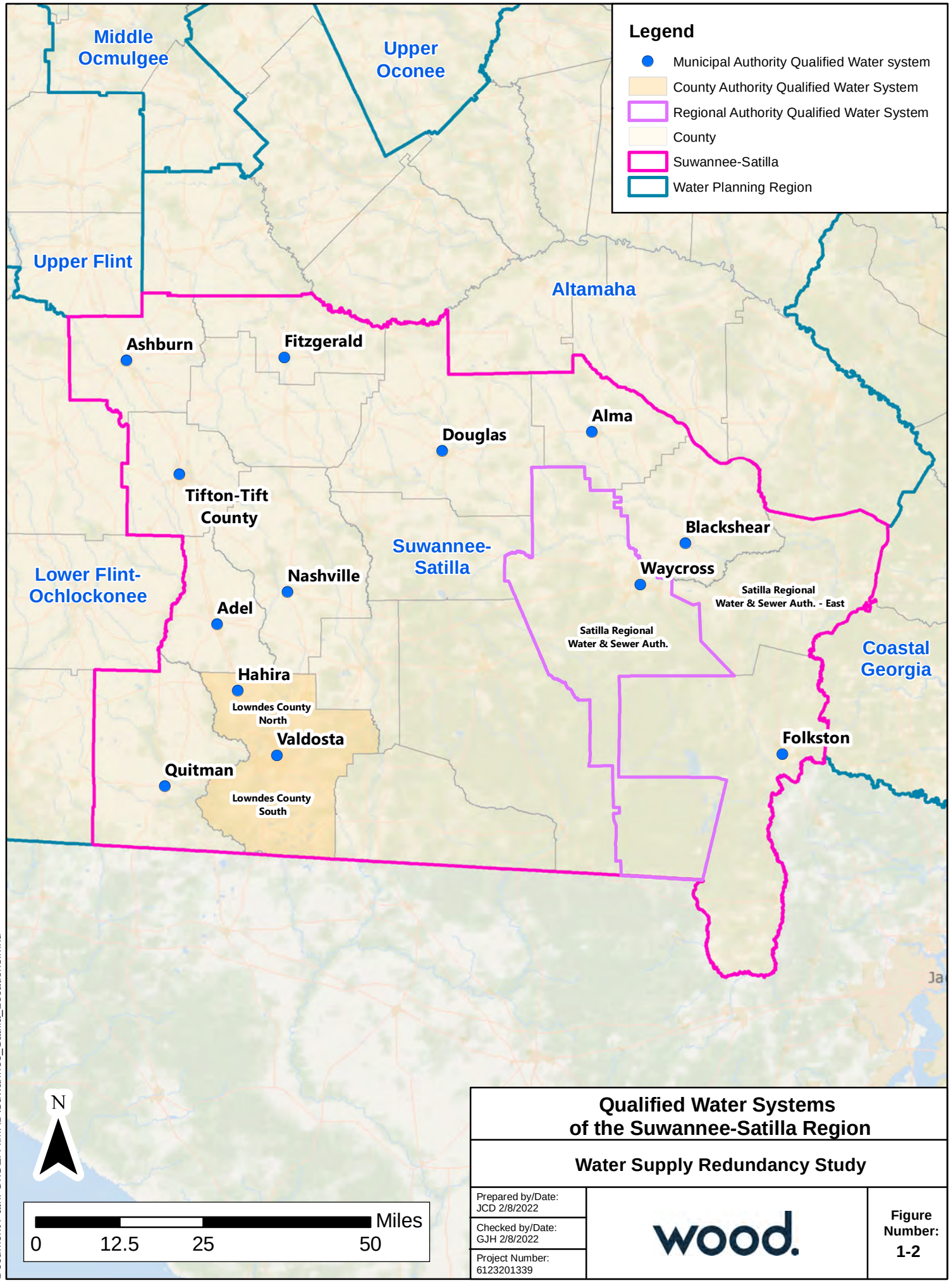


Water Planning Regions of Georgia

Water Supply Redundancy Study

Prepared by/Date: JCD 2/8/2022	wood.	Figure Number: 1-1
Checked by/Date: GJH 2/8/2022		
Project Number: 6123201339		

Document Path: G:\GEFA\MXD\Suwannee_Satilla_Region.mxd



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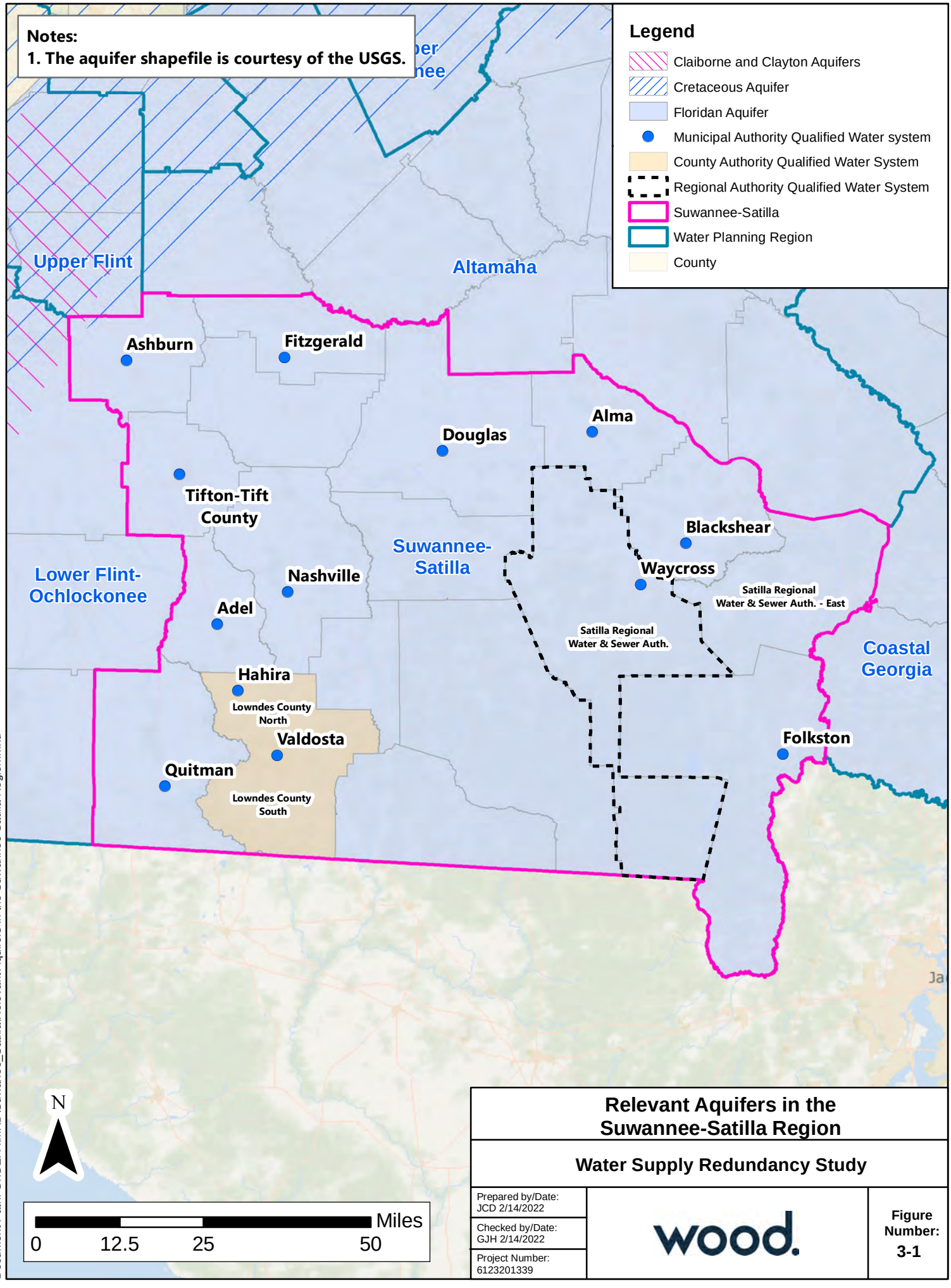
Qualified Water Systems of the Suwannee-Satilla Region

Water Supply Redundancy Study

Prepared by/Date: JCD 2/8/2022	
Checked by/Date: GJH 2/8/2022	
Project Number: 6123201339	

wood.

Figure Number: 1-2

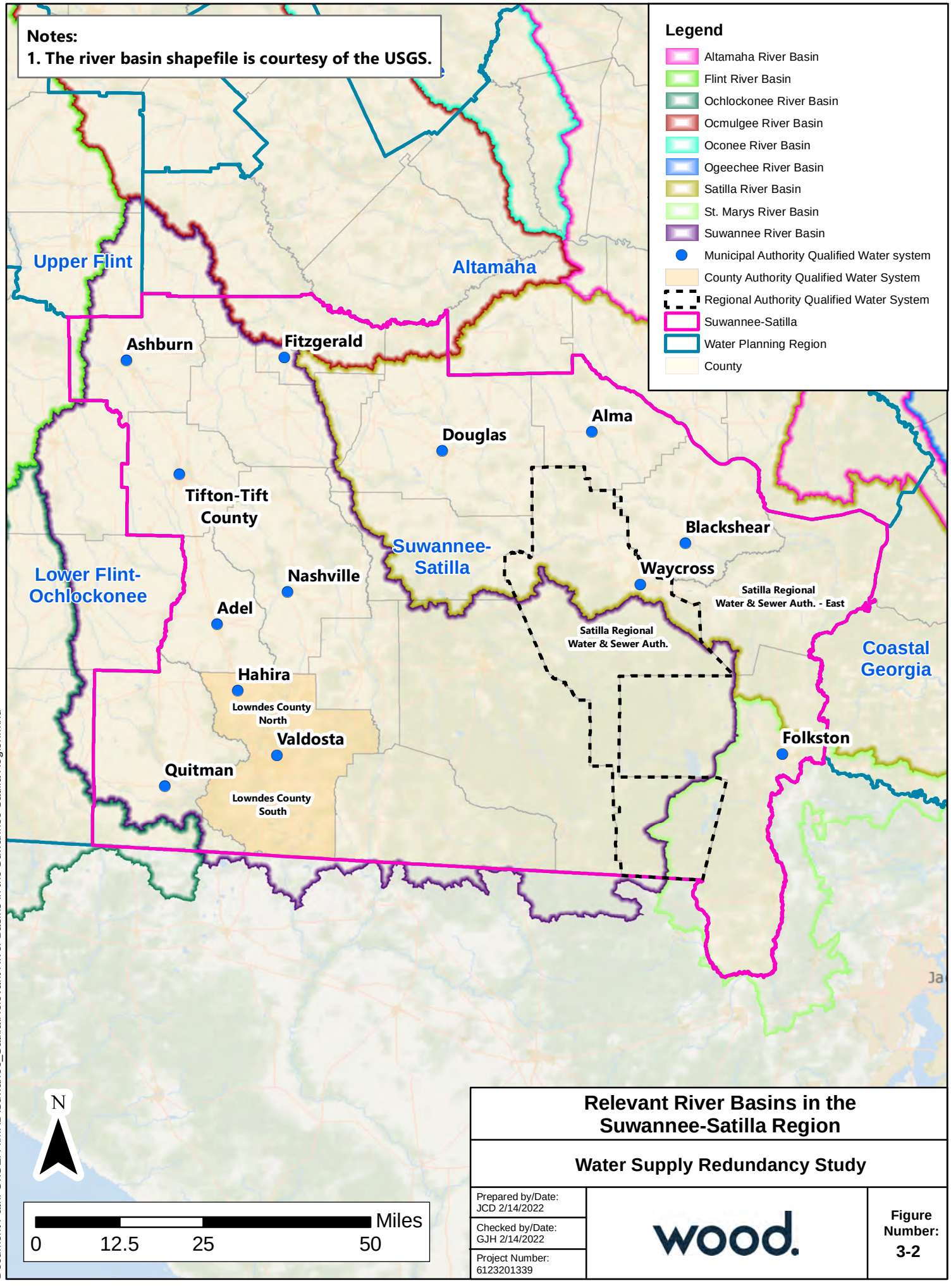


Relevant Aquifers in the Suwannee-Satilla Region

Water Supply Redundancy Study

Prepared by/Date: JCD 2/14/2022	wood.	Figure Number: 3-1
Checked by/Date: GJH 2/14/2022		
Project Number: 6123201339		

Document Path: G:\GEFA\MXD\Suwanee_Satilla\Relevant Aquifers in the Suwannee Satilla Region.mxd

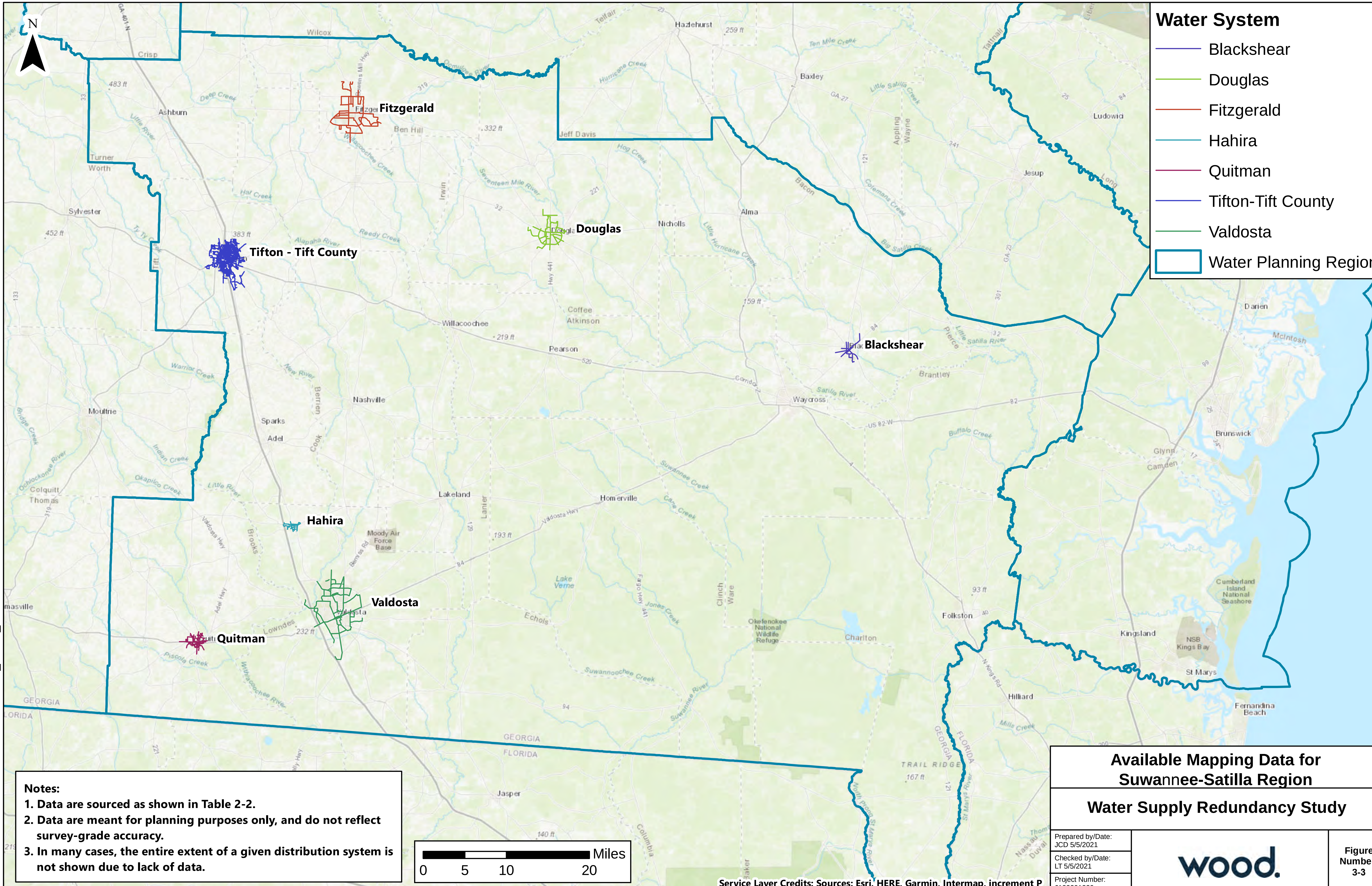


Document Path: G:\GEFA\MXD\Suwanee_Satilla\Relevant River Basins in the Suwannee Satilla Region.mxd

Relevant River Basins in the Suwannee-Satilla Region

Water Supply Redundancy Study

Prepared by/Date: JCD 2/14/2022	wood.	Figure Number: 3-2
Checked by/Date: GJH 2/14/2022		
Project Number: 6123201339		



Notes:

1. Data are sourced as shown in Table 2-2.
2. Data are meant for planning purposes only, and do not reflect survey-grade accuracy.
3. In many cases, the entire extent of a given distribution system is not shown due to lack of data.

Available Mapping Data for Suwannee-Satilla Region

Water Supply Redundancy Study

Prepared by/Date: JCD 5/5/2021	wood.		Figure Number: 3-3
Checked by/Date: LT 5/5/2021			
Project Number: 6123201339			

Document Path: G:\GEFA\MXD\Suwannee_Satilla_Interconnection.mxd

Notes:
1. The river basin shapefile is courtesy of the USGS.
2. The aquifer shapefile is courtesy of the USGS.
3. Interconnection lines are schematic to reflect interconnected systems. They do not reflect pipeline locations.

Ashburn
Sycamore
Fitzgerald
Douglas
Alma
Tifton-Tift County
Abraham Baldwin Ag. College
Blackshear
Waycross-Ware County Industrial Park
Satilla Regional Water & Sewer Auth.
Satilla Regional Water & Sewer Auth. East
Waycross
Nashville
Adel
Hahira
Lowndes County - North
Lowndes County-Spring Creek
Valdosta
Remerton
Quitman
Lowndes County - South
Lake Park
Homeland
Folkston

Water Planning Region
County
Interconnection
Claiborne and Clayton Aquifers
Cretaceous Aquifer
Floridan Aquifer
Altamaha River Basin
Flint River Basin
Ochlockonee River Basin
Ocmulgee River Basin
Oconee River Basin
Ogeechee River Basin
Satilla River Basin
St. Marys River Basin
Suwannee River Basin

2050 Total Demand (MGD)
0 -1
1-2
2-5
> 5

Raw Water Source
Groundwater

2050 Deficit Type
None
100% ADD
65% ADD
35% ADD

N

0 4 8 16 Miles

Schematic of Key QWS Data for the Suwannee-Satilla Region

Water Supply Redundancy Study

Prepared by/Date: JCD 3/28/2022	wood.	Figure Number: 5-1
Checked by/Date: GJH 3/28/2022		
Project Number: 6123201339		

Document Path: G:\GEFA\MXD\Suwanee_Satilla\Suwanee_Satilla_QWS_key_data.mxd

Appendix A: Excess Capacity Calculations

Contents

List of Tables

Acronyms

ADD	Average Daily Demand
EPD	Environmental Protection Division
GEFA	Georgia Environmental Finance Authority
GPM	Gallons Per Minute
MGD	Million Gallon(s) Per Day
QWS	Qualified Water System(s)
RWP	Regional Water Plan
USGS	U.S. Geological Survey

1.0 Introduction

This appendix describes and shows the peak day design capacity, average daily demand (ADD), and excess capacity index calculations.

2.0 Calculations

2.1 Peak Day Design Capacity

Peak day design capacity, defined as the maximum amount of water that can be pumped and treated within 24 hours, depends mostly on the water treatment plant configuration. For a groundwater-based qualified water system(s) (QWS), if water is treated at each well, then the peak day design value was calculated as the sum of each pump peak capacity (in gallons per minute [GPM] converted to million gallon(s) per day [MGD]). If water is treated at a single treatment plant after being pumped from multiple wells, then the peak day design value was calculated as the sum of each treatment plant's peak treatment capacity.

The 2050 peak day design capacity reflects current 2015 QWS peak day design capacity plus any capacity-expanding capital improvements identified by the QWS. For this water planning region, both Blackshear and Quitman indicated the addition of a potential new supply well each.

2.2 Average Daily Demand – Water Withdrawal Only

The 2015 ADD (water withdrawal only, not including purchased water) was obtained from the Environmental Protection Division (EPD)-validated 2015 water loss audit data by dividing "volume from own sources (million gallons per year)" by 365 days to convert values to MGD. Two QWS did not have 2015 water loss audit data: Hahira and Satilla Regional Water and Sewer Authority-East. The Hahira and Satilla Regional Water and Sewer Authority-East values were self-reported via the survey-based questionnaire.

The 2050 ADD for each QWS was estimated from each individual county's total municipal and industrial water demand projections. The region's *Water and Wastewater Forecasting Technical Memorandum* included 2050 population data and municipal water demand projections by county (CDM Smith, 2017). As defined by the Suwannee-Satilla Water Planning Council, the municipal sector includes public and private water withdrawal data for residential, commercial, and small industrial use. County municipal water demand values were allocated to each QWS based on the QWS' current total population served, obtained during the data collection stage. Table A-1 shows population forecasts and 2050 municipal demand by county. QWS 2050 municipal demand estimates are shown in Table A-2.

Because the 2015 ADD values include industrial water use, it is necessary to incorporate the 2050 regional industrial demand projections into the 2050 ADD estimates. The Regional Water Plan (RWP) provided a total regional projection for industrial water use rather than projections by county. However, the U.S. Geological Survey (USGS) report *Estimated Use of Water in Georgia for 2015 and Water-Use Trends, 1985–2015* showed 2015 county-level withdrawals and use by category, including industrial (Painter, 2019). It also reported withdrawals by major public suppliers, and 16 of 17 QWS (lacking Hahira) were included in the report. For Hahira, along with three QWS for which reported data appeared anomalous (Adel, Satilla Regional Water & Sewer Auth.-East, and Satilla Regional Water & Sewer Auth.), 2015 total demand values from Table 4-1 are reported. This USGS report was used to calculate the municipally supplied industrial use per county. The county industrial use was allocated to a QWS based on the QWS water use as a

percent of the county water use. The 2015 QWS-supplied industrial demand value was then divided by the 2015 RWP regional alternate industrial value (15.5 MGD) to obtain a QWS-specific percent. This percent was then applied to the 2050 RWP regional alternate industrial projection (22.0 MGD) to obtain the 2050 QWS-supplied industrial demand (MGD). Table A-3 shows 2015 withdrawal and use data by county and the estimated 2050 municipally supplied industrial demand values for each QWS.

2.3 Excess Capacity Index

The QWS' capacities were scaled to allow for a comparison of excess capacities. The index was calculated for each QWS for 2015 and 2050 capacities using the following equation:

$$(1) \qquad Index = 1 - \frac{ADD}{Excess\ Capacity}$$

Where:

Excess Capacity = Peak Day Design Capacity - ADD

A comparison of indices provides insight into the magnitude of difference with respect to each QWS' excess capacity. The following index regimes exist, which depend upon the relationship between ADD and excess capacity. Excess capacity, in turn, depends on both ADD and peak day design capacity.

(a) If ADD is zero, the index is 1.
(b) If ADD is greater than zero and less than 50% of the peak day design capacity, the index is a positive value between 0 and 1.
    i. As ADD approaches 50% of the peak day design capacity, the index approaches zero.
    ii. The higher the index in this regime, the more excess capacity the QWS has relative to other QWS.
(c) If ADD is more than 50% but less than 100% of the peak day design capacity, the index is a negative value.
    i. As ADD approaches 100% of the peak day design capacity, the index approaches negative infinity.
    ii. In this regime, the closer the index is to zero, the more excess capacity the QWS has relative to other QWS.
(d) If ADD is more than peak day design capacity, excess capacity is negative. The index was not calculated for this regime because there is no excess capacity sufficiency.

Regime (a) above is not meaningful to this study because the ADD is not zero for the QWS in this region. Regime (b) is the most meaningful to the Suwannee-Satilla QWS because each QWS' ADD is less than 50% of their peak day design capacity with the exception of Valdosta. Regime (c) is also meaningful to the Suwannee-Satilla QWS because Valdosta's 2015 ADD and 2050 ADD exceed 50% but remain below 100% of their peak day design capacity. Regime (d) does not apply to this region.

Table A-4 shows the 2015 and 2050 peak day design capacity, ADD, resultant excess capacity, and calculated excess capacity index for each QWS. The Suwannee-Satilla QWS are primarily in index regime (b). For those systems within this regime, Folkston's 2015 and Lowndes County-North's 2050 scaled excess capacity sufficiency are the lowest relative to other Suwannee-Satilla QWS.

References

CDM Smith, 2017. *Water and Wastewater Forecasting Technical Memorandum. Supplemental Material, Suwannee-Satilla Regional Water Plan*. March 2017.

Painter, 2019. *Estimated Use of Water in Georgia for 2015 and Water-Use Trends, 1985–2015*. U.S. Geological Survey Open-File Report 2019–1086.

Table A-1
Population Forecasts and 2050 Municipal Demand by County

County	2015 Population Forecast[1]	2050 Population Forecast[1]	2050 Municipal Demand Forecast (MGD)[1]
Atkinson	8,340	7,910	0.8
Bacon	11,437	14,686	1.7
Ben Hill	17,691	19,957	3.0
Berrien	19,022	15,446	1.6
Brantley	18,517	19,462	1.8
Brooks	15,464	12,424	1.4
Charlton	13,411	15,182	1.6
Clinch	6,848	6,747	0.7
Coffee	43,907	54,465	5.9
Cook	17,268	19,604	2.1
Echols	4,090	3,916	0.4
Irwin	9,428	8,347	0.9
Lanier	10,712	15,752	1.7
Lowndes	116,023	166,258	19.3
Pierce	19,384	28,211	2.8
Tift	40,979	49,902	6.5
Turner	7,940	4,736	0.6
Ware	35,911	35,894	3.5
Totals	**416,372**	**498,899**	**56.30**

Prepared by: LCT 03/12/21

Checked by: GJH 03/25/21

Notes:

MGD - million gallons per day

1. Values are from the 2017 CDM Smith *Water and Wastewater Forecasting Technical Memorandum. Supplemental Material, Suwannee-Satilla Regional Water Plan.*

Table A-2
2050 Municipal Demand Estimates

County	Qualified Water System (QWS)	Estimated Population Directly Served[1]	Estimated Consecutive Population Served[2]	Estimated Total Population	QWS Percent of County Population (%)[3]	QWS 2050 Municipal Demand Estimate (MGD)[4]
Cook	Adel	5,500	0	5,500	32%	0.67
Bacon	Alma	4,700	0	4,700	41%	0.70
Turner	Ashburn	4,600	0	4,600	58%	0.35
Pierce	Blackshear	5,800	0	5,800	30%	0.84
Coffee	Douglas	12,000	0	12,000	27%	1.61
Ben Hill	Fitzgerald	13,500	0	13,500	76%	2.29
Charlton	Folkston	4,800	900	5,700	43%	0.68
Lowndes	Hahira	3,100	0	3,100	3%	0.52
Lowndes	Lowndes Co.-North	7,200	0	7,200	6%	1.20
Lowndes	Lowndes Co.-South	5,900	0	5,900	5%	0.98
Berrien	Nashville	4,800	0	4,800	25%	0.40
Brooks	Quitman	4,900	0	4,900	32%	0.44
Ware	Satilla Regional Water & Sewer Auth. - East	5,300	0	5,300	15%	0.52
Ware	Satilla Regional Water & Sewer Auth.	15,000	0	15,000	42%	1.46
Tift	Tifton-Tift County	26,500	0	26,500	65%	4.20
Lowndes	Valdosta	56,500	1,100	57,600	50%	9.58
Ware	Waycross	19,900	0	19,900	55%	1.94
	Totals	**200,000**	**2,000**	**202,000**	**-**	**28.38**

Prepared by: LCT 03/12/21

Checked by: GJH 03/25/21

Notes:

MGD - million gallons per day

QWS - qualified water system

1. The population that the system directly sells water to, rounded to the nearest 100.
2. The population benefited from the system's regular sales to another system, rounded to the nearest 100.
3. 2015 county populations presented in Table A-1 and QWS estimated total populations are used to calculate these QWS-specific values.
4. 2050 county municipal demand forecasts presented in Table A-1 and QWS percent of county population values are used to calculate these QWS-specific values.

Table A-3
2015 Withdrawal and Use Data by County and 2050 Industrial Demand Estimates

Regional Water Plan - 2015 Regional Industrial Projection[1]	15.5 MGD
Regional Water Plan - 2050 Regional Industrial Projection[1]	22.0 MGD

Adel

Cook County[2]	2015 Total Withdrawal (MGD)	2015 Total Use (MGD)	2015 Total Publicly Supplied (MGD)
Domestic	0.62	1.50	0.88
Commercial	0.00	0.28	0.28
Industrial	0.00	0.02	0.02
Water Loss	-	-	0.22
Inter-County Delivery	-	-	0.00
		Total (MGD)	1.40
		Adel Public Supply (MGD)[3]	0.80
		QWS's Percent of County's Public Supply (%)	57%
		QWS's Supplied Industrial Demand (MGD)	0.01
		2015 QWS Percent of Regional Industrial Demand (%)	0.07%
		2050 QWS Industrial Demand Estimate (MGD)	0.02

Alma

Bacon County[2]	2015 Total Withdrawal (MGD)	2015 Total Use (MGD)	2015 Total Publicly Supplied (MGD)
Domestic	0.48	1.18	0.70
Commercial	0.00	0.10	0.10
Industrial	0.19	0.22	0.03
Water Loss	-	-	0.15
Inter-County Delivery	-	-	0.00
		Total (MGD)	0.98
		Alma Public Supply (MGD)	0.97
		QWS's Percent of County's Public Supply (%)	99%
		QWS's Supplied Industrial Demand (MGD)	0.03
		2015 QWS Percent of Regional Industrial Demand (%)	0.19%
		2050 QWS Industrial Demand Estimate (MGD)	0.04

Ashburn

Turner County[2]	2015 Total Withdrawal (MGD)	2015 Total Use (MGD)	2015 Total Publicly Supplied (MGD)
Domestic	0.21	0.71	0.50
Commercial	0.02	0.16	0.14
Industrial	0.00	0.02	0.02
Water Loss	-	-	0.13
Inter-County Delivery	-	-	0.00
		Total (MGD)	0.79
		Ashburn Public Supply (MGD)	0.71
		QWS's Percent of County's Public Supply (%)	90%
		QWS's Supplied Industrial Demand (MGD)	0.02
		2015 QWS Percent of Regional Industrial Demand (%)	0.12%
		2050 QWS Industrial Demand Estimate (MGD)	0.03

Blackshear

Pierce County[2]	2015 Total Withdrawal (MGD)	2015 Total Use (MGD)	2015 Total Publicly Supplied (MGD)
Domestic	0.83	1.25	0.42
Commercial	0.00	0.05	0.05
Industrial	0.11	0.15	0.04
Water Loss	-	-	0.06
Inter-County Delivery	-	-	0.00
		Total (MGD)	0.57
		Blackshear Public Supply (MGD)	0.43
		QWS's Percent of County's Public Supply (%)	75%
		QWS's Supplied Industrial Demand (MGD)	0.03
		2015 QWS Percent of Regional Industrial Demand (%)	0.19%
		2050 QWS Industrial Demand Estimate (MGD)	0.04

Table A-3
2015 Withdrawal and Use Data by County and 2050 Industrial Demand Estimates

Douglas

Coffee County[2]	2015 Total Withdrawal (MGD)	2015 Total Use (MGD)	2015 Total Publicly Supplied (MGD)
Domestic	1.63	3.63	2.00
Commercial	0.00	1.13	1.13
Industrial	0.09	0.46	0.37
Water Loss	-	-	0.55
Inter-County Delivery	-	-	0.00
		Total (MGD)	4.05
		Douglas Public Supply	3.34
		QWS's Percent of County's Public Supply (%)	82%
		QWS's Supplied Industrial Demand (MGD)	0.31
		2015 QWS Percent of Regional Industrial Demand (%)	1.97%
		2050 QWS Industrial Demand Estimate (MGD)	0.43

Fitzgerald

Ben Hill County[2]	2015 Total Withdrawal (MGD)	2015 Total Use (MGD)	2015 Total Publicly Supplied (MGD)
Domestic	0.33	1.56	1.23
Commercial	0.00	0.34	0.34
Industrial	0.00	0.44	0.44
Water Loss	-	-	0.45
Inter-County Delivery	-	-	0.00
		Total (MGD)	2.46
		Fitzgerald Public Supply (MGD)	2.46
		QWS's Percent of County's Public Supply (%)	100%
		QWS's Supplied Industrial Demand (MGD)	0.44
		2015 QWS Percent of Regional Industrial Demand (%)	2.84%
		2050 QWS Industrial Demand Estimate (MGD)	0.62

Folkston

Charlton County[2]	2015 Total Withdrawal (MGD)	2015 Total Use (MGD)	2015 Total Publicly Supplied (MGD)
Domestic	0.45	1.04	0.59
Commercial	0.00	0.08	0.08
Industrial	0.07	0.07	0.00
Water Loss	-	-	0.09
Inter-County Delivery	-	-	0.00
		Total (MGD)	0.76
		Folkston Public Supply (MGD)	0.70
		QWS's Percent of County's Public Supply (%)	92%
		QWS's Supplied Industrial Demand (MGD)	0.00
		2015 QWS Percent of Regional Industrial Demand (%)	0.00%
		2050 QWS Industrial Demand Estimate (MGD)	0.00

Hahira

Lowndes County[2]	2015 Total Withdrawal (MGD)	2015 Total Use (MGD)	2015 Total Publicly Supplied (MGD)
Domestic	1.76	8.96	7.20
Commercial	0.00	2.90	2.90
Industrial	11.26	12.33	1.07
Water Loss	-	-	1.99
Inter-County Delivery	-	-	0.00
		Total (MGD)	13.16
		Hahira Public Supply (MGD)[3]	0.20
		QWS's Percent of County's Public Supply (%)	2%
		QWS's Supplied Industrial Demand (MGD)	0.02
		2015 QWS Percent of Regional Industrial Demand (%)	0.10%
		2050 QWS Industrial Demand Estimate (MGD)	0.02

Table A-3
2015 Withdrawal and Use Data by County and 2050 Industrial Demand Estimates

Lowndes County-North

Lowndes County[2]	2015 Total Withdrawal (MGD)	2015 Total Use (MGD)	2015 Total Publicly Supplied (MGD)
Domestic	1.76	8.96	7.20
Commercial	0.00	2.90	2.90
Industrial	11.26	12.33	1.07
Water Loss	-	-	1.99
Inter-County Delivery	-	-	0.00
		Total (MGD)	13.16
		Lowndes County-North Public Supply (MGD)	0.32
		QWS's Percent of County's Public Supply (%)	2%
		QWS's Supplied Industrial Demand (MGD)	0.03
		2015 QWS Percent of Regional Industrial Demand (%)	0.17%
		2050 QWS Industrial Demand Estimate (MGD)	0.04

Lowndes County-South

Lowndes County[2]	2015 Total Withdrawal (MGD)	2015 Total Use (MGD)	2015 Total Publicly Supplied (MGD)
Domestic	1.76	8.96	7.20
Commercial	0.00	2.90	2.90
Industrial	11.26	12.33	1.07
Water Loss	-	-	1.99
Inter-County Delivery	-	-	0.00
		Total (MGD)	13.16
		Lowndes County-South Public Supply (MGD)	0.98
		QWS's Percent of County's Public Supply (%)	7%
		QWS's Supplied Industrial Demand (MGD)	0.08
		2015 QWS Percent of Regional Industrial Demand (%)	0.51%
		2050 QWS Industrial Demand Estimate (MGD)	0.11

Nashville

Berrien County[2]	2015 Total Withdrawal (MGD)	2015 Total Use (MGD)	2015 Total Publicly Supplied (MGD)
Domestic	0.86	1.41	0.55
Commercial	0.00	0.14	0.14
Industrial	0.00	0.01	0.01
Water Loss	-	-	0.08
Inter-County Delivery	-	-	0.00
		Total (MGD)	0.78
		Nashville Public Supply	0.58
		QWS's Percent of County's Public Supply (%)	74%
		QWS's Supplied Industrial Demand (MGD)	0.01
		2015 QWS Percent of Regional Industrial Demand (%)	0.05%
		2050 QWS Industrial Demand Estimate (MGD)	0.01

Quitman

Brooks County[2]	2015 Total Withdrawal (MGD)	2015 Total Use (MGD)	2015 Total Publicly Supplied (MGD)
Domestic	0.60	1.18	0.58
Commercial	0.01	0.21	0.20
Industrial	0.12	0.13	0.01
Water Loss	-	-	0.11
Inter-County Delivery	-	-	0.00
		Total (MGD)	0.90
		Quitman Public Supply (MGD)	0.67
		QWS's Percent of County's Public Supply (%)	74%
		QWS's Supplied Industrial Demand (MGD)	0.01
		2015 QWS Percent of Regional Industrial Demand (%)	0.05%
		2050 QWS Industrial Demand Estimate (MGD)	0.01

Table A-3
2015 Withdrawal and Use Data by County and 2050 Industrial Demand Estimates

Satilla Regional Water and Sewer Auth. - East

Ware County[2]	2015 Total Withdrawal (MGD)	2015 Total Use (MGD)	2015 Total Publicly Supplied (MGD)
Domestic	0.29	1.91	1.62
Commercial	0.00	0.41	0.41
Industrial	0.86	1.23	0.37
Water Loss	-	-	0.34
Inter-County Delivery	-	-	0.00
		Total (MGD)	2.74
		Satilla Regional Water and Sewer Auth.-East Public Supply (MGD)[3]	0.28
		QWS's Percent of County's Public Supply (%)	10%
		QWS's Supplied Industrial Demand (MGD)	0.04
		2015 QWS Percent of Regional Industrial Demand (%)	0.24%
		2050 QWS Industrial Demand Estimate (MGD)	0.05

Satilla Regional Water and Sewer Auth.

Ware County[2]	2015 Total Withdrawal (MGD)	2015 Total Use (MGD)	2015 Total Publicly Supplied (MGD)
Domestic	0.29	1.91	1.62
Commercial	0.00	0.41	0.41
Industrial	0.86	1.23	0.37
Water Loss	-	-	0.34
Inter-County Delivery	-	-	0.00
		Total (MGD)	2.74
		Satilla Regional Water and Sewer Auth. Public Supply (MGD)[3]	0.71
		QWS's Percent of County's Public Supply (%)	26%
		QWS's Supplied Industrial Demand (MGD)	0.10
		2015 QWS Percent of Regional Industrial Demand (%)	0.62%
		2050 QWS Industrial Demand Estimate (MGD)	0.14

Tifton - Tift County

Tift County[2]	2015 Total Withdrawal (MGD)	2015 Total Use (MGD)	2015 Total Publicly Supplied (MGD)
Domestic	1.00	4.21	3.21
Commercial	0.19	1.05	0.86
Industrial	0.00	0.04	0.04
Water Loss	-	-	0.67
Inter-County Delivery	-	-	0.00
		Total (MGD)	4.78
		Tifton - Tift County Public Supply (MGD)	4.57
		QWS's Percent of County's Public Supply (%)	96%
		QWS's Supplied Industrial Demand (MGD)	0.04
		2015 QWS Percent of Regional Industrial Demand (%)	0.25%
		2050 QWS Industrial Demand Estimate (MGD)	0.05

Valdosta

Lowndes County[2]	2015 Total Withdrawal (MGD)	2015 Total Use (MGD)	2015 Total Publicly Supplied (MGD)
Domestic	1.76	8.96	7.20
Commercial	0.00	2.90	2.90
Industrial	11.26	12.33	1.07
Water Loss	-	-	1.99
Inter-County Delivery	-	-	0.00
		Total (MGD)	13.16
		Valdosta Public Supply (MGD)	10.11
		QWS's Percent of County's Public Supply (%)	77%
		QWS's Supplied Industrial Demand (MGD)	0.82
		2015 QWS Percent of Regional Industrial Demand (%)	5.30%
		2050 QWS Industrial Demand Estimate (MGD)	1.17

Table A-3
2015 Withdrawal and Use Data by County and 2050 Industrial Demand Estimates

Waycross

Ware County[2]	2015 Total Withdrawal (MGD)	2015 Total Use (MGD)	2015 Total Publicly Supplied (MGD)
Domestic	0.29	1.91	1.62
Commercial	0.00	0.41	0.41
Industrial	0.86	1.23	0.37
Water Loss	-	-	0.34
Inter-County Delivery	-	-	0.00
		Total (MGD)	2.74
		Waycross Public Supply (MGD)	1.68
		QWS's Percent of County's Public Supply (%)	61%
		QWS's Supplied Industrial Demand (MGD)	0.23
		2015 QWS Percent of Regional Industrial Demand (%)	1.46%
		2050 QWS Industrial Demand Estimate (MGD)	0.32

Prepared by: LCT 03/12/21
Checked by: GJH 03/25/21

Notes:
MGD - million gallons per day
QWS - qualified water system
1. Values are from the 2017 Suwannee-Satilla Water Planning Council *Suwannee-Satilla Regional Water Plan* .
2. Values in the box with thick borders are from Painter, 2019: *Estimated Use of Water in Georgia for 2015 and Water-Use Trends, 1985–2015*.
3. Values do not appear or they appeared anomalous in the 2019 Painter report; rather, 2015 Total Demand values from Table 4-1 are reported.

Table A-4
Excess Capacity Index Values

County	Qualified Water System (QWS)	2015 Peak Day Design Capacity (MGD)	2015 ADD (MGD) (Water Withdrawal Only)[1]	2015 Excess Capacity (MGD)	2015 Excess Capacity Index	2050 Peak Day Design Capacity (MGD)[3]	2050 ADD (MGD) (Water Withdrawal Only)[4]	2050 Excess Capacity (MGD)	2050 Excess Capacity Index
Cook	Adel	8.2	0.8	7.4	0.89	8.2	0.7	7.5	0.91
Bacon	Alma	2.4	0.9	1.5	0.41	2.4	0.7	1.7	0.56
Turner	Ashburn	3.7	0.7	3.0	0.77	3.7	0.4	3.4	0.89
Pierce	Blackshear	3.4	0.3	3.1	0.91	4.7	0.9	3.8	0.77
Coffee	Douglas	10.7	3.3	7.4	0.55	10.7	2.0	8.7	0.76
Ben Hill	Fitzgerald	7.6	2.5	5.2	0.52	7.6	2.9	4.7	0.38
Charlton	Folkston	1.9	0.7	1.2	0.40	1.9	0.7	1.2	0.43
Lowndes	Hahira	4.3	0.2[(2)]	4.1	0.95	4.3	0.5	3.8	0.86
Lowndes	Lowndes Co.-North	2.8	0.5	2.3	0.76	2.8	1.2	1.6	0.21
Lowndes	Lowndes Co.-South	4.3	1.0	3.3	0.70	4.3	1.1	3.2	0.66
Berrien	Nashville	3.2	0.5	2.6	0.80	3.2	0.4	2.8	0.85
Brooks	Quitman	2.6	0.6	2.0	0.69	3.9	0.5	3.4	0.87
Ware	Satilla Regional Water & Sewer Auth. - East	3.2	0.3	2.9	0.91	3.2	0.6	2.6	0.78
Ware	Satilla Regional Water & Sewer Auth.	5.2	0.7	4.5	0.84	5.2	1.6	3.6	0.56
Tift	Tifton-Tift County	18.7	4.6	14.1	0.68	18.7	4.3	14.4	0.70
Lowndes	Valdosta	19.1	10.1	9.0	-0.13	19.1	10.7	8.4	-0.29
Ware	Waycross	7.0	1.7	5.3	0.69	7.0	2.3	4.8	0.53
	Totals	**108.4**	**29.4**	**79.0**	**-**	**110.9**	**31.5**	**79.4**	**-**

Prepared by: LCT 03/12/21

Checked by: GJH 03/25/21

Notes:

ADD - average daily demand

MGD - million gallons per day

1. 2015 EPD-validated water loss audit values are reported. In the event a QWS is not in that dataset, as identified in Table 2-3, QWS-provided values are reported.
2. 2016 self-reported value is reported because the 2015 value not available.
3. Blackshear and Quitman each indicated one potential new 1.25 MGD well.
4. Municipal and publicly-supplied industrial demand by county were allocated to each QWS.

Appendix B: Water Supply Deficit Calcuations

Table B-1a
Adel Emergency Scenario Evaluation: 2015

Risk	Scenario	Relative Liklihood	Duration (Days)	Peak Day Design Capacity (MGD)					Maximum Possible Purchased Water (MGD)	Water Storage (MGD)[3]	Total Possible Water Supply (MGD)	Capacity Loss (MGD)	Available Water Supply (MGD)
				WTP Well 1	WTP Well 3	WTP Well 4	WTP Well 5	WTP Well 6					
A. Failure of largest water treatment facility	A1. Power supply failure of largest WTP[1]	0.5	1	1.22	1.22	1.22	1.94	2.59	NA	0.48	8.69	0.39	8.30
	A2. Critical asset failure at largest WTP[2]	0.1	30	1.22	1.22	1.22	1.94	2.59	NA	NA	8.21	0.00	8.21
B. Short-term catastrophic failure of a water distribution system	Critical asset failure (transmission main)	0.1	1	1.22	1.22	1.22	1.94	2.59	NA	0.48	8.69	2.59	6.10
C. Short-term contamination of a water supply within distribution system	Contamination of distribution system triggers issuance of boil water notice	1	3	1.22	1.22	1.22	1.94	2.59	NA	NA	8.21	0.00	8.21
D. Short-term contamination of a raw water source	D1. Biological contamination of largest raw water source	0.5	1	1.22	1.22	1.22	1.94	2.59	NA	0.48	8.69	2.59	6.10
	D2. Chemical contamination of largest raw water source	0.1	1	1.22	1.22	1.22	1.94	2.59	NA	0.48	8.69	2.59	6.10
E. Full unavailability of major raw water sources due to federal or state government actions	--	Not Applicable											
F. Limited or reduced unavailability of major raw water sources due to federal or state government actions	--	Not Applicable											
G. Failure of an existing dam that impounds a raw water source	Dam failure for largest impoundment	Not Applicable											
H. Water supply reduction due to drought	Raw water supply available is 40% of ADD due to drought	Not Applicable											

Notes:

Prepared by: LCT 03/15/21
Checked by: GJH 03/26/21

ADD - average daily demand
MGD - million gallons per day
NA - not applicable
QWS - qualified water system
WTP - water treatment plant

1. WTP Well #6 has a backup generator that is able to provide 2.2 MGD of treatment capacity in the event of a loss of power.
2. Backup equipment is available, rendering no capacity loss.
3. Scenarios A1 and B include treated water storage; Scenarios D1 and D2 include raw (non-reservoir) and treated water storage.

Relative liklihood scale: 1 = high; 0.5 = medium; 0.1 = low; 0.05 = negligible

Table B-1b
Adel Deficits: 2015

Risk	Scenario	Available Water Supply (MGD)	2015 - Immediate Reliability Target					
			Total Demand (MGD)[1]	65% ADD (MGD)	35% ADD (MGD)	Total Demand Deficit (MGD)	65% ADD Deficit (MGD)	35% ADD Deficit (MGD)
A. Failure of largest water treatment facility	A1. Power supply failure of largest WTP	8.30	0.80	0.52	0.28	0.00	0.00	0.00
	A2. Critical asset failure at largest WTP	8.21	0.80	0.52	0.28	0.00	0.00	0.00
B. Short-term catastrophic failure of a water distribution system	Critical asset failure (transmission main)	6.10	0.80	0.52	0.28	0.00	0.00	0.00
C. Short-term contamination of a water supply within distribution system	Contamination of distribution system triggers issuance of boil water notice	8.21	0.80	0.52	0.28	0.00	0.00	0.00
D. Short-term contamination of a raw water source	D1. Biological contamination of largest raw water source	6.10	0.80	0.52	0.28	0.00	0.00	0.00
	D2. Chemical contamination of largest raw water source	6.10	0.80	0.52	0.28	0.00	0.00	0.00
E. Full unavailability of major raw water sources due to federal or state government actions	--	Not Applicable						
F. Limited or reduced unavailability of major raw water sources due to federal or state government actions	--	Not Applicable						
G. Failure of an existing dam that impounds a raw water source	Dam failure for largest impoundment	Not Applicable						
H. Water supply reduction due to drought	Raw water supply available is 40% of ADD due to drought	Not Applicable						

Notes:

ADD - average daily demand
MGD - million gallons per day
QWS - qualified water system
WTP - water treatment plant

1. Total demand (withdrawal plus purchases) is defined the same as 100% ADD.

Prepared by: LCT 03/15/21
Checked by: GJH 03/26/21

Table B-1c
Adel Emergency Scenario Evaluation: 2050

Risk	Scenario	Relative Liklihood	Duration (Days)	Peak Day Design Capacity (MGD)					Maximum Possible Purchased Water (MGD)	Water Storage (MGD)[3]	Total Possible Water Supply (MGD)	Capacity Loss (MGD)	Available Water Supply (MGD)
				WTP Well 1	WTP Well 3	WTP Well 4	WTP Well 5	WTP Well 6					
A. Failure of largest water treatment facility	A1. Power supply failure of largest WTP[1]	0.5	1	1.22	1.22	1.22	1.94	2.59	NA	0.48	8.69	0.39	8.30
	A2. Critical asset failure at largest WTP[2]	0.1	30	1.22	1.22	1.22	1.94	2.59	NA	NA	8.21	0.00	8.21
B. Short-term catastrophic failure of a water distribution system	Critical asset failure (transmission main)	0.1	1	1.22	1.22	1.22	1.94	2.59	NA	0.48	8.69	2.59	6.10
C. Short-term contamination of a water supply within distribution system	Contamination of distribution system triggers issuance of boil water notice	1	3	1.22	1.22	1.22	1.94	2.59	NA	NA	8.21	0.00	8.21
D. Short-term contamination of a raw water source	D1. Biological contamination of largest raw water source	0.5	1	1.22	1.22	1.22	1.94	2.59	NA	0.48	8.69	2.59	6.10
	D2. Chemical contamination of largest raw water source	0.1	1	1.22	1.22	1.22	1.94	2.59	NA	0.48	8.69	2.59	6.10
E. Full unavailability of major raw water sources due to federal or state government actions	--	Not Applicable											
F. Limited or reduced unavailability of major raw water sources due to federal or state government actions	--	Not Applicable											
G. Failure of an existing dam that impounds a raw water source	Dam failure for largest impoundment	Not Applicable											
H. Water supply reduction due to drought	Raw water supply available is 40% of ADD due to drought	Not Applicable											

Notes:

Prepared by: LCT 03/15/21
Checked by: GJH 03/26/21

ADD - average daily demand
MGD - million gallons per day
NA - not applicable
QWS - qualified water system
WTP - water treatment plant

1. WTP Well #6 has a backup generator that is able to provide 2.2 MGD of treatment capacity in the event of a loss of power
2. Backup equipment is available, rendering no capacity loss.
3. Scenarios A1 and B include treated water storage; Scenarios D1 and D2 include raw (non-reservoir) and treated water storage.

Relative liklihood scale: 1 = high; 0.5 = medium; 0.1 = low; 0.05 = negligible

Table B-1d
Adel Deficits: 2050

Risk	Scenario	Available Water Supply (MGD)	2050 - Long-Range Reliability Target					
			Total Demand (MGD)[1]	65% ADD (MGD)	35% ADD (MGD)	Total Demand Deficit (MGD)	65% ADD Deficit (MGD)	35% ADD Deficit (MGD)
A. Failure of largest water treatment facility	A1. Power supply failure of largest WTP	8.30	0.69	0.45	0.24	0.00	0.00	0.00
	A2. Critical asset failure at largest WTP	8.21	0.69	0.45	0.24	0.00	0.00	0.00
B. Short-term catastrophic failure of a water distribution system	Critical asset failure (transmission main)	6.10	0.69	0.45	0.24	0.00	0.00	0.00
C. Short-term contamination of a water supply within distribution system	Contamination of distribution system triggers issuance of boil water notice	8.21	0.69	0.45	0.24	0.00	0.00	0.00
D. Short-term contamination of a raw water source	D1. Biological contamination of largest raw water source	6.10	0.69	0.45	0.24	0.00	0.00	0.00
	D2. Chemical contamination of largest raw water source	6.10	0.69	0.45	0.24	0.00	0.00	0.00
E. Full unavailability of major raw water sources due to federal or state government actions	--	Not Applicable						
F. Limited or reduced unavailability of major raw water sources due to federal or state government actions	--	Not Applicable						
G. Failure of an existing dam that impounds a raw water source	Dam failure for largest impoundment	Not Applicable						
H. Water supply reduction due to drought	Raw water supply available is 40% of ADD due to drought	Not Applicable						

Notes:

ADD - average daily demand
MGD - million gallons per day
QWS - qualified water system
WTP - water treatment plant

1. Total demand (withdrawal plus purchases) is defined the same as 100% ADD.

Prepared by: LCT 03/15/21
Checked by: GJH 03/26/21

Table B-2a
Alma Emergency Scenario Evaluation: 2015

Risk	Scenario	Relative Liklihood	Duration (Days)	Peak Day Design Capacity (MGD)			Maximum Possible Purchased Water (MGD)	Water Storage (MGD)[3]	Total Possible Water Supply (MGD)	Capacity Loss (MGD)	Available Water Supply (MGD)
				WTP Well 3	WTP Well 4	WTP Well 2 (Emergency)					
A. Failure of largest water treatment facility	A1. Power supply failure of largest WTP[1]	0.5	1	0.86	0.86	0.69	NA	0.48	2.90	0.00	2.90
	A2. Critical asset failure at largest WTP[2]	0.1	30	0.86	0.86	0.69	NA	NA	2.42	0.00	2.42
B. Short-term catastrophic failure of a water distribution system	Critical asset failure (transmission main)	0.1	1	0.86	0.86	0.69	NA	0.48	2.90	0.86	2.04
C. Short-term contamination of a water supply within distribution system	Contamination of distribution system triggers issuance of boil water notice	1.0	3	0.86	0.86	0.69	NA	NA	2.42	0.00	2.42
D. Short-term contamination of a raw water source	D1. Biological contamination of largest raw water source	0.5	1	0.86	0.86	0.69	NA	0.48	2.90	0.86	2.04
	D2. Chemical contamination of largest raw water source	0.1	1	0.86	0.86	0.69	NA	0.48	2.90	0.86	2.04
E. Full unavailability of major raw water sources due to federal or state government actions	--	Not Applicable									
F. Limited or reduced unavailability of major raw water sources due to federal or state government actions	--	Not Applicable									
G. Failure of an existing dam that impounds a raw water source	Dam failure for largest impoundment	Not Applicable									
H. Water supply reduction due to drought	Raw water supply available is 40% of ADD due to drought	Not Applicable									

Notes:

ADD - average daily demand
MGD - million gallons per day
NA - not applicable
QWS - qualified water system
WTP - water treatment plant
Relative liklihood scale: 1 = high; 0.5 = medium; 0.1 = low; 0.05 = negligible

1. WTP 103 & 104 have a backup generator able to supply full treatment capacity, rendering no capacity loss at the largest WTP.
2. Backup equipment is available, rendering no capacity loss.
3. Scenarios A1 and B include treated water storage; Scenarios D1 and D2 include raw (non-reservoir) and treated water storage.

Prepared by: LCT 03/15/21
Checked by: GJH 03/26/21

Table B-2b
Alma Deficits: 2015

			2015 - Immediate Reliability Target					
Risk	**Scenario**	**Available Water Supply (MGD)**	**Total Demand (MGD)[1]**	**65% ADD (MGD)**	**35% ADD (MGD)**	**Total Demand Deficit (MGD)**	**65% ADD Deficit (MGD)**	**35% ADD Deficit (MGD)**
A. Failure of largest water treatment facility	A1. Power supply failure of largest WTP	2.90	0.90	0.59	0.32	0.0	0.0	0.0
	A2. Critical asset failure at largest WTP	2.42	0.90	0.59	0.32	0.0	0.0	0.0
B. Short-term catastrophic failure of a water distribution system	Critical asset failure (transmission main)	2.04	0.90	0.59	0.32	0.0	0.0	0.0
C. Short-term contamination of a water supply within distribution system	Contamination of distribution system triggers issuance of boil water notice	2.42	0.90	0.59	0.32	0.0	0.0	0.0
D. Short-term contamination of a raw water source	D1. Biological contamination of largest raw water source	2.04	0.90	0.59	0.32	0.0	0.0	0.0
	D2. Chemical contamination of largest raw water source	2.04	0.90	0.59	0.32	0.0	0.0	0.0
E. Full unavailability of major raw water sources due to federal or state government actions	--				Not Applicable			
F. Limited or reduced unavailability of major raw water sources due to federal or state government actions	--				Not Applicable			
G. Failure of an existing dam that impounds a raw water source	Dam failure for largest impoundment				Not Applicable			
H. Water supply reduction due to drought	Raw water supply available is 40% of ADD due to drought				Not Applicable			

Notes:

ADD - average daily demand
MGD - million gallons per day
QWS - qualified water system
WTP - water treatment plant

1. Total demand (withdrawal plus purchases) is defined the same as 100% ADD.

Prepared by: LCT 03/15/21
Checked by: GJH 03/26/21

Table B-2c
Alma Emergency Scenario Evaluation: 2050

				Peak Day Design Capacity (MGD)							
Risk	**Scenario**	**Relative Liklihood**	**Duration (Days)**	**WTP Well 3**	**WTP Well 4**	**WTP Well 2 (Emergency)**	**Maximum Possible Purchased Water (MGD)**	**Water Storage (MGD)[3]**	**Total Possible Water Supply (MGD)**	**Capacity Loss (MGD)**	**Available Water Supply (MGD)**
A. Failure of largest water treatment facility	A1. Power supply failure of largest WTP[1]	0.5	1	0.86	0.86	0.69	NA	0.48	2.90	0.00	2.90
	A2. Critical asset failure at largest WTP[2]	0.1	30	0.86	0.86	0.69	NA	NA	2.42	0.00	2.42
B. Short-term catastrophic failure of a water distribution system	Critical asset failure (transmission main)	0.1	1	0.86	0.86	0.69	NA	0.48	2.90	0.86	2.04
C. Short-term contamination of a water supply within distribution system	Contamination of distribution system triggers issuance of boil water notice	1.0	3	0.86	0.86	0.69	NA	NA	2.42	0.00	2.42
D. Short-term contamination of a raw water source	D1. Biological contamination of largest raw water source	0.5	1	0.86	0.86	0.69	NA	0.48	2.90	0.86	2.04
	D2. Chemical contamination of largest raw water source	0.1	1	0.86	0.86	0.69	NA	0.48	2.90	0.86	2.04
E. Full unavailability of major raw water sources due to federal or state government actions	--						Not Applicable				
F. Limited or reduced unavailability of major raw water sources due to federal or state government actions	--						Not Applicable				
G. Failure of an existing dam that impounds a raw water source	Dam failure for largest impoundment						Not Applicable				
H. Water supply reduction due to drought	Raw water supply available is 40% of ADD due to drought						Not Applicable				

Notes:

ADD - average daily demand
MGD - million gallons per day
NA - not applicable
QWS - qualified water system
WTP - water treatment plant
Relative liklihood scale: 1 = high; 0.5 = medium; 0.1 = low; 0.05 = negligible

1. WTP 103 & 104 has a backup generator able to supply full treatment capacity, rendering no capacity loss at the largest WTP.
2. Backup equipment is available, rendering no capacity loss.
3. Scenarios A1 and B include treated water storage; Scenarios D1 and D2 include raw (non-reservoir) and treated water storage.

Prepared by: LCT 03/15/21
Checked by: GJH 03/26/21

Table B-2d
Alma Deficits: 2050

			2050 - Long-Range Reliability Target					
Risk	**Scenario**	**Available Water Supply (MGD)**	**Total Demand (MGD)[1]**	**65% ADD (MGD)**	**35% ADD (MGD)**	**Total Demand Deficit (MGD)**	**65% ADD Deficit (MGD)**	**35% ADD Deficit (MGD)**
A. Failure of largest water treatment facility	A1. Power supply failure of largest WTP	2.90	0.74	0.48	0.26	0.00	0.00	0.00
	A2. Critical asset failure at largest WTP	2.42	0.74	0.48	0.26	0.00	0.00	0.00
B. Short-term catastrophic failure of a water distribution system	Critical asset failure (transmission main)	2.04	0.74	0.48	0.26	0.00	0.00	0.00
C. Short-term contamination of a water supply within distribution system	Contamination of distribution system triggers issuance of boil water notice	2.42	0.74	0.48	0.26	0.00	0.00	0.00
D. Short-term contamination of a raw water source	D1. Biological contamination of largest raw water source	2.04	0.74	0.48	0.26	0.00	0.00	0.00
	D2. Chemical contamination of largest raw water source	2.04	0.74	0.48	0.26	0.00	0.00	0.00
E. Full unavailability of major raw water sources due to federal or state government actions	--	Not Applicable						
F. Limited or reduced unavailability of major raw water sources due to federal or state government actions	--	Not Applicable						
G. Failure of an existing dam that impounds a raw water source	Dam failure for largest impoundment	Not Applicable						
H. Water supply reduction due to drought	Raw water supply available is 40% of ADD due to drought	Not Applicable						

Notes:

ADD - average daily demand
MGD - million gallons per day
QWS - qualified water system
WTP - water treatment plant

1. Total demand (withdrawal plus purchases) is defined the same as 100% ADD.

Prepared by: LCT 03/15/21
Checked by: GJH 03/26/21

Table B-3a
Ashburn Emergency Scenario Evaluation: 2015

Risk	Scenario	Relative Liklihood	Duration (Days)	Peak Day Design Capacity (MGD) WTP Well 101	WTP Well 102	WTP Well 104	WTP Well 105	Maximum Possible Purchased Water (MGD)[3]	Water Storage (MGD)[4]	Total Possible Water Supply (MGD)	Capacity Loss (MGD)	Available Water Supply (MGD)
A. Failure of largest water treatment facility	A1. Power supply failure of largest WTP[1]	0.5	1	0.72	0.86	0.86	1.30	0.20	0.51	4.45	1.30	3.16
	A2. Critical asset failure at largest WTP[2]	0.1	30	0.72	0.86	0.86	1.30	0.20	NA	3.94	0.00	3.94
B. Short-term catastrophic failure of a water distribution system	Critical asset failure (transmission main)	0.1	1	0.72	0.86	0.86	1.30	0.20	0.51	4.45	1.30	3.16
C. Short-term contamination of a water supply within distribution system	Contamination of distribution system triggers issuance of boil water notice	1	3	0.72	0.86	0.86	1.30	0.20	NA	3.94	0.00	3.94
D. Short-term contamination of a raw water source	D1. Biological contamination of largest raw water source	0.5	1	0.72	0.86	0.86	1.30	0.20	0.51	4.45	1.30	3.16
	D2. Chemical contamination of largest raw water source	0.1	1	0.72	0.86	0.86	1.30	0.20	0.51	4.45	1.30	3.16
E. Full unavailability of major raw water sources due to federal or state government actions	--							Not Applicable				
F. Limited or reduced unavailability of major raw water sources due to federal or state government actions	--							Not Applicable				
G. Failure of an existing dam that impounds a raw water source	Dam failure for largest impoundment							Not Applicable				
H. Water supply reduction due to drought	Raw water supply available is 40% of ADD due to drought							Not Applicable				

Notes:

ADD - average daily demand
MGD - million gallons per day
NA - not applicable
QWS - qualified water system
WTP - water treatment plant

1. WTP 104 has a backup generator but WTP 105, the largest WTP, does not, rendering full capacity loss.
2. Backup equipment is available, rendering no capacity loss.
3. The interconnection with Sycamore is limited by their permit withdrawal limits. The maximum possible purchased water value was calculated as the minimum of 1) the sum of existing interconnections (Table B-3e); or 2) the supplier's permitted withdrawal limit.
4. Scenarios A1 and B include treated water storage; Scenarios D1 and D2 include raw (non-reservoir) and treated water storage.

Relative liklihood scale: 1 = high; 0.5 = medium; 0.1 = low; 0.05 = negligible

Prepared by: LCT 03/15/21
Checked by: GJH 03/26/21

Table B-3b
Ashburn Deficits: 2015

			2015 - Immediate Reliability Target					
Risk	**Scenario**	**Available Water Supply (MGD)**	**Total Demand (MGD)[1]**	**65% ADD (MGD)**	**35% ADD (MGD)**	**Total Demand Deficit (MGD)**	**65% ADD Deficit (MGD)**	**35% ADD Deficit (MGD)**
A. Failure of largest water treatment facility	A1. Power supply failure of largest WTP	3.16	0.71	0.46	0.25	0.00	0.00	0.00
	A2. Critical asset failure at largest WTP	3.94	0.71	0.46	0.25	0.00	0.00	0.00
B. Short-term catastrophic failure of a water distribution system	Critical asset failure (transmission main)	3.16	0.71	0.46	0.25	0.00	0.00	0.00
C. Short-term contamination of a water supply within distribution system	Contamination of distribution system triggers issuance of boil water notice	3.94	0.71	0.46	0.25	0.00	0.00	0.00
D. Short-term contamination of a raw water source	D1. Biological contamination of largest raw water source	3.16	0.71	0.46	0.25	0.00	0.00	0.00
	D2. Chemical contamination of largest raw water source	3.16	0.71	0.46	0.25	0.00	0.00	0.00
E. Full unavailability of major raw water sources due to federal or state government actions	--	Not Applicable						
F. Limited or reduced unavailability of major raw water sources due to federal or state government actions	--	Not Applicable						
G. Failure of an existing dam that impounds a raw water source	Dam failure for largest impoundment	Not Applicable						
H. Water supply reduction due to drought	Raw water supply available is 40% of ADD due to drought	Not Applicable						

Notes:

ADD - average daily demand
MGD - million gallons per day
QWS - qualified water system
WTP - water treatment plant

1. Total demand (withdrawal plus purchases) is defined the same as 100% ADD.

Prepared by: LCT 03/15/21
Checked by: GJH 03/26/21

Table B-3c
Ashburn Emergency Scenario Evaluation: 2050

Risk	Scenario	Relative Liklihood	Duration (Days)	Peak Day Design Capacity (MGD)				Maximum Possible Purchased Water (MGD)[3]	Water Storage (MGD)[4]	Total Possible Water Supply (MGD)	Capacity Loss (MGD)	Available Water Supply (MGD)
				WTP Well 101	WTP Well 102	WTP Well 104	WTP Well 105					
A. Failure of largest water treatment facility	A1. Power supply failure of largest WTP[1]	0.5	1	0.72	0.86	0.86	1.30	0.20	0.51	4.45	1.30	3.16
	A2. Critical asset failure at largest WTP[2]	0.1	30	0.72	0.86	0.86	1.30	0.20	NA	3.94	0.00	3.94
B. Short-term catastrophic failure of a water distribution system	Critical asset failure (transmission main)	0.1	1	0.72	0.86	0.86	1.30	0.20	0.51	4.45	1.30	3.16
C. Short-term contamination of a water supply within distribution system	Contamination of distribution system triggers issuance of boil water notice	1	3	0.72	0.86	0.86	1.30	0.20	NA	3.94	0.00	3.94
D. Short-term contamination of a raw water source	D1. Biological contamination of largest raw water source	0.5	1	0.72	0.86	0.86	1.30	0.20	0.51	4.45	1.30	3.16
	D2. Chemical contamination of largest raw water source	0.1	1	0.72	0.86	0.86	1.30	0.20	0.51	4.45	1.30	3.16
E. Full unavailability of major raw water sources due to federal or state government actions	--	Not Applicable										
F. Limited or reduced unavailability of major raw water sources due to federal or state government actions	--	Not Applicable										
G. Failure of an existing dam that impounds a raw water source	Dam failure for largest impoundment	Not Applicable										
H. Water supply reduction due to drought	Raw water supply available is 40% of ADD due to drought	Not Applicable										

Notes:

ADD - average daily demand
MGD - million gallons per day
NA - not applicable
QWS - qualified water system
WTP - water treatment plant

1. WTP 104 has a backup generator but WTP 105, the largest WTP, does not, rendering full capacity loss.
2. Backup equipment is available, rendering no capacity loss.
3. The interconnection with Sycamore is limited by their permit withdrawal limits. The maximum possible purchased water value was calculated as the minimum of 1) the sum of existing interconnections (Table B-3e); or 2) the supplier's permitted withdrawal limit.
4. Scenarios A1 and B include treated water storage; Scenarios D1 and D2 include raw (non-reservoir) and treated water storage.

Relative liklihood scale: 1 = high; 0.5 = medium; 0.1 = low; 0.05 = negligible

Prepared by: LCT 03/15/21
Checked by: GJH 03/26/21

Table B-3d
Ashburn Deficits: 2050

Risk	Scenario	Available Water Supply (MGD)	2050 - Long-Range Reliability Target					
			Total Demand (MGD)[1]	65% ADD (MGD)	35% ADD (MGD)	Total Demand Deficit (MGD)	65% ADD Deficit (MGD)	35% ADD Deficit (MGD)
A. Failure of largest water treatment facility	A1. Power supply failure of largest WTP	3.16	0.37	0.24	0.13	0.00	0.00	0.00
	A2. Critical asset failure at largest WTP	3.94	0.37	0.24	0.13	0.00	0.00	0.00
B. Short-term catastrophic failure of a water distribution system	Critical asset failure (transmission main)	3.16	0.37	0.24	0.13	0.00	0.00	0.00
C. Short-term contamination of a water supply within distribution system	Contamination of distribution system triggers issuance of boil water notice	3.94	0.37	0.24	0.13	0.00	0.00	0.00
D. Short-term contamination of a raw water source	D1. Biological contamination of largest raw water source	3.16	0.37	0.24	0.13	0.00	0.00	0.00
	D2. Chemical contamination of largest raw water source	3.16	0.37	0.24	0.13	0.00	0.00	0.00
E. Full unavailability of major raw water sources due to federal or state government actions	--	Not Applicable						
F. Limited or reduced unavailability of major raw water sources due to federal or state government actions	--	Not Applicable						
G. Failure of an existing dam that impounds a raw water source	Dam failure for largest impoundment	Not Applicable						
H. Water supply reduction due to drought	Raw water supply available is 40% of ADD due to drought	Not Applicable						

Notes:

ADD - average daily demand
MGD - million gallons per day
QWS - qualified water system
WTP - water treatment plant

1. Total demand (withdrawal plus purchases) is defined the same as 100% ADD.

Prepared by: LCT 03/15/21
Checked by: GJH 03/26/21

Table B-3e
Ashburn Interconnections

Existing Incoming Interconnections

Number	System	Description	Diameter (in)	Maximum Velocity (fps)[1]	Maximum Flow (cfs)	Maximum Flow (MGD)	Capacity Already Purchased (MGD)	Maximum Possible Purchased Water (MGD)
1	GA2870002-Sycamore	Industrial Drive	12	5	3.927	2.538	0.000	2.538

Prepared by: LCT 03/15/21
Checked by: GJH 03/26/21

Notes:
in - inches
fps - feet per second
cfs - cubic feet per second
MGD - million gallons per day
1. The maximum velocity is assumed to be 3 fps for pipe diameters greater than or equal to 16 inches and 5 fps for pipe diameters less than or equal to 12 inches.

Table B-4a
Blackshear Emergency Scenario Evaluation: 2015

Risk	Scenario	Relative Liklihood	Duration (Days)	Peak Day Design Capacity (MGD) WTP Well 101	WTP Well 103	WTP Well 104	Maximum Possible Purchased Water (MGD)	Water Storage (MGD)[3]	Total Possible Water Supply (MGD)	Capacity Loss (MGD)	Available Water Supply (MGD)
A. Failure of largest water treatment facility	A1. Power supply failure of largest WTP[1]	0.5	1	1.08	1.15	1.21	NA	0.75	4.19	1.21	2.98
	A2. Critical asset failure at largest WTP[2]	0.1	30	1.08	1.15	1.21	NA	NA	3.44	0.00	3.44
B. Short-term catastrophic failure of a water distribution system	Critical asset failure (transmission main)	0.1	1	1.08	1.15	1.21	NA	0.75	4.19	1.21	2.98
C. Short-term contamination of a water supply within distribution system	Contamination of distribution system triggers issuance of boil water notice	1.0	3	1.08	1.15	1.21	NA	NA	3.44	0.00	3.44
D. Short-term contamination of a raw water source	D1. Biological contamination of largest raw water source	0.5	1	1.08	1.15	1.21	NA	0.75	4.19	1.21	2.98
	D2. Chemical contamination of largest raw water source	0.1	1	1.08	1.15	1.21	NA	0.75	4.19	1.21	2.98
E. Full unavailability of major raw water sources due to federal or state government actions	--	Not Applicable									
F. Limited or reduced unavailability of major raw water sources due to federal or state government actions	--	Not Applicable									
G. Failure of an existing dam that impounds a raw water source	Dam failure for largest impoundment	Not Applicable									
H. Water supply reduction due to drought	Raw water supply available is 40% of ADD due to drought	Not Applicable									

Notes:

ADD - average daily demand
MGD - million gallons per day
NA - not applicable
QWS - qualified water system
WTP - water treatment plant

1. No WTPs have backup generators.
2. Backup equipment is available, rendering no capacity loss.
3. Scenarios A1 and B include treated water storage; Scenarios D1 and D2 include raw (non-reservoir) and treated water storage.

Relative liklihood scale: 1 = high; 0.5 = medium; 0.1 = low; 0.05 = negligible

Prepared by: LCT 03/15/21
Checked by: GJH 03/26/21

Table B-4b
Blackshear Deficits: 2015

Risk	Scenario	Available Water Supply (MGD)	2015 - Immediate Reliability Target			Total Demand Deficit (MGD)	65% ADD Deficit (MGD)	35% ADD Deficit (MGD)
			Total Demand (MGD)[1]	65% ADD (MGD)	35% ADD (MGD)			
A. Failure of largest water treatment facility	A1. Power supply failure of largest WTP	2.98	0.29	0.19	0.10	0.00	0.00	0.00
	A2. Critical asset failure at largest WTP	3.44	0.29	0.19	0.10	0.00	0.00	0.00
B. Short-term catastrophic failure of a water distribution system	Critical asset failure (transmission main)	2.98	0.29	0.19	0.10	0.00	0.00	0.00
C. Short-term contamination of a water supply within distribution system	Contamination of distribution system triggers issuance of boil water notice	3.44	0.29	0.19	0.10	0.00	0.00	0.00
D. Short-term contamination of a raw water source	D1. Biological contamination of largest raw water source	2.98	0.29	0.19	0.10	0.00	0.00	0.00
	D2. Chemical contamination of largest raw water source	2.98	0.29	0.19	0.10	0.00	0.00	0.00
E. Full unavailability of major raw water sources due to federal or state government actions	--	Not Applicable						
F. Limited or reduced unavailability of major raw water sources due to federal or state government actions	--	Not Applicable						
G. Failure of an existing dam that impounds a raw water source	Dam failure for largest impoundment	Not Applicable						
H. Water supply reduction due to drought	Raw water supply available is 40% of ADD due to drought	Not Applicable						

Notes:

ADD - average daily demand
MGD - million gallons per day
QWS - qualified water system
WTP - water treatment plant

1. Total demand (withdrawal plus purchases) is defined the same as 100% ADD.

Prepared by: LCT 03/15/21
Checked by: GJH 03/26/21

Table B-4c
Blackshear Emergency Scenario Evaluation: 2050

Risk	Scenario	Relative Liklihood	Duration (Days)	Peak Day Design Capacity (MGD)				Maximum Possible Purchased Water (MGD)	Water Storage (MGD)[3]	Total Possible Water Supply (MGD)	Capacity Loss (MGD)	Available Water Supply (MGD)
				WTP Well 101	WTP Well 103	WTP Well 104	New Well					
A. Failure of largest water treatment facility	A1. Power supply failure of largest WTP[1]	0.5	1	1.08	1.15	1.21	1.25	NA	0.90	5.59	0.25	5.34
	A2. Critical asset failure at largest WTP[2]	0.1	30	1.08	1.15	1.21	1.25	NA	NA	4.69	0.00	4.69
B. Short-term catastrophic failure of a water distribution system	Critical asset failure (transmission main)	0.1	1	1.08	1.15	1.21	1.25	NA	0.90	5.59	1.25	4.34
C. Short-term contamination of a water supply within distribution system	Contamination of distribution system triggers issuance of boil water notice	1.0	3	1.08	1.15	1.21	1.25	NA	NA	4.69	0.00	4.69
D. Short-term contamination of a raw water source	D1. Biological contamination of largest raw water source	0.5	1	1.08	1.15	1.21	1.25	NA	0.90	5.59	1.25	4.34
	D2. Chemical contamination of largest raw water source	0.1	1	1.08	1.15	1.21	1.25	NA	0.90	5.59	1.25	4.34
E. Full unavailability of major raw water sources due to federal or state government actions	--							Not Applicable				
F. Limited or reduced unavailability of major raw water sources due to federal or state government actions	--							Not Applicable				
G. Failure of an existing dam that impounds a raw water source	Dam failure for largest impoundment							Not Applicable				
H. Water supply reduction due to drought	Raw water supply available is 40% of ADD due to drought							Not Applicable				

Notes:

Prepared by: LCT 03/15/21
Checked by: GJH 03/26/21

ADD - average daily demand
MGD - million gallons per day
NA - not applicable
QWS - qualified water system
WTP - water treatment plant

1. A new generator was indicated by the QWS. 80% of peak treatment at the largest WTP is assumed.
2. Backup equipment is available, rendering no capacity loss.
3. Scenarios A1 and B include treated water storage; Scenarios D1 and D2 include raw (non-reservoir) and treated water storage. Blackshear indicated a new 0.25 MG storage tank.

Relative liklihood scale: 1 = high; 0.5 = medium; 0.1 = low; 0.05 = negligible

Table B-4d
Blackshear Deficits: 2050

			2050 - Long-Range Reliability Target					
Risk	**Scenario**	**Available Water Supply (MGD)**	**Total Demand (MGD)[1]**	**65% ADD (MGD)**	**35% ADD (MGD)**	**Total Demand Deficit (MGD)**	**65% ADD Deficit (MGD)**	**35% ADD Deficit (MGD)**
A. Failure of largest water treatment facility	A1. Power supply failure of largest WTP	5.34	0.88	0.57	0.31	0.00	0.00	0.00
	A2. Critical asset failure at largest WTP	4.69	0.88	0.57	0.31	0.00	0.00	0.00
B. Short-term catastrophic failure of a water distribution system	Critical asset failure (transmission main)	4.34	0.88	0.57	0.31	0.00	0.00	0.00
C. Short-term contamination of a water supply within distribution system	Contamination of distribution system triggers issuance of boil water notice	4.69	0.88	0.57	0.31	0.00	0.00	0.00
D. Short-term contamination of a raw water source	D1. Biological contamination of largest raw water source	4.34	0.88	0.57	0.31	0.00	0.00	0.00
	D2. Chemical contamination of largest raw water source	4.34	0.88	0.57	0.31	0.00	0.00	0.00
E. Full unavailability of major raw water sources due to federal or state government actions	--	Not Applicable						
F. Limited or reduced unavailability of major raw water sources due to federal or state government actions	--	Not Applicable						
G. Failure of an existing dam that impounds a raw water source	Dam failure for largest impoundment	Not Applicable						
H. Water supply reduction due to drought	Raw water supply available is 40% of ADD due to drought	Not Applicable						

Notes:

ADD - average daily demand
MGD - million gallons per day
QWS - qualified water system
WTP - water treatment plant

1. Total demand (withdrawal plus purchases) is defined the same as 100% ADD.

Prepared by: LCT 03/15/21
Checked by: GJH 03/26/21

Table B-5a
Douglas Emergency Scenario Evaluation: 2015

Risk	Scenario	Relative Liklihood	Duration (Days)	Peak Day Design Capacity (MGD)					Maximum Possible Purchased Water (MGD)	Water Storage (MGD)[3]	Total Possible Water Supply (MGD)	Capacity Loss (MGD)	Available Water Supply (MGD)
				WTP Well 104	WTP Well 105	WTP Well 106	WTP Well 107	WTP Wells 102 & 103					
A. Failure of largest water treatment facility	A1. Power supply failure of largest WTP[1]	0.5	1	1.66	2.55	1.80	2.16	2.56	NA	1.20	11.92	0.00	11.92
	A2. Critical asset failure at largest WTP[2]	0.1	30	1.66	2.55	1.80	2.16	2.56	NA	NA	10.72	0.00	10.72
B. Short-term catastrophic failure of a water distribution system	Critical asset failure (transmission main)	0.1	1	1.66	2.55	1.80	2.16	2.56	NA	1.20	11.92	2.56	9.36
C. Short-term contamination of a water supply within distribution system	Contamination of distribution system triggers issuance of boil water notice	1	3	1.66	2.55	1.80	2.16	2.56	NA	NA	10.72	0.00	10.72
D. Short-term contamination of a raw water source	D1. Biological contamination of largest raw water source	0.5	1	1.66	2.55	1.80	2.16	2.56	NA	1.20	11.92	2.56	9.36
	D2. Chemical contamination of largest raw water source	0.1	1	1.66	2.55	1.80	2.16	2.56	NA	1.20	11.92	2.56	9.36
E. Full unavailability of major raw water sources due to federal or state government actions	--	Not Applicable											
F. Limited or reduced unavailability of major raw water sources due to federal or state government actions	--	Not Applicable											
G. Failure of an existing dam that impounds a raw water source	Dam failure for largest impoundment	Not Applicable											
H. Water supply reduction due to drought	Raw water supply available is 40% of ADD due to drought	Not Applicable											

Notes:

ADD - average daily demand
MGD - million gallons per day
NA - not applicable
QWS - qualified water system
WTP - water treatment plant
Relative liklihood scale: 1 = high; 0.5 = medium; 0.1 = low; 0.05 = negligible

1. The WTP for Wells 102 & 103 has a backup generator able to supply full capacity, rendering no capacity loss at the largest WTP.
2. Backup equipment is available, rendering no capacity loss.
3. Scenarios A1 and B include treated water storage; Scenarios D1 and D2 include raw (non-reservoir) and treated water storage.

Prepared by: LCT 03/15/21
Checked by: GJH 03/26/21

Table B-5b
Douglas Deficits: 2015

Risk	Scenario	Available Water Supply (MGD)	2015 - Immediate Reliability Target			Total Demand Deficit (MGD)	65% ADD Deficit (MGD)	35% ADD Deficit (MGD)
			Total Demand (MGD)[1]	65% ADD (MGD)	35% ADD (MGD)			
A. Failure of largest water treatment facility	A1. Power supply failure of largest WTP	11.92	3.35	2.18	1.17	0.00	0.00	0.00
	A2. Critical asset failure at largest WTP	10.72	3.35	2.18	1.17	0.00	0.00	0.00
B. Short-term catastrophic failure of a water distribution system	Critical asset failure (transmission main)	9.36	3.35	2.18	1.17	0.00	0.00	0.00
C. Short-term contamination of a water supply within distribution system	Contamination of distribution system triggers issuance of boil water notice	10.72	3.35	2.18	1.17	0.00	0.00	0.00
D. Short-term contamination of a raw water source	D1. Biological contamination of largest raw water source	9.36	3.35	2.18	1.17	0.00	0.00	0.00
	D2. Chemical contamination of largest raw water source	9.36	3.35	2.18	1.17	0.00	0.00	0.00
E. Full unavailability of major raw water sources due to federal or state government actions	--					Not Applicable		
F. Limited or reduced unavailability of major raw water sources due to federal or state government actions	--					Not Applicable		
G. Failure of an existing dam that impounds a raw water source	Dam failure for largest impoundment					Not Applicable		
H. Water supply reduction due to drought	Raw water supply available is 40% of ADD due to drought					Not Applicable		

Notes:

ADD - average daily demand
MGD - million gallons per day
QWS - qualified water system
WTP - water treatment plant

1. Total demand (withdrawal plus purchases) is defined the same as 100% ADD.

Prepared by: LCT 03/15/21
Checked by: GJH 03/26/21

Table B-5c
Douglas Emergency Scenario Evaluation: 2050

Risk	Scenario	Relative Liklihood	Duration (Days)	Peak Day Design Capacity (MGD)					Maximum Possible Purchased Water (MGD)	Water Storage (MGD)[3]	Total Possible Water Supply (MGD)	Capacity Loss (MGD)	Available Water Supply (MGD)
				WTP Well 104	WTP Well 105	WTP Well 106	WTP Well 107	WTP Wells 102 & 103					
A. Failure of largest water treatment facility	A1. Power supply failure of largest WTP[1]	0.5	1	1.66	2.55	1.80	2.16	2.56	NA	1.50	12.22	0.00	12.22
	A2. Critical asset failure at largest WTP[2]	0.1	30	1.66	2.55	1.80	2.16	2.56	NA	NA	10.72	0.00	10.72
B. Short-term catastrophic failure of a water distribution system	Critical asset failure (transmission main)	0.1	1	1.66	2.55	1.80	2.16	2.56	NA	1.50	12.22	2.56	9.66
C. Short-term contamination of a water supply within distribution system	Contamination of distribution system triggers issuance of boil water notice	1	3	1.66	2.55	1.80	2.16	2.56	NA	NA	10.72	0.00	10.72
D. Short-term contamination of a raw water source	D1. Biological contamination of largest raw water source	0.5	1	1.66	2.55	1.80	2.16	2.56	NA	1.50	12.22	2.56	9.66
	D2. Chemical contamination of largest raw water source	0.1	1	1.66	2.55	1.80	2.16	2.56	NA	1.50	12.22	2.56	9.66
E. Full unavailability of major raw water sources due to federal or state government actions	--	Not Applicable											
F. Limited or reduced unavailability of major raw water sources due to federal or state government actions	--	Not Applicable											
G. Failure of an existing dam that impounds a raw water source	Dam failure for largest impoundment	Not Applicable											
H. Water supply reduction due to drought	Raw water supply available is 40% of ADD due to drought	Not Applicable											

Notes:

Prepared by: LCT 03/15/21
Checked by: GJH 03/26/21

ADD - average daily demand
MGD - million gallons per day
NA - not applicable
QWS - qualified water system
WTP - water treatment plant

1. The WTP for Wells 102 & 103 has a backup generator able to supply full treatment capacity, rendering no capacity loss at the largest WTP.
2. Backup equipment is available, rendering no capacity loss.
3. Scenarios A1 and B include treated water storage; Scenarios D1 and D2 include raw (non-reservoir) and treated water storage. Douglas indicated a new 0.5 MG storage tank.

Relative liklihood scale: 1 = high; 0.5 = medium; 0.1 = low; 0.05 = negligible

Table B-5d
Douglas Deficits: 2050

Risk	Scenario	Available Water Supply (MGD)	2050 - Long-Range Reliability Target			Total Demand Deficit (MGD)	65% ADD Deficit (MGD)	35% ADD Deficit (MGD)
			Total Demand (MGD)[1]	65% ADD (MGD)	35% ADD (MGD)			
A. Failure of largest water treatment facility	A1. Power supply failure of largest WTP	12.22	2.05	1.33	0.72	0.00	0.00	0.00
	A2. Critical asset failure at largest WTP	10.72	2.05	1.33	0.72	0.00	0.00	0.00
B. Short-term catastrophic failure of a water distribution system	Critical asset failure (transmission main)	9.66	2.05	1.33	0.72	0.00	0.00	0.00
C. Short-term contamination of a water supply within distribution system	Contamination of distribution system triggers issuance of boil water notice	10.72	2.05	1.33	0.72	0.00	0.00	0.00
D. Short-term contamination of a raw water source	D1. Biological contamination of largest raw water source	9.66	2.05	1.33	0.72	0.00	0.00	0.00
	D2. Chemical contamination of largest raw water source	9.66	2.05	1.33	0.72	0.00	0.00	0.00
E. Full unavailability of major raw water sources due to federal or state government actions	--	Not Applicable						
F. Limited or reduced unavailability of major raw water sources due to federal or state government actions	--	Not Applicable						
G. Failure of an existing dam that impounds a raw water source	Dam failure for largest impoundment	Not Applicable						
H. Water supply reduction due to drought	Raw water supply available is 40% of ADD due to drought	Not Applicable						

Notes:

ADD - average daily demand
MGD - million gallons per day
QWS - qualified water system
WTP - water treatment plant

1. Total demand (withdrawal plus purchases) is defined the same as 100% ADD.

Prepared by: LCT 03/15/21
Checked by: GJH 03/26/21

Table B-6a
Fitzgerald Emergency Scenario Evaluation: 2015

Risk	Scenario	Relative Liklihood	Duration (Days)	Peak Day Design Capacity (MGD)					Maximum Possible Purchased Water (MGD)	Water Storage (MGD)[3]	Total Possible Water Supply (MGD)	Capacity Loss (MGD)	Available Water Supply (MGD)
				WTP Well 106	WTP Well 107	WTP Well 108	WTP Well 109	WTP Well 110					
A. Failure of largest water treatment facility	A1. Power supply failure of largest WTP[1]	0.5	1	1.44	1.44	1.87	1.44	1.44	NA	1.05	8.68	1.87	6.81
	A2. Critical asset failure at largest WTP[2]	0.1	30	1.44	1.44	1.87	1.44	1.44	NA	NA	7.63	0.00	7.63
B. Short-term catastrophic failure of a water distribution system	Critical asset failure (transmission main)	0.1	1	1.44	1.44	1.87	1.44	1.44	NA	1.05	8.68	1.87	6.81
C. Short-term contamination of a water supply within distribution system	Contamination of distribution system triggers issuance of boil water notice	1	3	1.44	1.44	1.87	1.44	1.44	NA	NA	7.63	0.00	7.63
D. Short-term contamination of a raw water source	D1. Biological contamination of largest raw water source	0.5	1	1.44	1.44	1.87	1.44	1.44	NA	1.05	8.68	1.87	6.81
	D2. Chemical contamination of largest raw water source	0.1	1	1.44	1.44	1.87	1.44	1.44	NA	1.05	8.68	1.87	6.81
E. Full unavailability of major raw water sources due to federal or state government actions	--	Not Applicable											
F. Limited or reduced unavailability of major raw water sources due to federal or state government actions	--	Not Applicable											
G. Failure of an existing dam that impounds a raw water source	Dam failure for largest impoundment	Not Applicable											
H. Water supply reduction due to drought	Raw water supply available is 40% of ADD due to drought	Not Applicable											

Notes:

ADD - average daily demand
MGD - million gallons per day
NA - not applicable
QWS - qualified water system
WTP - water treatment plant

1. WTP 110 has a backup generator but WTP 108, the largest WTP, does not, rendering full capacity loss.
2. Backup equipment is available, rendering no capacity loss.
3. Scenarios A1 and B include treated water storage; Scenarios D1 and D2 include raw (non-reservoir) and treated water storage.

Relative liklihood scale: 1 = high; 0.5 = medium; 0.1 = low; 0.05 = negligible

Prepared by: LCT 03/15/21
Checked by: GJH 03/26/21

Table B-6b
Fitzgerald Deficits: 2015

			2015 - Immediate Reliability Target					
Risk	**Scenario**	**Available Water Supply (MGD)**	**Total Demand (MGD)[1]**	**65% ADD (MGD)**	**35% ADD (MGD)**	**Total Demand Deficit (MGD)**	**65% ADD Deficit (MGD)**	**35% ADD Deficit (MGD)**
A. Failure of largest water treatment facility	A1. Power supply failure of largest WTP	6.81	2.46	1.60	0.86	0.00	0.00	0.00
	A2. Critical asset failure at largest WTP	7.63	2.46	1.60	0.86	0.00	0.00	0.00
B. Short-term catastrophic failure of a water distribution system	Critical asset failure (transmission main)	6.81	2.46	1.60	0.86	0.00	0.00	0.00
C. Short-term contamination of a water supply within distribution system	Contamination of distribution system triggers issuance of boil water notice	7.63	2.46	1.60	0.86	0.00	0.00	0.00
D. Short-term contamination of a raw water source	D1. Biological contamination of largest raw water source	6.81	2.46	1.60	0.86	0.00	0.00	0.00
	D2. Chemical contamination of largest raw water source	6.81	2.46	1.60	0.86	0.00	0.00	0.00
E. Full unavailability of major raw water sources due to federal or state government actions	--	Not Applicable						
F. Limited or reduced unavailability of major raw water sources due to federal or state government actions	--	Not Applicable						
G. Failure of an existing dam that impounds a raw water source	Dam failure for largest impoundment	Not Applicable						
H. Water supply reduction due to drought	Raw water supply available is 40% of ADD due to drought	Not Applicable						

Notes:

ADD - average daily demand
MGD - million gallons per day
QWS - qualified water system
WTP - water treatment plant

1. Total demand (withdrawal plus purchases) is defined the same as 100% ADD.

Prepared by: LCT 03/15/21
Checked by: GJH 03/26/21

Table B-6c
Fitzgerald Emergency Scenario Evaluation: 2050

Risk	Scenario	Relative Liklihood	Duration (Days)	Peak Day Design Capacity (MGD)					Maximum Possible Purchased Water (MGD)	Water Storage (MGD)[3]	Total Possible Water Supply (MGD)	Capacity Loss (MGD)	Available Water Supply (MGD)
				WTP Well 106	WTP Well 107	WTP Well 108	WTP Well 109	WTP Well 110					
A. Failure of largest water treatment facility	A1. Power supply failure of largest WTP[1]	0.5	1	1.44	1.44	1.87	1.44	1.44	NA	1.05	8.68	1.87	6.81
	A2. Critical asset failure at largest WTP[2]	0.1	30	1.44	1.44	1.87	1.44	1.44	NA	NA	7.63	0.00	7.63
B. Short-term catastrophic failure of a water distribution system	Critical asset failure (transmission main)	0.1	1	1.44	1.44	1.87	1.44	1.44	NA	1.05	8.68	1.87	6.81
C. Short-term contamination of a water supply within distribution system	Contamination of distribution system triggers issuance of boil water notice	1	3	1.44	1.44	1.87	1.44	1.44	NA	NA	7.63	0.00	7.63
D. Short-term contamination of a raw water source	D1. Biological contamination of largest raw water source	0.5	1	1.44	1.44	1.87	1.44	1.44	NA	1.05	8.68	1.87	6.81
	D2. Chemical contamination of largest raw water source	0.1	1	1.44	1.44	1.87	1.44	1.44	NA	1.05	8.68	1.87	6.81
E. Full unavailability of major raw water sources due to federal or state government actions	--	Not Applicable											
F. Limited or reduced unavailability of major raw water sources due to federal or state government actions	--	Not Applicable											
G. Failure of an existing dam that impounds a raw water source	Dam failure for largest impoundment	Not Applicable											
H. Water supply reduction due to drought	Raw water supply available is 40% of ADD due to drought	Not Applicable											

Notes:

ADD - average daily demand
MGD - million gallons per day
NA - not applicable
QWS - qualified water system
WTP - water treatment plant

1. WTP 110 has a backup generator but WTP 108, the largest WTP, does not, rendering full capacity loss.
2. Backup equipment is available, rendering no capacity loss.
3. Scenarios A1 and B include treated water storage; Scenarios D1 and D2 include raw (non-reservoir) and treated water storage.

Relative liklihood scale: 1 = high; 0.5 = medium; 0.1 = low; 0.05 = negligible

Prepared by: LCT 03/15/21
Checked by: GJH 03/26/21

Table B-6d
Fitzgerald Deficits: 2050

			2050 - Long-Range Reliability Target					
Risk	**Scenario**	**Available Water Supply (MGD)**	**Total Demand (MGD)[1]**	**65% ADD (MGD)**	**35% ADD (MGD)**	**Total Demand Deficit (MGD)**	**65% ADD Deficit (MGD)**	**35% ADD Deficit (MGD)**
A. Failure of largest water treatment facility	A1. Power supply failure of largest WTP	6.81	2.91	1.89	1.02	0.00	0.00	0.00
	A2. Critical asset failure at largest WTP	7.63	2.91	1.89	1.02	0.00	0.00	0.00
B. Short-term catastrophic failure of a water distribution system	Critical asset failure (transmission main)	6.81	2.91	1.89	1.02	0.00	0.00	0.00
C. Short-term contamination of a water supply within distribution system	Contamination of distribution system triggers issuance of boil water notice	7.63	2.91	1.89	1.02	0.00	0.00	0.00
D. Short-term contamination of a raw water source	D1. Biological contamination of largest raw water source	6.81	2.91	1.89	1.02	0.00	0.00	0.00
	D2. Chemical contamination of largest raw water source	6.81	2.91	1.89	1.02	0.00	0.00	0.00
E. Full unavailability of major raw water sources due to federal or state government actions	--	Not Applicable						
F. Limited or reduced unavailability of major raw water sources due to federal or state government actions	--	Not Applicable						
G. Failure of an existing dam that impounds a raw water source	Dam failure for largest impoundment	Not Applicable						
H. Water supply reduction due to drought	Raw water supply available is 40% of ADD due to drought	Not Applicable						

Notes:

ADD - average daily demand
MGD - million gallons per day
QWS - qualified water system
WTP - water treatment plant

1. Total demand (withdrawal plus purchases) is defined the same as 100% ADD.

Prepared by: LCT 03/15/21
Checked by: GJH 03/26/21

Table B-7a
Folkston Emergency Scenario Evaluation: 2015

Risk	Scenario	Relative Liklihood	Duration (Days)	Peak Day Design Capacity (MGD) WTP Well 101	WTP Well 102	WTP Well 103	Maximum Possible Purchased Water (MGD)	Water Storage (MGD)[3]	Total Possible Water Supply (MGD)	Capacity Loss (MGD)	Available Water Supply (MGD)
A. Failure of largest water treatment facility	A1. Power supply failure of largest WTP[1]	0.5	1	0.58	0.29	1.01	NA	0.33	2.20	0.20	2.00
	A2. Critical asset failure at largest WTP[2]	0.1	30	0.58	0.29	1.01	NA	NA	1.87	0.00	1.87
B. Short-term catastrophic failure of a water distribution system	Critical asset failure (transmission main)	0.1	1	0.58	0.29	1.01	NA	0.33	2.20	1.01	1.19
C. Short-term contamination of a water supply within distribution system	Contamination of distribution system triggers issuance of boil water notice	1	3	0.58	0.29	1.01	NA	NA	1.87	0.00	1.87
D. Short-term contamination of a raw water source	D1. Biological contamination of largest raw water source	0.5	1	0.58	0.29	1.01	NA	0.33	2.20	1.01	1.19
	D2. Chemical contamination of largest raw water source	0.1	1	0.58	0.29	1.01	NA	0.33	2.20	1.01	1.19
E. Full unavailability of major raw water sources due to federal or state government actions	--						Not Applicable				
F. Limited or reduced unavailability of major raw water sources due to federal or state government actions	--						Not Applicable				
G. Failure of an existing dam that impounds a raw water source	Dam failure for largest impoundment						Not Applicable				
H. Water supply reduction due to drought	Raw water supply available is 40% of ADD due to drought						Not Applicable				

Notes:

ADD - average daily demand
MGD - million gallons per day
NA - not applicable
QWS - qualified water system
WTP - water treatment plant

1. WTP 103 has backup power, but the amount of power provided is unknown and has been assumed to be 80% of total capacity
2. Backup equipment is available, rendering no capacity loss.
3. Scenarios A1 and B include treated water storage; Scenarios D1 and D2 include raw (non-reservoir) and treated water storage.

Relative liklihood scale: 1 = high; 0.5 = medium; 0.1 = low; 0.05 = negligible

Prepared by: LCT 03/15/21
Checked by: GJH 03/26/21

Table B-7b
Folkston Deficits: 2015

			2015 - Immediate Reliability Target					
Risk	**Scenario**	**Available Water Supply (MGD)**	**Total Demand (MGD)[1]**	**65% ADD (MGD)**	**35% ADD (MGD)**	**Total Demand Deficit (MGD)**	**65% ADD Deficit (MGD)**	**35% ADD Deficit (MGD)**
A. Failure of largest water treatment facility	A1. Power supply failure of largest WTP	2.00	0.70	0.46	0.25	0.00	0.00	0.00
	A2. Critical asset failure at largest WTP	1.87	0.70	0.46	0.25	0.00	0.00	0.00
B. Short-term catastrophic failure of a water distribution system	Critical asset failure (transmission main)	1.19	0.70	0.46	0.25	0.00	0.00	0.00
C. Short-term contamination of a water supply within distribution system	Contamination of distribution system triggers issuance of boil water notice	1.87	0.70	0.46	0.25	0.00	0.00	0.00
D. Short-term contamination of a raw water source	D1. Biological contamination of largest raw water source	1.19	0.70	0.46	0.25	0.00	0.00	0.00
	D2. Chemical contamination of largest raw water source	1.19	0.70	0.46	0.25	0.00	0.00	0.00
E. Full unavailability of major raw water sources due to federal or state government actions	--				Not Applicable			
F. Limited or reduced unavailability of major raw water sources due to federal or state government actions	--				Not Applicable			
G. Failure of an existing dam that impounds a raw water source	Dam failure for largest impoundment				Not Applicable			
H. Water supply reduction due to drought	Raw water supply available is 40% of ADD due to drought				Not Applicable			

Notes:

ADD - average daily demand
MGD - million gallons per day
QWS - qualified water system
WTP - water treatment plant

1. Total demand (withdrawal plus purchases) is defined the same as 100% ADD.

Prepared by: LCT 03/15/21
Checked by: GJH 03/26/21

Table B-7c
Folkston Emergency Scenario Evaluation: 2050

Risk	Scenario	Relative Liklihood	Duration (Days)	Peak Day Design Capacity (MGD) WTP Well 101	WTP Well 102	WTP Well 103	Maximum Possible Purchased Water (MGD)	Water Storage (MGD)[3]	Total Possible Water Supply (MGD)	Capacity Loss (MGD)	Available Water Supply (MGD)
A. Failure of largest water treatment facility	A1. Power supply failure of largest WTP[1]	0.5	1	0.58	0.29	1.01	NA	0.33	2.20	0.20	2.00
	A2. Critical asset failure at largest WTP[2]	0.1	30	0.58	0.29	1.01	NA	NA	1.87	0.00	1.87
B. Short-term catastrophic failure of a water distribution system	Critical asset failure (transmission main)	0.1	1	0.58	0.29	1.01	NA	0.33	2.20	1.01	1.19
C. Short-term contamination of a water supply within distribution system	Contamination of distribution system triggers issuance of boil water notice	1	3	0.58	0.29	1.01	NA	NA	1.87	0.00	1.87
D. Short-term contamination of a raw water source	D1. Biological contamination of largest raw water source	0.5	1	0.58	0.29	1.01	NA	0.33	2.20	1.01	1.19
	D2. Chemical contamination of largest raw water source	0.1	1	0.58	0.29	1.01	NA	0.33	2.20	1.01	1.19
E. Full unavailability of major raw water sources due to federal or state government actions	--	Not Applicable									
F. Limited or reduced unavailability of major raw water sources due to federal or state government actions	--	Not Applicable									
G. Failure of an existing dam that impounds a raw water source	Dam failure for largest impoundment	Not Applicable									
H. Water supply reduction due to drought	Raw water supply available is 40% of ADD due to drought	Not Applicable									

Notes:

ADD - average daily demand
MGD - million gallons per day
NA - not applicable
QWS - qualified water system
WTP - water treatment plant

1. WTP 103 has backup power, but the amount of power provided is unknown and has been assumed to be 80% of total capacity
2. Backup equipment is available, rendering no capacity loss.
3. Scenarios A1 and B include treated water storage; Scenarios D1 and D2 include raw (non-reservoir) and treated water storage.

Relative liklihood scale: 1 = high; 0.5 = medium; 0.1 = low; 0.05 = negligible

Prepared by: LCT 03/15/21
Checked by: GJH 03/26/21

Table B-7d
Folkston Deficits: 2050

Risk	Scenario	Available Water Supply (MGD)	2050 - Long-Range Reliability Target			Total Demand Deficit (MGD)	65% ADD Deficit (MGD)	35% ADD Deficit (MGD)
			Total Demand (MGD)[1]	65% ADD (MGD)	35% ADD (MGD)			
A. Failure of largest water treatment facility	A1. Power supply failure of largest WTP	2.00	0.68	0.44	0.24	0.00	0.00	0.00
	A2. Critical asset failure at largest WTP	1.87	0.68	0.44	0.24	0.00	0.00	0.00
B. Short-term catastrophic failure of a water distribution system	Critical asset failure (transmission main)	1.19	0.68	0.44	0.24	0.00	0.00	0.00
C. Short-term contamination of a water supply within distribution system	Contamination of distribution system triggers issuance of boil water notice	1.87	0.68	0.44	0.24	0.00	0.00	0.00
D. Short-term contamination of a raw water source	D1. Biological contamination of largest raw water source	1.19	0.68	0.44	0.24	0.00	0.00	0.00
	D2. Chemical contamination of largest raw water source	1.19	0.68	0.44	0.24	0.00	0.00	0.00
E. Full unavailability of major raw water sources due to federal or state government actions	--	Not Applicable						
F. Limited or reduced unavailability of major raw water sources due to federal or state government actions	--	Not Applicable						
G. Failure of an existing dam that impounds a raw water source	Dam failure for largest impoundment	Not Applicable						
H. Water supply reduction due to drought	Raw water supply available is 40% of ADD due to drought	Not Applicable						

Notes:

ADD - average daily demand
MGD - million gallons per day
QWS - qualified water system
WTP - water treatment plant

1. Total demand (withdrawal plus purchases) is defined the same as 100% ADD.

Prepared by: LCT 03/15/21
Checked by: GJH 03/26/21

Table B-8a
Hahira Emergency Scenario Evaluation: 2015

Risk	Scenario	Relative Liklihood	Duration (Days)	Peak Day Design Capacity (MGD)			Maximum Possible Purchased Water (MGD)	Water Storage (MGD)[3]	Total Possible Water Supply (MGD)	Capacity Loss (MGD)	Available Water Supply (MGD)
				WTP Well 101	WTP Well 102	WTP Well 103					
A. Failure of largest water treatment facility	A1. Power supply failure of largest WTP[1]	0.5	1	1.73	1.44	1.15	NA	0.29	4.61	0.00	4.61
	A2. Critical asset failure at largest WTP[2]	0.1	30	1.73	1.44	1.15	NA	NA	4.32	0.00	4.32
B. Short-term catastrophic failure of a water distribution system	Critical asset failure (transmission main)	0.1	1	1.73	1.44	1.15	NA	0.29	4.61	1.73	2.88
C. Short-term contamination of a water supply within distribution system	Contamination of distribution system triggers issuance of boil water notice	1	3	1.73	1.44	1.15	NA	NA	4.32	0.00	4.32
D. Short-term contamination of a raw water source	D1. Biological contamination of largest raw water source	0.5	1	1.73	1.44	1.15	NA	0.29	4.61	1.73	2.88
	D2. Chemical contamination of largest raw water source	0.1	1	1.73	1.44	1.15	NA	0.29	4.61	1.73	2.88
E. Full unavailability of major raw water sources due to federal or state government actions	--						Not Applicable				
F. Limited or reduced unavailability of major raw water sources due to federal or state government actions	--						Not Applicable				
G. Failure of an existing dam that impounds a raw water source	Dam failure for largest impoundment						Not Applicable				
H. Water supply reduction due to drought	Raw water supply available is 40% of ADD due to drought						Not Applicable				

Notes:

Prepared by: LCT 03/15/21
Checked by: GJH 03/26/21

ADD - average daily demand
MGD - million gallons per day
NA - not applicable
QWS - qualified water system
WTP - water treatment plant

1. All WTPs have backup generators able to supply full capacity, rendering no capacity loss at the largest WTP.
2. Backup equipment is available, rendering no capacity loss.
3. Scenarios A1 and B include treated water storage; Scenarios D1 and D2 include raw (non-reservoir) and treated water storage.

Relative liklihood scale: 1 = high; 0.5 = medium; 0.1 = low; 0.05 = negligible

Table B-8b
Hahira Deficits: 2015

			2015 - Immediate Reliability Target					
Risk	**Scenario**	**Available Water Supply (MGD)**	**Total Demand (MGD)[1]**	**65% ADD (MGD)**	**35% ADD (MGD)**	**Total Demand Deficit (MGD)**	**65% ADD Deficit (MGD)**	**35% ADD Deficit (MGD)**
A. Failure of largest water treatment facility	A1. Power supply failure of largest WTP	4.61	0.20	0.13	0.07	0.00	0.00	0.00
	A2. Critical asset failure at largest WTP	4.32	0.20	0.13	0.07	0.00	0.00	0.00
B. Short-term catastrophic failure of a water distribution system	Critical asset failure (transmission main)	2.88	0.20	0.13	0.07	0.00	0.00	0.00
C. Short-term contamination of a water supply within distribution system	Contamination of distribution system triggers issuance of boil water notice	4.32	0.20	0.13	0.07	0.00	0.00	0.00
D. Short-term contamination of a raw water source	D1. Biological contamination of largest raw water source	2.88	0.20	0.13	0.07	0.00	0.00	0.00
	D2. Chemical contamination of largest raw water source	2.88	0.20	0.13	0.07	0.00	0.00	0.00
E. Full unavailability of major raw water sources due to federal or state government actions	--					Not Applicable		
F. Limited or reduced unavailability of major raw water sources due to federal or state government actions	--					Not Applicable		
G. Failure of an existing dam that impounds a raw water source	Dam failure for largest impoundment					Not Applicable		
H. Water supply reduction due to drought	Raw water supply available is 40% of ADD due to drought					Not Applicable		

Notes:

ADD - average daily demand
MGD - million gallons per day
QWS - qualified water system
WTP - water treatment plant

1. Total demand (withdrawal plus purchases) is defined the same as 100% ADD.

Prepared by: LCT 03/15/21
Checked by: GJH 03/26/21

Table B-8c
Hahira Emergency Scenario Evaluation: 2050

Risk	Scenario	Relative Liklihood	Duration (Days)	Peak Day Design Capacity (MGD) WTP Well 101	WTP Well 102	WTP Well 103	Maximum Possible Purchased Water (MGD)	Water Storage (MGD)[3]	Total Possible Water Supply (MGD)	Capacity Loss (MGD)	Available Water Supply (MGD)
A. Failure of largest water treatment facility	A1. Power supply failure of largest WTP[1]	0.5	1	1.73	1.44	1.15	NA	0.29	4.61	0.00	4.61
	A2. Critical asset failure at largest WTP[2]	0.1	30	1.73	1.44	1.15	NA	NA	4.32	0.00	4.32
B. Short-term catastrophic failure of a water distribution system	Critical asset failure (transmission main)	0.1	1	1.73	1.44	1.15	NA	0.29	4.61	1.73	2.88
C. Short-term contamination of a water supply within distribution system	Contamination of distribution system triggers issuance of boil water notice	1	3	1.73	1.44	1.15	NA	NA	4.32	0.00	4.32
D. Short-term contamination of a raw water source	D1. Biological contamination of largest raw water source	0.5	1	1.73	1.44	1.15	NA	0.29	4.61	1.73	2.88
	D2. Chemical contamination of largest raw water source	0.1	1	1.73	1.44	1.15	NA	0.29	4.61	1.73	2.88
E. Full unavailability of major raw water sources due to federal or state government actions	--	Not Applicable									
F. Limited or reduced unavailability of major raw water sources due to federal or state government actions	--	Not Applicable									
G. Failure of an existing dam that impounds a raw water source	Dam failure for largest impoundment	Not Applicable									
H. Water supply reduction due to drought	Raw water supply available is 40% of ADD due to drought	Not Applicable									

Notes:

ADD - average daily demand
MGD - million gallons per day
NA - not applicable
QWS - qualified water system
WTP - water treatment plant
Relative liklihood scale: 1 = high; 0.5 = medium; 0.1 = low; 0.05 = negligible

1. All WTPs have backup generators able to supply full capacity, rendering no capacity loss at the largest WTP.
2. Backup equipment is available, rendering no capacity loss.
3. Scenarios A1 and B include treated water storage; Scenarios D1 and D2 include raw (non-reservoir) and treated water storage.

Prepared by: LCT 03/15/21
Checked by: GJH 03/26/21

Table B-8d
Hahira Deficits: 2050

			2050 - Long-Range Reliability Target					
Risk	**Scenario**	**Available Water Supply (MGD)**	**Total Demand (MGD)[1]**	**65% ADD (MGD)**	**35% ADD (MGD)**	**Total Demand Deficit (MGD)**	**65% ADD Deficit (MGD)**	**35% ADD Deficit (MGD)**
A. Failure of largest water treatment facility	A1. Power supply failure of largest WTP	4.61	0.54	0.35	0.19	0.00	0.00	0.00
	A2. Critical asset failure at largest WTP	4.32	0.54	0.35	0.19	0.00	0.00	0.00
B. Short-term catastrophic failure of a water distribution system	Critical asset failure (transmission main)	2.88	0.54	0.35	0.19	0.00	0.00	0.00
C. Short-term contamination of a water supply within distribution system	Contamination of distribution system triggers issuance of boil water notice	4.32	0.54	0.35	0.19	0.00	0.00	0.00
D. Short-term contamination of a raw water source	D1. Biological contamination of largest raw water source	2.88	0.54	0.35	0.19	0.00	0.00	0.00
	D2. Chemical contamination of largest raw water source	2.88	0.54	0.35	0.19	0.00	0.00	0.00
E. Full unavailability of major raw water sources due to federal or state government actions	--	Not Applicable						
F. Limited or reduced unavailability of major raw water sources due to federal or state government actions	--	Not Applicable						
G. Failure of an existing dam that impounds a raw water source	Dam failure for largest impoundment	Not Applicable						
H. Water supply reduction due to drought	Raw water supply available is 40% of ADD due to drought	Not Applicable						

Notes:

ADD - average daily demand
MGD - million gallons per day
QWS - qualified water system
WTP - water treatment plant

1. Total demand (withdrawal plus purchases) is defined the same as 100% ADD.

Prepared by: LCT 03/15/21
Checked by: GJH 03/26/21

Table B-9a
Lowndes County-North Emergency Scenario Evaluation: 2015

Risk	Scenario	Relative Liklihood	Duration (Days)	Peak Day Design Capacity (MGD)		Maximum Possible Purchased Water (MGD)[3]	Water Storage (MGD)[4]	Total Possible Water Supply (MGD)	Capacity Loss (MGD)	Available Water Supply (MGD)
				WTP Well 201 (Wells 1 & 2)	WTP Well 204 (Wells 4 & 5)					
A. Failure of largest water treatment facility	A1. Power supply failure of largest WTP[1]	0.5	1	1.08	1.73	2.54	0.90	6.25	0.00	6.25
	A2. Critical asset failure at largest WTP[2]	0.1	30	1.08	1.73	2.54	NA	5.35	0.00	5.35
B. Short-term catastrophic failure of a water distribution system	Critical asset failure (transmission main)	0.1	1	1.08	1.73	2.54	0.90	6.25	1.73	4.52
C. Short-term contamination of a water supply within distribution system	Contamination of distribution system triggers issuance of boil water notice	1	3	1.08	1.73	2.54	NA	5.35	0.00	5.35
D. Short-term contamination of a raw water source	D1. Biological contamination of largest raw water source	0.5	1	1.08	1.73	2.54	0.90	6.25	1.73	4.52
	D2. Chemical contamination of largest raw water source	0.1	1	1.08	1.73	2.54	0.90	6.25	1.73	4.52
E. Full unavailability of major raw water sources due to federal or state government actions	--					Not Applicable				
F. Limited or reduced unavailability of major raw water sources due to federal or state government actions	--					Not Applicable				
G. Failure of an existing dam that impounds a raw water source	Dam failure for largest impoundment					Not Applicable				
H. Water supply reduction due to drought	Raw water supply available is 40% of ADD due to drought					Not Applicable				

Notes:

Prepared by: LCT 03/15/21
Checked by: GJH 03/26/21

ADD - average daily demand
MGD - million gallons per day
NA - not applicable
QWS - qualified water system
WTP - water treatment plant

1. All WTPs have backup generators able to supply full capacity, rendering no capacity loss at the largest WTP.
2. Backup equipment is available, rendering no capacity loss.
3. The interconnection with Valdosta is not limited by their permit withdrawal limits.
4. Scenarios A1 and B include treated water storage; Scenarios D1 and D2 include raw (non-reservoir) and treated water storage.

Relative liklihood scale: 1 = high; 0.5 = medium; 0.1 = low; 0.05 = negligible

Table B-9b
Lowndes County-North Deficits: 2015

			2015 - Immediate Reliability Target					
Risk	**Scenario**	**Available Water Supply (MGD)**	**Total Demand (MGD)[1]**	**65% ADD (MGD)**	**35% ADD (MGD)**	**Total Demand Deficit (MGD)**	**65% ADD Deficit (MGD)**	**35% ADD Deficit (MGD)**
A. Failure of largest water treatment facility	A1. Power supply failure of largest WTP	6.25	1.02	0.66	0.36	0.00	0.00	0.00
	A2. Critical asset failure at largest WTP	5.35	1.02	0.66	0.36	0.00	0.00	0.00
B. Short-term catastrophic failure of a water distribution system	Critical asset failure (transmission main)	4.52	1.02	0.66	0.36	0.00	0.00	0.00
C. Short-term contamination of a water supply within distribution system	Contamination of distribution system triggers issuance of boil water notice	5.35	1.02	0.66	0.36	0.00	0.00	0.00
D. Short-term contamination of a raw water source	D1. Biological contamination of largest raw water source	4.52	1.02	0.66	0.36	0.00	0.00	0.00
	D2. Chemical contamination of largest raw water source	4.52	1.02	0.66	0.36	0.00	0.00	0.00
E. Full unavailability of major raw water sources due to federal or state government actions	--	Not Applicable						
F. Limited or reduced unavailability of major raw water sources due to federal or state government actions	--	Not Applicable						
G. Failure of an existing dam that impounds a raw water source	Dam failure for largest impoundment	Not Applicable						
H. Water supply reduction due to drought	Raw water supply available is 40% of ADD due to drought	Not Applicable						

Notes:

ADD - average daily demand
MGD - million gallons per day
QWS - qualified water system
WTP - water treatment plant

1. Total demand (withdrawal plus purchases) is defined the same as 100% ADD.

Prepared by: LCT 03/15/21
Checked by: GJH 03/26/21

Table B-9c
Lowndes County-North Emergency Scenario Evaluation: 2050

				Peak Day Design Capacity (MGD)						
Risk	**Scenario**	**Relative Liklihood**	**Duration (Days)**	**WTP Well 201 (Wells 1 & 2)**	**WTP Well 204 (Wells 4 & 5)**	**Maximum Possible Purchased Water (MGD)[3]**	**Water Storage (MGD)[4]**	**Total Possible Water Supply (MGD)**	**Capacity Loss (MGD)**	**Available Water Supply (MGD)**
A. Failure of largest water treatment facility	A1. Power supply failure of largest WTP[1]	0.5	1	1.08	1.73	2.54	0.90	6.25	0.00	6.25
	A2. Critical asset failure at largest WTP[2]	0.1	30	1.08	1.73	2.54	NA	5.35	0.00	5.35
B. Short-term catastrophic failure of a water distribution system	Critical asset failure (transmission main)	0.1	1	1.08	1.73	2.54	0.90	6.25	1.73	4.52
C. Short-term contamination of a water supply within distribution system	Contamination of distribution system triggers issuance of boil water notice	1	3	1.08	1.73	2.54	NA	5.35	0.00	5.35
D. Short-term contamination of a raw water source	D1. Biological contamination of largest raw water source	0.5	1	1.08	1.73	2.54	0.90	6.25	1.73	4.52
	D2. Chemical contamination of largest raw water source	0.1	1	1.08	1.73	2.54	0.90	6.25	1.73	4.52
E. Full unavailability of major raw water sources due to federal or state government actions	--					Not Applicable				
F. Limited or reduced unavailability of major raw water sources due to federal or state government actions	--					Not Applicable				
G. Failure of an existing dam that impounds a raw water source	Dam failure for largest impoundment					Not Applicable				
H. Water supply reduction due to drought	Raw water supply available is 40% of ADD due to drought					Not Applicable				

Notes:

Prepared by: LCT 03/15/21
Checked by: GJH 03/26/21

ADD - average daily demand
MGD - million gallons per day
NA - not applicable
QWS - qualified water system
WTP - water treatment plant

1. All WTPs have backup generators able to supply full capacity, rendering no capacity loss at the largest WTP.
2. Backup equipment is available, rendering no capacity loss.
3. The interconnection with Valdosta is not limited by their permit withdrawal limits.
4. Scenarios A1 and B include treated water storage; Scenarios D1 and D2 include raw (non-reservoir) and treated water storage.

Relative liklihood scale: 1 = high; 0.5 = medium; 0.1 = low; 0.05 = negligible

Table B-9d
Lowndes County-North Deficits: 2050

Risk	Scenario	Available Water Supply (MGD)	2050 - Long-Range Reliability Target					
			Total Demand (MGD)[1]	65% ADD (MGD)	35% ADD (MGD)	Total Demand Deficit (MGD)	65% ADD Deficit (MGD)	35% ADD Deficit (MGD)
A. Failure of largest water treatment facility	A1. Power supply failure of largest WTP	6.25	1.23	0.80	0.43	0.00	0.00	0.00
	A2. Critical asset failure at largest WTP	5.35	1.23	0.80	0.43	0.00	0.00	0.00
B. Short-term catastrophic failure of a water distribution system	Critical asset failure (transmission main)	4.52	1.23	0.80	0.43	0.00	0.00	0.00
C. Short-term contamination of a water supply within distribution system	Contamination of distribution system triggers issuance of boil water notice	5.35	1.23	0.80	0.43	0.00	0.00	0.00
D. Short-term contamination of a raw water source	D1. Biological contamination of largest raw water source	4.52	1.23	0.80	0.43	0.00	0.00	0.00
	D2. Chemical contamination of largest raw water source	4.52	1.23	0.80	0.43	0.00	0.00	0.00
E. Full unavailability of major raw water sources due to federal or state government actions	--	Not Applicable						
F. Limited or reduced unavailability of major raw water sources due to federal or state government actions	--	Not Applicable						
G. Failure of an existing dam that impounds a raw water source	Dam failure for largest impoundment	Not Applicable						
H. Water supply reduction due to drought	Raw water supply available is 40% of ADD due to drought	Not Applicable						

Notes:

ADD - average daily demand
MGD - million gallons per day
QWS - qualified water system
WTP - water treatment plant

1. Total demand (withdrawal plus purchases) is defined the same as 100% ADD.

Prepared by: LCT 03/15/21
Checked by: GJH 03/26/21

Table B-9e
Lowndes County-North Interconnections

Existing Incoming Interconnections

Number	System	Description	Diameter (in)	Maximum Velocity (fps)[1]	Maximum Flow (cfs)	Maximum Flow (MGD)	Capacity Already Purchased (MGD)[2]	Maximum Possible Purchased Water (MGD)[3]
2	GA1850002-Valdosta	North Valdosta Rd	12	5	3.927	2.538	0.485	2.538

Prepared by: LCT 03/15/21
Checked by: GJH 03/26/21

Notes:
in - inches
fps - feet per second
cfs - cubic feet per second
MGD - million gallons per day
1. The maximum velocity is assumed to be 3 fps for pipe diameters greater than or equal to 16 inches and 5 fps for pipe diameters less than or equal to 12 inches.
2. These purchases became emergency-only purchases after 2015.
3. Maximum flow values differ because the QWS reported these values as the maximum possible purchased water. The more conservative values were chosen.

Table B-10a
Lowndes County-South Emergency Scenario Evaluation: 2015

Risk	Scenario	Relative Liklihood	Duration (Days)	Peak Day Design Capacity (MGD) WTP Well 201 (Wells 1 & 2)	Maximum Possible Purchased Water (MGD)	Water Storage (MGD)[3]	Total Possible Water Supply (MGD)	Capacity Loss (MGD)	Available Water Supply (MGD)
A. Failure of largest water treatment facility	A1. Power supply failure of largest WTP[1]	0.5	1	4.30	NA	0.99	5.29	0.00	5.29
	A2. Critical asset failure at largest WTP[2]	0.1	30	4.30	NA	NA	4.30	0.00	4.30
B. Short-term catastrophic failure of a water distribution system	Critical asset failure (transmission main)	0.1	1	4.30	NA	0.99	5.29	4.30	0.99
C. Short-term contamination of a water supply within distribution system	Contamination of distribution system triggers issuance of boil water notice	1	3	4.30	NA	NA	4.30	0.00	4.30
D. Short-term contamination of a raw water source	D1. Biological contamination of largest raw water source	0.5	1	4.30	NA	0.99	5.29	4.30	0.99
	D2. Chemical contamination of largest raw water source	0.1	1	4.30	NA	0.99	5.29	4.30	0.99
E. Full unavailability of major raw water sources due to federal or state government actions	--	Not Applicable							
F. Limited or reduced unavailability of major raw water sources due to federal or state government actions	--	Not Applicable							
G. Failure of an existing dam that impounds a raw water source	Dam failure for largest impoundment	Not Applicable							
H. Water supply reduction due to drought	Raw water supply available is 40% of ADD due to drought	Not Applicable							

Notes:

ADD - average daily demand
MGD - million gallons per day
NA - not applicable
QWS - qualified water system
WTP - water treatment plant

1. The WTP has a backup generator able to supply full capacity, rendering no capacity loss.
2. Backup equipment is available, rendering no capacity loss.
3. Scenarios A1 and B include treated water storage; Scenarios D1 and D2 include raw (non-reservoir) and treated water storage.

Relative liklihood scale: 1 = high; 0.5 = medium; 0.1 = low; 0.05 = negligible

Prepared by: LCT 03/15/21
Checked by: GJH 03/26/21

Table B-10b
Lowndes County-South Deficits: 2015

			2015 - Immediate Reliability Target					
Risk	**Scenario**	**Available Water Supply (MGD)**	**Total Demand (MGD)[1]**	**65% ADD (MGD)**	**35% ADD (MGD)**	**Total Demand Deficit (MGD)**	**65% ADD Deficit (MGD)**	**35% ADD Deficit (MGD)**
A. Failure of largest water treatment facility	A1. Power supply failure of largest WTP	5.29	0.99	0.64	0.35	0.00	0.00	0.00
	A2. Critical asset failure at largest WTP	4.30	0.99	0.64	0.35	0.00	0.00	0.00
B. Short-term catastrophic failure of a water distribution system	Critical asset failure (transmission main)	0.99	0.99	0.64	0.35	0.00	0.00	0.00
C. Short-term contamination of a water supply within distribution system	Contamination of distribution system triggers issuance of boil water notice	4.30	0.99	0.64	0.35	0.00	0.00	0.00
D. Short-term contamination of a raw water source	D1. Biological contamination of largest raw water source	0.99	0.99	0.64	0.35	0.00	0.00	0.00
	D2. Chemical contamination of largest raw water source	0.99	0.99	0.64	0.35	0.00	0.00	0.00
E. Full unavailability of major raw water sources due to federal or state government actions	--	Not Applicable						
F. Limited or reduced unavailability of major raw water sources due to federal or state government actions	--	Not Applicable						
G. Failure of an existing dam that impounds a raw water source	Dam failure for largest impoundment	Not Applicable						
H. Water supply reduction due to drought	Raw water supply available is 40% of ADD due to drought	Not Applicable						

Notes:

ADD - average daily demand
MGD - million gallons per day
QWS - qualified water system
WTP - water treatment plant

1. Total demand (withdrawal plus purchases) is defined the same as 100% ADD.

Prepared by: LCT 03/15/21
Checked by: GJH 03/26/21

Table B-10c
Lowndes County-South Emergency Scenario Evaluation: 2050

Risk	Scenario	Relative Liklihood	Duration (Days)	Peak Day Design Capacity (MGD) WTP Well 201 (Wells 1 & 2)	Maximum Possible Purchased Water (MGD)	Water Storage (MGD)[3]	Total Possible Water Supply (MGD)	Capacity Loss (MGD)	Available Water Supply (MGD)
A. Failure of largest water treatment facility	A1. Power supply failure of largest WTP[1]	0.5	1	4.30	NA	0.99	5.29	0.00	5.29
	A2. Critical asset failure at largest WTP[2]	0.1	30	4.30	NA	NA	4.30	0.00	4.30
B. Short-term catastrophic failure of a water distribution system	Critical asset failure (transmission main)	0.1	1	4.30	NA	0.99	5.29	4.30	0.99
C. Short-term contamination of a water supply within distribution system	Contamination of distribution system triggers issuance of boil water notice	1	3	4.30	NA	NA	4.30	0.00	4.30
D. Short-term contamination of a raw water source	D1. Biological contamination of largest raw water source	0.5	1	4.30	NA	0.99	5.29	4.30	0.99
	D2. Chemical contamination of largest raw water source	0.1	1	4.30	NA	0.99	5.29	4.30	0.99
E. Full unavailability of major raw water sources due to federal or state government actions	--	Not Applicable							
F. Limited or reduced unavailability of major raw water sources due to federal or state government actions	--	Not Applicable							
G. Failure of an existing dam that impounds a raw water source	Dam failure for largest impoundment	Not Applicable							
H. Water supply reduction due to drought	Raw water supply available is 40% of ADD due to drought	Not Applicable							

Notes:

ADD - average daily demand
MGD - million gallons per day
NA - not applicable
QWS - qualified water system
WTP - water treatment plant

1. The WTP has a backup generator able to supply full capacity, rendering no capacity loss.
2. Backup equipment is available, rendering no capacity loss.
3. Scenarios A1 and B include treated water storage; Scenarios D1 and D2 include raw (non-reservoir) and treated water storage.

Relative liklihood scale: 1 = high; 0.5 = medium; 0.1 = low; 0.05 = negligible

Prepared by: LCT 03/15/21
Checked by: GJH 03/26/21

Table B-10d
Lowndes County-South Deficits: 2050

			2050 - Long-Range Reliability Target					
Risk	**Scenario**	**Available Water Supply (MGD)**	**Total Demand (MGD)[1]**	**65% ADD (MGD)**	**35% ADD (MGD)**	**Total Demand Deficit (MGD)**	**65% ADD Deficit (MGD)**	**35% ADD Deficit (MGD)**
A. Failure of largest water treatment facility	A1. Power supply failure of largest WTP	5.29	1.09	0.71	0.38	0.00	0.00	0.00
	A2. Critical asset failure at largest WTP	4.30	1.09	0.71	0.38	0.00	0.00	0.00
B. Short-term catastrophic failure of a water distribution system	Critical asset failure (transmission main)	0.99	1.09	0.71	0.38	0.10	0.00	0.00
C. Short-term contamination of a water supply within distribution system	Contamination of distribution system triggers issuance of boil water notice	4.30	1.09	0.71	0.38	0.00	0.00	0.00
D. Short-term contamination of a raw water source	D1. Biological contamination of largest raw water source	0.99	1.09	0.71	0.38	0.10	0.00	0.00
	D2. Chemical contamination of largest raw water source	0.99	1.09	0.71	0.38	0.10	0.00	0.00
E. Full unavailability of major raw water sources due to federal or state government actions	--				Not Applicable			
F. Limited or reduced unavailability of major raw water sources due to federal or state government actions	--				Not Applicable			
G. Failure of an existing dam that impounds a raw water source	Dam failure for largest impoundment				Not Applicable			
H. Water supply reduction due to drought	Raw water supply available is 40% of ADD due to drought				Not Applicable			

Notes:

ADD - average daily demand
MGD - million gallons per day
QWS - qualified water system
WTP - water treatment plant

1. Total demand (withdrawal plus purchases) is defined the same as 100% ADD.

Prepared by: LCT 03/15/21
Checked by: GJH 03/26/21

Table B-11a
Nashville Emergency Scenario Evaluation: 2015

Risk	Scenario	Relative Liklihood	Duration (Days)	Peak Day Design Capacity (MGD) WTP Well 104	Peak Day Design Capacity (MGD) WTP Well 105	Maximum Possible Purchased Water (MGD)	Water Storage (MGD)[3]	Total Possible Water Supply (MGD)	Capacity Loss (MGD)	Available Water Supply (MGD)
A. Failure of largest water treatment facility	A1. Power supply failure of largest WTP[1]	0.5	1	1.44	1.73	NA	0.48	3.65	1.73	1.92
	A2. Critical asset failure at largest WTP[2]	0.1	30	1.44	1.73	NA	NA	3.17	0.00	3.17
B. Short-term catastrophic failure of a water distribution system	Critical asset failure (transmission main)	0.1	1	1.44	1.73	NA	0.48	3.65	1.73	1.92
C. Short-term contamination of a water supply within distribution system	Contamination of distribution system triggers issuance of boil water notice	1	3	1.44	1.73	NA	NA	3.17	0.00	3.17
D. Short-term contamination of a raw water source	D1. Biological contamination of largest raw water source	0.5	1	1.44	1.73	NA	0.48	3.65	1.73	1.92
	D2. Chemical contamination of largest raw water source	0.1	1	1.44	1.73	NA	0.48	3.65	1.73	1.92
E. Full unavailability of major raw water sources due to federal or state government actions	--	Not Applicable								
F. Limited or reduced unavailability of major raw water sources due to federal or state government actions	--	Not Applicable								
G. Failure of an existing dam that impounds a raw water source	Dam failure for largest impoundment	Not Applicable								
H. Water supply reduction due to drought	Raw water supply available is 40% of ADD due to drought	Not Applicable								

Notes:

Prepared by: LCT 03/15/21
Checked by: GJH 03/26/21

ADD - average daily demand
MGD - million gallons per day
NA - not applicable
QWS - qualified water system
WTP - water treatment plant

1. WTP 104 has backup power, but not WTP 105, rendering full capacity loss at the largest WTP.
2. Backup equipment is available, rendering no capacity loss.
3. Scenarios A1 and B include treated water storage; Scenarios D1 and D2 include raw (non-reservoir) and treated water storage.

Relative liklihood scale: 1 = high; 0.5 = medium; 0.1 = low; 0.05 = negligible

Table B-11b
Nashville Deficits: 2015

			2015 - Immediate Reliability Target					
Risk	**Scenario**	**Available Water Supply (MGD)**	**Total Demand (MGD)[1]**	**65% ADD (MGD)**	**35% ADD (MGD)**	**Total Demand Deficit (MGD)**	**65% ADD Deficit (MGD)**	**35% ADD Deficit (MGD)**
A. Failure of largest water treatment facility	A1. Power supply failure of largest WTP	1.92	0.53	0.34	0.18	0.00	0.00	0.00
	A2. Critical asset failure at largest WTP	3.17	0.53	0.34	0.18	0.00	0.00	0.00
B. Short-term catastrophic failure of a water distribution system	Critical asset failure (transmission main)	1.92	0.53	0.34	0.18	0.00	0.00	0.00
C. Short-term contamination of a water supply within distribution system	Contamination of distribution system triggers issuance of boil water notice	3.17	0.53	0.34	0.18	0.00	0.00	0.00
D. Short-term contamination of a raw water source	D1. Biological contamination of largest raw water source	1.92	0.53	0.34	0.18	0.00	0.00	0.00
	D2. Chemical contamination of largest raw water source	1.92	0.53	0.34	0.18	0.00	0.00	0.00
E. Full unavailability of major raw water sources due to federal or state government actions	--	Not Applicable						
F. Limited or reduced unavailability of major raw water sources due to federal or state government actions	--	Not Applicable						
G. Failure of an existing dam that impounds a raw water source	Dam failure for largest impoundment	Not Applicable						
H. Water supply reduction due to drought	Raw water supply available is 40% of ADD due to drought	Not Applicable						

Notes:

ADD - average daily demand
MGD - million gallons per day
QWS - qualified water system
WTP - water treatment plant

1. Total demand (withdrawal plus purchases) is defined the same as 100% ADD.

Prepared by: LCT 03/15/21
Checked by: GJH 03/26/21

Table B-11c
Nashville Emergency Scenario Evaluation: 2050

Risk	Scenario	Relative Liklihood	Duration (Days)	Peak Day Design Capacity (MGD) WTP Well 104	Peak Day Design Capacity (MGD) WTP Well 105	Maximum Possible Purchased Water (MGD)	Water Storage (MGD)[3]	Total Possible Water Supply (MGD)	Capacity Loss (MGD)	Available Water Supply (MGD)
A. Failure of largest water treatment facility	A1. Power supply failure of largest WTP[1]	0.5	1	1.44	1.73	NA	0.48	3.65	1.73	1.92
	A2. Critical asset failure at largest WTP[2]	0.1	30	1.44	1.73	NA	NA	3.17	0.00	3.17
B. Short-term catastrophic failure of a water distribution system	Critical asset failure (transmission main)	0.1	1	1.44	1.73	NA	0.48	3.65	1.73	1.92
C. Short-term contamination of a water supply within distribution system	Contamination of distribution system triggers issuance of boil water notice	1	3	1.44	1.73	NA	NA	3.17	0.00	3.17
D. Short-term contamination of a raw water source	D1. Biological contamination of largest raw water source	0.5	1	1.44	1.73	NA	0.48	3.65	1.73	1.92
	D2. Chemical contamination of largest raw water source	0.1	1	1.44	1.73	NA	0.48	3.65	1.73	1.92
E. Full unavailability of major raw water sources due to federal or state government actions	--	Not Applicable								
F. Limited or reduced unavailability of major raw water sources due to federal or state government actions	--	Not Applicable								
G. Failure of an existing dam that impounds a raw water source	Dam failure for largest impoundment	Not Applicable								
H. Water supply reduction due to drought	Raw water supply available is 40% of ADD due to drought	Not Applicable								

Notes:

Prepared by: LCT 03/15/21
Checked by: GJH 03/26/21

ADD - average daily demand
MGD - million gallons per day
NA - not applicable
QWS - qualified water system
WTP - water treatment plant

1. WTP 104 has backup power, but not WTP 105, rendering full capacity loss at the largest WTP.
2. Backup equipment is available, rendering no capacity loss.
3. Scenarios A1 and B include treated water storage; Scenarios D1 and D2 include raw (non-reservoir) and treated water storage.

Relative liklihood scale: 1 = high; 0.5 = medium; 0.1 = low; 0.05 = negligible

Table B-11d
Nashville Deficits: 2050

			2050 - Long-Range Reliability Target					
Risk	**Scenario**	**Available Water Supply (MGD)**	**Total Demand (MGD)[1]**	**65% ADD (MGD)**	**35% ADD (MGD)**	**Total Demand Deficit (MGD)**	**65% ADD Deficit (MGD)**	**35% ADD Deficit (MGD)**
A. Failure of largest water treatment facility	A1. Power supply failure of largest WTP	1.92	0.41	0.27	0.15	0.00	0.00	0.00
	A2. Critical asset failure at largest WTP	3.17	0.41	0.27	0.15	0.00	0.00	0.00
B. Short-term catastrophic failure of a water distribution system	Critical asset failure (transmission main)	1.92	0.41	0.27	0.15	0.00	0.00	0.00
C. Short-term contamination of a water supply within distribution system	Contamination of distribution system triggers issuance of boil water notice	3.17	0.41	0.27	0.15	0.00	0.00	0.00
D. Short-term contamination of a raw water source	D1. Biological contamination of largest raw water source	1.92	0.41	0.27	0.15	0.00	0.00	0.00
	D2. Chemical contamination of largest raw water source	1.92	0.41	0.27	0.15	0.00	0.00	0.00
E. Full unavailability of major raw water sources due to federal or state government actions	--	Not Applicable						
F. Limited or reduced unavailability of major raw water sources due to federal or state government actions	--	Not Applicable						
G. Failure of an existing dam that impounds a raw water source	Dam failure for largest impoundment	Not Applicable						
H. Water supply reduction due to drought	Raw water supply available is 40% of ADD due to drought	Not Applicable						

Notes:

ADD - average daily demand
MGD - million gallons per day
QWS - qualified water system
WTP - water treatment plant

1. Total demand (withdrawal plus purchases) is defined the same as 100% ADD.

Prepared by: LCT 03/15/21
Checked by: GJH 03/26/21

Table B-12a
Quitman Emergency Scenario Evaluation: 2015

Risk	Scenario	Relative Liklihood	Duration (Days)	Peak Day Design Capacity (MGD)			Maximum Possible Purchased Water (MGD)	Water Storage (MGD)[4]	Total Possible Water Supply (MGD)	Capacity Loss (MGD)	Available Water Supply (MGD)
				WTP Well 101[(3)]	WTP Well 102	WTP Well 103					
A. Failure of largest water treatment facility	A1. Power supply failure of largest WTP[1]	0.5	1	1.30	1.30	1.30	NA	0.38	2.98	1.30	1.68
	A2. Critical asset failure at largest WTP[2]	0.1	30	1.30	1.30	1.30	NA	NA	2.60	0.00	2.60
B. Short-term catastrophic failure of a water distribution system	Critical asset failure (transmission main)	0.1	1	1.30	1.30	1.30	NA	0.38	2.98	1.30	1.68
C. Short-term contamination of a water supply within distribution system	Contamination of distribution system triggers issuance of boil water notice	1	3	1.30	1.30	1.30	NA	NA	2.60	0.00	2.60
D. Short-term contamination of a raw water source	D1. Biological contamination of largest raw water source	0.5	1	1.30	1.30	1.30	NA	0.38	2.98	1.30	1.68
	D2. Chemical contamination of largest raw water source	0.1	1	1.30	1.30	1.30	NA	0.38	2.98	1.30	1.68
E. Full unavailability of major raw water sources due to federal or state government actions	--						Not Applicable				
F. Limited or reduced unavailability of major raw water sources due to federal or state government actions	--						Not Applicable				
G. Failure of an existing dam that impounds a raw water source	Dam failure for largest impoundment						Not Applicable				
H. Water supply reduction due to drought	Raw water supply available is 40% of ADD due to drought						Not Applicable				

Notes:

ADD - average daily demand
MGD - million gallons per day
NA - not applicable
QWS - qualified water system
WTP - water treatment plant

1. WTP 103 has backup power that can provide full capacity. There is potential for full capacity loss at WTPs 101 and 102.
2. Backup equipment is available, rendering no capacity loss.
3. WTP 101 is currently non-operational and is not included in the calculations. It is listed for informational purposes only.
4. Scenarios A1 and B include treated water storage; Scenarios D1 and D2 include raw (non-reservoir) and treated water storage.

Relative liklihood scale: 1 = high; 0.5 = medium; 0.1 = low; 0.05 = negligible

Prepared by: LCT 03/15/21
Checked by: GJH 03/26/21

Table B-12b
Quitman Deficits: 2015

			2015 - Immediate Reliability Target					
Risk	**Scenario**	**Available Water Supply (MGD)**	**Total Demand (MGD)[1]**	**65% ADD (MGD)**	**35% ADD (MGD)**	**Total Demand Deficit (MGD)**	**65% ADD Deficit (MGD)**	**35% ADD Deficit (MGD)**
A. Failure of largest water treatment facility	A1. Power supply failure of largest WTP	1.68	0.61	0.40	0.21	0.00	0.00	0.00
	A2. Critical asset failure at largest WTP	2.60	0.61	0.40	0.21	0.00	0.00	0.00
B. Short-term catastrophic failure of a water distribution system	Critical asset failure (transmission main)	1.68	0.61	0.40	0.21	0.00	0.00	0.00
C. Short-term contamination of a water supply within distribution system	Contamination of distribution system triggers issuance of boil water notice	2.60	0.61	0.40	0.21	0.00	0.00	0.00
D. Short-term contamination of a raw water source	D1. Biological contamination of largest raw water source	1.68	0.61	0.40	0.21	0.00	0.00	0.00
	D2. Chemical contamination of largest raw water source	1.68	0.61	0.40	0.21	0.00	0.00	0.00
E. Full unavailability of major raw water sources due to federal or state government actions	--	Not Applicable						
F. Limited or reduced unavailability of major raw water sources due to federal or state government actions	--	Not Applicable						
G. Failure of an existing dam that impounds a raw water source	Dam failure for largest impoundment	Not Applicable						
H. Water supply reduction due to drought	Raw water supply available is 40% of ADD due to drought	Not Applicable						

Notes:

ADD - average daily demand
MGD - million gallons per day
QWS - qualified water system
WTP - water treatment plant

1. Total demand (withdrawal plus purchases) is defined the same as 100% ADD.

Prepared by: LCT 03/15/21
Checked by: GJH 03/26/21

Table B-12c
Quitman Emergency Scenario Evaluation: 2050

Risk	Scenario	Relative Liklihood	Duration (Days)	Peak Day Design Capacity (MGD)				Maximum Possible Purchased Water (MGD)	Water Storage (MGD)[4]	Total Possible Water Supply (MGD)	Capacity Loss (MGD)	Available Water Supply (MGD)
				WTP Well 101[(3)]	WTP Well 102	WTP Well 103	New WTP					
A. Failure of largest water treatment facility	A1. Power supply failure of largest WTP[1]	0.5	1	1.30	1.30	1.30	1.25	NA	0.68	4.53	1.30	3.23
	A2. Critical asset failure at largest WTP[2]	0.1	30	1.30	1.30	1.30	1.25	NA	NA	3.85	0.00	3.85
B. Short-term catastrophic failure of a water distribution system	Critical asset failure (transmission main)	0.1	1	1.30	1.30	1.30	1.25	NA	0.68	4.53	1.30	3.23
C. Short-term contamination of a water supply within distribution system	Contamination of distribution system triggers issuance of boil water notice	1	3	1.30	1.30	1.30	1.25	NA	NA	3.85	0.00	3.85
D. Short-term contamination of a raw water source	D1. Biological contamination of largest raw water source	0.5	1	1.30	1.30	1.30	1.25	NA	0.68	4.53	1.30	3.23
	D2. Chemical contamination of largest raw water source	0.1	1	1.30	1.30	1.30	1.25	NA	0.68	4.53	1.30	3.23
E. Full unavailability of major raw water sources due to federal or state government actions	--							Not Applicable				
F. Limited or reduced unavailability of major raw water sources due to federal or state government actions	--							Not Applicable				
G. Failure of an existing dam that impounds a raw water source	Dam failure for largest impoundment							Not Applicable				
H. Water supply reduction due to drought	Raw water supply available is 40% of ADD due to drought							Not Applicable				

Notes:

Prepared by: LCT 03/15/21
Checked by: GJH 03/26/21

ADD - average daily demand
MGD - million gallons per day
NA - not applicable
QWS - qualified water system
WTP - water treatment plant

1. WTP 103 has backup power that can provide full capacity. There is potential for full capacity loss at WTPs 101 and 102.
2. Backup equipment is available, rendering no capacity loss.
3. WTP 101 is currently non-operational and is not included in the calculations. It is listed for informational purposes only.
4. Scenarios A1 and B include treated water storage; Scenarios D1 and D2 include raw (non-reservoir) and treated water storage. Quitman indicated a new 0.5 MG storage tank.

Relative liklihood scale: 1 = high; 0.5 = medium; 0.1 = low; 0.05 = negligible

Table B-12d
Quitman Deficits: 2050

Risk	Scenario	Available Water Supply (MGD)	2050 - Long-Range Reliability Target			Total Demand Deficit (MGD)	65% ADD Deficit (MGD)	35% ADD Deficit (MGD)
			Total Demand (MGD)[1]	65% ADD (MGD)	35% ADD (MGD)			
A. Failure of largest water treatment facility	A1. Power supply failure of largest WTP	3.23	0.45	0.30	0.16	0.00	0.00	0.00
	A2. Critical asset failure at largest WTP	3.85	0.45	0.30	0.16	0.00	0.00	0.00
B. Short-term catastrophic failure of a water distribution system	Critical asset failure (transmission main)	3.23	0.45	0.30	0.16	0.00	0.00	0.00
C. Short-term contamination of a water supply within distribution system	Contamination of distribution system triggers issuance of boil water notice	3.85	0.45	0.30	0.16	0.00	0.00	0.00
D. Short-term contamination of a raw water source	D1. Biological contamination of largest raw water source	3.23	0.45	0.30	0.16	0.00	0.00	0.00
	D2. Chemical contamination of largest raw water source	3.23	0.45	0.30	0.16	0.00	0.00	0.00
E. Full unavailability of major raw water sources due to federal or state government actions	--	Not Applicable						
F. Limited or reduced unavailability of major raw water sources due to federal or state government actions	--	Not Applicable						
G. Failure of an existing dam that impounds a raw water source	Dam failure for largest impoundment	Not Applicable						
H. Water supply reduction due to drought	Raw water supply available is 40% of ADD due to drought	Not Applicable						

Notes:

ADD - average daily demand
MGD - million gallons per day
QWS - qualified water system
WTP - water treatment plant

1. Total demand (withdrawal plus purchases) is defined the same as 100% ADD.

Prepared by: LCT 03/15/21
Checked by: GJH 03/26/21

Table B-13a
Satilla Regional Water & Sewer Auth.-East Emergency Scenario Evaluation: 2015

Risk	Scenario	Relative Liklihood	Duration (Days)	Peak Day Design Capacity (MGD) WTP 101	Peak Day Design Capacity (MGD) WTP Well 102	Maximum Possible Purchased Water (MGD)[3]	Water Storage (MGD)[4]	Total Possible Water Supply (MGD)	Capacity Loss (MGD)	Available Water Supply (MGD)
A. Failure of largest water treatment facility	A1. Power supply failure of largest WTP[1]	0.5	1	2.10	1.10	1.48	0.21	4.89	2.10	2.79
	A2. Critical asset failure at largest WTP[2]	0.1	30	2.10	1.10	1.48	NA	4.68	0.00	4.68
B. Short-term catastrophic failure of a water distribution system	Critical asset failure (transmission main)	0.1	1	2.10	1.10	1.48	0.21	4.89	2.10	2.79
C. Short-term contamination of a water supply within distribution system	Contamination of distribution system triggers issuance of boil water notice	1	3	2.10	1.10	1.48	NA	4.68	0.00	4.68
D. Short-term contamination of a raw water source	D1. Biological contamination of largest raw water source	0.5	1	2.10	1.10	1.48	0.21	4.89	2.10	2.79
	D2. Chemical contamination of largest raw water source	0.1	1	2.10	1.10	1.48	0.21	4.89	2.10	2.79
E. Full unavailability of major raw water sources due to federal or state government actions	--	Not Applicable								
F. Limited or reduced unavailability of major raw water sources due to federal or state government actions	--	Not Applicable								
G. Failure of an existing dam that impounds a raw water source	Dam failure for largest impoundment	Not Applicable								
H. Water supply reduction due to drought	Raw water supply available is 40% of ADD due to drought	Not Applicable								

Notes:

ADD - average daily demand
MGD - million gallons per day
NA - not applicable
QWS - qualified water system
WTP - water treatment plant

1. No WTPs have backup power, rendering full capacity loss.
2. Backup equipment is available, rendering no capacity loss.
3. The interconnections with Waycross are limited by their permit withdrawal limits and 2015 ADD. The maximum possible purchased water value was calculated as the minimum of 1) the sum of existing interconnections (Table B-13e); or 2) the supplier's 2015 ADD subtracted from the supplier's permitted withdrawal limit.
4. Scenarios A1 and B include treated water storage; Scenarios D1 and D2 include raw (non-reservoir) and treated water storage.

Relative liklihood scale: 1 = high; 0.5 = medium; 0.1 = low; 0.05 = negligible

Prepared by: LCT 03/15/21
Checked by: GJH 03/26/21

Table B-13b
Satilla Regional Water & Sewer Auth.-East Deficits: 2015

			2015 - Immediate Reliability Target					
Risk	**Scenario**	**Available Water Supply (MGD)**	**Total Demand (MGD)[1]**	**65% ADD (MGD)**	**35% ADD (MGD)**	**Total Demand Deficit (MGD)**	**65% ADD Deficit (MGD)**	**35% ADD Deficit (MGD)**
A. Failure of largest water treatment facility	A1. Power supply failure of largest WTP	2.79	0.28	0.18	0.10	0.00	0.00	0.00
	A2. Critical asset failure at largest WTP	4.68	0.28	0.18	0.10	0.00	0.00	0.00
B. Short-term catastrophic failure of a water distribution system	Critical asset failure (transmission main)	2.79	0.28	0.18	0.10	0.00	0.00	0.00
C. Short-term contamination of a water supply within distribution system	Contamination of distribution system triggers issuance of boil water notice	4.68	0.28	0.18	0.10	0.00	0.00	0.00
D. Short-term contamination of a raw water source	D1. Biological contamination of largest raw water source	2.79	0.28	0.18	0.10	0.00	0.00	0.00
	D2. Chemical contamination of largest raw water source	2.79	0.28	0.18	0.10	0.00	0.00	0.00
E. Full unavailability of major raw water sources due to federal or state government actions	--	Not Applicable						
F. Limited or reduced unavailability of major raw water sources due to federal or state government actions	--	Not Applicable						
G. Failure of an existing dam that impounds a raw water source	Dam failure for largest impoundment	Not Applicable						
H. Water supply reduction due to drought	Raw water supply available is 40% of ADD due to drought	Not Applicable						

Notes:

ADD - average daily demand
MGD - million gallons per day
QWS - qualified water system
WTP - water treatment plant

1. Total demand (withdrawal plus purchases) is defined the same as 100% ADD.

Prepared by: LCT 03/15/21
Checked by: GJH 03/26/21

Table B-13c
Satilla Regional Water & Sewer Auth.-East Emergency Scenario Evaluation: 2050

Risk	Scenario	Relative Liklihood	Duration (Days)	Peak Day Design Capacity (MGD) WTP 101	Peak Day Design Capacity (MGD) WTP Well 102	Maximum Possible Purchased Water (MGD)[3]	Water Storage (MGD)[4]	Total Possible Water Supply (MGD)	Capacity Loss (MGD)	Available Water Supply (MGD)
A. Failure of largest water treatment facility	A1. Power supply failure of largest WTP[1]	0.5	1	2.10	1.10	0.90	0.21	4.31	0.42	3.89
	A2. Critical asset failure at largest WTP[2]	0.1	30	2.10	1.10	0.90	NA	4.10	0.00	4.10
B. Short-term catastrophic failure of a water distribution system	Critical asset failure (transmission main)	0.1	1	2.10	1.10	0.90	0.21	4.31	2.10	2.21
C. Short-term contamination of a water supply within distribution system	Contamination of distribution system triggers issuance of boil water notice	1	3	2.10	1.10	0.90	NA	4.10	0.00	4.10
D. Short-term contamination of a raw water source	D1. Biological contamination of largest raw water source	0.5	1	2.10	1.10	0.90	0.21	4.31	2.10	2.21
	D2. Chemical contamination of largest raw water source	0.1	1	2.10	1.10	0.90	0.21	4.31	2.10	2.21
E. Full unavailability of major raw water sources due to federal or state government actions	--	Not Applicable								
F. Limited or reduced unavailability of major raw water sources due to federal or state government actions	--	Not Applicable								
G. Failure of an existing dam that impounds a raw water source	Dam failure for largest impoundment	Not Applicable								
H. Water supply reduction due to drought	Raw water supply available is 40% of ADD due to drought	Not Applicable								

Notes:

Prepared by: LCT 03/15/21
Checked by: GJH 03/26/21

ADD - average daily demand
MGD - million gallons per day
NA - not applicable
QWS - qualified water system
WTP - water treatment plant

1. A new portable generator was indicated by the QWS. 80% of peak treatment at the largest WTP is assumed.
2. Backup equipment is available, rendering no capacity loss.
3. The interconnections with Waycross are limited by their permit withdrawal limits and 2050 ADD. The maximum possible purchased water value was calculated as the minimum of 1) the sum of existing interconnections (Table B-13e); or 2) the supplier's 2050 ADD subtracted from the supplier's permitted withdrawal limit.
4. Scenarios A1 and B include treated water storage; Scenarios D1 and D2 include raw (non-reservoir) and treated water storage.

Relative liklihood scale: 1 = high; 0.5 = medium; 0.1 = low; 0.05 = negligible

Table B-13d

Satilla Regional Water & Sewer Auth.-East Deficits: 2050

			2050 - Long-Range Reliability Target					
Risk	**Scenario**	**Available Water Supply (MGD)**	**Total Demand (MGD)[1]**	**65% ADD (MGD)**	**35% ADD (MGD)**	**Total Demand Deficit (MGD)**	**65% ADD Deficit (MGD)**	**35% ADD Deficit (MGD)**
A. Failure of largest water treatment facility	A1. Power supply failure of largest WTP	3.89	0.57	0.37	0.20	0.00	0.00	0.00
	A2. Critical asset failure at largest WTP	4.10	0.57	0.37	0.20	0.00	0.00	0.00
B. Short-term catastrophic failure of a water distribution system	Critical asset failure (transmission main)	2.21	0.57	0.37	0.20	0.00	0.00	0.00
C. Short-term contamination of a water supply within distribution system	Contamination of distribution system triggers issuance of boil water notice	4.10	0.57	0.37	0.20	0.00	0.00	0.00
D. Short-term contamination of a raw water source	D1. Biological contamination of largest raw water source	2.21	0.57	0.37	0.20	0.00	0.00	0.00
	D2. Chemical contamination of largest raw water source	2.21	0.57	0.37	0.20	0.00	0.00	0.00
E. Full unavailability of major raw water sources due to federal or state government actions	--	Not Applicable						
F. Limited or reduced unavailability of major raw water sources due to federal or state government actions	--	Not Applicable						
G. Failure of an existing dam that impounds a raw water source	Dam failure for largest impoundment	Not Applicable						
H. Water supply reduction due to drought	Raw water supply available is 40% of ADD due to drought	Not Applicable						

Notes:

ADD - average daily demand
MGD - million gallons per day
QWS - qualified water system
WTP - water treatment plant

1. Total demand (withdrawal plus purchases) is defined the same as 100% ADD.

Prepared by: LCT 03/15/21
Checked by: GJH 03/26/21

Table B-13e
Satilla Regional Water & Sewer Auth.-East Interconnections

Existing Incoming Interconnections

Number	System	Description	Diameter (in)	Maximum Velocity (fps)[1]	Maximum Flow (cfs)	Maximum Flow (MGD)	Capacity Already Purchased (MGD)	Maximum Possible Purchased Water (MGD)[2]
3	GA2990002-Waycross	Brunswick Hwy	6	5	0.982	0.635	0.000	0.635
4	GA2990002-Waycross	Seminole Trail	6	5	0.982	0.635	0.000	0.635
5	GA2990002-Waycross	Mt Pleasant Rd	6	5	0.982	0.635	0.000	0.635
6	GA2990002-Waycross	East Washington Ave	6	5	0.982	0.635	0.000	0.635
7	GA2990002-Waycross	Brunel Street	6	5	0.982	0.635	0.000	0.635

Prepared by: LCT 03/15/21
Checked by: GJH 03/26/21

Notes:
in - inches
fps - feet per second
cfs - cubic feet per second
MGD - million gallons per day
1. The maximum velocity is assumed to be 3 fps for pipe diameters greater than or equal to 16 inches and 5 fps for pipe diameters less than or equal to 12 inches.
2. Maximum flow values differ because the QWS reported these values as the maximum possible purchased water. The more conservative values were chosen.

Table B-14a

Satilla Regional Water & Sewer Auth. Emergency Scenario Evaluation: 2015

Risk	Scenario	Relative Liklihood	Duration (Days)	Peak Day Design Capacity (MGD)			Maximum Possible Purchased Water (MGD)[3]	Water Storage (MGD)[4]	Total Possible Water Supply (MGD)	Capacity Loss (MGD)	Available Water Supply (MGD)
				WTP Well 101	WTP Well 102	WTP Well 103					
A. Failure of largest water treatment facility	A1. Power supply failure of largest WTP[1]	0.5	1	2.10	2.10	1.00	0.64	0.75	6.59	2.10	4.49
	A2. Critical asset failure at largest WTP[2]	0.1	30	2.10	2.10	1.00	0.64	NA	5.84	0.00	5.84
B. Short-term catastrophic failure of a water distribution system	Critical asset failure (transmission main)	0.1	1	2.10	2.10	1.00	0.64	0.75	6.59	2.10	4.49
C. Short-term contamination of a water supply within distribution system	Contamination of distribution system triggers issuance of boil water notice	1	3	2.10	2.10	1.00	0.64	NA	5.84	0.00	5.84
D. Short-term contamination of a raw water source	D1. Biological contamination of largest raw water source	0.5	1	2.10	2.10	1.00	0.64	0.75	6.59	2.10	4.49
	D2. Chemical contamination of largest raw water source	0.1	1	2.10	2.10	1.00	0.64	0.75	6.59	2.10	4.49
E. Full unavailability of major raw water sources due to federal or state government actions	--						Not Applicable				
F. Limited or reduced unavailability of major raw water sources due to federal or state government actions	--						Not Applicable				
G. Failure of an existing dam that impounds a raw water source	Dam failure for largest impoundment						Not Applicable				
H. Water supply reduction due to drought	Raw water supply available is 40% of ADD due to drought						Not Applicable				

Notes:

Prepared by: LCT 03/15/21

Checked by: GJH 03/26/21

ADD - average daily demand

MGD - million gallons per day

NA - not applicable

QWS - qualified water system

WTP - water treatment plant

1. No WTPs have backup power, rendering full capacity loss.

2. Backup equipment is available, rendering no capacity loss.

3. The interconnection with Waycross-Ware County Industrial Park is not limited by their permit withdrawal limits.

4. Scenarios A1 and B include treated water storage; Scenarios D1 and D2 include raw (non-reservoir) and treated water storage.

Relative liklihood scale: 1 = high; 0.5 = medium; 0.1 = low; 0.05 = negligible

Table B-14b
Satilla Regional Water & Sewer Auth. Deficits: 2015

			2015 - Immediate Reliability Target					
Risk	**Scenario**	**Available Water Supply (MGD)**	**Total Demand (MGD)[1]**	**65% ADD (MGD)**	**35% ADD (MGD)**	**Total Demand Deficit (MGD)**	**65% ADD Deficit (MGD)**	**35% ADD Deficit (MGD)**
A. Failure of largest water treatment facility	A1. Power supply failure of largest WTP	4.49	0.71	0.46	0.25	0.00	0.00	0.00
	A2. Critical asset failure at largest WTP	5.84	0.71	0.46	0.25	0.00	0.00	0.00
B. Short-term catastrophic failure of a water distribution system	Critical asset failure (transmission main)	4.49	0.71	0.46	0.25	0.00	0.00	0.00
C. Short-term contamination of a water supply within distribution system	Contamination of distribution system triggers issuance of boil water notice	5.84	0.71	0.46	0.25	0.00	0.00	0.00
D. Short-term contamination of a raw water source	D1. Biological contamination of largest raw water source	4.49	0.71	0.46	0.25	0.00	0.00	0.00
	D2. Chemical contamination of largest raw water source	4.49	0.71	0.46	0.25	0.00	0.00	0.00
E. Full unavailability of major raw water sources due to federal or state government actions	--				Not Applicable			
F. Limited or reduced unavailability of major raw water sources due to federal or state government actions	--				Not Applicable			
G. Failure of an existing dam that impounds a raw water source	Dam failure for largest impoundment				Not Applicable			
H. Water supply reduction due to drought	Raw water supply available is 40% of ADD due to drought				Not Applicable			

Notes:

ADD - average daily demand
MGD - million gallons per day
QWS - qualified water system
WTP - water treatment plant

1. Total demand (withdrawal plus purchases) is defined the same as 100% ADD.

Prepared by: LCT 03/15/21
Checked by: GJH 03/26/21

Table B-14c

Satilla Regional Water & Sewer Auth. Emergency Scenario Evaluation: 2050

Risk	Scenario	Relative Liklihood	Duration (Days)	Peak Day Design Capacity (MGD) WTP Well 101	WTP Well 102	WTP Well 103	Maximum Possible Purchased Water (MGD)[3]	Water Storage (MGD)[4]	Total Possible Water Supply (MGD)	Capacity Loss (MGD)	Available Water Supply (MGD)
A. Failure of largest water treatment facility	A1. Power supply failure of largest WTP[1]	0.5	1	2.10	2.10	1.00	0.64	0.75	6.59	0.42	6.17
	A2. Critical asset failure at largest WTP[2]	0.1	30	2.10	2.10	1.00	0.64	NA	5.84	0.00	5.84
B. Short-term catastrophic failure of a water distribution system	Critical asset failure (transmission main)	0.1	1	2.10	2.10	1.00	0.64	0.75	6.59	2.10	4.49
C. Short-term contamination of a water supply within distribution system	Contamination of distribution system triggers issuance of boil water notice	1	3	2.10	2.10	1.00	0.64	NA	5.84	0.00	5.84
D. Short-term contamination of a raw water source	D1. Biological contamination of largest raw water source	0.5	1	2.10	2.10	1.00	0.64	0.75	6.59	2.10	4.49
	D2. Chemical contamination of largest raw water source	0.1	1	2.10	2.10	1.00	0.64	0.75	6.59	2.10	4.49
E. Full unavailability of major raw water sources due to federal or state government actions	--						Not Applicable				
F. Limited or reduced unavailability of major raw water sources due to federal or state government actions	--						Not Applicable				
G. Failure of an existing dam that impounds a raw water source	Dam failure for largest impoundment						Not Applicable				
H. Water supply reduction due to drought	Raw water supply available is 40% of ADD due to drought						Not Applicable				

Notes:

Prepared by: LCT 03/15/21

Checked by: GJH 03/26/21

ADD - average daily demand

MGD - million gallons per day

NA - not applicable

QWS - qualified water system

WTP - water treatment plant

1. A new portable generator was indicated by the QWS. 80% of peak treatment at the largest WTP is assumed.

2. Backup equipment is available, rendering no capacity loss.

3. The interconnection with Waycross-Ware County Industrial Park is not limited by their permit withdrawal limits.

4. Scenarios A1 and B include treated water storage; Scenarios D1 and D2 include raw (non-reservoir) and treated water storage.

Relative liklihood scale: 1 = high; 0.5 = medium; 0.1 = low; 0.05 = negligible

Table B-14d

Satilla Regional Water & Sewer Auth. Deficits: 2050

			2050 - Long-Range Reliability Target					
Risk	**Scenario**	**Available Water Supply (MGD)**	**Total Demand (MGD)[1]**	**65% ADD (MGD)**	**35% ADD (MGD)**	**Total Demand Deficit (MGD)**	**65% ADD Deficit (MGD)**	**35% ADD Deficit (MGD)**
A. Failure of largest water treatment facility	A1. Power supply failure of largest WTP	6.17	1.60	1.04	0.56	0.00	0.00	0.00
	A2. Critical asset failure at largest WTP	5.84	1.60	1.04	0.56	0.00	0.00	0.00
B. Short-term catastrophic failure of a water distribution system	Critical asset failure (transmission main)	4.49	1.60	1.04	0.56	0.00	0.00	0.00
C. Short-term contamination of a water supply within distribution system	Contamination of distribution system triggers issuance of boil water notice	5.84	1.60	1.04	0.56	0.00	0.00	0.00
D. Short-term contamination of a raw water source	D1. Biological contamination of largest raw water source	4.49	1.60	1.04	0.56	0.00	0.00	0.00
	D2. Chemical contamination of largest raw water source	4.49	1.60	1.04	0.56	0.00	0.00	0.00
E. Full unavailability of major raw water sources due to federal or state government actions	--				Not Applicable			
F. Limited or reduced unavailability of major raw water sources due to federal or state government actions	--				Not Applicable			
G. Failure of an existing dam that impounds a raw water source	Dam failure for largest impoundment				Not Applicable			
H. Water supply reduction due to drought	Raw water supply available is 40% of ADD due to drought				Not Applicable			

Notes:

ADD - average daily demand
MGD - million gallons per day
QWS - qualified water system
WTP - water treatment plant

1. Total demand (withdrawal plus purchases) is defined the same as 100% ADD.

Prepared by: LCT 03/15/21
Checked by: GJH 03/26/21

Table B-14e
Satilla Regional Water & Sewer Auth. Interconnections

Existing Incoming Interconnections

Number	System	Description	Diameter (in)	Maximum Velocity (fps)[1]	Maximum Flow (cfs)	Maximum Flow (MGD)	Capacity Already Purchased (MGD)	Maximum Possible Purchased Water (MGD)[2]
8	GA2990019-Waycross-Ware County Industrial Park	Industrial Blvd and Albany Ave	6	5	0.982	0.635	0.000	0.635

Prepared by: LCT 03/15/21
Checked by: GJH 03/26/21

Notes:
in - inches
fps - feet per second
cfs - cubic feet per second
MGD - million gallons per day
1. The maximum velocity is assumed to be 3 fps for pipe diameters greater than or equal to 16 inches and 5 fps for pipe diameters less than or equal to 12 inches.
2. Maximum flow values differ because the QWS reported these values as the maximum possible purchased water. The more conservative values were chosen.

Table B-15a
Tifton-Tift County Emergency Scenario Evaluation: 2015

Risk	Scenario	Relative Liklihood	Duration (Days)	Peak Day Design Capacity (MGD)					Maximum Possible Purchased Water (MGD)	Water Storage (MGD)[4]	Total Possible Water Supply (MGD)	Capacity Loss (MGD)	Available Water Supply (MGD)
				WTP Well 103	WTP Well 106	WTP Well 107	WTP Well 111	WTP All Others[3]					
A. Failure of largest water treatment facility	A1. Power supply failure of largest WTP[1]	0.5	1	2.52	3.60	3.60	2.52	6.44	NA	1.95	20.63	3.60	17.03
	A2. Critical asset failure at largest WTP[2]	0.1	30	2.52	3.60	3.60	2.52	6.44	NA	NA	18.68	0.00	18.68
B. Short-term catastrophic failure of a water distribution system	Critical asset failure (transmission main)	0.1	1	2.52	3.60	3.60	2.52	6.44	NA	1.95	20.63	3.60	17.03
C. Short-term contamination of a water supply within distribution system	Contamination of distribution system triggers issuance of boil water notice	1	3	2.52	3.60	3.60	2.52	6.44	NA	NA	18.68	0.00	18.68
D. Short-term contamination of a raw water source	D1. Biological contamination of largest raw water source	0.5	1	2.52	3.60	3.60	2.52	6.44	NA	1.95	20.63	3.60	17.03
	D2. Chemical contamination of largest raw water source	0.1	1	2.52	3.60	3.60	2.52	6.44	NA	1.95	20.63	3.60	17.03
E. Full unavailability of major raw water sources due to federal or state government actions	--	Not Applicable											
F. Limited or reduced unavailability of major raw water sources due to federal or state government actions	--	Not Applicable											
G. Failure of an existing dam that impounds a raw water source	Dam failure for largest impoundment	Not Applicable											
H. Water supply reduction due to drought	Raw water supply available is 40% of ADD due to drought	Not Applicable											

Notes:

Prepared by: LCT 03/15/21
Checked by: GJH 03/26/21

ADD - average daily demand
MGD - million gallons per day
NA - not applicable
QWS - qualified water system
WTP - water treatment plant

1. WTPs for Wells 103, 106, and 111 have backup power, but WTP 107 does not, rendering full capacity loss at the largest WTP.
2. Backup equipment is available, rendering no capacity loss.
3. Tifton-Tift County has 8 wells, so all but the largest four wells are summarized in one column.
4. Scenarios A1 and B include treated water storage; Scenarios D1 and D2 include raw (non-reservoir) and treated water storage.

Relative liklihood scale: 1 = high; 0.5 = medium; 0.1 = low; 0.05 = negligible

Table B-15b
Tifton-Tift County Deficits: 2015

			2015 - Immediate Reliability Target					
Risk	**Scenario**	**Available Water Supply (MGD)**	**Total Demand (MGD)[1]**	**65% ADD (MGD)**	**35% ADD (MGD)**	**Total Demand Deficit (MGD)**	**65% ADD Deficit (MGD)**	**35% ADD Deficit (MGD)**
A. Failure of largest water treatment facility	A1. Power supply failure of largest WTP	17.03	4.57	2.97	1.60	0.00	0.00	0.00
	A2. Critical asset failure at largest WTP	18.68	4.57	2.97	1.60	0.00	0.00	0.00
B. Short-term catastrophic failure of a water distribution system	Critical asset failure (transmission main)	17.03	4.57	2.97	1.60	0.00	0.00	0.00
C. Short-term contamination of a water supply within distribution system	Contamination of distribution system triggers issuance of boil water notice	18.68	4.57	2.97	1.60	0.00	0.00	0.00
D. Short-term contamination of a raw water source	D1. Biological contamination of largest raw water source	17.03	4.57	2.97	1.60	0.00	0.00	0.00
	D2. Chemical contamination of largest raw water source	17.03	4.57	2.97	1.60	0.00	0.00	0.00
E. Full unavailability of major raw water sources due to federal or state government actions	--					Not Applicable		
F. Limited or reduced unavailability of major raw water sources due to federal or state government actions	--					Not Applicable		
G. Failure of an existing dam that impounds a raw water source	Dam failure for largest impoundment					Not Applicable		
H. Water supply reduction due to drought	Raw water supply available is 40% of ADD due to drought					Not Applicable		

Notes:

ADD - average daily demand
MGD - million gallons per day
QWS - qualified water system
WTP - water treatment plant

1. Total demand (withdrawal plus purchases) is defined the same as 100% ADD.

Prepared by: LCT 03/15/21
Checked by: GJH 03/26/21

Table B-15c
Tifton-Tift County Emergency Scenario Evaluation: 2050

				Peak Day Design Capacity (MGD)									
Risk	**Scenario**	**Relative Liklihood**	**Duration (Days)**	**WTP Well 103**	**WTP Well 106**	**WTP Well 107**	**WTP Well 111**	**WTP All Others[3]**	**Maximum Possible Purchased Water (MGD)**	**Water Storage (MGD)[4]**	**Total Possible Water Supply (MGD)**	**Capacity Loss (MGD)**	**Available Water Supply (MGD)**
A. Failure of largest water treatment facility	A1. Power supply failure of largest WTP[1]	0.5	1	2.52	3.60	3.60	2.52	6.44	NA	1.95	20.63	3.60	17.03
	A2. Critical asset failure at largest WTP[2]	0.1	30	2.52	3.60	3.60	2.52	6.44	NA	NA	18.68	0.00	18.68
B. Short-term catastrophic failure of a water distribution system	Critical asset failure (transmission main)	0.1	1	2.52	3.60	3.60	2.52	6.44	NA	1.95	20.63	3.60	17.03
C. Short-term contamination of a water supply within distribution system	Contamination of distribution system triggers issuance of boil water notice	1	3	2.52	3.60	3.60	2.52	6.44	NA	NA	18.68	0.00	18.68
D. Short-term contamination of a raw water source	D1. Biological contamination of largest raw water source	0.5	1	2.52	3.60	3.60	2.52	6.44	NA	1.95	20.63	3.60	17.03
	D2. Chemical contamination of largest raw water source	0.1	1	2.52	3.60	3.60	2.52	6.44	NA	1.95	20.63	3.60	17.03
E. Full unavailability of major raw water sources due to federal or state government actions	--	Not Applicable											
F. Limited or reduced unavailability of major raw water sources due to federal or state government actions	--	Not Applicable											
G. Failure of an existing dam that impounds a raw water source	Dam failure for largest impoundment	Not Applicable											
H. Water supply reduction due to drought	Raw water supply available is 40% of ADD due to drought	Not Applicable											

Notes:

Prepared by: LCT 03/15/21
Checked by: GJH 03/26/21

ADD - average daily demand
MGD - million gallons per day
NA - not applicable
QWS - qualified water system
WTP - water treatment plant

1. WTPs for Wells 103, 106, and 111 have backup power, but WTP 107 does not, rendering full capacity loss at the largest WTP.
2. Backup equipment is available, rendering no capacity loss.
3. Tifton-Tift County has 8 wells, so all but the largest four wells are summarized in one column.
4. Scenarios A1 and B include treated water storage; Scenarios D1 and D2 include raw (non-reservoir) and treated water storage.

Relative liklihood scale: 1 = high; 0.5 = medium; 0.1 = low; 0.05 = negligible

Table B-15d
Tifton-Tift County Deficits: 2050

Risk	Scenario	Available Water Supply (MGD)	2050 - Long-Range Reliability Target			Total Demand Deficit (MGD)	65% ADD Deficit (MGD)	35% ADD Deficit (MGD)
			Total Demand (MGD)[1]	65% ADD (MGD)	35% ADD (MGD)			
A. Failure of largest water treatment facility	A1. Power supply failure of largest WTP	17.03	4.26	2.77	1.49	0.00	0.00	0.00
	A2. Critical asset failure at largest WTP	18.68	4.26	2.77	1.49	0.00	0.00	0.00
B. Short-term catastrophic failure of a water distribution system	Critical asset failure (transmission main)	17.03	4.26	2.77	1.49	0.00	0.00	0.00
C. Short-term contamination of a water supply within distribution system	Contamination of distribution system triggers issuance of boil water notice	18.68	4.26	2.77	1.49	0.00	0.00	0.00
D. Short-term contamination of a raw water source	D1. Biological contamination of largest raw water source	17.03	4.26	2.77	1.49	0.00	0.00	0.00
	D2. Chemical contamination of largest raw water source	17.03	4.26	2.77	1.49	0.00	0.00	0.00
E. Full unavailability of major raw water sources due to federal or state government actions	--	Not Applicable						
F. Limited or reduced unavailability of major raw water sources due to federal or state government actions	--	Not Applicable						
G. Failure of an existing dam that impounds a raw water source	Dam failure for largest impoundment	Not Applicable						
H. Water supply reduction due to drought	Raw water supply available is 40% of ADD due to drought	Not Applicable						

Notes:

ADD - average daily demand
MGD - million gallons per day
QWS - qualified water system
WTP - water treatment plant

1. Total demand (withdrawal plus purchases) is defined the same as 100% ADD.

Prepared by: LCT 03/15/21
Checked by: GJH 03/26/21

Table B-16a
Valdosta Emergency Scenario Evaluation: 2015

Risk	Scenario	Relative Liklihood	Duration (Days)	Peak Day Design Capacity (MGD) Valdosta WTP[3]	Maximum Possible Purchased Water (MGD)[4]	Water Storage (MGD)[5]	Total Possible Water Supply (MGD)	Capacity Loss (MGD)	Available Water Supply (MGD)
A. Failure of largest water treatment facility	A1. Power supply failure of largest WTP[1]	0.5	1	19.10	1.58	4.80	25.48	0.00	25.48
	A2. Critical asset failure at largest WTP[2]	0.1	30	19.10	1.58	NA	20.68	0.00	20.68
B. Short-term catastrophic failure of a water distribution system	Critical asset failure (transmission main)	0.1	1	19.10	1.58	4.80	25.48	19.10	6.38
C. Short-term contamination of a water supply within distribution system	Contamination of distribution system triggers issuance of boil water notice	1	3	19.10	1.58	NA	20.68	0.00	20.68
D. Short-term contamination of a raw water source	D1. Biological contamination of largest raw water source	0.5	1	19.10	1.58	4.80	25.48	19.10	6.38
	D2. Chemical contamination of largest raw water source	0.1	1	19.10	1.58	4.80	25.48	19.10	6.38
E. Full unavailability of major raw water sources due to federal or state government actions	--	Not Applicable							
F. Limited or reduced unavailability of major raw water sources due to federal or state government actions	--	Not Applicable							
G. Failure of an existing dam that impounds a raw water source	Dam failure for largest impoundment	Not Applicable							
H. Water supply reduction due to drought	Raw water supply available is 40% of ADD due to drought	Not Applicable							

Notes:

Prepared by: LCT 03/15/21
Checked by: GJH 03/26/21

ADD - average daily demand
MGD - million gallons per day
NA - not applicable
QWS - qualified water system
WTP - water treatment plant

1. The WTP has backup generators able to provide full capacity, rendering no capacity loss.
2. Backup equipment is available, rendering no capacity loss.
3. The WTP has 9 operating wells and one emergency non-potable well.
4. The interconnections with other water systems are limited by their permit withdrawal limits and 2015 ADD. The maximum possible purchased water value was calculated as the minimum of 1) the sum of existing interconnections (Table B-16e); or 2) the suppliers' 2015 ADD (if available) subtracted from the suppliers' permitted withdrawal limit.
5. Scenarios A1 and B include treated water storage; Scenarios D1 and D2 include raw (non-reservoir) and treated water storage.

Relative liklihood scale: 1 = high; 0.5 = medium; 0.1 = low; 0.05 = negligible

Table B-16b
Valdosta Deficits: 2015

			2015 - Immediate Reliability Target					
Risk	**Scenario**	**Available Water Supply (MGD)**	**Total Demand (MGD)[1]**	**65% ADD (MGD)**	**35% ADD (MGD)**	**Total Demand Deficit (MGD)**	**65% ADD Deficit (MGD)**	**35% ADD Deficit (MGD)**
A. Failure of largest water treatment facility	A1. Power supply failure of largest WTP	25.48	10.12	6.58	3.54	0.00	0.00	0.00
	A2. Critical asset failure at largest WTP	20.68	10.12	6.58	3.54	0.00	0.00	0.00
B. Short-term catastrophic failure of a water distribution system	Critical asset failure (transmission main)	6.38	10.12	6.58	3.54	3.74	0.20	0.00
C. Short-term contamination of a water supply within distribution system	Contamination of distribution system triggers issuance of boil water notice	20.68	10.12	6.58	3.54	0.00	0.00	0.00
D. Short-term contamination of a raw water source	D1. Biological contamination of largest raw water source	6.38	10.12	6.58	3.54	3.74	0.20	0.00
	D2. Chemical contamination of largest raw water source	6.38	10.12	6.58	3.54	3.74	0.20	0.00
E. Full unavailability of major raw water sources due to federal or state government actions	--					Not Applicable		
F. Limited or reduced unavailability of major raw water sources due to federal or state government actions	--					Not Applicable		
G. Failure of an existing dam that impounds a raw water source	Dam failure for largest impoundment					Not Applicable		
H. Water supply reduction due to drought	Raw water supply available is 40% of ADD due to drought					Not Applicable		

Notes:

ADD - average daily demand
MGD - million gallons per day
QWS - qualified water system
WTP - water treatment plant

1. Total demand (withdrawal plus purchases) is defined the same as 100% ADD.

Prepared by: LCT 03/15/21
Checked by: GJH 03/26/21

Table B-16c
Valdosta Emergency Scenario Evaluation: 2050

Risk	Scenario	Relative Liklihood	Duration (Days)	Peak Day Design Capacity (MGD) Valdosta WTP[3]	Maximum Possible Purchased Water (MGD)[4]	Water Storage (MGD)[4]	Total Possible Water Supply (MGD)	Capacity Loss (MGD)	Available Water Supply (MGD)
A. Failure of largest water treatment facility	A1. Power supply failure of largest WTP[1]	0.5	1	19.10	1.40	4.80	25.30	0.00	25.30
	A2. Critical asset failure at largest WTP[2]	0.1	30	19.10	1.40	NA	20.50	0.00	20.50
B. Short-term catastrophic failure of a water distribution system	Critical asset failure (transmission main)	0.1	1	19.10	1.40	4.80	25.30	19.10	6.20
C. Short-term contamination of a water supply within distribution system	Contamination of distribution system triggers issuance of boil water notice	1	3	19.10	1.40	NA	20.50	0.00	20.50
D. Short-term contamination of a raw water source	D1. Biological contamination of largest raw water source	0.5	1	19.10	1.40	4.80	25.30	19.10	6.20
	D2. Chemical contamination of largest raw water source	0.1	1	19.10	1.40	4.80	25.30	19.10	6.20
E. Full unavailability of major raw water sources due to federal or state government actions	--	Not Applicable							
F. Limited or reduced unavailability of major raw water sources due to federal or state government actions	--	Not Applicable							
G. Failure of an existing dam that impounds a raw water source	Dam failure for largest impoundment	Not Applicable							
H. Water supply reduction due to drought	Raw water supply available is 40% of ADD due to drought	Not Applicable							

Notes:

ADD - average daily demand
MGD - million gallons per day
NA - not applicable
QWS - qualified water system
WTP - water treatment plant

Prepared by: LCT 03/15/21
Checked by: GJH 03/26/21

1. The WTP has backup generators able to provide full capacity, rendering no capacity loss.
2. Backup equipment is available, rendering no capacity loss.
3. The WTP has 9 operating wells and one emergency non-potable well.
4. The interconnections with other water systems are limited by their permit withdrawal limits and 2050 ADD. The maximum possible purchased water value was calculated as the minimum of 1) the sum of existing interconnections (Table B-16e); or 2) the suppliers' 2050 ADD (if available) subtracted from the suppliers' permitted withdrawal limit.
5. Scenarios A1 and B include treated water storage; Scenarios D1 and D2 include raw (non-reservoir) and treated water storage.

Relative liklihood scale: 1 = high; 0.5 = medium; 0.1 = low; 0.05 = negligible

Table B-16d
Valdosta Deficits: 2050

Risk	Scenario	Available Water Supply (MGD)	2050 - Long-Range Reliability Target			Total Demand Deficit (MGD)	65% ADD Deficit (MGD)	35% ADD Deficit (MGD)
			Total Demand (MGD)[1]	65% ADD (MGD)	35% ADD (MGD)			
A. Failure of largest water treatment facility	A1. Power supply failure of largest WTP	25.30	10.75	6.99	3.76	0.00	0.00	0.00
	A2. Critical asset failure at largest WTP	20.50	10.75	6.99	3.76	0.00	0.00	0.00
B. Short-term catastrophic failure of a water distribution system	Critical asset failure (transmission main)	6.20	10.75	6.99	3.76	4.55	0.79	0.00
C. Short-term contamination of a water supply within distribution system	Contamination of distribution system triggers issuance of boil water notice	20.50	10.75	6.99	3.76	0.00	0.00	0.00
D. Short-term contamination of a raw water source	D1. Biological contamination of largest raw water source	6.20	10.75	6.99	3.76	4.55	0.79	0.00
	D2. Chemical contamination of largest raw water source	6.20	10.75	6.99	3.76	4.55	0.79	0.00
E. Full unavailability of major raw water sources due to federal or state government actions	--				Not Applicable			
F. Limited or reduced unavailability of major raw water sources due to federal or state government actions	--				Not Applicable			
G. Failure of an existing dam that impounds a raw water source	Dam failure for largest impoundment				Not Applicable			
H. Water supply reduction due to drought	Raw water supply available is 40% of ADD due to drought				Not Applicable			

Notes:

ADD - average daily demand
MGD - million gallons per day
QWS - qualified water system
WTP - water treatment plant

1. Total demand (withdrawal plus purchases) is defined the same as 100% ADD.

Prepared by: LCT 03/15/21
Checked by: GJH 03/26/21

Table B-16e
Valdosta Interconnections

Existing Incoming Interconnections

Number	System	Description	Diameter (in)	Maximum Velocity (fps)[1]	Maximum Flow (cfs)	Maximum Flow (MGD)	Capacity Already Purchased (MGD)	Maximum Possible Purchased Water (MGD)[2]
2	GA1850016-Lowndes County-North	North Valdosta Rd	12	5	3.927	2.538	0.000	2.538
9	GA1850297-Lowndes County-Spring Creek	Guest Rd	20	3	6.545	4.230	0.000	0.100

Prepared by: LCT 03/15/21
Checked by: GJH 03/26/21

Notes:
in - inches
fps - feet per second
cfs - cubic feet per second
MGD - million gallons per day
1. The maximum velocity is assumed to be 3 fps for pipe diameters greater than or equal to 16 inches and 5 fps for pipe diameters less than or equal to 12 inches.
2. Maximum flow values differ for the following reasons and the more conservative values were chosen:
Interconnection 2: the QWS reported these values as the maximum possible purchased water.
Interconnection 9: a water withdrawal permit was unavailable, indicating this system withdrawals less than 0.1 MGD. As a groundwater-based system, it was assumed that GA1850297 could provide 0.1 MGD.

Table B-17a
Waycross Emergency Scenario Evaluation: 2015

Risk	Scenario	Relative Liklihood	Duration (Days)	Peak Day Design Capacity (MGD) Waycross WTP[3]	Maximum Possible Purchased Water (MGD)[4]	Water Storage (MGD)[5]	Total Possible Water Supply (MGD)	Capacity Loss (MGD)	Available Water Supply (MGD)
A. Failure of largest water treatment facility	A1. Power supply failure of largest WTP[1]	0.5	1	7.03	1.92	1.65	10.60	0.00	10.60
	A2. Critical asset failure at largest WTP[2]	0.1	30	7.03	1.92	NA	8.95	0.00	8.95
B. Short-term catastrophic failure of a water distribution system	Critical asset failure (transmission main)	0.1	1	7.03	1.92	1.65	10.60	7.03	3.57
C. Short-term contamination of a water supply within distribution system	Contamination of distribution system triggers issuance of boil water notice	1	3	7.03	1.92	NA	8.95	0.00	8.95
D. Short-term contamination of a raw water source	D1. Biological contamination of largest raw water source	0.5	1	7.03	1.92	2.25	11.20	7.03	4.17
	D2. Chemical contamination of largest raw water source	0.1	1	7.03	1.92	2.25	11.20	7.03	4.17
E. Full unavailability of major raw water sources due to federal or state government actions	--	Not Applicable							
F. Limited or reduced unavailability of major raw water sources due to federal or state government actions	--	Not Applicable							
G. Failure of an existing dam that impounds a raw water source	Dam failure for largest impoundment	Not Applicable							
H. Water supply reduction due to drought	Raw water supply available is 40% of ADD due to drought	Not Applicable							

Notes:

Prepared by: LCT 03/15/21
Checked by: GJH 03/26/21

ADD - average daily demand
MGD - million gallons per day
NA - not applicable
QWS - qualified water system
WTP - water treatment plant

1. The WTP has a backup generator able to provide full capacity, rendering no capacity loss.
2. Backup equipment is available, rendering no capacity loss.
3. The WTP has 2 operating wells.
4. The interconnections with Satilla Regional Water & Sewer Auth.-East are limited by their permit withdrawal limits and 2015 ADD. The maximum possible purchased water value was calculated as the minimum of 1) the sum of existing interconnections (Table B-17e); or 2) the supplier's 2015 ADD subtracted from the supplier's permitted withdrawal limit.
5. Scenarios A1 and B include treated water storage; Scenarios D1 and D2 include raw (non-reservoir) and treated water storage.

Relative liklihood scale: 1 = high; 0.5 = medium; 0.1 = low; 0.05 = negligible

Table B-17b
Waycross Deficits: 2015

			2015 - Immediate Reliability Target					
Risk	**Scenario**	**Available Water Supply (MGD)**	**Total Demand (MGD)[1]**	**65% ADD (MGD)**	**35% ADD (MGD)**	**Total Demand Deficit (MGD)**	**65% ADD Deficit (MGD)**	**35% ADD Deficit (MGD)**
A. Failure of largest water treatment facility	A1. Power supply failure of largest WTP[1]	10.60	1.68	1.09	0.59	0.00	0.00	0.00
	A2. Critical asset failure at largest WTP[2]	8.95	1.68	1.09	0.59	0.00	0.00	0.00
B. Short-term catastrophic failure of a water distribution system	Critical asset failure (transmission main)	3.57	1.68	1.09	0.59	0.00	0.00	0.00
C. Short-term contamination of a water supply within distribution system	Contamination of distribution system triggers issuance of boil water notice	8.95	1.68	1.09	0.59	0.00	0.00	0.00
D. Short-term contamination of a raw water source	D1. Biological contamination of largest raw water source	4.17	1.68	1.09	0.59	0.00	0.00	0.00
	D2. Chemical contamination of largest raw water source	4.17	1.68	1.09	0.59	0.00	0.00	0.00
E. Full unavailability of major raw water sources due to federal or state government actions	--	Not Applicable						
F. Limited or reduced unavailability of major raw water sources due to federal or state government actions	--	Not Applicable						
G. Failure of an existing dam that impounds a raw water source	Dam failure for largest impoundment	Not Applicable						
H. Water supply reduction due to drought	Raw water supply available is 40% of ADD due to drought	Not Applicable						

Notes:

ADD - average daily demand
MGD - million gallons per day
QWS - qualified water system
WTP - water treatment plant

1. Total demand (withdrawal plus purchases) is defined the same as 100% ADD.

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Table B-17c
Waycross Emergency Scenario Evaluation: 2050

Risk	Scenario	Relative Liklihood	Duration (Days)	Peak Day Design Capacity (MGD) Waycross WTP[3]	Maximum Possible Purchased Water (MGD)[4]	Water Storage (MGD)[5]	Total Possible Water Supply (MGD)	Capacity Loss (MGD)	Available Water Supply (MGD)
A. Failure of largest water treatment facility	A1. Power supply failure of largest WTP[1]	0.5	1	7.03	1.63	1.65	10.31	0.00	10.31
	A2. Critical asset failure at largest WTP[2]	0.1	30	7.03	1.63	NA	8.66	0.00	8.66
B. Short-term catastrophic failure of a water distribution system	Critical asset failure (transmission main)	0.1	1	7.03	1.63	1.65	10.31	7.03	3.28
C. Short-term contamination of a water supply within distribution system	Contamination of distribution system triggers issuance of boil water notice	1	3	7.03	1.63	NA	8.66	0.00	8.66
D. Short-term contamination of a raw water source	D1. Biological contamination of largest raw water source	0.5	1	7.03	1.63	2.25	10.91	7.03	3.88
	D2. Chemical contamination of largest raw water source	0.1	1	7.03	1.63	2.25	10.91	7.03	3.88
E. Full unavailability of major raw water sources due to federal or state government actions	--	Not Applicable							
F. Limited or reduced unavailability of major raw water sources due to federal or state government actions	--	Not Applicable							
G. Failure of an existing dam that impounds a raw water source	Dam failure for largest impoundment	Not Applicable							
H. Water supply reduction due to drought	Raw water supply available is 40% of ADD due to drought	Not Applicable							

Notes:

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ADD - average daily demand
MGD - million gallons per day
NA - not applicable
QWS - qualified water system
WTP - water treatment plant

1. The WTP has a backup generator able to provide full capacity, rendering no capacity loss.
2. Backup equipment is available, rendering no capacity loss.
3. The WTP has 2 operating wells.
4. The interconnections with Satilla Regional Water & Sewer Auth.-East are limited by their permit withdrawal limits and 2050 ADD. The maximum possible purchased water value was calculated as the minimum of 1) the sum of existing interconnections (Table B-17e); or 2) the supplier's 2050 ADD subtracted from the supplier's permitted withdrawal limit.
5. Scenarios A1 and B include treated water storage; Scenarios D1 and D2 include raw (non-reservoir) and treated water storage.

Relative liklihood scale: 1 = high; 0.5 = medium; 0.1 = low; 0.05 = negligible

Table B-17d
Waycross Deficits: 2050

Risk	Scenario	Available Water Supply (MGD)	2050 - Long-Range Reliability Target			Total Demand Deficit (MGD)	65% ADD Deficit (MGD)	35% ADD Deficit (MGD)
			Total Demand (MGD)[1]	65% ADD (MGD)	35% ADD (MGD)			
A. Failure of largest water treatment facility	A1. Power supply failure of largest WTP[1]	10.31	2.26	1.47	0.79	0.00	0.00	0.00
	A2. Critical asset failure at largest WTP[2]	8.66	2.26	1.47	0.79	0.00	0.00	0.00
B. Short-term catastrophic failure of a water distribution system	Critical asset failure (transmission main)	3.28	2.26	1.47	0.79	0.00	0.00	0.00
C. Short-term contamination of a water supply within distribution system	Contamination of distribution system triggers issuance of boil water notice	8.66	2.26	1.47	0.79	0.00	0.00	0.00
D. Short-term contamination of a raw water source	D1. Biological contamination of largest raw water source	3.88	2.26	1.47	0.79	0.00	0.00	0.00
	D2. Chemical contamination of largest raw water source	3.88	2.26	1.47	0.79	0.00	0.00	0.00
E. Full unavailability of major raw water sources due to federal or state government actions	--	Not Applicable						
F. Limited or reduced unavailability of major raw water sources due to federal or state government actions	--	Not Applicable						
G. Failure of an existing dam that impounds a raw water source	Dam failure for largest impoundment	Not Applicable						
H. Water supply reduction due to drought	Raw water supply available is 40% of ADD due to drought	Not Applicable						

Notes:

ADD - average daily demand
MGD - million gallons per day
QWS - qualified water system
WTP - water treatment plant

1. Total demand (withdrawal plus purchases) is defined the same as 100% ADD.

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Table B-17e
Waycross Interconnections

Existing Incoming Interconnections

Number	System	Description	Diameter (in)	Maximum Velocity (fps)[1]	Maximum Flow (cfs)	Maximum Flow (MGD)	Capacity Already Purchased (MGD)	Maximum Possible Purchased Water (MGD)[2]
3	GA2990051-Satilla Regional Water & Sewer Auth. - East	Brunswick Hwy	6	5	0.982	0.635	0.000	0.635
4	GA2990051-Satilla Regional Water & Sewer Auth. - East	Seminole Trail	6	5	0.982	0.635	0.000	0.635
5	GA2990051-Satilla Regional Water & Sewer Auth. - East	Mt Pleasant Rd	6	5	0.982	0.635	0.000	0.635
6	GA2990051-Satilla Regional Water & Sewer Auth. - East	East Washington Ave	6	5	0.982	0.635	0.000	0.635
7	GA2990051-Satilla Regional Water & Sewer Auth. - East	Brunel Street	6	5	0.982	0.635	0.000	0.635

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Notes:
in - inches
fps - feet per second
cfs - cubic feet per second
MGD - million gallons per day
1. The maximum velocity is assumed to be 3 fps for pipe diameters greater than or equal to 16 inches and 5 fps for pipe diameters less than or equal to 12 inches.
2. Maximum flow values differ because the QWS reported these values as the maximum possible purchased water. The more conservative values were chosen.

Appendix C: Sensitivity Analysis

Contents

Acronyms

GEFA	Georgia Environmental Finance Authority
QWS	Qualified Water System(s)

1.0 Introduction

This appendix describes the sensitivity analysis that was conducted to test the influence of criterion weightings on the initial manual rank outcome.

2.0 Sensitivity Analysis

As described in Section 7.1 of the report, scores were assigned either 1, 2, 3, or 4 using a methodology shown in Table 7-1. Criterion weights were initially assigned either 1, 2, or 3 based on professional judgement.

To conduct the sensitivity analysis, scenarios were considered to test the influence of criterion weightings on the rank outcome. First, all criteria were assigned the highest weight (3). The effect of this weighting adjustment is equivalent to the absolute score because although it amplified score values, the rank outcome was the same. Second, one of the eight criteria was assigned the highest weight (3) with the remaining seven criteria assigned the lowest weight (1). The effects of these weighting variations are described below:

1. Systems Benefitted weight = 3; all other criteria weights = 1
    a. All new well/WTP projects maintained rank.
    b. Interpretation: this weighting adjustment had no effect on rank order.
2. Population Benefitted weight = 3; all other criteria weights = 1
    a. Project 1 worsened rank by one rank.
    b. Project 2 and Project 3 maintained rank.
    c. Project 4 improved rank by one rank.
    d. Interpretation: it is expected that Project 4 improved rank because in this weighting adjustment, higher priority is given to projects that benefit larger populations.
3. Critical Scenario Duration (days) weight = 3; all other criteria weights = 1
    a. All new well/WTP projects maintained rank.
    b. Interpretation: this weighting adjustment had no effect on rank order.
4. Added Capacity as a Percent of Total Demand (%) weight = 3; all other criteria weights = 1
    a. Project 1 and Project 2 improved rank by one rank.
    b. Project 3 and Project 4 worsened rank by one rank.
    c. Interpretation: it is expected that Project 1 and Project 2 improved rank because in this weighting adjustment, higher priority is given to projects that provide a larger added capacity as a percent of total demand.
5. Cost ($) weight = 3; all other criteria weights = 1
    a. All new well/WTP projects maintained rank.
    b. Interpretation: this weighting adjustment had no effect on rank order.
6. Potential Environmental Impacts weight = 3; all other criteria weights = 1
    a. All new well/WTP projects maintained rank.
    b. Interpretation: this weighting adjustment had no effect on rank order.
7. Potential System and Community Impacts weight = 3; all other criteria weights = 1
    a. All new well/WTP projects maintained rank.
    b. Interpretation: this weighting adjustment had no effect on rank order.
8. Excess Capacity Index weight = 3; all other criteria weights = 1

a. All new well/WTP projects maintained rank.
b. Interpretation: this weighting adjustment had no effect on rank order.

The sensitivity analysis results demonstrate that each criterion is generally insensitive to weighting. Therefore, retaining their initial assigned weights is appropriate.