Georgia Water Supply Redundancy Study
Coastal Georgia Water Planning Region
Georgia Environmental Finance Authority (GEFA)

Prepared for:

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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 Gallons 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 Coastal Georgia Water Planning Region, which consists of 9 counties in southeast Georgia, as shown in Figure 1-1. GEFA identified 14 QWS within the Coastal Georgia 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) from 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, including Savannah Main and Savannah I&D, 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/or 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 needs, 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, 14 QWS in the Coastal Georgia Water Planning Region were surveyed. Port, industry, business, tourism, trade, government facilities, and transportation are the primary economic sectors in the Coastal Georgia Region. Land cover in the region is composed of approximately 35% wetland, 31% forest, 14% open water, 8% row crops/pasture, 7% urban, and 5% other (Coastal Georgia Regional Water Planning Council, 2017).

2.2.1 General System Information

Table 2-1 shows key general information about the 14 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 Tybee Island QWS serves the smallest total population and has three supply wells while the Savannah Main QWS serves the largest total population and has 22 supply wells.

Findings from data collection include the following general information about the Coastal Georgia Region:

- 13 QWS use groundwater as their drinking water source.

- One QWS (Savannah I&D) is primarily a surface water system with emergency groundwater sources.
- Two QWS (Pooler and Port Wentworth) are primarily groundwater systems that purchase surface water.
- Distribution systems range from approximately 30 years old to more than 100 years old, with eight systems more than 70 years old. Five 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).
- 13 QWS have at least one backup power source/facility.
- Two systems reported distribution system flow surplus capabilities.
- The following system interconnections, including emergency interconnections, were reported:
    - Garden City is interconnected to Savannah Main, but this is an emergency connection which has never been used
    - Pooler is interconnected with Savannah I&D and Bloomingdale
    - Port Wentworth is interconnected with Savannah I&D
    - Rincon is interconnected with Effingham County
    - Savannah I&D is interconnected with Effingham County, Pooler, Port Wentworth, and Savannah Main
    - Savannah Main is interconnected with Savannah I&D and Garden City
    - Statesboro is interconnected to Georgia Southern University

Overall, data collected show that the QWS have a 2015 combined average treatment capacity of over 71 million gallons per day (MGD). The 14 QWS serve a total estimated direct population of approximately 464,550 people and a total estimated consecutive population of 41,720 people. 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, Savannah I&D regularly sells water to Pooler and Port Wentworth.

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 (if any) received from the 14 QWS. Six systems provided GIS data. Hard copy/PDF maps were obtained from six 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 14 QWS. The 14 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:

- New wells for Hinesville and Tybee Island
- New storage tanks for Hinesville, Kingsland, Richmond Hill, and St. Simons Island
- Water line repair/replacement projects for Brunswick, Kingsland, Pooler, St. Simons Island, and Tybee Island
- An expanded distribution system for Garden City and Pooler
- Water meter upgrades for Brunswick and St. Simons Island
- General maintenance for Pooler and Rincon
- Water treatment plant rehabilitation for Brunswick, Kingsland, and St. Simons Island

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. Appendix A describes and shows the peak day design capacity and ADD calculations.

Excess capacity for a groundwater QWS short-term, defined emergency scenario was calculated by subtracting the ADD (water withdrawal only, not including purchased water) from the peak day design capacity. For surface water QWS, the smaller of the peak day design capacity value and the peak permitted withdrawal value (24-hr maximum) was used for the excess capacity calculation. The excess capacity evaluation has a few key assumptions. It relies on readily available interconnections with the appropriate capacities, of which there are few in this region. 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 emergency durations for 2015 demands for the 14 QWS. For 2015 demands, excess capacity is at least two times a given QWS's 2015 ADD for Brunswick, Garden City, Hinesville, Pooler, Port Wentworth, Richmond Hill, Savannah Main, St. Marys, St. Simons Island, and Statesboro. The 2015 excess capacity values range from 0.9 MGD (Rincon) to 37.1 MGD (Savannah Main).

For 2050 demands, there is sufficient capacity for 11 of the 14 QWS, while Pooler, Rincon, and Port Wentworth have a deficit of 1.7 MGD, 0.8 MGD, and 0.5 MGD, respectively. While it may be likely that these QWS would increase peak day design capacity before the predicted ADD surpasses it, the potential lack of excess capacity highlights the need for increased capacity in 2050. Excess capacity is at least two times a given QWS's 2050 ADD for none of the QWS. The 2050 excess capacity values range from -1.7 MGD (Pooler) to 24 MGD (Savannah I&D). 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. Excluding the negative 2050 excess capacity values, Savannah I&D's 2015 and Kingsland's 2050 scaled excess capacity sufficiency are the lowest relative to other Coastal Georgia 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). As discussed in Section 3.2.1 and Section 3.2.2, most water withdrawals in Coastal Georgia Region are for energy, industrial and municipal use.

3.2.1 Groundwater

Currently the Coastal Georgia Region, as reported in their RWP, obtains approximately two-thirds of its municipal water supply from groundwater. Groundwater sources accounted for 30% of the region's 2010 water supply, whereas surface water sources accounted for 70% of the region's 2010 water supply. The 2010 groundwater withdrawal by category is as follows: 46% industrial, 44% municipal, 5% domestic/self-supply, 4% agriculture, and 1% energy (Coastal Georgia Regional Water Planning Council, 2017). Industrial demand is largely driven by industries located in Chatham County, Glynn County, and Effingham County (CDM Smith, 2017). Aquifer systems in the Coastal Georgia Region include the Floridan, Brunswick, surficial, and Cretaceous. Figure 3-1 shows relevant aquifers in the Coastal Georgia Region.

The RWP noted that a groundwater availability resource assessment was performed by EPD for prioritized aquifers in the Coastal Georgia Region. Aquifer sustainable yield for the purposes of the resource assessment was defined as the amount of water that can be withdrawn without reaching specific thresholds that indicate the potential for local or regional impacts. Impacts included local 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, including municipal withdrawal, from this aquifer is expected to increase from 2015 to 2050. The estimated sustainable yields for modeled portions of aquifers in the Coastal Georgia 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 if withdrawal rates exceed sustainable yield (Coastal Georgia Regional Water Planning Council, 2017).

All 9 counties in the Coastal Georgia 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. Chatham County, the southern half of Effingham County, and a small area of Glynn County that includes Brunswick are in the "red zone," meaning that no net increase in Floridan Aquifer withdrawals is allowed. Combined Floridan Aquifer municipal and baseline industrial demands within the Chatham/Effingham County "red zone" are expected to exceed permitted withdrawal limits starting in 2020. Floridan Aquifer municipal demands alone, however, do not exceed permitted withdrawal limits over the planning horizon. Bryan County and Liberty County are in the "yellow zone," meaning that there are limitations on the net increase in Floridan Aquifer withdrawals. Combined Floridan Aquifer municipal and baseline industrial demands within the "yellow zone" are not expected to exceed permitted withdrawal limits over the planning horizon. Including the alternate (higher growth rate) industrial demand, however, yields an expected withdrawal permit exceedance starting in 2050. The remaining Coastal Georgia Region areas are in the "green zone," meaning that no pumping restrictions exist. However, conservation requirements do apply (Coastal Georgia Regional Water Planning Council, 2017).

Municipal groundwater withdrawals are almost entirely from the Floridan Aquifer, with much less withdrawal from the Cretaceous and Brunswick Aquifers (CDM Smith, 2017). Significant regional

groundwater demand is driven by industrial activities, and these withdrawals are also almost entirely from the Floridan Aquifer (CDM Smith, 2017). Municipal water demand is projected to increase from 2015 (87.7 MGD) to 2050 (121.6 MGD), although the change in demand varies considerably by county (CDM Smith, 2017). Additional municipal supply wells outside of the "red zone," other than replacement wells, may be needed in the Coastal Georgia Region.

The RWP indicated that at this time, no regional groundwater resource gaps are expected to occur in the Coastal Georgia 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, three of which contain QWS, that may need additional municipal annual average withdrawal capacity if demand exceeds current permit limits. The four counties and their potential additional municipal capacity needed are as follows: Bryan, 0.8 MGD; Bulloch, 5.1 MGD; Chatham, 10.4 MGD; and Long, 0.9 MGD (Coastal Georgia Regional Water Planning Council, 2017). When comparing current peak permitted withdrawal and 2050 ADD, Table 3-1 indicates that the following QWS may need additional permitted capacity or alternate water supply sources: Garden City, Hinesville, Pooler, Port Wentworth, Richmond Hill, Rincon, Savannah Main, and Tybee Island.

3.2.2 Surface Water

The 2010 surface water withdrawal by category is as follows: 80% energy, 10% industrial, 9% municipal, and 1% agriculture (Coastal Georgia Regional Water Planning Council, 2017). One power generation facility is assumed retired in the forecasts beyond 2015. Therefore, future energy demands sharply decrease (CDM Smith, 2017). The Coastal Georgia Region contains portions of the following major river basins: the Ogeechee River Basin in the central and northern part of the region; a small portion of the Savannah River Basin in the northeastern part of the region; a small portion of the Altamaha River Basin in the central part of the region; the Satilla River Basin in the southern part of the region; and a small portion of the St. Marys River Basin in the far southern part of the region. Figure 3-2 shows relevant river basins in the Coastal Georgia Region. Major rivers within the region include the Savannah, Ogeechee, Altamaha, Satilla, and St. Marys. No major reservoirs exist in this region. Notable surface water features include coastal salt marshes.

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 Savannah River Basin indicated that no potential gaps exist at the Clyo or Savannah nodes. For context, the Clyo node borders Effingham County and the Savannah node borders Chatham County, both along the Georgia-South Carolina state line. Model results for 2015 and 2050 in the Ogeechee River Basin indicated potential gaps at the Claxton, Eden, and Kings Ferry nodes. For context, the Claxton node is in Evans County (Altamaha Water Planning Region). However, part of the node's drainage area is in Bulloch County. The Eden node borders Effingham and Bryan Counties and the Kings Ferry node borders Chatham and Bryan Counties. Model results for 2015 and 2050 in the Altamaha River Basin indicated that no potential gaps exist at the Doctortown node. For context, the Doctortown node borders Long and Wayne Counties. 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 WC-1 through WC-12, ASWS-1 through ASWS-10, and AAGS-1 through AAGS-11 (Coastal Georgia 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 Coastal Georgia Regional Water Planning Council, although Management Practice AAGS-3 mentioned the potential to increase surface water storage (reservoirs), and Management Practice ASWS-9 mentioned the potential for a multi-region reservoir to also serve the Savannah-Upper Ogeechee and/or Upper Oconee Regions (Coastal Georgia Regional Water Planning Council, 2017).

Figure 3-3 displays the potential water storage options identified in Section 3.2.3 through Section 3.2.6.

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 for expansion potential and 16 reservoirs were identified in the report for potential expansion. The report focused on the 78 counties above the Georgia fall line. Counties within the Coastal Georgia Region are located below the fall line, including Bulloch, Effingham, Bryan, Chatham, Liberty, Long, McIntosh, Glynn, and Camden Counties. No reservoirs within the Coastal Georgia Region were identified in the 2008 report as possible candidates for expansion.

Figure 3-3 displays the potential water storage options identified in Section 3.2.3 through Section 3.2.6.

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 Coastal Georgia Region does not currently include a watershed flood control dam; therefore, watershed dams cannot be potential water supply reservoirs in this region. Figure 3-3 displays the potential water storage options identified in Section 3.2.3 through Section 3.2.6.

3.2.6 Quarries

Abandoned rock quarries may serve as potential water 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, 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) location was used as the radius origin for Savannah I&D. Aerial imagery was visually inspected to identify quarries. In addition, publicly available, online quarry inventories were checked.

In the Coastal Georgia Region, two potential quarries were identified. USGS GIS data from *The State Geologic Map Compilation (SGMC) Geodatabase of the Conterminous United States* was used to identify quarry bedrock (Horton et al., 2017). Split between Effingham County and Chatham County, a seemingly active quarry exists approximately 4 miles northwest of Pooler. The quarry's bedrock is unconsolidated, undifferentiated fine-detrital (silt-sized) marsh and lagoonal facies (Horton et al., 2017). Pooler's distribution system is in the vicinity of the quarry. In Chatham County, an area of seemingly active quarries exists approximately 4.5 miles west-southwest of downtown Savannah. The quarries' bedrock is primarily unconsolidated, undifferentiated sand barrier island facies (Horton et al., 2017). Savannah's distribution system is in the vicinity of the quarries. Given their sedimentary nature, these quarries are unlikely candidates for potential future water storage reservoirs.

Consideration should be given to the technical issues important for development and operation of a quarry that could serve as a water supply reservoir, including the potential for water seepage from the reservoir through the permeable, jointed, and fractured rock mass, the stability of the rock quarry slopes, environmental permitting requirements, and water quality considerations.

Figure 3-3 displays the potential water storage options identified in Section 3.2.3 through Section 3.2.6.

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. The Coastal Georgia Water Planning Council's Management Practice AAGS-4 is to conduct research to determine the feasibility, role, and potential benefits of ASR in critical gap areas and/or aquifer recharge (Coastal Georgia Water Planning Council, 2017). Management Practice AAGS-5 is to implement ASR based on the outcomes of AAGS-4.

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.

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 system should individually consider the feasibility of direct potable reuse.

The Coastal Georgia RWP identifies Management Practice ASWS-8 to incentivize greater wastewater return flows (Coastal Georgia Water Planning Council, 2017).

3.4 Current Interconnections Between Systems

As noted in Section 2.2.1, interconnections in the Coastal Georgia Region are few. Savannah Main has two emergency interconnections. Pooler regularly sells water to a smaller public water system. Savannah I&D has the potential to provide excess capacity during emergencies (Table 3-1) to Pooler, Port Wentworth, and Effingham County (which can sell water to Rincon).

One QWS, Statesboro, indicated an emergency outgoing interconnection with Georgia Southern University. As this is an outgoing interconnection, the infrastructure and potentially the water chemistry would have to be adjusted such that Statesboro (permitted capacity 7.345 MGD-monthly average) would be able to receive water. Although the university requires water for its own purposes (permitted capacity 1.000 MGD-monthly average), Statesboro's 2015 ADD is 3.1 MGD, indicating that the university may be able to supply a fair amount of water during an emergency.

Figure 3-4 displays the available mapping data for the water region. As Figure 3-4 shows, several QWS have the potential to interconnect, which will be further discussed in Section 6.

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 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.

Outside of Chatham County and Effingham County, municipal water systems are generally not interconnected in the Coastal Georgia Region. Although Table 3-1 shows that 11 QWS have 2050 excess capacity, the excess capacity index is low for the 14 QWS, indicating a need for increased water supply. Increasing system interconnectivity, especially in the "red zone" and "yellow zone," may alleviate supply problems like aquifer saltwater intrusion.

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. Any entity who withdraws from, diverts from, or impounds waters of the state by more than 0.1 MGD on a monthly average basis 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 peak permitted withdrawal limit for each QWS. For groundwater withdrawal permits, daily peak can be above the permitted limit if the annual and monthly average withdrawals are below their respective 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. As explained in Section 3.2.1, all 9 counties in the Coastal Georgia Region face additional permit conditions because they are part of the Coastal Georgia Water and Wastewater Permitting Plan for Managing Saltwater Intrusion. Therefore, water withdrawal permitting should be a key consideration when proposing new or expanded water withdrawal.

3.5.3 Water Quality Factors

Thirteen of the 14 QWS in this region utilize groundwater sources. Raw water treatment for these ten QWS is similar, although certain differences exist. Within an individual aquifer, localized water chemistry and heterogeneity can be responsible for raw water quality differences and, therefore, treatment differences.

One of the 14 QWS, Savannah I&D, utilizes a surface water source. Raw water treatment for surface water is more robust and can vary. Differences are mainly attributed to pumping from one of the multiple surface water systems. Factors that may affect surface water source quality include land use, potential pollutant sources, nutrient loading, and storm events within the water supply basin. If a new surface water source is proposed, a source water assessment plan may be required to evaluate its suitability.

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. Reverse flows 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, Savannah I&D withdrew 33.03 MGD in 2015, of which 0.70 MGD was sold to Port Wentworth. This 0.70 MGD is also reported for Port Wentworth, which is appropriate because both Savannah I&D and Port Wentworth 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 industry needs, 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 for a statewide effort. Therefore, not every risk and scenario apply to the Coastal Georgia 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 Coastal Georgia Region treat groundwater at each withdrawal well. For the purposes of this study, an individual well that receives water treatment is classified as a WTP. 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 Brunswick, Kingsland, and St. Simons Island. 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 only one QWS in this region utilizes a non-impounded surface water source, Risk G did not apply to QWS in the Coastal Georgia 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. The screening criteria for Risk H are described below:

1. Small watersheds are defined as Hydrologic Unit Code (HUC)-10 watersheds less than 100 square miles (CH2M, Black & Veatch, 2017). The U.S. Department of Agriculture's Natural Resources Conservation Service Geospatial Data Gateway was used to obtain GIS data. Specifically, the

shapefile "10 Digit Watershed Boundary Dataset in HUC8" was used to calculate the area (in square miles) for HUC-10 watersheds.

2. Strahler Stream Order is a hierarchical method of categorizing streams by size. Strahler Stream Orders range from 1 (headwaters with no tributaries) to 12 (e.g., mouth of the Amazon River). For consistency with USGS literature on Georgia rivers (Elliott et al., 2014), major rivers in this study are defined as being Strahler Stream Order 6 or greater. The National Hydrography Dataset Plus, developed and maintained by the U.S. Environmental Protection Agency and USGS, is a collection of GIS and geospatial databases. It contains Strahler Stream Order as a "value added attribute," which was used to identify major rivers for the Coastal Georgia Region.

To meet the criteria, a QWS would need to have 1) a dammed reservoir in a small watershed; and/or 2) withdrawal is not from a major river. The second criterion was met for Savannah I&D, which pumps from Abercorn Creek. Therefore, Risk H applies to one surface water QWS in the Coastal Georgia Region (see Appendix B for QWS-specific explanations).

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 Appendix A. For surface water QWS, the smaller of the peak day design capacity value and the peak permitted withdrawal value (24-hr maximum) was used for the available water supply calculation. For this region, the Savannah I&D permit limits affect the available water supply calculation. 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 Kingsland and St. Marys do not experience an emergency) except for Risk H (drought).
- The 2050 available water supply accounts for additional capacity due to planned capital improvements. (Tybee Island provided an estimated increase in water capacity due to a proposed capital improvement.)
- 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 at the largest WTP, rendering no capacity loss for Scenario A2. Therefore, permit limits are assumed to be followed.
    - For surface water withdrawal permits, a daily peak must adhere to the 24-hour maximum withdrawal limit. If a longer emergency scenario requires a QWS to exceed their permitted withdrawal limit, QWS may do so given EPD approval. Under Water Quality Control Rule §391-3-6-.07(9)(b), systems may receive a temporary permit modification to exceed existing permitted withdrawal limits for emergencies lasting less than 180 days (Ga. Comp. R. & Regs. r. 391-3-6-.07).
- 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, Risks A, B, C, D, and H apply to the Coastal Georgia Region. One QWS, Savannah I&D, had a 2015 total demand deficit (i.e., 100% ADD). Savannah I&D's capacity loss caused a 65% ADD deficit. Three QWS had a 2050 total demand deficit: Kingsland, Rincon, and Savannah I&D. Rincon's and Savannah I&D's capacity losses 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.

Savannah I&D performs less favorably when faced with emergency scenarios because their single WTP design lacks inherent redundancy. Although Risk H is the Critical Scenario Deficit, three additional emergency scenarios leave Savannah I&D with substantial 2015 and 2050 total demand deficits and 65% ADD deficits.

Overall, groundwater QWS in the Coastal Georgia Region perform well when faced with the emergency scenarios because their multi-well, 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. However, with a region-wide projected population increase of over 300,000 people and a withdrawal permitting plan to manage saltwater intrusion, the Coastal Georgia Region may struggle under current conditions to meet future water demand. Kingsland and Rincon are examples of 2050 available water supply being unable to meet 2050 total demand. Under some emergency scenarios, Richmond Hill and Tybee Island barely meet 2050 total demand.

For QWS experiencing more than one deficit, the highest deficit with the longest duration and/or highest relative likelihood, 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 Coastal Georgia Region. As described in Section 5.4 and Table 5-2, three Coastal Georgia 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. The one exception is for Savannah Main, because details of the interconnection(s) with Savannah I&D are not known and Savannah I&D has the potential to provide excess capacity to Savannah Main. 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 Coastal Georgia Region, four types of projects are recommended: 1) new interconnection, 2) upgrade to existing interconnection, 3) new surface water reservoir, and 4) new well and WTP (which includes a backup generator) to supply internal infrastructure redundancy. Interconnection projects support the Coastal Georgia Water Planning Council's Management Practice AAGS-1 Cross-Jurisdictional Collaboration (Coastal Georgia Water Planning Council, 2017). New surface water reservoir projects support two Management Practices: 1) AAGS-2: Increase Surface Water Supplies; and 2) AAGS-3: Additional Reservoir Storage (Coastal Georgia Water Planning Council, 2017). New well and WTP projects support two Management Practices: 1) MGWPC-1: Increase Municipal Groundwater Permit Capacity; and 2) GW-1: Develop and Practice Sustainable Groundwater Use (Coastal Georgia 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. Designations and impacts by project type are detailed below.

- For interconnection projects, impacts due to excavation (for pipelines), stream crossings, and wetlands disturbance were considered, as applicable. The relative difficulty of permitting steps is implied for the following designations. A "low" designation was applied to a potential project if known streams/wetlands are not likely affected and if offsite excavation is less than 200 feet. A "medium-low" designation was applied if known streams/wetlands are not likely affected and if offsite excavation is greater than 200 but less than 5,000 feet. A "medium-high" designation was applied if known streams/wetlands may be affected and/or if offsite excavation is greater than 200 but less than 5,000 feet. A "high" designation was applied if more than 5,000 feet of offsite excavation is needed and/or wetlands are likely affected and/or a stream crossing is likely needed. A list of threatened/endangered species was not compiled for each potential project. Prior to construction, a review of site-specific threatened/endangered species should be conducted. Cost and permitting requirements may increase if species or critical habitats are impacted.
- For new surface water reservoir projects, "high" was applied because of the environmentally sensitive nature of reservoirs. Pipeline excavation impacts were considered, as applicable. It was assumed that a new WTP would not be required because raw water could be pumped and transmitted to the existing WTP. Designations were applied for excavation in the same way as interconnection projects.
- Based on the groundwater demands of certain QWS in this region, one potential project type is a new well and groundwater WTP. 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. Designations were applied for excavation in the same way as interconnection projects.
    - The new well and WTP project considered for this region includes 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 peak permitted withdrawal limits (Table 3-1) to understand their ability to supply water to another QWS experiencing an emergency. Note that 24-hour maximum permitted withdrawal for surface water QWS and monthly average permitted withdrawal for groundwater QWS are higher than annual average permitted withdrawal. Using peak values is appropriate because of the short-term, defined duration scenarios considered. Pooler, Port Wentworth, and Effingham County (not a QWS but a supplier to Rincon) purchase a significant amount of water from Savannah I&D. In order to reflect potential withdrawal permit and purchased water impacts for these QWS, the maximum possible purchased water

values from Savannah I&D were added to the QWS' permit limits to arrive at combined values. For example, Port Wentworth has a peak permitted withdrawal limit of 0.94 MGD and can purchase an estimated maximum of 2.68 MGD from Savannah I&D. The combined value for Port Wentworth is 3.62 MGD. A "low" designation was applied to a potential project if combined values would not limit the maximum capacity added. A "medium-low" designation was applied if combined values would limit the maximum capacity added by 1-49%, and a "medium-high" designation was applied if combined values would limit the maximum capacity added by 50-99%. A "high" designation was applied if combined values 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. For example, if chlorination and fluoridation, a common treatment scheme for groundwater systems, are used at both QWS. A "medium-low" designation was applied if one water treatment type differs between QWS, and a "medium-high" designation was applied if two water treatment types differ. A "high" designation was applied if water treatment significantly differs between QWS. For example, if three or more treatment types differ or if groundwater QWS and surface water QWS exchange water. If an interconnection project progresses beyond the planning-level evaluation discussed in this report, water chemistry analyses and hydraulic flow modeling should be conducted to assess both systems' abilities to exchange water.

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

Six interconnection projects were evaluated. QWS modifications for interconnection projects include connecting, metering, pumping, and operation and maintenance requirements of new pipelines and associated appurtenances. The maximum capacity added (in MGD) from a potential project is an important factor that depends on each specific project's details. Interconnection project pipe diameter, average system pressure, QWS future excess capacity, and maximum capacity added are detailed in Table 6-3. Additional information is provided below.

- Project 2 – Kingsland and St. Marys QWS water mains are within 2,200 linear feet and one interconnection option exists along Kings Bay Road. Figure 6-1 shows large-scale available mapping data for these QWS. Kingsland's existing pipe diameters in the area of interest are 12 inches. St. Marys's existing pipe diameters and locations in the area of interest are unknown, although St. Marys identified the location of a potential interconnection to a 10-inch pipe. Approximately 2,200 feet of 10-inch diameter ductile iron pipe (DIP) is estimated for this project.
- Project 3 – Pooler and Garden City QWS water mains are within 80 linear feet and interconnection options exist along Dean Forest Road. Figure 6-2 shows large-scale available mapping data for these QWS. Garden City's existing pipe diameters in the area of interest are 12 inches. Pooler's

existing pipe diameters in the area of interest are unknown. Approximately 80 feet of 12-inch diameter DIP is estimated for this project.

- Project 4 – Port Wentworth and Garden City QWS are within 825 linear feet and one interconnection option exists from Grange Road to Commerce Court. Figure 6-3 shows large-scale available mapping data for these QWS. Garden City's existing pipe diameters in the area of interest are 10 inches. Port Wentworth's existing pipe diameters in the area of interest are 6 inches and 8 inches. Approximately 825 feet of 10-inch diameter DIP is estimated for this project. Excavation would involve crossing private industrial property, a railroad track, and a divided highway.
- Project 5 – Richmond Hill QWS and Savannah-Georgetown/Gateway are within 3.6 linear miles and one interconnection option exists along U.S. Highway 17. Figure 6-4 shows large-scale available mapping data for these systems. Richmond Hill's existing pipe diameters in the area of interest are 8 inches. Savannah-Georgetown/Gateway's existing pipe diameters and locations in the area of interest are unknown. Approximately 3.6 miles of 8-inch diameter DIP is estimated for this project. Water head loss due to pipe friction, pipe bends, and elevation changes becomes a more important factor when pipelines extend for longer distances. Booster pump stations are needed to overcome head losses. A 50-horsepower pump was estimated to convey water from Richmond Hill to Savannah-Georgetown/Gateway and from Savannah-Georgetown/Gateway to Richmond Hill.
- Project 6 – Rincon QWS and Effingham County are interconnected along McCall Road. It is currently a 16-inch diameter one-way interconnection into Rincon limited by the booster pump capacity. To upgrade the interconnection, the existing booster pump station and associated appurtenances would be updated to maximize flow to Rincon through existing pipes.
- Project 9 – Tybee Island QWS and Savannah-Wilmington Island water mains are within 6.7 linear miles and one interconnection option exists along U.S. Highway 80. Figure 6-5 shows large-scale available mapping data for these systems. Tybee Island's existing pipe diameters in the area of interest are unknown. Savannah-Wilmington Island's existing pipe diameters and locations in the area of interest are unknown. Approximately 6.7 miles of 8-inch DIP is estimated for this project. A 100-horsepower pump was estimated to convey water from Tybee Island to Savannah-Wilmington Island and from Savannah-Wilmington Island to Tybee Island.

If a QWS' future excess capacity and/or permit withdrawal limits are less than the maximum capacity added, it was assumed that the QWS would increase its future supply. For example, Pooler and Port Wentworth have an estimated 2050 excess capacity deficit of 1.69 MGD and 0.54 MGD, respectively. These two QWS are also in the "red zone." Increased permit withdrawal limits are not likely in the "red zone" and "yellow zone." However, increasing system interconnectivity may alleviate withdrawal limit supply problems. Large suppliers, like Savannah I&D, or suppliers in the "green zone" are likely candidates for new and upgraded interconnections.

The above-mentioned interconnection projects are not a comprehensive list of all possible interconnections. Per Table 2-2, mapping data were not available or not complete for all QWS. Therefore, only select interconnections are discussed where data are available.

6.1.2 Internal Infrastructure Redundancy

As shown in Table 6-2, potential Project 1 and Project 8 are new well and groundwater WTP projects 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. Although the Coastal Georgia region is south of the fall line, several QWS are within the "red zone" or "yellow zone." Therefore, new well and WTP projects are only recommended for QWS drilling wells in the "green zone." A new generator to supply internal infrastructure redundancy is included in new well and WTP projects. QWS modifications for generators include the ability to connect and store a backup generator. The maximum capacity (in MGD) of a generator was assumed to be the peak day design capacity of the well/WTP receiving the generator.

Hinesville (in Liberty County, a "yellow zone" county) plans for a new well/WTP in an adjacent "green zone" county. The project has not been advanced yet, which is why Project 1 is recommended in this study. Hinesville's current permitted monthly average withdrawal is 4.5 MGD. Hinesville's 2050 total demand is 5.3 MGD. The QWS would likely need to request a new permit for a "green zone" county (rather than an increased limit) because their current permit applies to Liberty County.

Project 8 is for Statesboro (in Bulloch County, a "green zone" county). Statesboro's current permitted monthly average withdrawal is 7.345 MGD. Statesboro's 2050 total demand is 6.4 MGD. The QWS may need to request a permit increase.

Project 7 is for Savannah I&D (in Chatham County, a "red zone" county) and is a new surface water storage or reservoir. This project type can address emergency scenarios A1, A2, B, D1, D2, G, and H. QWS modifications for new reservoir projects include the ability to site, procure land, permit, design, build, and manage a new reservoir. The maximum capacity added (in MGD) was estimated based on QWS-specific information. A reservoir of approximately 5,000 acre-feet, or 1,630 million gallons, was estimated to meet ADD under Risk H. Savannah I&D currently has a reservoir of approximately 90 million gallons. However, the location and details are unknown. Therefore, Savannah I&D can consider expanding their existing reservoir if the conditions allow. Aerial imagery and land use classifications between the WTP and Abercorn Creek suggest that there may be land available for a 1,630-million-gallon reservoir. The location of the potential reservoir will not be sited due to a lack of information. It was assumed that one mile of 30-inch diameter DIP would be needed to tie-in to the existing raw water transmission main from Abercorn Creek to the WTP.

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 interconnection projects, it was assumed that multijurisdictional agreements and procurement would take 6 months, engineering design and hydraulic modeling would take 4 months, and procurement of materials and construction would take a minimum of 2 months. If a project requires a booster pump station, an extra

4 months was added to the materials procurement and construction time. For new surface water reservoir projects, it was assumed that multijurisdictional agreements, permitting, and procurement would take a minimum of 18 months, engineering design and hydraulic modeling would take a minimum of 9 months, and procurement of materials and construction would take a minimum of 9 months. For new well and WTP projects, it was assumed that procurement and permitting would take 6 months, engineering design and hydraulic modeling would take 4 months, and drilling and construction would take a minimum of 2 months. Planning-level costs and macro-level timeframes are presented in Table 6-4.

6.2.1 Interconnections

Pipeline costs were estimated per linear foot of pipe. Manufacturer prices were obtained for several standard 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.

An underground concrete vault was assumed for interconnection locations such that valves can be manually opened/closed. RSMeans was used to estimate concrete vault construction, valves, water meters, and associated appurtenances. Mark-ups include installation mark-ups and overall contingency.

RSMeans was used to estimate booster pump and motor costs, while a parametric cost estimating formula was used to estimate booster pump station (structure, appurtenances, electrical system) costs. Mark-ups include construction mark-ups, engineering design, and overall contingency.

For upgrading existing interconnections, a value was estimated to encompass potential work involved based on engineering judgement. This value is consistent with the MNGWPD study, and the value will need to be adjusted based on site-specific information.

In addition to water head loss, operational pressure differences between interconnections may require a booster pump station or additional appurtenances to establish a functional interconnection. Therefore, hydraulic modeling is necessary to establish interconnection feasibility before a project can advance beyond this planning-level stage.

6.2.2 Internal Infrastructure Redundancy

New surface water reservoir costs were estimated from the EPD supplemental guidance document. The document provides unit costs for anticipated water management practices, of which "WS-1 New Surface Water Storage Reservoirs" was applicable (EPD, 2011). The low-range cost was assumed to be representative for Savannah I&D's potential new reservoir because the site will not likely require a dam. The 2011 costs were brought to 2021 dollars using the Engineering News-Record's Construction Cost Index. The unit cost was multiplied by the number of units (1,630 MG) and the sum appears as the additional cost in Table 6-4. Applicable pipeline costs were also estimated for this project type.

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). The middle-range cost was assumed to be representative for Hinesville's and Statesboro's proposed new well and the low-range cost was assumed to be representative for their 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 (e.g., 1.7 MGD for Project 1's maximum capacity added) and the sum appears as the additional cost in Table 6-4. 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. 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.

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 Coastal Georgia 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 interconnection projects, which have the capacity to benefit multiple water systems, select criteria were assigned the average of the two interconnecting system scores. These criteria include Criterion 4 (Added Capacity as a Percent of Total Demand), Criterion 7 (Potential System and Community Impacts), and Criterion 8 (Excess Capacity Index). For example, Project 3 (Pooler – Garden City interconnection) received a Criterion 4 score of 2 for Pooler and 4 for Garden City. The assigned score was the average of these individual scores, resulting in a score of 3. For Criterion 3 (Critical Scenario Duration), if no Critical Scenario Deficit exists and 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. Second, one of the eight criteria was assigned the highest weight (3) with the remaining seven

criteria assigned the lowest weight (1). In the case of a tie, the absolute score was considered, and in the case of a further tie, the lower cost per individual supplied broke the tie. The effects of these weighting variations are described in Appendix C. The sensitivity analysis results demonstrate that two of the eight criteria are somewhat sensitive to weighting. Initially assigned weights were retained nonetheless, and sensitivity analysis results can qualify the weighted scores.

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.

Regarding interconnection projects, fair and equitable project cost allocation to each beneficiary can be achieved in several ways. First, if an interconnection primarily benefits one QWS (purchaser), that QWS will likely bear the majority of costs. The provider QWS will financially benefit if water is sold to the purchaser; thus, the provider may bear some of the costs. Second, if an interconnection primarily benefits one QWS but also adds redundancy for the provider QWS, the provider QWS may bear further costs, such as assisting with immediate costs and/or operation and maintenance costs. Third, if an interconnection mutually benefits both QWS, a cost allocation strategy would be appropriate. Such strategies can be based on QWS population served, ADD, added capacity as a percent of total demand, or other creative approaches.

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.

Fourteen QWS in the Coastal Georgia 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 Coastal Georgia Water Planning Region.

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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]
Glynn	Brunswick	GA1270000	37,800	0	Groundwater Wells (11)	-	-	-	-
Chatham	Garden City	GA0510000	8,400	0	Groundwater Wells (4)	-	-	-	-
Liberty	Hinesville	GA1790000	32,000	0	Groundwater Wells (4)	-	-	-	-
Camden	Kingsland	GA0390000	22,100	0	Groundwater Wells (4)	-	-	-	-
Chatham	Pooler	GA0510001	25,000	0	Groundwater Wells (3)	Savannah I & D (2015-2019)	-	-	Bloomingdale (2015-2019)
Chatham	Port Wentworth	GA0510002	9,300	0	Groundwater Wells (3)	Savannah I & D (2015-2019)	-	-	-
Bryan	Richmond Hill	GA0290000	13,000	0	Groundwater Wells (4)	-	-	-	-
Effingham	Rincon	GA1030001	10,400	0	Groundwater Wells (3)	-	Effingham County (2015-2019)	-	-
Chatham	Savannah I & D	GA0510004	10,500	28,600	Surface Water (1) Groundwater Wells (4)	-	-	Pooler (2015-2019) Port Wentworth (2015-2019) Effingham County (2015-2019)	-
Chatham	Savannah Main	GA0510003	169,000	0	Groundwater Wells (22)	-	-	-	-
Camden	St. Marys	GA0390001	18,600	0	Groundwater Wells (3)	-	-	-	-
Glynn	St. Simons Island	GA1270001	23,600	0	Groundwater Wells (6)	-	-	-	-
Bulloch	Statesboro	GA0310004	33,000	0	Groundwater Wells (6)	-	-	-	Georgia Southern University (2015)
Chatham	Tybee Island	GA0510005	8,300	0	Groundwater Wells (3)	-	-	-	-

Prepared by: LCT 01/25/21
Checked by: GJH 02/01/21

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**
Glynn	Brunswick	37,800		◊				
Chatham	Garden City	8,400			◊			
Liberty	Hinesville	32,000			◊			
Camden	Kingsland	22,100		◊				
Chatham	Pooler	25,000		◊				
Chatham	Port Wentworth	9,300			◊			
Bryan	Richmond Hill	13,000			◊			
Effingham	Rincon	10,400			◊			
Chatham	Savannah I & D	10,500	◊					
Chatham	Savannah Main	169,000	◊					
Camden	St. Marys	18,600	◊					
Glynn	St. Simons Island	23,600		◊	◊			
Bulloch	Statesboro	33,000		◊				
Chatham	Tybee Island	8,300		◊				

Notes:

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

Prepared by: LCT 01/25/21
Checked by: GJH 02/01/21

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**
Glynn	Brunswick	37,800	◊	◊	◊			◊		◊	◊
Chatham	Garden City	8,400	◊	◊	◊					◊	◊
Liberty	Hinesville	32,000	◊	◊	◊		◊	◊		◊	◊
Camden	Kingsland	22,100	◊	◊	◊		◊	◊		◊	
Chatham	Pooler	25,000	◊	◊	◊	◊	◊	◊		◊	
Chatham	Port Wentworth	9,300	◊	◊	◊	◊		◊		◊	
Bryan	Richmond Hill	13,000	◊	◊	◊					◊	
Effingham	Rincon	10,400	◊	◊	◊					◊	
Chatham	Savannah I & D	10,500	◊	◊	◊						
Chatham	Savannah Main	169,000	◊	◊[5]	◊					◊	
Camden	St. Marys	18,600	◊	◊	◊					◊	◊
Glynn	St. Simons Island	23,600	◊	◊	◊			◊		◊	◊
Bulloch	Statesboro	33,000	◊	◊	◊	◊	◊	◊		◊	◊
Chatham	Tybee Island	8,300	◊	◊	◊		◊			◊	◊

Prepared by: LCT 01/25/21
Checked by: GJH 02/01/21

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.
5. The Savannah Main groundwater withdrawal permit is a consolidation of the previous permits consisting of Travis Field, Wilmington Island, Gateway, Georgetown, Whitemarsh Island, Dutch Island, Savannah I & D (groundwater), and Savannah Quarters.

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 Peak Permitted Withdrawal (MGD)[3]	2050 Peak Day Design Capacity (MGD)[5]	2050 ADD (MGD) (Water Withdrawal Only)[6]	2050 Excess Capacity (MGD)
Glynn	Brunswick	Groundwater Wells (11)	18.6	3.8	14.8	9.45	18.6	6.5	12.1
Chatham	Garden City	Groundwater Wells (4)	4.3	0.9	3.5	2.0	4.3	2.1	2.2
Liberty	Hinesville	Groundwater Wells (4)	9.2	3.0	6.2	4.5	9.2	5.3	3.8
Camden	Kingsland	Groundwater Wells (4)	3.8	1.6	2.2	4.0	3.8	3.3	0.5
Chatham	Pooler	Groundwater Wells (3)	4.1	1.4	2.7	1.893	4.1	5.8	-1.7
Chatham	Port Wentworth	Groundwater Wells (3)	1.73	0.19	1.53	0.94	1.73	2.3	-0.5
Bryan	Richmond Hill	Groundwater Wells (4)	5.0	1.3	3.8	3.280	5.0	3.7	1.3
Effingham	Rincon	Groundwater Wells (3)	1.6	0.8	0.9	1.401	1.6	2.4	-0.8
Chatham	Savannah I & D	Surface Water (1) Groundwater Wells (4)	62.5	33.0	22.0	55.0	62.5	31.0	24.0
Chatham	Savannah Main	Groundwater Wells (22)	53.8	16.7	37.1	38.05[4]	53.8	41.5	12.3
Camden	St. Marys	Groundwater Wells (3)	5.5	1.4	4.0	6.0	5.5	2.8	2.7
Glynn	St. Simons Island	Groundwater Wells (6)	10.2	2.6	7.6	5.95	10.2	4.1	6.1
Bulloch	Statesboro	Groundwater Wells (6)	10.2	3.1	7.1	7.345	10.2	6.4	3.7
Chatham	Tybee Island	Groundwater Wells (3)	2.3	0.8	1.5	1.6	2.8	2.0	0.7
Totals			**192.7**	**70.5**	**114.8**	**139.7**	**193.2**	**119.1**	**66.6**

Prepared by: GJH 04/15/21

Checked by: LCT 04/19/21

Notes:

ADD - average daily demand

MGD - million gallons per day

QWS - qualified water system

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. Values for groundwater systems are MGD - monthly average; values for surface water systems are combined (if multiple permits) MGD - 24-hour max. Surface water permitted withdrawal values include withdrawals for immediate water treatment and for reservoir filling, if applicable.
4. The Savannah Main groundwater withdrawal permit is a consolidation of the previous permits consisting of Main, Travis Field, Wilmington Island, Gateway, Georgetown, Whitemarsh Island, Dutch Island, and Savannah Quarters.
5. Tybee Island indicated a new 0.5 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 (QWS)	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)
Glynn	Brunswick	3.80	0.00	0.00	3.80	6.50
Chatham	Garden City	0.90	0.00	0.00	0.90	2.11
Liberty	Hinesville	2.99	0.00	0.00	2.99	5.30
Camden	Kingsland	1.55	0.00	0.00	1.55	3.31
Chatham	Pooler	1.36	0.00	0.61	1.96	5.77
Chatham	Port Wentworth	0.19	0.00	0.70	0.90	2.27
Bryan	Richmond Hill	1.27	0.00	0.00	1.27	3.70
Effingham	Rincon	0.79	0.00	0.02	0.81	2.40
Chatham	Savannah I & D	33.03	0.00	0.00	33.03	31.00
Chatham	Savannah Main	16.69	0.00	0.00	16.69	41.50
Camden	St. Marys	1.42	0.00	0.00	1.42	2.79
Glynn	St. Simons Island	2.65	0.00	0.00	2.65	4.07
Bulloch	Statesboro	3.06	0.00	0.00	3.06	6.41
Chatham	Tybee Island	0.78	0.00	0.00	0.78	2.01
	Totals	**70.48**	**0.00**	**1.34**	**71.82**	**119.13**

Prepared by: GJH 04/15/21

Checked by: LCT 04/19/21

Notes:

ADD - average daily demand

MGD - million gallons per day

QWS - qualified water system

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

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)**
Glynn	Brunswick	GA1270000	3.8	2.5	1.3	6.5	4.2	2.3
Chatham	Garden City	GA0510000	0.9	0.6	0.3	2.1	1.4	0.7
Liberty	Hinesville	GA1790000	3.0	1.9	1.0	5.3	3.4	1.9
Camden	Kingsland	GA0390000	1.6	1.0	0.5	3.3	2.1	1.2
Chatham	Pooler	GA0510001	2.0	1.3	0.7	5.8	3.7	2.0
Chatham	Port Wentworth	GA0510002	0.9	0.6	0.3	2.3	1.5	0.8
Bryan	Richmond Hill	GA0290000	1.3	0.8	0.4	3.7	2.4	1.3
Effingham	Rincon	GA1030001	0.8	0.5	0.3	2.4	1.6	0.8
Chatham	Savannah I & D	GA0510004	33.0	21.5	11.6	31.0	20.1	10.8
Chatham	Savannah Main	GA0510003	16.7	10.9	5.8	41.5	27.0	14.5
Camden	St. Marys	GA0390001	1.4	0.9	0.5	2.8	1.8	1.0
Glynn	St. Simons Island	GA1270001	2.6	1.7	0.9	4.1	2.6	1.4
Bulloch	Statesboro	GA0310004	3.1	2.0	1.1	6.4	4.2	2.2
Chatham	Tybee Island	GA0510005	0.8	0.5	0.3	2.0	1.3	0.7
Totals			**71.8**	**46.7**	**25.1**	**119.1**	**77.4**	**41.7**

Prepared by: GJH 04/15/21
Checked by: LCT 04/19/21

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)**
Glynn	Brunswick	A1	19.4	3.8	2.5	1.3	0.0	0.0	0.0	19.4	6.5	4.2	2.3	0.0	0.0	0.0
		A2	18.6	3.8	2.5	1.3	0.0	0.0	0.0	18.6	6.5	4.2	2.3	0.0	0.0	0.0
		B	19.4	3.8	2.5	1.3	0.0	0.0	0.0	19.4	6.5	4.2	2.3	0.0	0.0	0.0
		C	18.6	3.8	2.5	1.3	0.0	0.0	0.0	18.6	6.5	4.2	2.3	0.0	0.0	0.0
		D1	19.4	3.8	2.5	1.3	0.0	0.0	0.0	19.4	6.5	4.2	2.3	0.0	0.0	0.0
		D2	19.4	3.8	2.5	1.3	0.0	0.0	0.0	19.4	6.5	4.2	2.3	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
Chatham	Garden City	A1	5.2	0.9	0.6	0.3	0.0	0.0	0.0	5.2	2.1	1.4	0.7	0.0	0.0	0.0
		A2	5.5	0.9	0.6	0.3	0.0	0.0	0.0	5.5	2.1	1.4	0.7	0.0	0.0	0.0
		B	4.7	0.9	0.6	0.3	0.0	0.0	0.0	4.7	2.1	1.4	0.7	0.0	0.0	0.0
		C	5.5	0.9	0.6	0.3	0.0	0.0	0.0	5.5	2.1	1.4	0.7	0.0	0.0	0.0
		D1	4.7	0.9	0.6	0.3	0.0	0.0	0.0	4.7	2.1	1.4	0.7	0.0	0.0	0.0
		D2	4.7	0.9	0.6	0.3	0.0	0.0	0.0	4.7	2.1	1.4	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
Liberty	Hinesville	A1	12.0	3.0	1.9	1.0	0.0	0.0	0.0	12.0	5.3	3.4	1.9	0.0	0.0	0.0
		A2	9.2	3.0	1.9	1.0	0.0	0.0	0.0	9.2	5.3	3.4	1.9	0.0	0.0	0.0
		B	8.9	3.0	1.9	1.0	0.0	0.0	0.0	8.9	5.3	3.4	1.9	0.0	0.0	0.0
		C	9.2	3.0	1.9	1.0	0.0	0.0	0.0	9.2	5.3	3.4	1.9	0.0	0.0	0.0
		D1	8.9	3.0	1.9	1.0	0.0	0.0	0.0	8.9	5.3	3.4	1.9	0.0	0.0	0.0
		D2	8.9	3.0	1.9	1.0	0.0	0.0	0.0	8.9	5.3	3.4	1.9	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)**
Camden	Kingsland	A1	4.9	1.6	1.0	0.5	0.0	0.0	0.0	4.9	3.3	2.1	1.2	0.0	0.0	0.0
		A2	3.8	1.6	1.0	0.5	0.0	0.0	0.0	3.8	3.3	2.1	1.2	0.0	0.0	0.0
		B	2.9	1.6	1.0	0.5	0.0	0.0	0.0	**2.9**	**3.3**	**2.1**	**1.2**	**0.5**	0.0	0.0
		C	3.8	1.6	1.0	0.5	0.0	0.0	0.0	3.8	3.3	2.1	1.2	0.0	0.0	0.0
		D1	3.0	1.6	1.0	0.5	0.0	0.0	0.0	3.1	3.3	2.1	1.2	0.2	0.0	0.0
		D2	3.0	1.6	1.0	0.5	0.0	0.0	0.0	3.1	3.3	2.1	1.2	0.2	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
Chatham	Pooler	A1	9.3	2.0	1.3	0.7	0.0	0.0	0.0	9.3	5.8	3.7	2.0	0.0	0.0	0.0
		A2	9.2	2.0	1.3	0.7	0.0	0.0	0.0	9.2	5.8	3.7	2.0	0.0	0.0	0.0
		B	6.8	2.0	1.3	0.7	0.0	0.0	0.0	6.8	5.8	3.7	2.0	0.0	0.0	0.0
		C	9.2	2.0	1.3	0.7	0.0	0.0	0.0	9.2	5.8	3.7	2.0	0.0	0.0	0.0
		D1	7.5	2.0	1.3	0.7	0.0	0.0	0.0	7.5	5.8	3.7	2.0	0.0	0.0	0.0
		D2	7.5	2.0	1.3	0.7	0.0	0.0	0.0	7.5	5.8	3.7	2.0	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
Chatham	Port Wentworth	A1	4.9	0.9	0.6	0.3	0.0	0.0	0.0	4.9	2.3	1.6	0.8	0.0	0.0	0.0
		A2	4.4	0.9	0.6	0.3	0.0	0.0	0.0	4.4	2.3	1.6	0.8	0.0	0.0	0.0
		B	3.5	0.9	0.6	0.3	0.0	0.0	0.0	3.5	2.3	1.6	0.8	0.0	0.0	0.0
		C	4.4	0.9	0.6	0.3	0.0	0.0	0.0	4.4	2.3	1.6	0.8	0.0	0.0	0.0
		D1	3.7	0.9	0.6	0.3	0.0	0.0	0.0	3.7	2.3	1.6	0.8	0.0	0.0	0.0
		D2	3.7	0.9	0.6	0.3	0.0	0.0	0.0	3.7	2.3	1.6	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

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)**
Bryan	Richmond Hill	A1	5.2	1.3	0.8	0.3	0.0	0.0	0.0	5.5	3.7	1.3	1.3	0.0	0.0	0.0
		A2	5.0	1.3	0.8	0.3	0.0	0.0	0.0	5.0	3.7	1.3	1.3	0.0	0.0	0.0
		B	3.5	1.3	0.8	0.3	0.0	0.0	0.0	3.8	3.7	1.3	1.3	0.0	0.0	0.0
		C	5.0	1.3	0.8	0.3	0.0	0.0	0.0	5.0	3.7	1.3	1.3	0.0	0.0	0.0
		D1	3.5	1.3	0.8	0.3	0.0	0.0	0.0	3.8	3.7	1.3	1.3	0.0	0.0	0.0
		D2	3.5	1.3	0.8	0.3	0.0	0.0	0.0	3.8	3.7	1.3	1.3	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
Effingham	Rincon	A1	2.4	0.8	0.5	0.3	0.0	0.0	0.0	2.4	2.4	1.6	0.8	0.0	0.0	0.0
		A2	2.1	0.8	0.5	0.3	0.0	0.0	0.0	2.1	2.4	1.6	0.8	0.3	0.0	0.0
		B	1.4	0.8	0.5	0.3	0.0	0.0	0.0	1.4	2.4	1.6	0.8	1.0	0.1	0.0
		C	2.1	0.8	0.5	0.3	0.0	0.0	0.0	2.1	2.4	1.6	0.8	0.3	0.0	0.0
		D1	1.4	0.8	0.5	0.3	0.0	0.0	0.0	**1.4**	**2.4**	**1.6**	**0.8**	**1.0**	**0.1**	0.0
		D2	1.4	0.8	0.5	0.3	0.0	0.0	0.0	1.4	2.4	1.6	0.8	1.0	0.1	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
Chatham	Savannah I & D	A1	67.6	33.0	21.5	11.6	0.0	0.0	0.0	67.6	31.0	20.1	10.8	0.0	0.0	0.0
		A2	58.7	33.0	21.5	11.6	0.0	0.0	0.0	58.7	31.0	20.1	10.8	0.0	0.0	0.0
		B	67.6	33.0	21.5	11.6	0.0	0.0	0.0	67.6	31.0	20.1	10.8	0.0	0.0	0.0
		C	58.7	33.0	21.5	11.6	0.0	0.0	0.0	58.7	31.0	20.1	10.8	0.0	0.0	0.0
		D1	14.4	33.0	21.5	11.6	18.7	7.1	0.0	14.4	31.0	20.1	10.8	16.6	5.8	0.0
		D2	14.4	33.0	21.5	11.6	18.7	7.1	0.0	14.4	31.0	20.1	10.8	16.6	5.8	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	**13.2**	**33.0**	**21.5**	**11.6**	**19.8**	**8.3**	0.0	**12.4**	**31.0**	**20.1**	**10.8**	**18.6**	**7.7**	0.0

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)**
Chatham	Savannah Main	A1	52.4	16.7	10.9	5.8	0.0	0.0	0.0	52.4	41.5	27.0	14.5	0.0	0.0	0.0
		A2	53.8	16.7	10.9	5.8	0.0	0.0	0.0	53.8	41.5	27.0	14.5	0.0	0.0	0.0
		B	52.4	16.7	10.9	5.8	0.0	0.0	0.0	52.4	41.5	27.0	14.5	0.0	0.0	0.0
		C	53.8	16.7	10.9	5.8	0.0	0.0	0.0	53.8	41.5	27.0	14.5	0.0	0.0	0.0
		D1	52.4	16.7	10.9	5.8	0.0	0.0	0.0	52.4	41.5	27.0	14.5	0.0	0.0	0.0
		D2	52.4	16.7	10.9	5.8	0.0	0.0	0.0	52.4	41.5	27.0	14.5	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
Camden	St. Marys	A1	6.2	1.4	0.9	0.5	0.0	0.0	0.0	6.2	2.8	1.8	1.0	0.0	0.0	0.0
		A2	5.5	1.4	0.9	0.5	0.0	0.0	0.0	5.5	2.8	1.8	1.0	0.0	0.0	0.0
		B	3.9	1.4	0.9	0.5	0.0	0.0	0.0	3.9	2.8	1.8	1.0	0.0	0.0	0.0
		C	5.5	1.4	0.9	0.5	0.0	0.0	0.0	5.5	2.8	1.8	1.0	0.0	0.0	0.0
		D1	4.1	1.4	0.9	0.5	0.0	0.0	0.0	4.1	2.8	1.8	1.0	0.0	0.0	0.0
		D2	4.1	1.4	0.9	0.5	0.0	0.0	0.0	4.1	2.8	1.8	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
Glynn	St. Simons Island	A1	11.1	2.6	1.7	0.9	0.0	0.0	0.0	11.7	4.1	2.6	1.4	0.0	0.0	0.0
		A2	10.2	2.6	1.7	0.9	0.0	0.0	0.0	10.2	4.1	2.6	1.4	0.0	0.0	0.0
		B	8.9	2.6	1.7	0.9	0.0	0.0	0.0	9.5	4.1	2.6	1.4	0.0	0.0	0.0
		C	10.2	2.6	1.7	0.9	0.0	0.0	0.0	10.2	4.1	2.6	1.4	0.0	0.0	0.0
		D1	8.9	2.6	1.7	0.9	0.0	0.0	0.0	9.5	4.1	2.6	1.4	0.0	0.0	0.0
		D2	8.9	2.6	1.7	0.9	0.0	0.0	0.0	9.5	4.1	2.6	1.4	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)**
Bulloch	Statesboro	A1	11.9	3.1	2.0	1.1	0.0	0.0	0.0	11.9	6.4	4.2	2.2	0.0	0.0	0.0
		A2	10.2	3.1	2.0	1.1	0.0	0.0	0.0	10.2	6.4	4.2	2.2	0.0	0.0	0.0
		B	9.1	3.1	2.0	1.1	0.0	0.0	0.0	9.1	6.4	4.2	2.2	0.0	0.0	0.0
		C	10.2	3.1	2.0	1.1	0.0	0.0	0.0	10.2	6.4	4.2	2.2	0.0	0.0	0.0
		D1	9.1	3.1	2.0	1.1	0.0	0.0	0.0	9.1	6.4	4.2	2.2	0.0	0.0	0.0
		D2	9.1	3.1	2.0	1.1	0.0	0.0	0.0	9.1	6.4	4.2	2.2	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
Chatham	Tybee Island	A1	2.6	0.8	0.5	0.3	0.0	0.0	0.0	3.1	2.0	1.3	0.7	0.0	0.0	0.0
		A2	2.3	0.8	0.5	0.3	0.0	0.0	0.0	2.8	2.0	1.3	0.7	0.0	0.0	0.0
		B	1.8	0.8	0.5	0.3	0.0	0.0	0.0	2.3	2.0	1.3	0.7	0.0	0.0	0.0
		C	2.3	0.8	0.5	0.3	0.0	0.0	0.0	2.8	2.0	1.3	0.7	0.0	0.0	0.0
		D1	1.8	0.8	0.5	0.3	0.0	0.0	0.0	2.3	2.0	1.3	0.7	0.0	0.0	0.0
		D2	1.8	0.8	0.5	0.3	0.0	0.0	0.0	2.3	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

Prepared by: GJH 04/21/21

Checked by: LCT 04/23/21

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	New Well New WTP New Surface Water Source	◊	◊	◊	◊

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

County	Qualified Water System	Project Number	Potential Project Description	Emergency Scenario(s) Addressed	Maximum Capacity Added (MGD)	Potential Environmental Impacts	System Impacts		
							Withdrawal Permit / Purchased Water Impacts	Water Quality Impacts	Community Impacts
Glynn	Brunswick	-	No recommended project	-	-	-	-	-	-
Chatham	Garden City	3	Interconnection: Pooler-Garden City 80 ft along Dean Forest Road	A1, A2, B, D1, D2	2.54[(2)]	Low: less than 200 ft excavation	Pooler: medium-high Garden City: high	Medium-high	Medium-low: less than 200 ft excavation; multijurisdictional agreement
		4	Interconnection: Port Wentworth-Garden City; 825 ft from Grange Road to Commerce Court	A1, A2, B, D1, D2	1.76[(2)]	Medium-low: excavation greater than 200 but less than 5,000 ft	Port Wentworth: medium-low Garden City: high	Low	Medium-high: excavation greater than 200 but less than 5,000 ft; multijurisdictional agreement.
Liberty	Hinesville	1	New Well and WTP[1]	A1, A2, B, D1, D2	1.7[(2)]	Medium-low: less than 200 ft excavation; no regional groundwater resource gaps for Floridan Aquifer; drilled in green zone	High	Low	Medium-low: offsite excavation less than 200 ft
Camden	Kingsland	2	Interconnection: Kingsland-St. Marys 2200 ft along Kings Bay Road	A1, A2, B, D1, D2	1.76[(2)]	Medium-low: excavation greater than 200 but less than 5,000 ft	Kingsland: medium-high St. Marys: low	Medium-low	Medium-high: excavation greater than 200 but less than 5,000 ft; multijurisdictional agreement.
Chatham	Pooler	3	Interconnection: Pooler-Garden City 80 ft along Dean Forest Road	A1, A2, B, D1, D2	2.54[(2)]	Low: less than 200 ft excavation	Pooler: medium-high Garden City: high	Medium-high	Medium-low: less than 200 ft excavation; multijurisdictional agreement
Chatham	Port Wentworth	4	Interconnection: Port Wentworth-Garden City; 825 ft from Grange Road to Commerce Court	A1, A2, B, D1, D2	1.76[(2)]	Medium-low: excavation greater than 200 but less than 5,000 ft	Port Wentworth: medium-low Garden City: high	Low	Medium-high: excavation greater than 200 but less than 5,000 ft; multijurisdictional agreement.
Bryan	Richmond Hill	5	Interconnection: Richmond Hill-Savannah-Georgetown/Gateway 3.6 miles along U.S. Hwy 17	A1, A2, B, D1, D2	1.13[(2)]	High: more than 5000 ft excavation; wetlands likely affected; stream crossing	Richmond Hill: high Savannah-Georgetown/Gateway: high	Low	High: more than 5000 ft excavation; multijurisdictional agreement
Effingham	Rincon	6	Upgrade existing interconnection: increase supply from Effingham County; McCall Road[3]	A1, A2, B, D1, D2	2.0	Low: less than 200 ft excavation	Effingham County: medium-high	High	Medium-low: less than 200 ft excavation; multijurisdictional agreement
Chatham	Savannah I & D	7	New surface water reservoir	A1, A2, B, D1, D2, H	18.0	High: reservoir impacts; more than 5000 ft excavation	Low	Low	High: more than 5000 ft excavation
Chatham	Savannah Main		No recommended project	-	-	-	-	-	-
Camden	St. Marys	2	Interconnection: Kingsland-St. Marys 0.5 mile along Kings Bay Road	A1, A2, B, D1, D2	1.76[(2)]	Medium-high: excavation greater than 200 but less than 5,000 ft	Kingsland: medium-high St. Marys: low	Medium-low	Medium-high: excavation greater than 200 but less than 5,000 ft; multijurisdictional agreement.
Glynn	St. Simons Island		No recommended project	-	-	-	-	-	-
Bulloch	Statesboro	8	New Well and WTP	A1, A2, B, D1, D2	2.0[(2)]	Medium-low: less than 200 ft excavation; no regional groundwater resource gaps for Floridan Aquifer; drilled in green zone	Medium-high	Low	Medium-low: offsite excavation less than 200 ft

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 / Purchased Water Impacts**	**Water Quality Impacts**	**Community Impacts**
Chatham	Tybee Island	9	Interconnection: Tybee Island-Savannah-Wilmington Island 6.7 miles along U.S. Hwy 80	A1, A2, B, D1, D2	1.13[(2)]	High: more than 5000 ft excavation; wetlands likely affected; stream crossing	Tybee Island: high Savannah-Wilmington Island: high	Low	High: more than 5000 ft excavation; multijurisdictional agreement

Prepared by: GJH 07/16/21
Checked by: LCT 08/16/21

Notes:
ft - feet
MGD - million gallons per day
NA - not applicable
WTP - water treatment plant

1. Hinesville plans for a new well/WTP in an adjacent green zone county, but the project has not been advanced yet.
2. This value was estimated based on QWS-specific information.
3. This is currently a one-way interconnection into Rincon limited by the booster pump capacity. This project upgrades the booster pump station.

Table 6-3
Interconnection Project Capacity Added

Project ID	Potential Project Description	Water System Involved	Pipe Diameter (inches)	Average Pressure (psi)	2050 Excess Capacity (MGD)	Maximum Capacity Added (MGD)[1]
2	Interconnection: Kingsland-St. Marys 2200 ft along Kings Bay Road	Kingsland	12	63	0.49	1.76
		St. Marys	10	46	2.68	1.76
3	Interconnection: Pooler-Garden City 80 ft along Dean Forest Road	Pooler	unknown	58	-1.69	2.54
		Garden City	12	54	2.23	2.54
4	Interconnection: Port Wentworth-Garden City; 825 ft from Grange Road to Commerce Court	Port Wentworth	8	62	-0.54	1.76
		Garden City	10	54	2.23	1.76
5	Interconnection: Richmond Hill-Savannah-Georgetown/Gateway 3.6 miles along U.S. Hwy 17	Richmond Hill	8	53	1.34	1.13
		Savannah-Georgetown/Gateway	unknown	48	unknown	1.13
6	Upgrade existing interconnection: increase supply from Effingham County; McCall Road	Rincon	16	40-60	-0.76	2.00
		Effingham County	unknown	45	unknown	0.00
9	Interconnection: Tybee Island-Savannah-Wilmington Island 6.7 miles along U.S. Hwy 80	Tybee Island	unknown	64	0.75	1.13
		Savannah-Wilmington Island	unknown	58	unknown	1.13

Prepared by: GJH 07/16/21

Checked by: LCT 08/16/21

Notes:
MGD - million gallons per day
psi - pound-force per square inch
1. In the case of a one-way interconnection, the supplier's maximum capacity added is 0 MGD.

Table 6-4
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	Hinesville	New Well and WTP	1.7	175	10-inch diameter DIP	$ 200	(1) new groundwater source (1) new WTP (1) 300 KW generator	$ 6,990,700	$ 7,025,700	12 months
2	Kingsland St. Marys	Interconnection: Kingsland-St. Marys 2200 ft along Kings Bay Road	1.76	2200	10-inch diameter DIP	$ 200	(1) control valve station	$ 42,250	$ 482,300	12 months
3	Pooler Garden City	Interconnection: Pooler-Garden City 80 ft along Dean Forest Road	2.54	80	12-inch diameter DIP	$ 240	(1) control valve station	$ 44,450	$ 63,700	12 months
4	Port Wentworth Garden City	Interconnection: Port Wentworth-Garden City; 825 ft from Grange Road to Commerce Court	1.76	825	10-inch diameter DIP	$ 200	(1) control valve station	$ 42,250	$ 207,300	12 months
5	Richmond Hill Savannah-Georgetown / Gateway	Interconnection: Richmond Hill-Savannah-Georgetown/Gateway 3.6 miles along U.S. Hwy 17	1.13	19008	8-inch diameter DIP	$ 170	(1) control valve station (1) 50 HP booster pump station	$ 1,110,050	$ 4,341,400	16 months
6	Rincon	Upgrade existing interconnection: increase supply from Effingham County; McCall Road	2.0	-	16-inch diameter DIP	-	-	-	$ 50,000	12 months
7	Savannah I & D	New surface water reservoir	18.0	5280	30-inch diameter DIP	$ 770	(1) new reservoir	$ 108,395,000	$ 112,460,600	36 months
8	Statesboro	New Well and WTP	2.0	175	12-inch diameter DIP	$ 240	(1) new groundwater source (1) new WTP (1) 300 KW generator	$ 8,207,800	$ 8,249,800	12 months
9	Tybee Island Savannah-Wilmington Island	Interconnection: Tybee Island-Savannah-Wilmington Island 6.7 miles along U.S. Hwy 80	1.13	35376	8-inch diameter DIP	$ 170	(1) control valve station (1) 100 HP booster pump station	$ 1,739,050	$ 7,753,000	16 months

Prepared by: GJH 07/26/21
Checked by: LCT 08/16/21

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	<15,000	15,000 - 25,000	25,000 - 35,000	>35,000	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	Hinesville	New Well and WTP	Hinesville	1	32,000	3	A1, A2, B, D1, D2	3
2	Kingsland St. Marys	Interconnection: Kingsland-St. Marys 2200 ft along Kings Bay Road	Kingsland St. Marys	4	40,700	4	A1, A2, B, D1, D2	3
3	Pooler Garden City	Interconnection: Pooler-Garden City 80 ft along Dean Forest Road	Pooler Garden City	4	33,400	3	A1, A2, B, D1, D2	3
4	Port Wentworth Garden City	Interconnection: Port Wentworth-Garden City; 825 ft from Grange Road to Commerce Court	Port Wentworth Garden City	4	17,700	2	A1, A2, B, D1, D2	3
5	Richmond Hill Savannah-Georgetown / Gateway	Interconnection: Richmond Hill-Savannah-Georgetown/Gateway 3.6 miles along U.S. Hwy 17	Richmond Hill Savannah-Georgetown/Gateway	2	27,600[1]	3	A1, A2, B, D1, D2	3
6	Rincon	Upgrade existing interconnection: increase supply from Effingham County; McCall Road	Rincon	1	10,400	1	A1, A2, B, D1, D2	3
7	Savannah I & D	New surface water reservoir	Savannah I & D	1	39,100	4	A1, A2, B, D1, D2, H	4
8	Statesboro	New Well and WTP	Statesboro	1	33,000	4	A1, A2, B, D1, D2	3
9	Tybee Island Savannah-Wilmington Island	Interconnection: Tybee Island-Savannah-Wilmington Island 6.7 miles along U.S. Hwy 80	Tybee Island Savannah-Wilmington Island	2	21,800[2]	2	A1, A2, B, D1, D2	3

Notes:
MGD - million gallons per day
WTP - water treatment plant
1. GA0510081-Savannah-Georgetown/Gateway serves an estimated population of 14,600 people.
2. GA0510229-Savannah-Wilmington Island serves an estimated population of 13,500 people.
3. These values were estimated based on available information.
4. These scores were assumed based on regional trends.

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	Hinesville	New Well and WTP	1.70	5.30	32%	-	2	$ 7,025,700	1
2	Kingsland St. Marys	Interconnection: Kingsland-St. Marys 2200 ft along Kings Bay Road	1.76	Kingsland: 3.31 St. Marys: 2.79	Kingsland: 53% St. Marys: 63%	Kingsland: 3 St. Marys: 3	3	$ 482,300	3
3	Pooler Garden City	Interconnection: Pooler-Garden City 80 ft along Dean Forest Road	2.54	Pooler: 5.77 Garden City: 2.11	Pooler: 44% Garden City: 120%	Pooler: 2 Garden City: 4	3	$ 63,700	4
4	Port Wentworth Garden City	Interconnection: Port Wentworth-Garden City; 825 ft from Grange Road to Commerce Court	1.76	Port Wentworth: 2.27 Garden City: 2.11	Port Wentworth: 78% Garden City: 83%	Port Wentworth: 4 Garden City: 4	4	$ 207,300	3
5	Richmond Hill Savannah-Georgetown / Gateway	Interconnection: Richmond Hill-Savannah-Georgetown/Gateway 3.6 miles along U.S. Hwy 17	1.13	Richmond Hill: 3.70 Savannah-Georgetown/ Gateway: 2.00[3]	Richmond Hill: 31% Savannah-Georgetown/ Gateway: 57%	Richmond Hill: 2 Savannah-Georgetown/ Gateway: 3	2.5	$ 4,341,400	1
6	Rincon	Upgrade existing interconnection: increase supply from Effingham County; McCall Road	2.00	2.40	83%	-	4	$ 50,000	4
7	Savannah I & D	New surface water reservoir	18.00	31.00	58%	-	3	$ 112,460,600	1
8	Statesboro	New Well and WTP	2.02	6.41	32%	-	2	$ 8,249,800	1
9	Tybee Island Savannah-Wilmington Island	Interconnection: Tybee Island-Savannah-Wilmington Island 6.7 miles along U.S. Hwy 80	1.13	Tybee Island: 2.01 Savannah - Wilmington Island: 2.00[3]	Tybee Island: 56% Savannah - Wilmington Island: 57%	Tybee Island: 3 Savannah - Wilmington Island: 3	3	$ 7,753,000	1

Notes:
MGD - million gallons per day
WTP - water treatment plant
1. GA0510081-Savannah-Georgetown/Gateway serves an estimated population of 14,600 people.
2. GA0510229-Savannah-Wilmington Island serves an estimated population of 13,500 people.
3. These values were estimated based on available information.
4. These scores were assumed based on regional trends.

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 / Purchased Water Impacts**	**Water Quality Impacts**	**Community Impacts**	**Individual Scores**	**Score: Community Impacts**
1	Hinesville	New Well and WTP	Medium-low	3	High	Low	Medium-low	Withdrawal: 1 Water Quality: 4 Community: 3	2.7
2	Kingsland St. Marys	Interconnection: Kingsland-St. Marys 2200 ft along Kings Bay Road	Medium-low	3	Kingsland: medium-high St. Marys: low	Medium-low	Medium-high	Withdrawal: (2+4)/2 = 3 Water Quality: 3 Community: 2	2.7
3	Pooler Garden City	Interconnection: Pooler-Garden City 80 ft along Dean Forest Road	Low	4	Pooler: medium-high Garden City: high	Medium-high	Medium-low	Withdrawal: (2+1)/2 = 1.5 Water Quality: 2 Community: 3	2.2
4	Port Wentworth Garden City	Interconnection: Port Wentworth-Garden City; 825 ft from Grange Road to Commerce Court	Medium-low	3	Port Wentworth: medium-low Garden City: high	Low	Medium-high	Withdrawal: (3+1)/2 = 2 Water Quality: 2 Community: 3	2.3
5	Richmond Hill Savannah-Georgetown / Gateway	Interconnection: Richmond Hill-Savannah-Georgetown/Gateway 3.6 miles along U.S. Hwy 17	High	1	Richmond Hill: high Savannah-Georgetown/ Gateway: high	Low	High	Withdrawal: (1+1)/2 = 1 Water Quality: 4 Community: 1	2.0
6	Rincon	Upgrade existing interconnection: increase supply from Effingham County; McCall Road	Low	4	Effingham County: medium high	High	Medium-low	Withdrawal: 2 Water Quality: 1 Community: 3	2.0
7	Savannah I & D	New surface water reservoir	High	1	Low	Low	High	Withdrawal: 4 Water Quality: 4 Community: 1	3.0
8	Statesboro	New Well and WTP	Medium-low	3	Medium-high	Low	Medium-low	Withdrawal: 2 Water Quality: 4 Community: 3	3.0
9	Tybee Island Savannah-Wilmington Island	Interconnection: Tybee Island-Savannah-Wilmington Island 6.7 miles along U.S. Hwy 80	High	1	Tybee Island: high Savannah - Wilmington Island: high	Low	High	Withdrawal: (1+1)/2 = 1 Water Quality: 4 Community: 1	2.0

Notes:
MGD - million gallons per day
WTP - water treatment plant
1. GA0510081-Savannah-Georgetown/Gateway serves an estimated population of 14,600 people.
2. GA0510229-Savannah-Wilmington Island serves an estimated population of 13,500 people.
3. These values were estimated based on available information.
4. These scores were assumed based on regional trends.

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	Hinesville	New Well and WTP	(-)	-	3	2.33	1	9	3	4	3	9	8	6	5.38
2	Kingsland St. Marys	Interconnection: Kingsland-St. Marys 2200 ft along Kings Bay Road	Kingsland: (-) St. Marys: (-)	Kingsland: 3 St. Marys: 3	3	3.21	4	12	3	6	9	9	8	6	7.13
3	Pooler Garden City	Interconnection: Pooler-Garden City 80 ft along Dean Forest Road	Pooler: none Garden City: (+) < 0.5	Pooler: 4 Garden City: 2	3	3.27	4	9	3	6	12	12	6.5	6	7.31
4	Port Wentworth Garden City	Interconnection: Port Wentworth-Garden City; 825 ft from Grange Road to Commerce Court	Port Wentworth: none Garden City: (+) < 0.5	Port Wentworth: 4 Garden City: 2	3	3.04	4	6	3	8	9	9	7	6	6.50
5	Richmond Hill Savannah-Georgetown / Gateway	Interconnection: Richmond Hill-Savannah-Georgetown/Gateway 3.6 miles along U.S. Hwy 17	Richmond Hill: (-) Savannah-Georgetown/ Gateway: unknown	Richmond Hill: 3 Savannah-Georgetown/ Gateway: 3[4]	3	2.19	2	9	3	5	3	3	6	6	4.63
6	Rincon	Upgrade existing interconnection: increase supply from Effingham County; McCall Road	Effingham County: unknown[4]	-	3	2.75	1	3	3	8	12	12	6	6	6.38
7	Savannah I & D	New surface water reservoir	(-)	-	3	2.50	1	12	4	6	3	3	9	6	5.50
8	Statesboro	New Well and WTP	(-)	-	3	2.50	1	12	3	4	3	9	9	6	5.88
9	Tybee Island Savannah-Wilmington Island	Interconnection: Tybee Island-Savannah-Wilmington Island 6.7 miles along U.S. Hwy 80	Tybee Island: (-) Savannah - Wilmington Island: unknown	Tybee Island: 3 Savannah - Wilmington Island: 3[4]	3	2.13	2	6	3	6	3	3	6	6	4.38

Prepared by: GJH 07/29/21
Checked by: LCT 08/16/21

Notes:
MGD - million gallons per day
WTP - water treatment plant
1. GA0510081-Savannah-Georgetown/Gateway serves an estimated population of 14,600 people.
2. GA0510229-Savannah-Wilmington Island serves an estimated population of 13,500 people.
3. These values were estimated based on available information.
4. These scores were assumed based on regional trends.

Table 7-3
Potential Project Decision-Making Summary

Project Number	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	Hinesville	New Well and WTP	$ 4,132,765	$ 219.55	2.33	5.38	7
2	Kingsland St. Marys	Interconnection: Kingsland-St. Marys 2200 ft along Kings Bay Road	$ 274,034	$ 11.85	3.21	7.13	2
3	Pooler Garden City	Interconnection: Pooler-Garden City 80 ft along Dean Forest Road	$ 25,079	$ 1.91	3.27	7.31	1
4	Port Wentworth Garden City	Interconnection: Port Wentworth-Garden City; 825 ft from Grange Road to Commerce Court	$ 117,784	$ 11.71	3.04	6.50	3
5	Richmond Hill Savannah-Georgetown / Gateway	Interconnection: Richmond Hill-Savannah-Georgetown/Gateway 3.6 miles along U.S. Hwy 17	$ 3,841,947	$ 157.30	2.19	4.63	8
6	Rincon	Upgrade existing interconnection: increase supply from Effingham County; McCall Road	$ 25,000	$ 4.81	2.75	6.38	4
7	Savannah I & D	New surface water reservoir	$ 6,247,811	$ 2,876.23	2.50	5.50	6
8	Statesboro	New Well and WTP	$ 4,084,059	$ 249.99	2.50	5.88	5
9	Tybee Island Savannah-Wilmington Island	Interconnection: Tybee Island-Savannah-Wilmington Island 6.7 miles along U.S. Hwy 80	$ 6,861,062	$ 355.64	2.13	4.38	9

Prepared by: GJH 07/30/21

Checked by: LCT 08/16/21

Notes:

WTP - water treatment plant

Table 7-4
Potential Projects Sorted by Final Rank Order

Project Number	Water System(s) Benefitted	Potential Project Description	Cost ($)	Final Rank
3	Pooler Garden City	Interconnection: Pooler-Garden City 80 ft along Dean Forest Road	$ 63,700	1
2	Kingsland St. Marys	Interconnection: Kingsland-St. Marys 2200 ft along Kings Bay Road	$ 482,300	2
4	Port Wentworth Garden City	Interconnection: Port Wentworth-Garden City; 825 ft from Grange Road to Commerce Court	$ 207,300	3
6	Rincon	Upgrade existing interconnection: increase supply from Effingham County; McCall Road	$ 50,000	4
8	Statesboro	New Well and WTP	$ 8,249,800	5
7	Savannah I & D	New surface water reservoir	$ 112,460,600	6
1	Hinesville	New Well and WTP	$ 7,025,700	7
5	Richmond Hill Savannah-Georgetown / Gateway	Interconnection: Richmond Hill-Savannah-Georgetown/Gateway 3.6 miles along U.S. Hwy 17	$ 4,341,400	8
9	Tybee Island Savannah-Wilmington Island	Interconnection: Tybee Island-Savannah-Wilmington Island 6.7 miles along U.S. Hwy 80	$ 7,753,000	9

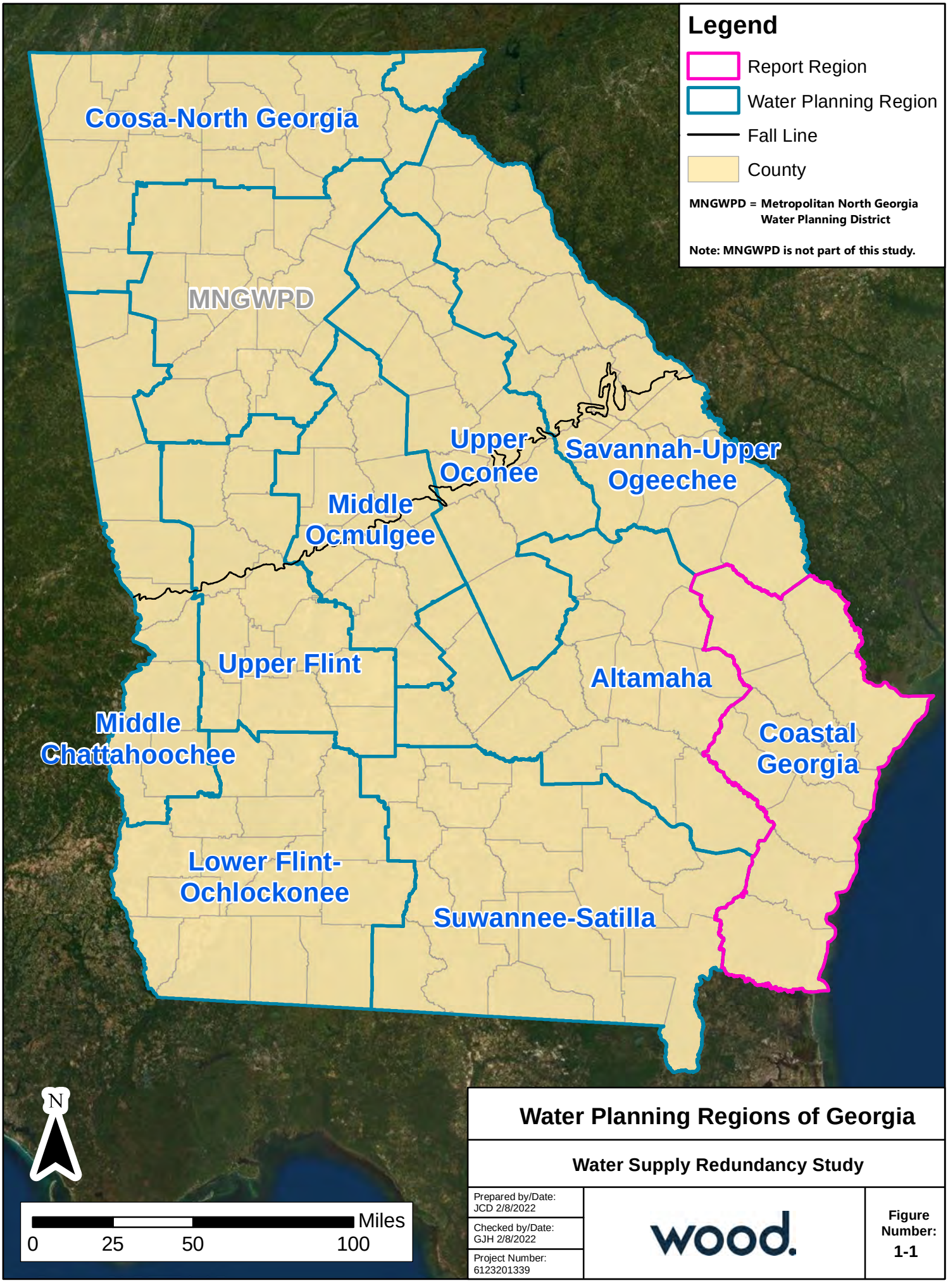
Prepared by: GJH 07/30/21

Checked by: LCT 08/16/21

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		

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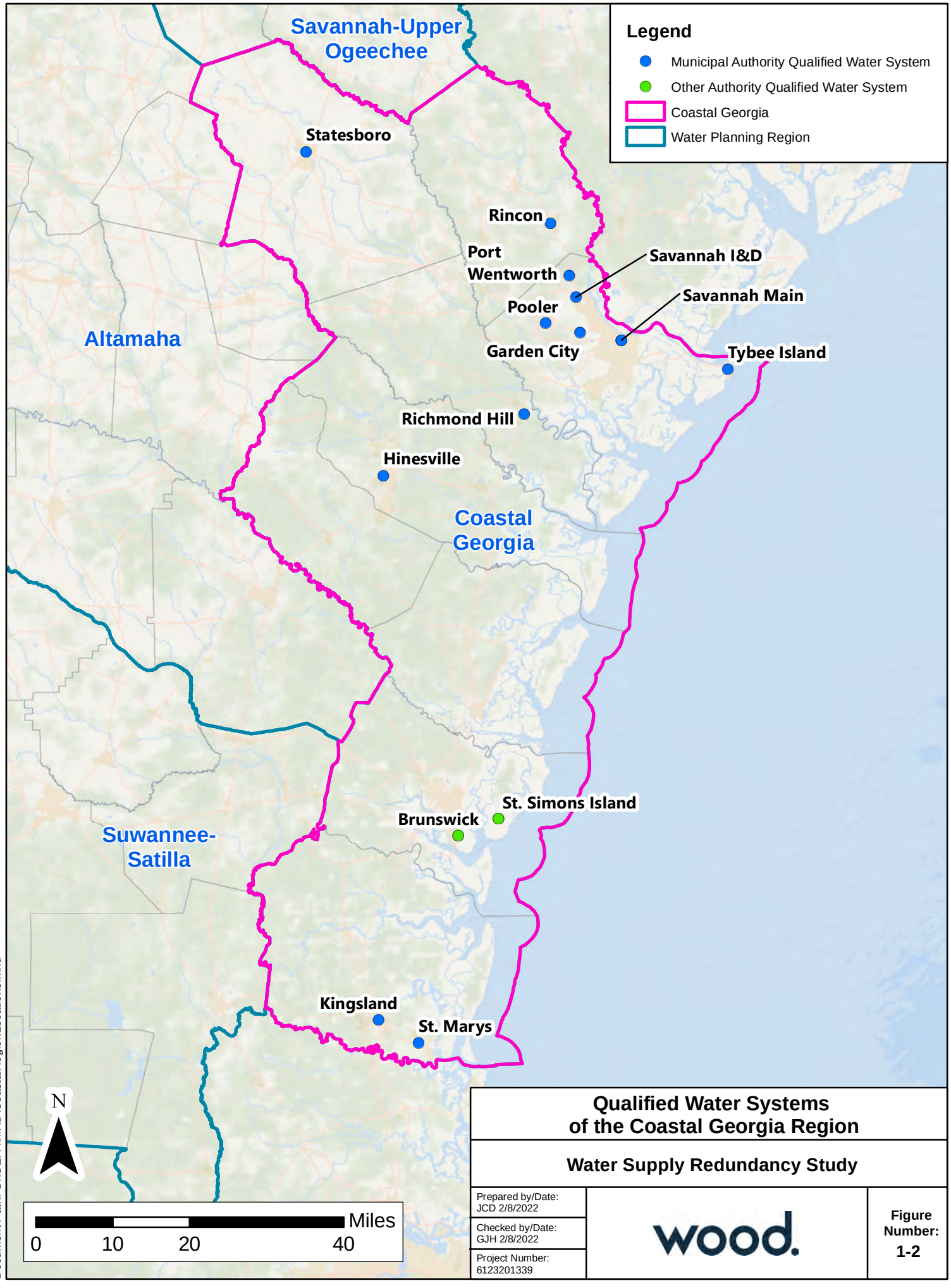

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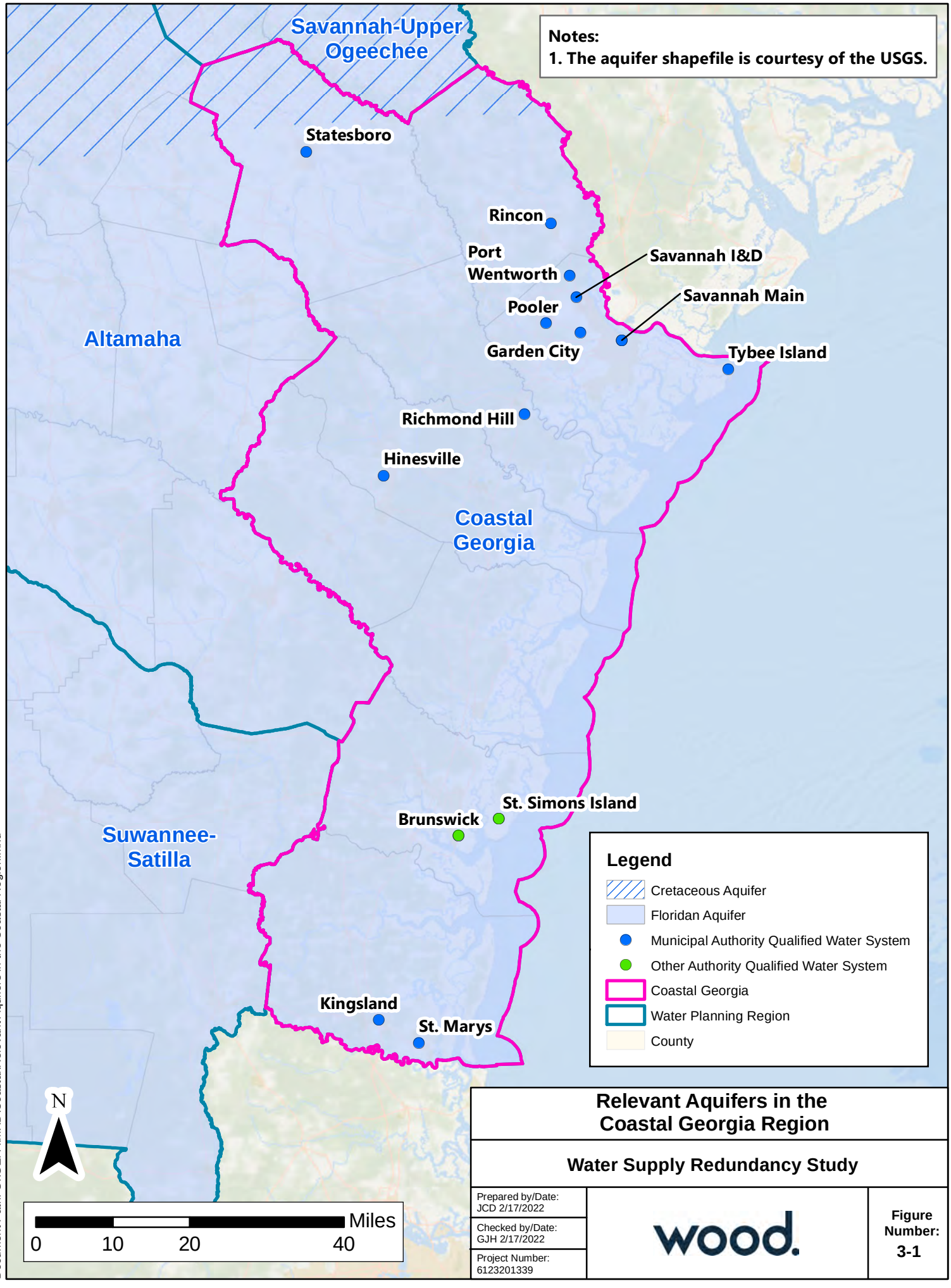
Qualified Water Systems of the Coastal Georgia Region

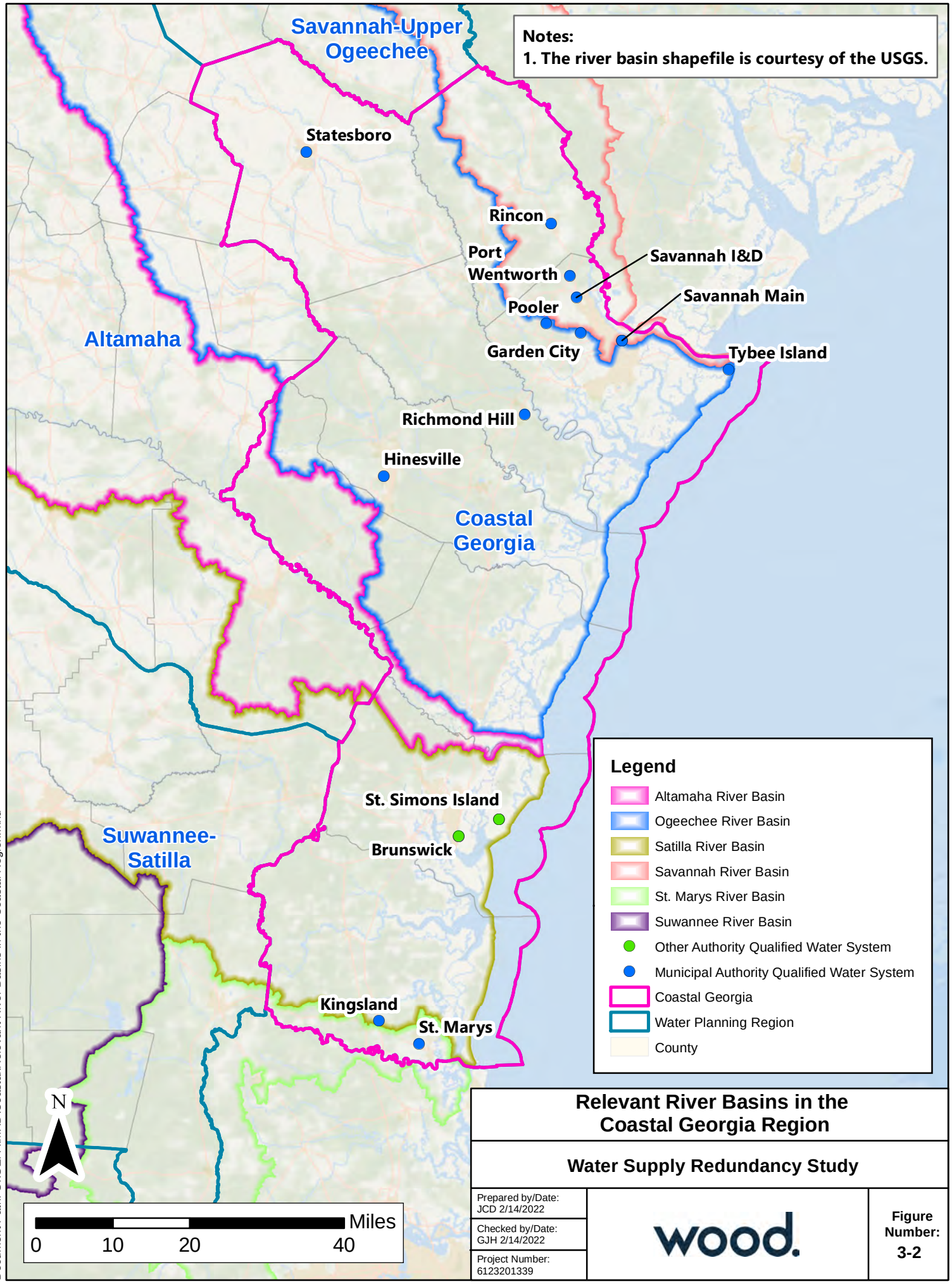
Water Supply Redundancy Study

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

wood.

Figure Number: 1-2


Notes:
1. The aquifer shapefile is courtesy of the USGS.
Savannah-Upper Ogeechee
Statesboro
Rincon
Port Wentworth
Savannah I&D
Savannah Main
Pooler
Garden City
Tybee Island
Altamaha
Richmond Hill
Hinesville
Coastal Georgia
St. Simons Island
Brunswick
Suwannee-Satilla
Kingsland
St. Marys
Legend
Cretaceous Aquifer
Floridan Aquifer
Municipal Authority Qualified Water System
Other Authority Qualified Water System
Coastal Georgia
Water Planning Region
County
N
0
10
20
40
Miles
Relevant Aquifers in the Coastal Georgia Region
Water Supply Redundancy Study
Prepared by/Date: JCD 2/17/2022
Checked by/Date: GJH 2/17/2022
Project Number: 6123201339
wood.
Figure Number: 3-1
Document Path: G:\GEFA\MXD\Coastal\Relevant Aquifers in the Coastal Region.mxd



Document Path: G:\GEFA\MXD\Coastal\Relevant River Basins in the Coastal Region.mxd

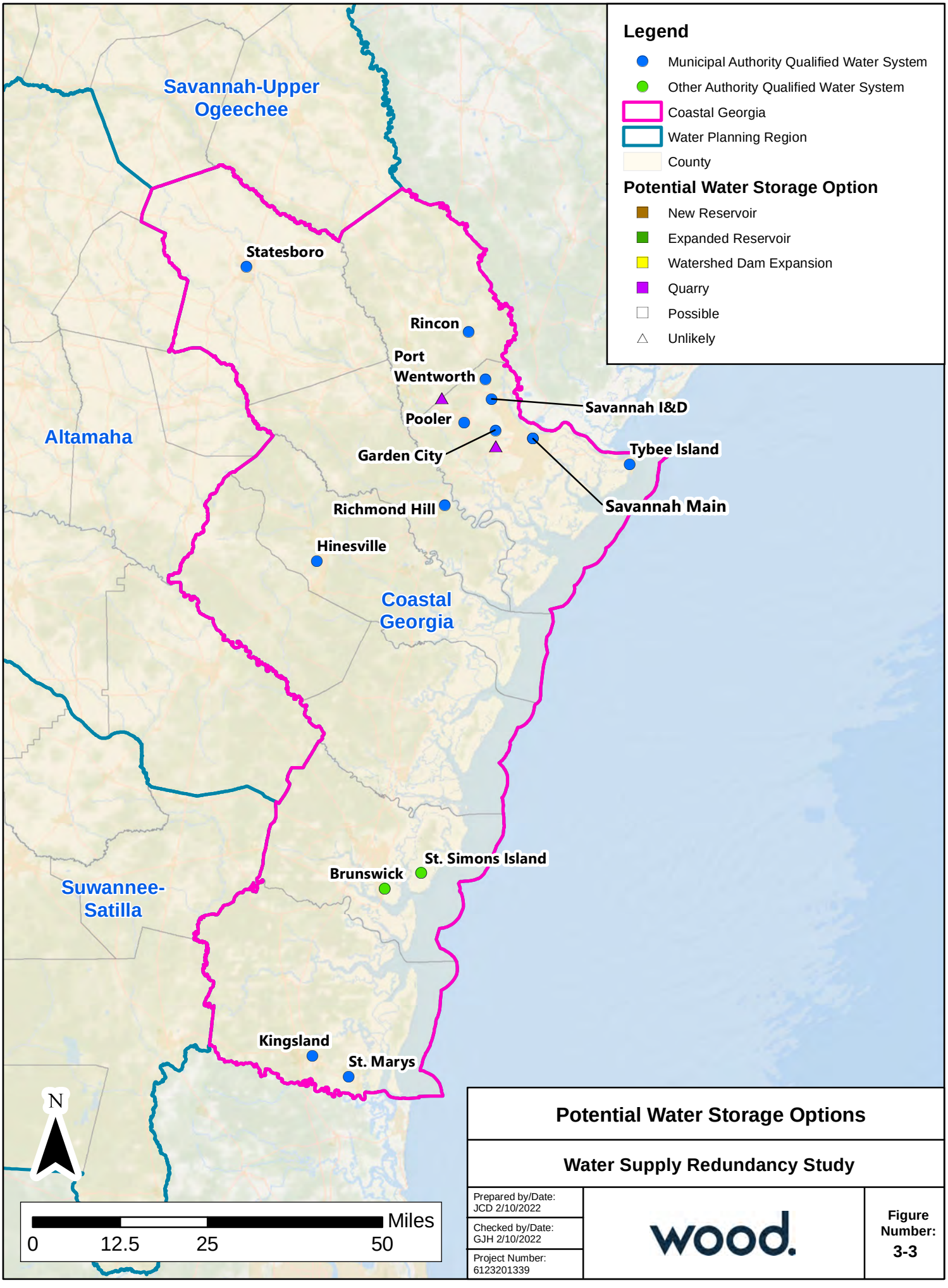
Relevant River Basins in the Coastal Georgia Region

Water Supply Redundancy Study

Prepared by/Date: JCD 2/14/2022	
Checked by/Date: GJH 2/14/2022	
Project Number: 6123201339	

wood.

Figure Number: 3-2



Document Path: G:\GEFA\MXD\Coastal\Coastal_water_storage_options.mxd

Potential Water Storage Options

Water Supply Redundancy Study

Prepared by/Date: JCD 2/10/2022	wood.	Figure Number: 3-3
Checked by/Date: GJH 2/10/2022		
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.

Water System
- Garden City
- Hinesville
- Kingsland
- Pooler
- Port Wentworth
- Richmond Hill
- Rincon
- Statesboro
- St. Simons Island
- Water Planning Region

Statesboro
Rincon
Port Wentworth
Pooler
Garden City
Hinesville
Richmond Hill
St. Simons Island
Kingsland

N

0 5 10 20 Miles

Service Layer Credits: Sources: Esri, HERE, Garmin, Intermap, increment P Corp., GEBCO, USGS, FAO, NPS, NRCAN, GeoBase, IGN, Kadaster NL, Ordnance Survey, Esri Japan, METI, Esri China (Hong Kong), (c) OpenStreetMap contributors, and the GIS User Community

Available Mapping Data for Coastal Georgia Region

Water Supply Redundancy Study

Prepared by/Date: JCD 4/28/2021	wood.	Figure Number: 3-4
Checked by/Date: GJH 4/28/2021		
Project Number: 6123201339		

Document Path: G:\GEFA\MXD\Coastal_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.

Statesboro
Georgia Southern University
Rincon
Effingham County
Port Wentworth
Savannah I&D
Bloomingdale
Pooler
Garden City
Savannah Main
Tybee Island
Richmond Hill
Hinesville
Brunswick
St. Simons Island
Kingsland
St. Marys

Water Planning Region
County
Interconnection
Cretaceous Aquifer
Floridan Aquifer
Altamaha River Basin
Ogeechee River Basin
Satilla River Basin
Savannah River Basin
St. Marys River Basin
Suwannee River Basin

2050 Total Demand (MGD)
0 -2.5
2.5-5
5-10
> 10

Raw Water Source
Groundwater
Groundwater and Surface Water

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

N

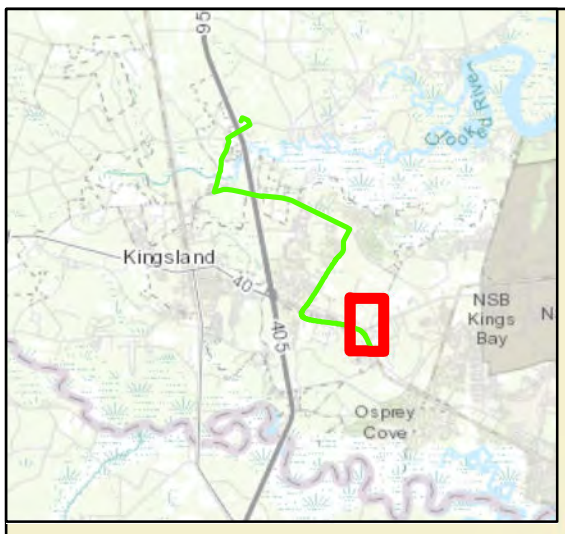
0 4 8 16 Miles

Schematic of Key QWS Data in the Coastal Georgia Region

Water Supply Redundancy Study

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

Document Path: G:\GEFA\MXD\Coastal\Coastal_GA_QWS_key_data.mxd



Kingsland Mains

Diameter (in)

12

Potential Interconnection

TIE-IN TO ST. MARYS

Kingsland
St Marys
Andrews Way
Lindsey Ln
Winding Rd
County Road 78
Mayo Group Drwy
Kings Bay Rd
E King Ave
Garfunkle Rd
Walmart PKNG Lot
Walmart PKNG Lot
Lakeshore Dr
Lakeshore Pt
GA Highway 40 E
Plantation Dr
Scotchville

N

Feet
0 200 400 800

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.

Kingsland and St. Marys Potential Interconnection

Water Supply Redundancy Study

Prepared by/Date: JCD 7/27/2021	wood.	Figure Number: 6-1
Checked by/Date: GJH 7/27/2021		
Project Number: 6123201339		

Document Path: G:\GEFA\MXD\Kingsland and St. Marys Potential Interconnection.mxd

Service Layer Credits: Sources: Esri, HERE, Garmin, USGS, Intermap, INCREMENT P, NRCan, Esri Japan, METI, Esri China (Hong Kong), Esri Korea, Esri (Thailand), NGCC, (c) OpenStreetMap contributors, and the GIS User Community
Sources: Esri, HERE, Garmin, Intermap, increment P Corp., GEBCO, USGS, FAO, NPS, NRCAN, GeoBase, IGN, Kadaster NL, Ordnance Survey, Esri Japan, METI, Esri China (Hong Kong), (c) OpenStreetMap contributors, and the GIS User Community

Garden City and Pooler Mains

Diameter (in)

- 6
- 8
- 10
- 12
- Pooler
- Potential Interconnection

POTENTIAL INTERCONNECTION

Ridgdill St

Old Louisville Rd

N

0 100 200 400 Feet

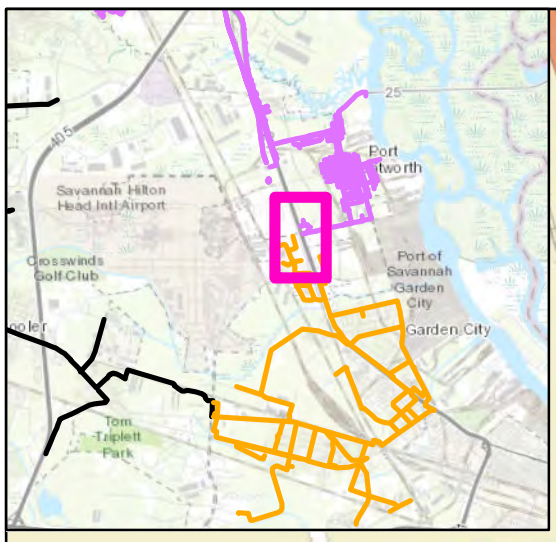
Notes:
1. Data are sourced as shown in Table 2-2.
2. Data are meant for planning purposes only, and do not reflect survey-grade accuracy.
3. In many cases, the entire extent of a given distribution system is not shown due to lack of data.

Pooler and Garden City Pipes

Water Supply Redundancy Study

Prepared by/Date: JCD 7/27/2021	wood.	Figure Number: 6-2
Checked by/Date: GJH 7/27/2021		
Project Number: 6123201339		

Document Path: G:\GEFA\MXD\Pooler and Garden City Pipes.mxd



Garden City and Port Wentworth Mains

Diameter (in)

- 2
- 6
- 8
- 10
- 12
- Potential Interconnection

POTENTIAL INTERCONNECTION

N

0 400 800 1,600 Feet

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.

Port Wentworth and Garden City Pipes

Water Supply Redundancy Study

Prepared by/Date: JCD 7/27/2021	wood.	Figure Number: 6-3
Checked by/Date: GJH 7/27/2021		
Project Number: 6123201339		

Document Path: G:\GEFA\MXD\Port Wentworth and Garden City Pipes.mxd

Service Layer Credits: Sources: Esri, HERE, Garmin, USGS, Intermap, INCREMENT P, NRCan, Esri Japan, METI, Esri China (Hong Kong), Esri Korea, Esri (Thailand), NGCC, (c) OpenStreetMap contributors, and the GIS User Community
Sources: Esri, HERE, Garmin, Intermap, increment P Corp., GEBCO, USGS, FAO, NPS, NRCAN, GeoBase, IGN, Kadaster NL, Ordnance Survey, Esri Japan, METI, Esri China (Hong Kong), (c) OpenStreetMap contributors, and the GIS User Community

Richmond Hill Mains

Diameter (in)

- 6
- 8
- 10
- 12
- Potential Interconnection

TIE-IN TO SAVANNAH-GEORGETOWN/GATEWAY

N

Feet
0 1,000 2,000 4,000

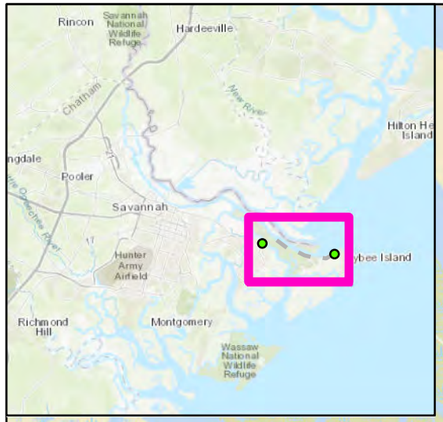
Notes:
1. Data are sourced as shown in Table 2-2.
2. Data are meant for planning purposes only, and do not reflect survey-grade accuracy.
3. In many cases, the entire extent of a given distribution system is not shown due to lack of data.

Richmond Hill and Savannah-Georgetown/ Gateway Potential Interconnection

Water Supply Redundancy Study

Prepared by/Date: JCD 7/27/2021	wood.	Figure Number: 6-4
Checked by/Date: GJH 7/27/2021		
Project Number: 6123201339		

Document Path: G:\GEFA\MXD\Richmond Hill and Savannah-Georgetown Gateway Potential Interconnection.mxd



Potential Interconnection

Atlantic Ocean

SOUTH CAROLINA
GEORGIA

SOUTH CAROLINA
GEORGIA

Fort Pulaski National Monument

Falligant Ave
Point Dr E
US Highway 80 E
Quarterman Dr
Crest Blvd
Johnny Mercer Blvd
Concord Rd
Charlie C Brooks Park
Betz Creek
Penn Waller Rd
Oemler Loop
Shad River
Walthour Rd
Wilmington Island

SAVANNAH-WILMINGTON ISLAND TIE-IN

TYBEE ISLAND TIE-IN

Solomon Ave
1st St
Campbell Ave
Estill Hammock Rd
Catalina Dr
Jones Ave
Tybee

N

Feet
0 2,000 4,000 8,000

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.

Tybee Island and Savannah-Wilmington Island Potential Interconnection

Water Supply Redundancy Study

Prepared by/Date: JCD 8/9/2021	wood.	Figure Number: 6-5
Checked by/Date: GJH 8/9/2021		
Project Number: 6123201339		

Document Path: G:\GEFA\MXD\Tybee Savannah Interconnection.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 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, Tybee Island indicated a new well (0.5 MGD).

2.2 Average Daily Demand

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. One QWS, Savannah I&D, did not have 2015 water loss audit data. This value was instead obtained during the data collection stage.

The 2050 ADD (water withdrawal or purchased water) 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 Coastal Georgia Regional 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 values for 8 of 14 QWS were used. For the other six QWS, values either do not appear, are aggregated by water authority (i.e., Brunswick-Glynn County Joint Water & Sewer Commission; City of Savannah), or appear anomalous in the 2019 Painter report. For these six QWS, 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 (166.0 MGD) to obtain a QWS-specific percent. This percent was then applied to the 2050 RWP regional alternate industrial projection (196.6 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, as applicable, 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 meaningful to the Coastal Georgia QWS because many QWS' ADD is less than 50% of their peak day design capacity. Regime (c) is also meaningful to the Coastal Georgia QWS because one QWS' 2015 ADD and eight QWS' 2050 ADD exceed 50% but remain below 100% of their peak day design capacity. Regime (d) Applies to three QWS' 2050 ADD because their ADD exceeds their peak day design capacity.

Table A-4 shows the 2015 and 2050 peak day design capacity, ADD, resultant excess capacity, and calculated excess capacity index, as applicable, for each QWS. The QWS with the lowest 2015 excess capacity sufficiency, as defined by Regime (c), is Savannah I&D. Pooler, Port Wentworth, and Rincon have no 2050 excess capacity sufficiency, as defined by Regime (d). The next eight QWS with the lowest 2050

excess capacity sufficiency, as defined by Regime (c), are Kingsland, Savannah Main, Richmond Hill, Tybee Island, Statesboro, Hinesville, Savannah I&D, and St. Marys.

References

CDM Smith, 2017. *Water and Wastewater Forecasting Technical Memorandum. Supplemental Material, Coastal Georgia 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]
Bryan	35,107	84,449	10.0
Bulloch	73,278	113,950	13.9
Camden	52,580	66,339	7.7
Chatham	285,958	405,573	49.5
Effingham	56,847	108,029	12.6
Glynn	83,355	115,502	14.1
Liberty	65,294	72,064	8.9
Long	17,447	36,757	3.8
McIntosh	13,937	9,958	1.1
Totals	**683,803**	**1,012,621**	**121.6**

Prepared by: GJH 04/14/21

Checked by: LCT 04/19/21

Notes:

MGD - million gallons per day

1. Values are from the 2017 CDM Smith *Water and Wastewater Forecasting Technical Memorandum. Supplemental Material, Coastal Georgia 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	Serves Out-of-County Population	QWS Percent of County Population (%)[3]	QWS 2050 Municipal Demand Estimate (MGD)[4]
Glynn	Brunswick	37,800	0	37,800		45%	6.39
Chatham	Garden City	8,400	0	8,400		3%	1.45
Liberty	Hinesville	32,000	0	32,000		49%	4.36
Camden	Kingsland	22,100	0	22,100		42%	3.24
Chatham	Pooler	25,000	0	25,000		9%	4.33
Chatham	Port Wentworth	9,300	0	9,300		3%	1.61
Bryan	Richmond Hill	13,000	0	13,000		37%	3.70
Effingham	Rincon	10,400	0	10,400		18%	2.31
Chatham	Savannah I & D	10,500	28,600	39,100	◊	14%	6.77
Chatham	Savannah Main	169,000	0	169,000		59%	29.25
Camden	St. Marys	18,600	0	18,600		35%	2.72
Glynn	St. Simons Island	23,600	0	23,600		28%	3.99
Bulloch	Statesboro	33,000	0	33,000		45%	6.26
Chatham	Tybee Island	8,300	0	8,300		3%	1.44
	Totals	**421,000**	**28,600**	**449,600**	**-**	**-**	**77.83**

Prepared by: GJH 04/14/21

Checked by: LCT 04/19/21

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 Alternate Industrial Projection[1]	166.0 MGD
Regional Water Plan - 2050 Regional Alternate Industrial Projection[1]	196.6 MGD

Brunswick

Glynn County[2]	2015 Total Withdrawal (MGD)	2015 Total Use (MGD)	2015 Total Publicly Supplied (MGD)
Domestic	0.71	6.00	5.29
Commercial	0.06	2.40	2.34
Industrial	29.53	29.75	0.22
Water Loss	-	-	1.46
Inter-County Delivery	-	-	0.00
		Total (MGD)	9.31
		Brunswick Public Supply (MGD)[3]	3.80
		QWS's Percent of County's Public Supply (%)	41%
		QWS's Supplied Industrial Demand (MGD)	0.09
		2015 QWS Percent of Regional Industrial Demand (%)	0.05%
		2050 QWS Industrial Demand Estimate (MGD)	0.11

Garden City

Chatham County[4]	2015 Total Withdrawal (MGD)	2015 Total Use (MGD)	2015 Total Publicly Supplied (MGD)
Domestic	0.29	16.12	15.83
Commercial	0.25	5.53	5.28
Industrial	40.76	60.37	19.61
Water Loss	-	-	12.64
Inter-County Delivery	-	-	-21.70
		Total (MGD)	31.66
		Garden City Public Supply (MGD)	0.90
		QWS's Percent of County's Public Supply (%)	3%
		QWS's Supplied Industrial Demand (MGD)	0.56
		2015 QWS Percent of Regional Industrial Demand (%)	0.34%
		2050 QWS Industrial Demand Estimate (MGD)	0.66

Hinesville

Liberty County[2]	2015 Total Withdrawal (MGD)	2015 Total Use (MGD)	2015 Total Publicly Supplied (MGD)
Domestic	0.84	4.02	3.18
Commercial	0.05	0.70	0.65
Industrial	11.06	12.76	1.70
Water Loss	-	-	0.89
Inter-County Delivery	-	-	0.00
		Total (MGD)	6.42
		Hinesville Public Supply (MGD)	3.00
		QWS's Percent of County's Public Supply (%)	47%
		QWS's Supplied Industrial Demand (MGD)	0.79
		2015 QWS Percent of Regional Industrial Demand (%)	0.48%
		2050 QWS Industrial Demand Estimate (MGD)	0.94

Kingsland

Camden County[2]	2015 Total Withdrawal (MGD)	2015 Total Use (MGD)	2015 Total Publicly Supplied (MGD)
Domestic	1.07	3.68	2.61
Commercial	0.00	0.61	0.61
Industrial	0.02	0.17	0.15
Water Loss	-	-	0.57
Inter-County Delivery	-	-	0.00
		Total (MGD)	3.94
		Kingsland Public Supply (MGD)	1.55
		QWS's Percent of County's Public Supply (%)	39%
		QWS's Supplied Industrial Demand (MGD)	0.06
		2015 QWS Percent of Regional Industrial Demand (%)	0.04%
		2050 QWS Industrial Demand Estimate (MGD)	0.07

Table A-3

2015 Withdrawal and Use Data by County and 2050 Industrial Demand Estimates

Pooler

Chatham County[4]	2015 Total Withdrawal (MGD)	2015 Total Use (MGD)	2015 Total Publicly Supplied (MGD)
Domestic	0.29	16.12	15.83
Commercial	0.25	5.53	5.28
Industrial	40.76	60.37	19.61
Water Loss	-	-	12.64
Inter-County Delivery	-	-	-21.70
		Total (MGD)	31.66
		Pooler Public Supply[3]	1.96
		QWS's Percent of County's Public Supply (%)	6%
		QWS's Supplied Industrial Demand (MGD)	1.22
		2015 QWS Percent of Regional Industrial Demand (%)	0.73%
		2050 QWS Industrial Demand Estimate (MGD)	1.44

Port Wentworth

Chatham County[4]	2015 Total Withdrawal (MGD)	2015 Total Use (MGD)	2015 Total Publicly Supplied (MGD)
Domestic	0.29	16.12	15.83
Commercial	0.25	5.53	5.28
Industrial	40.76	60.37	19.61
Water Loss	-	-	12.64
Inter-County Delivery	-	-	-21.70
		Total (MGD)	31.66
		Port Wentworth Public Supply (MGD)[3]	0.90
		QWS's Percent of County's Public Supply (%)	3%
		QWS's Supplied Industrial Demand (MGD)	0.56
		2015 QWS Percent of Regional Industrial Demand (%)	0.34%
		2050 QWS Industrial Demand Estimate (MGD)	0.66

Richmond Hill

Bryan County[2]	2015 Total Withdrawal (MGD)	2015 Total Use (MGD)	2015 Total Publicly Supplied (MGD)
Domestic	0.67	3.00	2.33
Commercial	0.00	0.16	0.16
Industrial	0.00	0.00	0.00
Water Loss	-	-	0.17
Inter-County Delivery	-	-	0.00
		Total (MGD)	2.66
		Richmond Hill Public Supply (MGD)	1.28
		QWS's Percent of County's Public Supply (%)	48%
		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

Rincon

Effingham County[2]	2015 Total Withdrawal (MGD)	2015 Total Use (MGD)	2015 Total Publicly Supplied (MGD)
Domestic	1.47	5.16	3.69
Commercial	0.00	0.00	0.00
Industrial	13.90	14.38	0.48
Water Loss[5]	-	-	31.24
Inter-County Delivery[5]	-	-	-30.54
		Total (MGD)	4.87
		Rincon Public Supply (MGD)	0.79
		QWS's Percent of County's Public Supply (%)	16%
		QWS's Supplied Industrial Demand (MGD)	0.08
		2015 QWS Percent of Regional Industrial Demand (%)	0.05%
		2050 QWS Industrial Demand Estimate (MGD)	0.09

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

Savannah I & D

Chatham County[4]	2015 Total Withdrawal (MGD)	2015 Total Use (MGD)	2015 Total Publicly Supplied (MGD)
Domestic	0.29	16.12	15.83
Commercial	0.25	5.53	5.28
Industrial	40.76	60.37	19.61
Water Loss	-	-	12.64
Inter-County Delivery	-	-	-21.70
		Total (MGD)	31.66
		Savannah I & D Public Supply[3]	33.03
		QWS's Percent of County's Public Supply (%)	104%
		QWS's Supplied Industrial Demand (MGD)	20.46
		2015 QWS Percent of Regional Industrial Demand (%)	12.32%
		2050 QWS Industrial Demand Estimate (MGD)	24.23

Savannah Main

Chatham County[4]	2015 Total Withdrawal (MGD)	2015 Total Use (MGD)	2015 Total Publicly Supplied (MGD)
Domestic	0.29	16.12	15.83
Commercial	0.25	5.53	5.28
Industrial	40.76	60.37	19.61
Water Loss	-	-	12.64
Inter-County Delivery	-	-	-21.70
		Total (MGD)	31.66
		Savannah Main Public Supply (MGD)[3]	16.69
		QWS's Percent of County's Public Supply (%)	53%
		QWS's Supplied Industrial Demand (MGD)	10.34
		2015 QWS Percent of Regional Industrial Demand (%)	6.23%
		2050 QWS Industrial Demand Estimate (MGD)	12.25

St. Marys

Camden County[2]	2015 Total Withdrawal (MGD)	2015 Total Use (MGD)	2015 Total Publicly Supplied (MGD)
Domestic	1.07	3.68	2.61
Commercial	0.00	0.61	0.61
Industrial	0.02	0.17	0.15
Water Loss	-	-	0.57
Inter-County Delivery	-	-	0.00
		Total (MGD)	3.94
		St. Marys Public Supply (MGD)	1.42
		QWS's Percent of County's Public Supply (%)	36%
		QWS's Supplied Industrial Demand (MGD)	0.05
		2015 QWS Percent of Regional Industrial Demand (%)	0.03%
		2050 QWS Industrial Demand Estimate (MGD)	0.06

St. Simons Island

Glynn County[2]	2015 Total Withdrawal (MGD)	2015 Total Use (MGD)	2015 Total Publicly Supplied (MGD)
Domestic	0.71	6.00	5.29
Commercial	0.06	2.40	2.34
Industrial	29.53	29.75	0.22
Water Loss	-	-	1.46
Inter-County Delivery	-	-	0.00
		Total (MGD)	9.31
		St. Simons Island Public Supply (MGD)[3]	2.65
		QWS's Percent of County's Public Supply (%)	28%
		QWS's Supplied Industrial Demand (MGD)	0.06
		2015 QWS Percent of Regional Industrial Demand (%)	0.04%
		2050 QWS Industrial Demand Estimate (MGD)	0.07

Table A-3

2015 Withdrawal and Use Data by County and 2050 Industrial Demand Estimates

Statesboro

Bulloch County[2]	2015 Total Withdrawal (MGD)	2015 Total Use (MGD)	2015 Total Publicly Supplied (MGD)
Domestic	1.15	4.16	3.01
Commercial	0.27	1.31	1.04
Industrial	0.00	0.20	0.20
Water Loss	-	-	0.52
Inter-County Delivery	-	-	0.00
		Total (MGD)	4.77
		Statesboro Public Supply (MGD)	3.06
		QWS's Percent of County's Public Supply (%)	64%
		QWS's Supplied Industrial Demand (MGD)	0.13
		2015 QWS Percent of Regional Industrial Demand (%)	0.08%
		2050 QWS Industrial Demand Estimate (MGD)	0.15

Tybee Island

Chatham County[4]	2015 Total Withdrawal (MGD)	2015 Total Use (MGD)	2015 Total Publicly Supplied (MGD)
Domestic	0.29	16.12	15.83
Commercial	0.25	5.53	5.28
Industrial	40.76	60.37	19.61
Water Loss	-	-	12.64
Inter-County Delivery	-	-	-21.70
		Total (MGD)	31.66
		Tybee Island Public Supply (MGD)	0.78
		QWS's Percent of County's Public Supply (%)	2%
		QWS's Supplied Industrial Demand (MGD)	0.48
		2015 QWS Percent of Regional Industrial Demand (%)	0.29%
		2050 QWS Industrial Demand Estimate (MGD)	0.57

Prepared by: GJH 04/15/21

Checked by: LCT 04/19/21

Notes:

MGD - million gallons per day

QWS - qualified water system

1. Values are from the 2017 CDM Smith *Water and Wastewater Forecasting Technical Memorandum Supplemental Material, Coastal Georgia 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, are aggregated by water authority, or appear anomalous in the 2019 Painter report; instead, 2015 Total Demand values from Table 4-1 are reported.
4. Chatham County values appear slightly anomalous in the 2019 Painter report, but are reported for methodology consistency.
5. This value includes the Savannah I&D QWS because its raw water source, Abercorn Creek, is in Effingham County.

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)[2]	2050 ADD (MGD) (Water Withdrawal Only)[3]	2050 Excess Capacity (MGD)	2050 Excess Capacity Index
Glynn	Brunswick	18.6	3.8	14.8	0.74	18.6	6.5	12.1	0.46
Chatham	Garden City	4.3	0.9	3.5	0.74	4.3	2.1	2.2	0.05
Liberty	Hinesville	9.2	3.0	6.2	0.51	9.2	5.3	3.8	-0.38
Camden	Kingsland	3.8	1.6	2.2	0.31	3.8	3.3	0.5	-5.70
Chatham	Pooler	4.1	1.4	2.7	0.50	4.1	5.8	-1.7	-
Chatham	Port Wentworth	1.7	0.2	1.53	0.87	1.7	2.3	-0.5	-
Bryan	Richmond Hill	5.0	1.3	3.8	0.66	5.0	3.7	1.3	-1.77
Effingham	Rincon	1.6	0.8	0.9	0.08	1.6	2.4	-0.8	-
Chatham	Savannah I & D	62.5	33.0	22.0	-0.50	62.5	31.0	24.0	-0.29
Chatham	Savannah Main	53.8	16.7	37.1	0.55	53.8	41.5	12.3	-2.38
Camden	St. Marys	5.5	1.4	4.0	0.65	5.5	2.8	2.7	-0.04
Glynn	St. Simons Island	10.2	2.6	7.6	0.65	10.2	4.1	6.1	0.34
Bulloch	Statesboro	10.2	3.1	7.1	0.57	10.2	6.4	3.7	-0.71
Chatham	Tybee Island	2.3	0.8	1.5	0.47	2.8	2.0	0.7	-1.69
	Totals	**192.7**	**70.5**	**114.8**	**-**	**193.2**	**119.1**	**66.6**	**-**

Prepared by: GJH 04/15/21

Checked by: LCT 04/19/21

Notes:

ADD - average daily demand

MGD - million gallons per day

QWS - qualified water system

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. Tybee Island indicated a new 0.5 MGD well.

3. Municipal and publicly-supplied industrial demand by county were allocated to each QWS.

Appendix B: Water Supply Deficit Calcuations

Table B-1a
Brunswick 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 Wells 112 & 114	WTP Well 104	WTP Wells 108 & 109	WTP Well 110	All other WTPs[3]					
A. Failure of largest water treatment facility	A1. Power supply failure of largest WTP[1]	0.5	1	2.70	2.80	2.40	2.60	8.10	NA	3.58	22.18	2.80	19.38
	A2. Critical asset failure at largest WTP[2]	0.1	30	2.70	2.80	2.40	2.60	8.10	NA	NA	18.60	0.00	18.60
B. Short-term catastrophic failure of a water distribution system	Critical asset failure (transmission main)	0.1	1	2.70	2.80	2.40	2.60	8.10	NA	3.58	22.18	2.80	19.38
C. Short-term contamination of a water supply within distribution system	Contamination of distribution system triggers issuance of boil water notice	1	3	2.70	2.80	2.40	2.60	8.10	NA	NA	18.60	0.00	18.60
D. Short-term contamination of a raw water source	D1. Biological contamination of largest raw water source	0.5	1	2.70	2.80	2.40	2.60	8.10	NA	3.58	22.18	2.80	19.38
	D2. Chemical contamination of largest raw water source	0.1	1	2.70	2.80	2.40	2.60	8.10	NA	3.58	22.18	2.80	19.38
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:

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

1. WTP Well 104 does not have a backup generator, rendering full capacity loss.
2. Backup equipment is available, rendering no capacity loss.
3. Brunswick has 9 WTPs, including two emergency wells/WTPs, so all but the largest four 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

Prepared by: GJH 04/19/21
Checked by: LCT 04/22/21

Table B-1b
Brunswick 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	19.38	3.80	2.47	1.33	0.00	0.00	0.00
	A2. Critical asset failure at largest WTP	18.60	3.80	2.47	1.33	0.00	0.00	0.00
B. Short-term catastrophic failure of a water distribution system	Critical asset failure (transmission main)	19.38	3.80	2.47	1.33	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	18.60	3.80	2.47	1.33	0.00	0.00	0.00
D. Short-term contamination of a raw water source	D1. Biological contamination of largest raw water source	19.38	3.80	2.47	1.33	0.00	0.00	0.00
	D2. Chemical contamination of largest raw water source	19.38	3.80	2.47	1.33	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: GJH 04/19/21
Checked by: LCT 04/22/21

Table B-1c
Brunswick Emergency Scenario Evaluation: 2050

				Peak Day Design Capacity (MGD)									
Risk	**Scenario**	**Relative Liklihood**	**Duration (Days)**	**WTP Wells 112 & 114**	**WTP Well 104**	**WTP Wells 108 & 109**	**WTP Well 110**	**All other WTPs[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	2.70	2.80	2.40	2.60	8.10	NA	3.58	22.18	2.80	19.38
	A2. Critical asset failure at largest WTP[2]	0.1	30	2.70	2.80	2.40	2.60	8.10	NA	NA	18.60	0.00	18.60
B. Short-term catastrophic failure of a water distribution system	Critical asset failure (transmission main)	0.1	1	2.70	2.80	2.40	2.60	8.10	NA	3.58	22.18	2.80	19.38
C. Short-term contamination of a water supply within distribution system	Contamination of distribution system triggers issuance of boil water notice	1	3	2.70	2.80	2.40	2.60	8.10	NA	NA	18.60	0.00	18.60
D. Short-term contamination of a raw water source	D1. Biological contamination of largest raw water source	0.5	1	2.70	2.80	2.40	2.60	8.10	NA	3.58	22.18	2.80	19.38
	D2. Chemical contamination of largest raw water source	0.1	1	2.70	2.80	2.40	2.60	8.10	NA	3.58	22.18	2.80	19.38
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: GJH 04/19/21
Checked by: LCT 04/22/21

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

1. WTP Well 104 does not have a backup generator, rendering full capacity loss.
2. Backup equipment is available, rendering no capacity loss.
3. Brunswick has 9 WTPs, including two emergency wells/WTPs, so all but the largest four 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-1d
Brunswick 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	19.38	6.50	4.23	2.28	0.00	0.00	0.00
	A2. Critical asset failure at largest WTP	18.60	6.50	4.23	2.28	0.00	0.00	0.00
B. Short-term catastrophic failure of a water distribution system	Critical asset failure (transmission main)	19.38	6.50	4.23	2.28	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	18.60	6.50	4.23	2.28	0.00	0.00	0.00
D. Short-term contamination of a raw water source	D1. Biological contamination of largest raw water source	19.38	6.50	4.23	2.28	0.00	0.00	0.00
	D2. Chemical contamination of largest raw water source	19.38	6.50	4.23	2.28	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: GJH 04/19/21
Checked by: LCT 04/22/21

Table B-2a
Garden City 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 1	WTP Well 2	WTP Well 3	WTP Well 5					
A. Failure of largest water treatment facility	A1. Power supply failure of largest WTP[1]	0.5	1	1.25	0.62	0.94	1.54	1.13	0.73	6.21	1.04	5.17
	A2. Critical asset failure at largest WTP[2]	0.1	30	1.25	0.62	0.94	1.54	1.13	NA	5.48	0.00	5.48
B. Short-term catastrophic failure of a water distribution system	Critical asset failure (transmission main)	0.1	1	1.25	0.62	0.94	1.54	1.13	0.73	6.21	1.54	4.67
C. Short-term contamination of a water supply within distribution system	Contamination of distribution system triggers issuance of boil water notice	1.0	3	1.25	0.62	0.94	1.54	1.13	NA	5.48	0.00	5.48
D. Short-term contamination of a raw water source	D1. Biological contamination of largest raw water source	0.5	1	1.25	0.62	0.94	1.54	1.13	0.73	6.21	1.54	4.67
	D2. Chemical contamination of largest raw water source	0.1	1	1.25	0.62	0.94	1.54	1.13	0.73	6.21	1.54	4.67
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 105 has a backup generator able to supply an estimated 0.5 MGD treatment capacity, rendering partial capacity loss at the largest WTP.
2. Backup equipment is available, rendering no capacity loss.
3. Their interconnection with Savannah Main 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.

Prepared by: GJH 04/19/21
Checked by: LCT 04/22/21

Table B-2b
Garden City 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	5.17	0.90	0.58	0.31	0.00	0.00	0.00
	A2. Critical asset failure at largest WTP	5.48	0.90	0.58	0.31	0.00	0.00	0.00
B. Short-term catastrophic failure of a water distribution system	Critical asset failure (transmission main)	4.67	0.90	0.58	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	5.48	0.90	0.58	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	4.67	0.90	0.58	0.31	0.00	0.00	0.00
	D2. Chemical contamination of largest raw water source	4.67	0.90	0.58	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: GJH 04/19/21
Checked by: LCT 04/22/21

Table B-2c
Garden City 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 1	WTP Well 2	WTP Well 3	WTP Well 5					
A. Failure of largest water treatment facility	A1. Power supply failure of largest WTP[1]	0.5	1	1.25	0.62	0.94	1.54	1.13	0.73	6.21	1.04	5.17
	A2. Critical asset failure at largest WTP[2]	0.1	30	1.25	0.62	0.94	1.54	1.13	NA	5.48	0.00	5.48
B. Short-term catastrophic failure of a water distribution system	Critical asset failure (transmission main)	0.1	1	1.25	0.62	0.94	1.54	1.13	0.73	6.21	1.54	4.67
C. Short-term contamination of a water supply within distribution system	Contamination of distribution system triggers issuance of boil water notice	1.0	3	1.25	0.62	0.94	1.54	1.13	NA	5.48	0.00	5.48
D. Short-term contamination of a raw water source	D1. Biological contamination of largest raw water source	0.5	1	1.25	0.62	0.94	1.54	1.13	0.73	6.21	1.54	4.67
	D2. Chemical contamination of largest raw water source	0.1	1	1.25	0.62	0.94	1.54	1.13	0.73	6.21	1.54	4.67
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 105 has a backup generator able to supply an estimated 0.5 MGD treatment capacity, rendering partial capacity loss at the largest WTP.
2. Backup equipment is available, rendering no capacity loss.
3. The interconnection with Savannah Main is completely limited by their permit withdrawal limits and 2050 ADD.
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: GJH 04/19/21
Checked by: LCT 04/22/21

Table B-2d
Garden City 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	5.17	2.11	1.37	0.74	0.00	0.00	0.00
	A2. Critical asset failure at largest WTP	5.48	2.11	1.37	0.74	0.00	0.00	0.00
B. Short-term catastrophic failure of a water distribution system	Critical asset failure (transmission main)	4.67	2.11	1.37	0.74	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	5.48	2.11	1.37	0.74	0.00	0.00	0.00
D. Short-term contamination of a raw water source	D1. Biological contamination of largest raw water source	4.67	2.11	1.37	0.74	0.00	0.00	0.00
	D2. Chemical contamination of largest raw water source	4.67	2.11	1.37	0.74	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: GJH 04/19/21
Checked by: LCT 04/22/21

Table B-2e
Garden City 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	GA0510003-Savannah Main	Hwy 80 and Eighth St.	8	5	1.745	1.128	0.000	1.128

Prepared by: GJH 04/19/21
Checked by: LCT 04/22/21

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-3a
Hinesville 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					
A. Failure of largest water treatment facility	A1. Power supply failure of largest WTP[1]	0.5	1	0.94	3.05	2.07	3.10	NA	2.85	12.00	0.00	12.00
	A2. Critical asset failure at largest WTP[2]	0.1	30	0.94	3.05	2.07	3.10	NA	NA	9.15	0.00	9.15
B. Short-term catastrophic failure of a water distribution system	Critical asset failure (transmission main)	0.1	1	0.94	3.05	2.07	3.10	NA	2.85	12.00	3.10	8.91
C. Short-term contamination of a water supply within distribution system	Contamination of distribution system triggers issuance of boil water notice	1	3	0.94	3.05	2.07	3.10	NA	NA	9.15	0.00	9.15
D. Short-term contamination of a raw water source	D1. Biological contamination of largest raw water source	0.5	1	0.94	3.05	2.07	3.10	NA	2.85	12.00	3.10	8.91
	D2. Chemical contamination of largest raw water source	0.1	1	0.94	3.05	2.07	3.10	NA	2.85	12.00	3.10	8.91
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 107 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.
Relative liklihood scale: 1 = high; 0.5 = medium; 0.1 = low; 0.05 = negligible

Prepared by: GJH 04/19/21
Checked by: LCT 04/22/21

Table B-3b
Hinesville 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	12.00	2.99	1.95	1.05	0.00	0.00	0.00
	A2. Critical asset failure at largest WTP	9.15	2.99	1.95	1.05	0.00	0.00	0.00
B. Short-term catastrophic failure of a water distribution system	Critical asset failure (transmission main)	8.91	2.99	1.95	1.05	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	9.15	2.99	1.95	1.05	0.00	0.00	0.00
D. Short-term contamination of a raw water source	D1. Biological contamination of largest raw water source	8.91	2.99	1.95	1.05	0.00	0.00	0.00
	D2. Chemical contamination of largest raw water source	8.91	2.99	1.95	1.05	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: GJH 04/19/21
Checked by: LCT 04/22/21

Table B-3c
Hinesville 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 New Well					
A. Failure of largest water treatment facility	A1. Power supply failure of largest WTP[1]	0.5	1	0.94	3.05	2.07	3.10	unknown	NA	2.85	12.00	0.00	12.00
	A2. Critical asset failure at largest WTP[2]	0.1	30	0.94	3.05	2.07	3.10	unknown	NA	NA	9.15	0.00	9.15
B. Short-term catastrophic failure of a water distribution system	Critical asset failure (transmission main)	0.1	1	0.94	3.05	2.07	3.10	unknown	NA	2.85	12.00	3.10	8.91
C. Short-term contamination of a water supply within distribution system	Contamination of distribution system triggers issuance of boil water notice	1	3	0.94	3.05	2.07	3.10	unknown	NA	NA	9.15	0.00	9.15
D. Short-term contamination of a raw water source	D1. Biological contamination of largest raw water source	0.5	1	0.94	3.05	2.07	3.10	unknown	NA	2.85	12.00	3.10	8.91
	D2. Chemical contamination of largest raw water source	0.1	1	0.94	3.05	2.07	3.10	unknown	NA	2.85	12.00	3.10	8.91
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: GJH 04/19/21
Checked by: LCT 04/22/21

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

1. WTP 107 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. Hinesville indicated a new tank of unknown capacity.

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

Table B-3d
Hinesville 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	12.00	5.30	3.45	1.86	0.00	0.00	0.00
	A2. Critical asset failure at largest WTP	9.15	5.30	3.45	1.86	0.00	0.00	0.00
B. Short-term catastrophic failure of a water distribution system	Critical asset failure (transmission main)	8.91	5.30	3.45	1.86	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	9.15	5.30	3.45	1.86	0.00	0.00	0.00
D. Short-term contamination of a raw water source	D1. Biological contamination of largest raw water source	8.91	5.30	3.45	1.86	0.00	0.00	0.00
	D2. Chemical contamination of largest raw water source	8.91	5.30	3.45	1.86	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: GJH 04/19/21
Checked by: LCT 04/22/21

Table B-4a
Kingsland Emergency Scenario Evaluation: 2015

Risk	Scenario	Relative Liklihood	Duration (Days)	Peak Day Design Capacity (MGD) WTP 1 Wells 1 & 2	Peak Day Design Capacity (MGD) WTP 2 Wells 3 & 4	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	2.00	1.80	NA	1.05	4.85	0.00	4.85
	A2. Critical asset failure at largest WTP[2]	0.1	30	2.00	1.80	NA	NA	3.80	0.00	3.80
B. Short-term catastrophic failure of a water distribution system	Critical asset failure (transmission main)	0.1	1	2.00	1.80	NA	1.05	4.85	2.00	2.85
C. Short-term contamination of a water supply within distribution system	Contamination of distribution system triggers issuance of boil water notice	1.0	3	2.00	1.80	NA	NA	3.80	0.00	3.80
D. Short-term contamination of a raw water source	D1. Biological contamination of largest raw water source	0.5	1	2.00	1.80	NA	1.24	5.04	2.00	3.04
	D2. Chemical contamination of largest raw water source	0.1	1	2.00	1.80	NA	1.24	5.04	2.00	3.04
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

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

Prepared by: GJH 04/19/21
Checked by: LCT 04/22/21

Table B-4b
Kingsland 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	4.85	1.55	1.01	0.54	0.00	0.00	0.00
	A2. Critical asset failure at largest WTP	3.80	1.55	1.01	0.54	0.00	0.00	0.00
B. Short-term catastrophic failure of a water distribution system	Critical asset failure (transmission main)	2.85	1.55	1.01	0.54	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	3.80	1.55	1.01	0.54	0.00	0.00	0.00
D. Short-term contamination of a raw water source	D1. Biological contamination of largest raw water source	3.04	1.55	1.01	0.54	0.00	0.00	0.00
	D2. Chemical contamination of largest raw water source	3.04	1.55	1.01	0.54	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: GJH 04/19/21
Checked by: LCT 04/22/21

Table B-4c
Kingsland 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 1 Wells 1 & 2	WTP 2 Wells 3 & 4					
A. Failure of largest water treatment facility	A1. Power supply failure of largest WTP[1]	0.5	1	2.00	1.80	NA	1.05	4.85	0.00	4.85
	A2. Critical asset failure at largest WTP[2]	0.1	30	2.00	1.80	NA	NA	3.80	0.00	3.80
B. Short-term catastrophic failure of a water distribution system	Critical asset failure (transmission main)	0.1	1	2.00	1.80	NA	1.05	4.85	2.00	2.85
C. Short-term contamination of a water supply within distribution system	Contamination of distribution system triggers issuance of boil water notice	1.0	3	2.00	1.80	NA	NA	3.80	0.00	3.80
D. Short-term contamination of a raw water source	D1. Biological contamination of largest raw water source	0.5	1	2.00	1.80	NA	1.33	5.13	2.00	3.13
	D2. Chemical contamination of largest raw water source	0.1	1	2.00	1.80	NA	1.33	5.13	2.00	3.13
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 1 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. Kingsland indicated a new 0.152 MG raw water storage tank.

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

Prepared by: GJH 04/19/21
Checked by: LCT 04/22/21

Table B-4d
Kingsland 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	4.85	3.31	2.15	1.16	0.00	0.00	0.00
	A2. Critical asset failure at largest WTP	3.80	3.31	2.15	1.16	0.00	0.00	0.00
B. Short-term catastrophic failure of a water distribution system	Critical asset failure (transmission main)	2.85	3.31	2.15	1.16	0.46	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	3.80	3.31	2.15	1.16	0.00	0.00	0.00
D. Short-term contamination of a raw water source	D1. Biological contamination of largest raw water source	3.13	3.31	2.15	1.16	0.18	0.00	0.00
	D2. Chemical contamination of largest raw water source	3.13	3.31	2.15	1.16	0.18	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: GJH 04/19/21
Checked by: LCT 04/22/21

Table B-5a
Pooler Emergency Scenario Evaluation: 2015

Risk	Scenario	Relative Liklihood	Duration (Days)	Peak Day Design Capacity (MGD) WTP Well 101	WTP Well 102	WTP Well 106	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	1.77	0.87	1.44	5.08	0.15	9.31	0.00	9.31
	A2. Critical asset failure at largest WTP[2]	0.1	30	1.77	0.87	1.44	5.08	NA	9.16	0.00	9.16
B. Short-term catastrophic failure of a water distribution system	Critical asset failure (transmission main)[3]	0.1	1	1.77	0.87	1.44	5.08	0.15	9.31	2.54	6.77
C. Short-term contamination of a water supply within distribution system	Contamination of distribution system triggers issuance of boil water notice	1	3	1.77	0.87	1.44	5.08	NA	9.16	0.00	9.16
D. Short-term contamination of a raw water source	D1. Biological contamination of largest raw water source	0.5	1	1.77	0.87	1.44	5.08	0.15	9.31	1.77	7.54
	D2. Chemical contamination of largest raw water source	0.1	1	1.77	0.87	1.44	5.08	0.15	9.31	1.77	7.54
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: GJH 04/19/21
Checked by: LCT 04/22/21

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

1. The WTP for Well 101 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. Their interconnections with Savannah I&D were deemed critical assets. The maximum possible purchased water value via the largest interconnection is reported because it is greater than the largest WTP's capacity.
4. Their interconnections with Savannah I&D are not limited by their permit withdrawal limits.
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-5b
Pooler 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	9.31	1.96	1.28	0.69	0.00	0.00	0.00
	A2. Critical asset failure at largest WTP	9.16	1.96	1.28	0.69	0.00	0.00	0.00
B. Short-term catastrophic failure of a water distribution system	Critical asset failure (transmission main)	6.77	1.96	1.28	0.69	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	9.16	1.96	1.28	0.69	0.00	0.00	0.00
D. Short-term contamination of a raw water source	D1. Biological contamination of largest raw water source	7.54	1.96	1.28	0.69	0.00	0.00	0.00
	D2. Chemical contamination of largest raw water source	7.54	1.96	1.28	0.69	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: GJH 04/19/21
Checked by: LCT 04/22/21

Table B-5c
Pooler Emergency Scenario Evaluation: 2050

Risk	Scenario	Relative Liklihood	Duration (Days)	Peak Day Design Capacity (MGD) WTP Well 101	WTP Well 102	WTP Well 106	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	1.77	0.87	1.44	5.08	0.15	9.31	0.00	9.31
	A2. Critical asset failure at largest WTP[2]	0.1	30	1.77	0.87	1.44	5.08	NA	9.16	0.00	9.16
B. Short-term catastrophic failure of a water distribution system	Critical asset failure (transmission main)[3]	0.1	1	1.77	0.87	1.44	5.08	0.15	9.31	2.54	6.77
C. Short-term contamination of a water supply within distribution system	Contamination of distribution system triggers issuance of boil water notice	1	3	1.77	0.87	1.44	5.08	NA	9.16	0.00	9.16
D. Short-term contamination of a raw water source	D1. Biological contamination of largest raw water source	0.5	1	1.77	0.87	1.44	5.08	0.15	9.31	1.77	7.54
	D2. Chemical contamination of largest raw water source	0.1	1	1.77	0.87	1.44	5.08	0.15	9.31	1.77	7.54
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: GJH 04/19/21
Checked by: LCT 04/22/21

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

1. The WTP for Well 101 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. Their interconnections with Savannah I&D were deemed critical assets. The maximum possible purchased water value via the largest interconnection is reported because it is greater than the largest WTP's capacity.
4. Their interconnections with Savannah I&D are not limited by their permit withdrawal limits.
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-5d
Pooler 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	9.31	5.77	3.75	2.02	0.00	0.00	0.00
	A2. Critical asset failure at largest WTP	9.16	5.77	3.75	2.02	0.00	0.00	0.00
B. Short-term catastrophic failure of a water distribution system	Critical asset failure (transmission main)	6.77	5.77	3.75	2.02	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	9.16	5.77	3.75	2.02	0.00	0.00	0.00
D. Short-term contamination of a raw water source	D1. Biological contamination of largest raw water source	7.54	5.77	3.75	2.02	0.00	0.00	0.00
	D2. Chemical contamination of largest raw water source	7.54	5.77	3.75	2.02	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: GJH 04/19/21
Checked by: LCT 04/22/21

Table B-5e
Pooler 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	GA0510004-Savannah I&D	Benton Blvd.	12	5	3.927	2.538	0.304	2.538
3	GA0510004-Savannah I&D	Triple B Trail	12	5	3.927	2.538	0.304	2.538

Prepared by: GJH 04/19/21
Checked by: LCT 04/23/21

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. Purchased water (0.608 MGD) was assumed to be distributed equally between the two interconnections.
3. The QWS reported 3 MGD as the maximum possible purchased water for each interconnection. The more conservative values were chosen.

Table B-6a
Port Wentworth Emergency Scenario Evaluation: 2015

Risk	Scenario	Relative Liklihood	Duration (Days)	Peak Day Design Capacity (MGD)		Maximum Possible Purchased Water (MGD)[4]	Water Storage (MGD)[5]	Total Possible Water Supply (MGD)	Capacity Loss (MGD)	Available Water Supply (MGD)
				WTP Wells 1 & 2	WTP Well 3					
A. Failure of largest water treatment facility	A1. Power supply failure of largest WTP[1]	0.5	1	1.15	0.58	2.68	0.48	4.89	0.00	4.89
	A2. Critical asset failure at largest WTP[2]	0.1	30	1.15	0.58	2.68	NA	4.41	0.00	4.41
B. Short-term catastrophic failure of a water distribution system	Critical asset failure (transmission main)[3]	0.1	1	1.15	0.58	2.68	0.48	4.89	1.43	3.46
C. Short-term contamination of a water supply within distribution system	Contamination of distribution system triggers issuance of boil water notice	1	3	1.15	0.58	2.68	NA	4.41	0.00	4.41
D. Short-term contamination of a raw water source	D1. Biological contamination of largest raw water source	0.5	1	1.15	0.58	2.68	0.48	4.89	1.15	3.73
	D2. Chemical contamination of largest raw water source	0.1	1	1.15	0.58	2.68	0.48	4.89	1.15	3.73
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: GJH 04/19/21
Checked by: LCT 04/22/21

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 treatment capacity, rendering no capacity loss.
2. Backup equipment is available at the WTP for Well 1 and Well 2, rendering no capacity loss.
3. Their interconnections with Savannah I&D were deemed critical assets. The maximum possible purchased water value via the largest interconnection is reported because it is greater than the largest WTP's capacity.
4. Their interconnections with Savannah I&D are not limited by their permit withdrawal limits.
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-6b
Port Wentworth 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	4.89	0.90	0.58	0.31	0.00	0.00	0.00
	A2. Critical asset failure at largest WTP	4.41	0.90	0.58	0.31	0.00	0.00	0.00
B. Short-term catastrophic failure of a water distribution system	Critical asset failure (transmission main)	3.46	0.90	0.58	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	4.41	0.90	0.58	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	3.73	0.90	0.58	0.31	0.00	0.00	0.00
	D2. Chemical contamination of largest raw water source	3.73	0.90	0.58	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: GJH 04/19/21
Checked by: LCT 04/22/21

Table B-6c
Port Wentworth Emergency Scenario Evaluation: 2050

Risk	Scenario	Relative Liklihood	Duration (Days)	Peak Day Design Capacity (MGD)		Maximum Possible Purchased Water (MGD)[4]	Water Storage (MGD)[5]	Total Possible Water Supply (MGD)	Capacity Loss (MGD)	Available Water Supply (MGD)
				WTP Wells 1 & 2	WTP Well 3					
A. Failure of largest water treatment facility	A1. Power supply failure of largest WTP[1]	0.5	1	1.15	0.58	2.68	0.48	4.89	0.00	4.89
	A2. Critical asset failure at largest WTP[2]	0.1	30	1.15	0.58	2.68	NA	4.41	0.00	4.41
B. Short-term catastrophic failure of a water distribution system	Critical asset failure (transmission main)[3]	0.1	1	1.15	0.58	2.68	0.48	4.89	1.43	3.46
C. Short-term contamination of a water supply within distribution system	Contamination of distribution system triggers issuance of boil water notice	1	3	1.15	0.58	2.68	NA	4.41	0.00	4.41
D. Short-term contamination of a raw water source	D1. Biological contamination of largest raw water source	0.5	1	1.15	0.58	2.68	0.48	4.89	1.15	3.73
	D2. Chemical contamination of largest raw water source	0.1	1	1.15	0.58	2.68	0.48	4.89	1.15	3.73
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: GJH 04/19/21
Checked by: LCT 04/22/21

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 treatment capacity, rendering no capacity loss.
2. Backup equipment is available at the WTP for Well 1 and Well 2, rendering no capacity loss.
3. Their interconnections with Savannah I&D were deemed critical assets. The maximum possible purchased water value via the largest interconnection is reported because it is greater than the largest WTP's capacity.
4. Their interconnections with Savannah I&D are not limited by their permit withdrawal limits.
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-6d
Port Wentworth 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	4.89	2.27	1.62	0.79	0.00	0.00	0.00
	A2. Critical asset failure at largest WTP	4.41	2.27	1.62	0.79	0.00	0.00	0.00
B. Short-term catastrophic failure of a water distribution system	Critical asset failure (transmission main)	3.46	2.27	1.62	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	4.41	2.27	1.62	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	3.73	2.27	1.62	0.79	0.00	0.00	0.00
	D2. Chemical contamination of largest raw water source	3.73	2.27	1.62	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.

Prepared by: GJH 04/19/21
Checked by: LCT 04/22/21

Table B-6e
Port Wentworth 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]
4	GA0510004-Savannah I&D	Sonny Dixon Interchange & Highway 21	9	5	2.209	1.428	0.235	1.428
5	GA0510004-Savannah I&D	State Highway 30 & Meinhard Rd.	9	5	2.209	1.428	0.235	0.250
6	GA0510004-Savannah I&D	Clifton Blvd. & Gulf Stream Rd.	9	5	2.209	1.428	0.235	1.000

Prepared by: GJH 04/19/21
Checked by: LCT 04/22/21

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. Purchased water (0.704 MGD) was assumed to be distributed equally among the three interconnections.
3. The QWS reported maximum possible purchased water values for each interconnection. The more conservative values were chosen.

Table B-7a
Richmond Hill 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 303	WTP Well 304	WTP Well 305	WTP Well 306					
A. Failure of largest water treatment facility	A1. Power supply failure of largest WTP[1]	0.5	1	1.01	1.58	0.72	1.73	NA	0.18	5.22	0.00	5.22
	A2. Critical asset failure at largest WTP[2]	0.1	30	1.01	1.58	0.72	1.73	NA	NA	5.04	0.00	5.04
B. Short-term catastrophic failure of a water distribution system	Critical asset failure (transmission main)	0.1	1	1.01	1.58	0.72	1.73	NA	0.18	5.22	1.73	3.49
C. Short-term contamination of a water supply within distribution system	Contamination of distribution system triggers issuance of boil water notice	1	3	1.01	1.58	0.72	1.73	NA	NA	5.04	0.00	5.04
D. Short-term contamination of a raw water source	D1. Biological contamination of largest raw water source	0.5	1	1.01	1.58	0.72	1.73	NA	0.18	5.22	1.73	3.49
	D2. Chemical contamination of largest raw water source	0.1	1	1.01	1.58	0.72	1.73	NA	0.18	5.22	1.73	3.49
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: GJH 04/19/21
Checked by: LCT 04/23/21

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

1. The WTP for Well 306 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.
Relative liklihood scale: 1 = high; 0.5 = medium; 0.1 = low; 0.05 = negligible

Table B-7b
Richmond Hill 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	5.22	1.27	0.83	0.29	0.00	0.00	0.00
	A2. Critical asset failure at largest WTP	5.04	1.27	0.83	0.29	0.00	0.00	0.00
B. Short-term catastrophic failure of a water distribution system	Critical asset failure (transmission main)	3.49	1.27	0.83	0.29	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	5.04	1.27	0.83	0.29	0.00	0.00	0.00
D. Short-term contamination of a raw water source	D1. Biological contamination of largest raw water source	3.49	1.27	0.83	0.29	0.00	0.00	0.00
	D2. Chemical contamination of largest raw water source	3.49	1.27	0.83	0.29	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: GJH 04/19/21
Checked by: LCT 04/22/21

Table B-7c
Richmond Hill 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 303	WTP Well 304	WTP Well 305	WTP Well 306					
A. Failure of largest water treatment facility	A1. Power supply failure of largest WTP[1]	0.5	1	1.01	1.58	0.72	1.73	NA	0.48	5.52	0.00	5.52
	A2. Critical asset failure at largest WTP[2]	0.1	30	1.01	1.58	0.72	1.73	NA	NA	5.04	0.00	5.04
B. Short-term catastrophic failure of a water distribution system	Critical asset failure (transmission main)	0.1	1	1.01	1.58	0.72	1.73	NA	0.48	5.52	1.73	3.79
C. Short-term contamination of a water supply within distribution system	Contamination of distribution system triggers issuance of boil water notice	1	3	1.01	1.58	0.72	1.73	NA	NA	5.04	0.00	5.04
D. Short-term contamination of a raw water source	D1. Biological contamination of largest raw water source	0.5	1	1.01	1.58	0.72	1.73	NA	0.48	5.52	1.73	3.79
	D2. Chemical contamination of largest raw water source	0.1	1	1.01	1.58	0.72	1.73	NA	0.48	5.52	1.73	3.79
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:

Prepared by: GJH 04/19/21
Checked by: LCT 04/23/21

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

1. The WTP for Well 306 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.
Relative liklihood scale: 1 = high; 0.5 = medium; 0.1 = low; 0.05 = negligible

Table B-7d
Richmond Hill 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	5.52	3.70	1.30	1.30	0.00	0.00	0.00
	A2. Critical asset failure at largest WTP	5.04	3.70	1.30	1.30	0.00	0.00	0.00
B. Short-term catastrophic failure of a water distribution system	Critical asset failure (transmission main)	3.79	3.70	1.30	1.30	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	5.04	3.70	1.30	1.30	0.00	0.00	0.00
D. Short-term contamination of a raw water source	D1. Biological contamination of largest raw water source	3.79	3.70	1.30	1.30	0.00	0.00	0.00
	D2. Chemical contamination of largest raw water source	3.79	3.70	1.30	1.30	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: GJH 04/19/21
Checked by: LCT 04/22/21

Table B-8a
Rincon Emergency Scenario Evaluation: 2015

Risk	Scenario	Relative Liklihood	Duration (Days)	Peak Day Design Capacity (MGD) WTP Well 103	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	0.32	0.32	1.00	0.50	0.30	2.44	0.00	2.44
	A2. Critical asset failure at largest WTP[2]	0.1	30	0.32	0.32	1.00	0.50	NA	2.14	0.00	2.14
B. Short-term catastrophic failure of a water distribution system	Critical asset failure (transmission main)	0.1	1	0.32	0.32	1.00	0.50	0.30	2.44	1.00	1.44
C. Short-term contamination of a water supply within distribution system	Contamination of distribution system triggers issuance of boil water notice	1	3	0.32	0.32	1.00	0.50	NA	2.14	0.00	2.14
D. Short-term contamination of a raw water source	D1. Biological contamination of largest raw water source	0.5	1	0.32	0.32	1.00	0.50	0.30	2.44	1.00	1.44
	D2. Chemical contamination of largest raw water source	0.1	1	0.32	0.32	1.00	0.50	0.30	2.44	1.00	1.44
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: GJH 04/19/21
Checked by: LCT 04/23/21

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. Their interconnection with Effingham County is not limited by Effingham County's combined purchases and 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-8b
Rincon 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	2.44	0.81	0.53	0.28	0.00	0.00	0.00
	A2. Critical asset failure at largest WTP	2.14	0.81	0.53	0.28	0.00	0.00	0.00
B. Short-term catastrophic failure of a water distribution system	Critical asset failure (transmission main)	1.44	0.81	0.53	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	2.14	0.81	0.53	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	1.44	0.81	0.53	0.28	0.00	0.00	0.00
	D2. Chemical contamination of largest raw water source	1.44	0.81	0.53	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: GJH 04/19/21
Checked by: LCT 04/22/21

Table B-8c
Rincon 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 103	WTP Well 104	WTP Well 105					
A. Failure of largest water treatment facility	A1. Power supply failure of largest WTP[1]	0.5	1	0.32	0.32	1.00	0.50	0.30	2.44	0.00	2.44
	A2. Critical asset failure at largest WTP[2]	0.1	30	0.32	0.32	1.00	0.50	NA	2.14	0.00	2.14
B. Short-term catastrophic failure of a water distribution system	Critical asset failure (transmission main)	0.1	1	0.32	0.32	1.00	0.50	0.30	2.44	1.00	1.44
C. Short-term contamination of a water supply within distribution system	Contamination of distribution system triggers issuance of boil water notice	1	3	0.32	0.32	1.00	0.50	NA	2.14	0.00	2.14
D. Short-term contamination of a raw water source	D1. Biological contamination of largest raw water source	0.5	1	0.32	0.32	1.00	0.50	0.30	2.44	1.00	1.44
	D2. Chemical contamination of largest raw water source	0.1	1	0.32	0.32	1.00	0.50	0.30	2.44	1.00	1.44
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: GJH 04/19/21
Checked by: LCT 04/23/21

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. Their interconnection with Effingham County is not limited by Effingham County's combined purchases and 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-8d
Rincon 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	2.44	2.40	1.56	0.84	0.00	0.00	0.00
	A2. Critical asset failure at largest WTP	2.14	2.40	1.56	0.84	0.26	0.00	0.00
B. Short-term catastrophic failure of a water distribution system	Critical asset failure (transmission main)	1.44	2.40	1.56	0.84	0.96	0.12	0.00
C. Short-term contamination of a water supply within distribution system	Contamination of distribution system triggers issuance of boil water notice	2.14	2.40	1.56	0.84	0.26	0.00	0.00
D. Short-term contamination of a raw water source	D1. Biological contamination of largest raw water source	1.44	2.40	1.56	0.84	0.96	0.12	0.00
	D2. Chemical contamination of largest raw water source	1.44	2.40	1.56	0.84	0.96	0.12	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: GJH 04/19/21
Checked by: LCT 04/22/21

Table B-8e
Rincon 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]
7	GA1030131-Effingham County	Sonny Dixon Interchange & Highway 21	16	3	4.189	2.707	0.024	0.500

Prepared by: GJH 04/19/21
Checked by: LCT 04/22/21

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. The QWS reported a maximum possible purchased water value. The more conservative value was chosen.

Table B-9a
Savannah I&D Emergency Scenario Evaluation: 2015

Risk	Scenario	Relative Liklihood	Duration (Days)	Peak Day Design Capacity (MGD)				Peak Permitted Withdrawal (MGD-24-hour maximum)	Maximum Possible Purchased Water (MGD)[5]	Water Storage (MGD)[6]	Total Possible Water Supply (MGD)	Capacity Loss (MGD)	Available Water Supply (MGD)
				Savannah I&D WTP	WTP Well 17[3]	WTP Well 18[3]	WTP Well 19[3]	Abercorn Creek[4]					
A. Failure of largest water treatment facility	A1. Power supply failure of largest WTP[1]	0.5	1	62.50	0.72	0.86	2.16	55.00	NA	8.82	67.56	0.00	67.56
	A2. Critical asset failure at largest WTP[2]	0.1	30	62.50	0.72	0.86	2.16	55.00	NA	NA	58.74	0.00	58.74
B. Short-term catastrophic failure of a water distribution system	Critical asset failure (transmission main)[7]	0.1	1	62.50	0.72	0.86	2.16	55.00	NA	8.82	67.56	0.00	67.56
C. Short-term contamination of a water supply within distribution system	Contamination of distribution system triggers issuance of boil water notice	1	3	62.50	0.72	0.86	2.16	55.00	NA	NA	58.74	0.00	58.74
D. Short-term contamination of a raw water source	D1. Biological contamination of largest raw water source	0.5	1	62.50	0.72	0.86	2.16	55.00	NA	10.62	69.36	55.00	14.36
	D2. Chemical contamination of largest raw water source	0.1	1	62.50	0.72	0.86	2.16	55.00	NA	10.62	69.36	55.00	14.36
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[8]							Not Applicable					
H. Water supply reduction due to drought	Raw water supply available is 40% of ADD due to drought[9]	0.1	120	62.50	0.72	0.86	2.16	55.00	NA	NA	13.21	-	13.21

Notes:

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

1. The I&D WTP has backup generators able to supply full capacity, rendering no capacity loss at the largest WTP.
2. The WTP met chemical redundancy and unit process redundancy, rendering no capacity loss.
3. This is an emergency well. One more emergency well of unknown capacity exists.
4. The smaller of the peak day design capacity and the peak permitted withdrawal value was selected for the total possible water supply calculation.
5. Details of the interconnection with Savannah Main are not known.
6. Scenarios A1 and B include treated water storage; Scenarios D1 and D2 include raw (non-reservoir) and treated water storage.
7. Two raw water transmission mains enter the WTP, indicating redundancy and rendering no capacity loss.
8. They do not have an impoundment.
9. Abercorn Creek at the withdrawal point is Strahler Stream Order 3 (not a major river).

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

Prepared by: GJH 04/19/21
Checked by: LCT 04/22/21

Table B-9b
Savannah I&D 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	67.56	33.03	21.47	11.56	0.00	0.00	0.00
	A2. Critical asset failure at largest WTP	58.74	33.03	21.47	11.56	0.00	0.00	0.00
B. Short-term catastrophic failure of a water distribution system	Critical asset failure (transmission main)	67.56	33.03	21.47	11.56	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	58.74	33.03	21.47	11.56	0.00	0.00	0.00
D. Short-term contamination of a raw water source	D1. Biological contamination of largest raw water source	14.36	33.03	21.47	11.56	18.67	7.11	0.00
	D2. Chemical contamination of largest raw water source	14.36	33.03	21.47	11.56	18.67	7.11	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	13.21	33.03	21.47	11.56	19.82	8.26	0.00

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: GJH 04/19/21
Checked by: LCT 04/22/21

Table B-9c
Savannah I&D Emergency Scenario Evaluation: 2050

				Peak Day Design Capacity (MGD)				Peak Permitted Withdrawal (MGD-24-hour maximum)					
Risk	**Scenario**	**Relative Liklihood**	**Duration (Days)**	**Savannah I&D WTP**	**WTP Well 17[3]**	**WTP Well 18[3]**	**WTP Well 19[3]**	**Abercorn Creek[4]**	**Maximum Possible Purchased Water (MGD)[5]**	**Water Storage (MGD)[6]**	**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	62.50	0.72	0.86	2.16	55.00	NA	8.82	67.56	0.00	67.56
	A2. Critical asset failure at largest WTP[2]	0.1	30	62.50	0.72	0.86	2.16	55.00	NA	NA	58.74	0.00	58.74
B. Short-term catastrophic failure of a water distribution system	Critical asset failure (transmission main)[7]	0.1	1	62.50	0.72	0.86	2.16	55.00	NA	8.82	67.56	0.00	67.56
C. Short-term contamination of a water supply within distribution system	Contamination of distribution system triggers issuance of boil water notice	1	3	62.50	0.72	0.86	2.16	55.00	NA	NA	58.74	0.00	58.74
D. Short-term contamination of a raw water source	D1. Biological contamination of largest raw water source	0.5	1	62.50	0.72	0.86	2.16	55.00	NA	10.62	69.36	55.00	14.36
	D2. Chemical contamination of largest raw water source	0.1	1	62.50	0.72	0.86	2.16	55.00	NA	10.62	69.36	55.00	14.36
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[8]							Not Applicable					
H. Water supply reduction due to drought	Raw water supply available is 40% of ADD due to drought[9]	0.1	120	62.50	0.72	0.86	2.16	55.00	NA	NA	12.40	-	12.40

Notes:

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

1. The I&D WTP has backup generators able to supply full capacity, rendering no capacity loss at the largest WTP.
2. The WTP met chemical redundancy and unit process redundancy, rendering no capacity loss.
3. This is an emergency well. One more emergency well of unknown capacity exists.
4. The smaller of the peak day design capacity and the peak permitted withdrawal value was selected for the total possible water supply calculation.
5. Details of the interconnection with Savannah Main are not known.
6. Scenarios A1 and B include treated water storage; Scenarios D1 and D2 include raw (non-reservoir) and treated water storage.
7. Two raw water transmission mains enter the WTP, indicating redundancy and rendering no capacity loss.
8. They do not have an impoundment.
9. Abercorn Creek at the withdrawal point is Strahler Stream Order 3 (not a major river).

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

Prepared by: GJH 04/19/21
Checked by: LCT 04/22/21

Table B-9d
Savannah I&D 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	67.56	31.00	20.15	10.85	0.00	0.00	0.00
	A2. Critical asset failure at largest WTP	58.74	31.00	20.15	10.85	0.00	0.00	0.00
B. Short-term catastrophic failure of a water distribution system	Critical asset failure (transmission main)	67.56	31.00	20.15	10.85	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	58.74	31.00	20.15	10.85	0.00	0.00	0.00
D. Short-term contamination of a raw water source	D1. Biological contamination of largest raw water source	14.36	31.00	20.15	10.85	16.63	5.78	0.00
	D2. Chemical contamination of largest raw water source	14.36	31.00	20.15	10.85	16.63	5.78	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	12.40	31.00	20.15	10.85	18.60	7.75	0.00

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: GJH 04/19/21
Checked by: LCT 04/22/21

Table B-10a
Savannah Main Emergency Scenario Evaluation: 2015

Risk	Scenario	Relative Liklihood	Duration (Days)	Peak Day Design Capacity (MGD)					Maximum Possible Purchased Water (MGD)[4]	Water Storage (MGD)[5]	Total Possible Water Supply (MGD)	Capacity Loss (MGD)	Available Water Supply (MGD)
				WTP Well 104	WTP Well 105	WTP Well 108	WTP Well 109	All other WTPs[3]					
A. Failure of largest water treatment facility	A1. Power supply failure of largest WTP[1]	0.5	1	4.45	5.04	4.46	4.46	35.35	NA	3.63	57.39	5.04	52.35
	A2. Critical asset failure at largest WTP[2]	0.1	30	4.45	5.04	4.46	4.46	35.35	NA	NA	53.76	0.00	53.76
B. Short-term catastrophic failure of a water distribution system	Critical asset failure (transmission main)	0.1	1	4.45	5.04	4.46	4.46	35.35	NA	3.63	57.39	5.04	52.35
C. Short-term contamination of a water supply within distribution system	Contamination of distribution system triggers issuance of boil water notice	1	3	4.45	5.04	4.46	4.46	35.35	NA	NA	53.76	0.00	53.76
D. Short-term contamination of a raw water source	D1. Biological contamination of largest raw water source	0.5	1	4.45	5.04	4.46	4.46	35.35	NA	3.63	57.39	5.04	52.35
	D2. Chemical contamination of largest raw water source	0.1	1	4.45	5.04	4.46	4.46	35.35	NA	3.63	57.39	5.04	52.35
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: GJH 04/19/21
Checked by: LCT 04/22/21

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

1. The WTP for Well 105 does not have a backup generator, rendering full capacity loss at the largest WTP.
2. Backup equipment is available, rendering no capacity loss.
3. Savannah Main has 22 wells, so all but the largest four as summarized in one column.
4. Details of the interconnection with Savannah I&D are not known.
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-10b
Savannah Main 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	52.35	16.69	10.85	5.84	0.00	0.00	0.00
	A2. Critical asset failure at largest WTP	53.76	16.69	10.85	5.84	0.00	0.00	0.00
B. Short-term catastrophic failure of a water distribution system	Critical asset failure (transmission main)	52.35	16.69	10.85	5.84	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	53.76	16.69	10.85	5.84	0.00	0.00	0.00
D. Short-term contamination of a raw water source	D1. Biological contamination of largest raw water source	52.35	16.69	10.85	5.84	0.00	0.00	0.00
	D2. Chemical contamination of largest raw water source	52.35	16.69	10.85	5.84	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: GJH 04/19/21
Checked by: LCT 04/22/21

Table B-10c
Savannah Main Emergency Scenario Evaluation: 2050

Risk	Scenario	Relative Liklihood	Duration (Days)	Peak Day Design Capacity (MGD)					Maximum Possible Purchased Water (MGD)[4]	Water Storage (MGD)[5]	Total Possible Water Supply (MGD)	Capacity Loss (MGD)	Available Water Supply (MGD)
				WTP Well 104	WTP Well 105	WTP Well 108	WTP Well 109	All other WTPs[3]					
A. Failure of largest water treatment facility	A1. Power supply failure of largest WTP[1]	0.5	1	4.45	5.04	4.46	4.46	35.35	NA	3.63	57.39	5.04	52.35
	A2. Critical asset failure at largest WTP[2]	0.1	30	4.45	5.04	4.46	4.46	35.35	NA	NA	53.76	0.00	53.76
B. Short-term catastrophic failure of a water distribution system	Critical asset failure (transmission main)	0.1	1	4.45	5.04	4.46	4.46	35.35	NA	3.63	57.39	5.04	52.35
C. Short-term contamination of a water supply within distribution system	Contamination of distribution system triggers issuance of boil water notice	1	3	4.45	5.04	4.46	4.46	35.35	NA	NA	53.76	0.00	53.76
D. Short-term contamination of a raw water source	D1. Biological contamination of largest raw water source	0.5	1	4.45	5.04	4.46	4.46	35.35	NA	3.63	57.39	5.04	52.35
	D2. Chemical contamination of largest raw water source	0.1	1	4.45	5.04	4.46	4.46	35.35	NA	3.63	57.39	5.04	52.35
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: GJH 04/19/21
Checked by: LCT 04/22/21

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

1. The WTP for Well 105 does not have a backup generator, rendering full capacity loss at the largest WTP.
2. Backup equipment is available, rendering no capacity loss.
3. Savannah Main has 22 wells, so all but the largest four as summarized in one column.
4. Details of the interconnection with Savannah I&D are not known.
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-10d
Savannah Main 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	52.35	41.50	26.98	14.53	0.00	0.00	0.00
	A2. Critical asset failure at largest WTP	53.76	41.50	26.98	14.53	0.00	0.00	0.00
B. Short-term catastrophic failure of a water distribution system	Critical asset failure (transmission main)	52.35	41.50	26.98	14.53	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	53.76	41.50	26.98	14.53	0.00	0.00	0.00
D. Short-term contamination of a raw water source	D1. Biological contamination of largest raw water source	52.35	41.50	26.98	14.53	0.00	0.00	0.00
	D2. Chemical contamination of largest raw water source	52.35	41.50	26.98	14.53	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: GJH 04/19/21
Checked by: LCT 04/22/21

Table B-11a
St. Marys Emergency Scenario Evaluation: 2015

Risk	Scenario	Relative Liklihood	Duration (Days)	Peak Day Design Capacity (MGD) WTP Well 102	WTP Well 103	WTP Well 106	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	1.15	2.02	2.30	NA	0.75	6.22	0.00	6.22
	A2. Critical asset failure at largest WTP[2]	0.1	30	1.15	2.02	2.30	NA	NA	5.47	0.00	5.47
B. Short-term catastrophic failure of a water distribution system	Critical asset failure (transmission main)	0.1	1	1.15	2.02	2.30	NA	0.75	6.22	2.30	3.92
C. Short-term contamination of a water supply within distribution system	Contamination of distribution system triggers issuance of boil water notice	1	3	1.15	2.02	2.30	NA	NA	5.47	0.00	5.47
D. Short-term contamination of a raw water source	D1. Biological contamination of largest raw water source	0.5	1	1.15	2.02	2.30	NA	0.93	6.40	2.30	4.10
	D2. Chemical contamination of largest raw water source	0.1	1	1.15	2.02	2.30	NA	0.93	6.40	2.30	4.10
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:

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

1. The WTP for Well 106 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.
Relative liklihood scale: 1 = high; 0.5 = medium; 0.1 = low; 0.05 = negligible

Prepared by: GJH 04/19/21
Checked by: LCT 04/22/21

Table B-11b
St. Marys 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	6.22	1.42	0.93	0.50	0.00	0.00	0.00
	A2. Critical asset failure at largest WTP	5.47	1.42	0.93	0.50	0.00	0.00	0.00
B. Short-term catastrophic failure of a water distribution system	Critical asset failure (transmission main)	3.92	1.42	0.93	0.50	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	5.47	1.42	0.93	0.50	0.00	0.00	0.00
D. Short-term contamination of a raw water source	D1. Biological contamination of largest raw water source	4.10	1.42	0.93	0.50	0.00	0.00	0.00
	D2. Chemical contamination of largest raw water source	4.10	1.42	0.93	0.50	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: GJH 04/19/21
Checked by: LCT 04/22/21

Table B-11c
St. Marys 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 102	WTP Well 103	WTP Well 106					
A. Failure of largest water treatment facility	A1. Power supply failure of largest WTP[1]	0.5	1	1.15	2.02	2.30	NA	0.75	6.22	0.00	6.22
	A2. Critical asset failure at largest WTP[2]	0.1	30	1.15	2.02	2.30	NA	NA	5.47	0.00	5.47
B. Short-term catastrophic failure of a water distribution system	Critical asset failure (transmission main)	0.1	1	1.15	2.02	2.30	NA	0.75	6.22	2.30	3.92
C. Short-term contamination of a water supply within distribution system	Contamination of distribution system triggers issuance of boil water notice	1	3	1.15	2.02	2.30	NA	NA	5.47	0.00	5.47
D. Short-term contamination of a raw water source	D1. Biological contamination of largest raw water source	0.5	1	1.15	2.02	2.30	NA	0.93	6.40	2.30	4.10
	D2. Chemical contamination of largest raw water source	0.1	1	1.15	2.02	2.30	NA	0.93	6.40	2.30	4.10
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:

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

1. The WTP for Well 106 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.
Relative liklihood scale: 1 = high; 0.5 = medium; 0.1 = low; 0.05 = negligible

Prepared by: GJH 04/19/21
Checked by: LCT 04/22/21

Table B-11d
St. Marys 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	6.22	2.79	1.81	0.98	0.00	0.00	0.00
	A2. Critical asset failure at largest WTP	5.47	2.79	1.81	0.98	0.00	0.00	0.00
B. Short-term catastrophic failure of a water distribution system	Critical asset failure (transmission main)	3.92	2.79	1.81	0.98	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	5.47	2.79	1.81	0.98	0.00	0.00	0.00
D. Short-term contamination of a raw water source	D1. Biological contamination of largest raw water source	4.10	2.79	1.81	0.98	0.00	0.00	0.00
	D2. Chemical contamination of largest raw water source	4.10	2.79	1.81	0.98	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: GJH 04/19/21
Checked by: LCT 04/22/21

Table B-12a

St. Simons Island 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 Wells 101 & 105	WTP Well 102	WTP Well 106	WTP Well 108	WTP Well 109					
A. Failure of largest water treatment facility	A1. Power supply failure of largest WTP[1]	0.5	1	2.10	2.10	2.10	1.20	2.70	NA	1.41	11.61	0.54	11.07
	A2. Critical asset failure at largest WTP[2]	0.1	30	2.10	2.10	2.10	1.20	2.70	NA	NA	10.20	0.00	10.20
B. Short-term catastrophic failure of a water distribution system	Critical asset failure (transmission main)	0.1	1	2.10	2.10	2.10	1.20	2.70	NA	1.41	11.61	2.70	8.91
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	2.10	1.20	2.70	NA	NA	10.20	0.00	10.20
D. Short-term contamination of a raw water source	D1. Biological contamination of largest raw water source	0.5	1	2.10	2.10	2.10	1.20	2.70	NA	1.41	11.61	2.70	8.91
	D2. Chemical contamination of largest raw water source	0.1	1	2.10	2.10	2.10	1.20	2.70	NA	1.41	11.61	2.70	8.91
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: GJH 04/19/21

Checked by: LCT 04/22/21

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

1. The WTP for Well 109 has a backup generator of unknown capacity. 80% of this WTP's peak day design capacity 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.

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

Table B-12b
St. Simons Island 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	11.07	2.65	1.72	0.93	0.00	0.00	0.00
	A2. Critical asset failure at largest WTP	10.20	2.65	1.72	0.93	0.00	0.00	0.00
B. Short-term catastrophic failure of a water distribution system	Critical asset failure (transmission main)	8.91	2.65	1.72	0.93	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	10.20	2.65	1.72	0.93	0.00	0.00	0.00
D. Short-term contamination of a raw water source	D1. Biological contamination of largest raw water source	8.91	2.65	1.72	0.93	0.00	0.00	0.00
	D2. Chemical contamination of largest raw water source	8.91	2.65	1.72	0.93	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: GJH 04/19/21
Checked by: LCT 04/22/21

Table B-12c

St. Simons Island 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 Wells 101 & 105	WTP Well 102	WTP Well 106	WTP Well 108	WTP Well 109					
A. Failure of largest water treatment facility	A1. Power supply failure of largest WTP[1]	0.5	1	2.10	2.10	2.10	1.20	2.70	NA	2.01	12.21	0.54	11.67
	A2. Critical asset failure at largest WTP[2]	0.1	30	2.10	2.10	2.10	1.20	2.70	NA	NA	10.20	0.00	10.20
B. Short-term catastrophic failure of a water distribution system	Critical asset failure (transmission main)	0.1	1	2.10	2.10	2.10	1.20	2.70	NA	2.01	12.21	2.70	9.51
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	2.10	1.20	2.70	NA	NA	10.20	0.00	10.20
D. Short-term contamination of a raw water source	D1. Biological contamination of largest raw water source	0.5	1	2.10	2.10	2.10	1.20	2.70	NA	2.01	12.21	2.70	9.51
	D2. Chemical contamination of largest raw water source	0.1	1	2.10	2.10	2.10	1.20	2.70	NA	2.01	12.21	2.70	9.51
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: GJH 04/19/21

Checked by: LCT 04/22/21

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

1. The WTP for Well 109 has a backup generator of unknown capacity. 80% of this WTP's peak day design capacity 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. The QWS indicated two new 0.5 MGD treated water storage tanks.

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

Table B-12d
St. Simons Island 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	11.67	4.07	2.64	1.42	0.00	0.00	0.00
	A2. Critical asset failure at largest WTP	10.20	4.07	2.64	1.42	0.00	0.00	0.00
B. Short-term catastrophic failure of a water distribution system	Critical asset failure (transmission main)	9.51	4.07	2.64	1.42	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	10.20	4.07	2.64	1.42	0.00	0.00	0.00
D. Short-term contamination of a raw water source	D1. Biological contamination of largest raw water source	9.51	4.07	2.64	1.42	0.00	0.00	0.00
	D2. Chemical contamination of largest raw water source	9.51	4.07	2.64	1.42	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: GJH 04/19/21
Checked by: LCT 04/22/21

Table B-13a
Statesboro 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 104	WTP Well 106	WTP Well 109	WTP Well 110	All other WTPs[3]					
A. Failure of largest water treatment facility	A1. Power supply failure of largest WTP[1]	0.5	1	1.58	1.37	2.66	2.81	1.73	NA	1.74	11.89	0.00	11.89
	A2. Critical asset failure at largest WTP[2]	0.1	30	1.58	1.37	2.66	2.81	1.73	NA	NA	10.15	0.00	10.15
B. Short-term catastrophic failure of a water distribution system	Critical asset failure (transmission main)	0.1	1	1.58	1.37	2.66	2.81	1.73	NA	1.74	11.89	2.81	9.08
C. Short-term contamination of a water supply within distribution system	Contamination of distribution system triggers issuance of boil water notice	1	3	1.58	1.37	2.66	2.81	1.73	NA	NA	10.15	0.00	10.15
D. Short-term contamination of a raw water source	D1. Biological contamination of largest raw water source	0.5	1	1.58	1.37	2.66	2.81	1.73	NA	1.74	11.89	2.81	9.08
	D2. Chemical contamination of largest raw water source	0.1	1	1.58	1.37	2.66	2.81	1.73	NA	1.74	11.89	2.81	9.08
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: GJH 04/19/21
Checked by: LCT 04/22/21

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

1. The WTP for Well 110 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. Statesboro has 6 WTPs, so the smallest two 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-13b
Statesboro 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	11.89	3.06	1.99	1.07	0.00	0.00	0.00
	A2. Critical asset failure at largest WTP	10.15	3.06	1.99	1.07	0.00	0.00	0.00
B. Short-term catastrophic failure of a water distribution system	Critical asset failure (transmission main)	9.08	3.06	1.99	1.07	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	10.15	3.06	1.99	1.07	0.00	0.00	0.00
D. Short-term contamination of a raw water source	D1. Biological contamination of largest raw water source	9.08	3.06	1.99	1.07	0.00	0.00	0.00
	D2. Chemical contamination of largest raw water source	9.08	3.06	1.99	1.07	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: GJH 04/19/21
Checked by: LCT 04/22/21

Table B-13c
Statesboro 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 104	WTP Well 106	WTP Well 109	WTP Well 110	All other WTPs[3]					
A. Failure of largest water treatment facility	A1. Power supply failure of largest WTP[1]	0.5	1	1.58	1.37	2.66	2.81	1.73	NA	1.74	11.89	0.00	11.89
	A2. Critical asset failure at largest WTP[2]	0.1	30	1.58	1.37	2.66	2.81	1.73	NA	NA	10.15	0.00	10.15
B. Short-term catastrophic failure of a water distribution system	Critical asset failure (transmission main)	0.1	1	1.58	1.37	2.66	2.81	1.73	NA	1.74	11.89	2.81	9.08
C. Short-term contamination of a water supply within distribution system	Contamination of distribution system triggers issuance of boil water notice	1	3	1.58	1.37	2.66	2.81	1.73	NA	NA	10.15	0.00	10.15
D. Short-term contamination of a raw water source	D1. Biological contamination of largest raw water source	0.5	1	1.58	1.37	2.66	2.81	1.73	NA	1.74	11.89	2.81	9.08
	D2. Chemical contamination of largest raw water source	0.1	1	1.58	1.37	2.66	2.81	1.73	NA	1.74	11.89	2.81	9.08
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: GJH 04/19/21
Checked by: LCT 04/22/21

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

1. The WTP for Well 110 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. Statesboro has 6 WTPs, so the smallest two 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-13d
Statesboro 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	11.89	6.41	4.17	2.24	0.00	0.00	0.00
	A2. Critical asset failure at largest WTP	10.15	6.41	4.17	2.24	0.00	0.00	0.00
B. Short-term catastrophic failure of a water distribution system	Critical asset failure (transmission main)	9.08	6.41	4.17	2.24	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	10.15	6.41	4.17	2.24	0.00	0.00	0.00
D. Short-term contamination of a raw water source	D1. Biological contamination of largest raw water source	9.08	6.41	4.17	2.24	0.00	0.00	0.00
	D2. Chemical contamination of largest raw water source	9.08	6.41	4.17	2.24	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: GJH 04/19/21
Checked by: LCT 04/22/21

Table B-14a
Tybee Island 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	0.77	0.72	0.77	NA	0.30	2.56	0.00	2.56
	A2. Critical asset failure at largest WTP[2]	0.1	30	0.77	0.72	0.77	NA	NA	2.26	0.00	2.26
B. Short-term catastrophic failure of a water distribution system	Critical asset failure (transmission main)	0.1	1	0.77	0.72	0.77	NA	0.30	2.56	0.77	1.79
C. Short-term contamination of a water supply within distribution system	Contamination of distribution system triggers issuance of boil water notice	1	3	0.77	0.72	0.77	NA	NA	2.26	0.00	2.26
D. Short-term contamination of a raw water source	D1. Biological contamination of largest raw water source	0.5	1	0.77	0.72	0.77	NA	0.30	2.56	0.77	1.79
	D2. Chemical contamination of largest raw water source	0.1	1	0.77	0.72	0.77	NA	0.30	2.56	0.77	1.79
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. All WTPs have 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: GJH 04/19/21
Checked by: LCT 04/22/21

Table B-14b
Tybee Island 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	2.56	0.78	0.50	0.27	0.00	0.00	0.00
	A2. Critical asset failure at largest WTP	2.26	0.78	0.50	0.27	0.00	0.00	0.00
B. Short-term catastrophic failure of a water distribution system	Critical asset failure (transmission main)	1.79	0.78	0.50	0.27	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	2.26	0.78	0.50	0.27	0.00	0.00	0.00
D. Short-term contamination of a raw water source	D1. Biological contamination of largest raw water source	1.79	0.78	0.50	0.27	0.00	0.00	0.00
	D2. Chemical contamination of largest raw water source	1.79	0.78	0.50	0.27	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: GJH 04/19/21
Checked by: LCT 04/22/21

Table B-14c
Tybee Island 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 102	WTP Well 103	WTP New Well					
A. Failure of largest water treatment facility	A1. Power supply failure of largest WTP[1]	0.5	1	0.77	0.72	0.77	0.50	NA	0.30	3.06	0.00	3.06
	A2. Critical asset failure at largest WTP[2]	0.1	30	0.77	0.72	0.77	0.50	NA	NA	2.76	0.00	2.76
B. Short-term catastrophic failure of a water distribution system	Critical asset failure (transmission main)	0.1	1	0.77	0.72	0.77	0.50	NA	0.30	3.06	0.77	2.29
C. Short-term contamination of a water supply within distribution system	Contamination of distribution system triggers issuance of boil water notice	1	3	0.77	0.72	0.77	0.50	NA	NA	2.76	0.00	2.76
D. Short-term contamination of a raw water source	D1. Biological contamination of largest raw water source	0.5	1	0.77	0.72	0.77	0.50	NA	0.30	3.06	0.77	2.29
	D2. Chemical contamination of largest raw water source	0.1	1	0.77	0.72	0.77	0.50	NA	0.30	3.06	0.77	2.29
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: GJH 04/19/21
Checked by: LCT 04/22/21

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

1. All WTPs have 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

Table B-14d
Tybee Island 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	3.06	2.01	1.31	0.70	0.00	0.00	0.00
	A2. Critical asset failure at largest WTP	2.76	2.01	1.31	0.70	0.00	0.00	0.00
B. Short-term catastrophic failure of a water distribution system	Critical asset failure (transmission main)	2.29	2.01	1.31	0.70	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	2.76	2.01	1.31	0.70	0.00	0.00	0.00
D. Short-term contamination of a raw water source	D1. Biological contamination of largest raw water source	2.29	2.01	1.31	0.70	0.00	0.00	0.00
	D2. Chemical contamination of largest raw water source	2.29	2.01	1.31	0.70	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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Checked by: LCT 04/22/21

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. In the case of a tie, the absolute score was considered, and in the case of a further tie, the lower cost per individual supplied broke the tie. 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. Project 1 worsened rank by one rank.
    b. Project 9 improved rank by one rank.
    c. All other projects maintained rank.
    d. Interpretation: this weighting adjustment yielded an overall minimal effect. Project 9 serves two water systems, so it is expected that it should improve rank (when compared to Project 1) because higher priority is given to projects that benefit multiple systems.
2. Population Benefitted weight = 3; all other criteria weights = 1
    a. Project 3 worsened rank by one rank.
    b. Project 6 worsened rank by three ranks.
    c. Projects 1, 2, 7, and 8 each improved rank by one rank.
    d. All other projects maintained rank.
    e. Interpretation: this weighting adjustment yielded a noticeable effect. Higher priority is given to projects that benefit larger populations. Except for Rincon, projects either maintained rank or were slightly adjusted. Of all the potential projects, Rincon had the lowest population served.
3. Critical Scenario Duration (days) weight = 3; all other criteria weights = 1
    a. Project 8 worsened rank by one rank.
    b. Project 7 improved rank by one rank.
    c. All other projects maintained rank.
    d. Interpretation: this weighting adjustment yielded an overall minimal effect. When comparing Projects 7 and 8, it is expected that Project 7 should improve rank because higher priority is given to projects that aid longer critical scenario durations.
4. Added Capacity as a Percent of Total Demand (%) weight = 3; all other criteria weights = 1
    a. Projects 1, 2, 3, 5, and 8 each worsened rank by one rank.
    b. Project 7 improved rank by one rank.
    c. Projects 4 and 9 each improved rank by two ranks.

   d. Project 6 maintained rank.
   e. Interpretation: this weighting adjustment yielded a noticeable effect. Higher priority is given to projects that yield a higher added capacity as a percent of total demand.
5. Cost ($) weight = 3; all other criteria weights = 1
   a. All projects maintained rank.
   b. Interpretation: the potential projects for this region are not sensitive to cost weighting.
6. Potential Environmental Impacts weight = 3; all other criteria weights = 1
   a. Project 7 worsened rank by one rank.
   b. Project 1 improved rank by one rank.
   c. All other projects maintained rank.
   d. Interpretation: this weighting adjustment yielded an overall minimal effect. This adjustment caused Project 7 to switch rank order with Project 1 because Project 7 has higher potential environmental impacts.
7. Potential System and Community Impacts weight = 3; all other criteria weights = 1
   a. Project 3 worsened rank by one rank.
   b. Project 2 improved rank by one rank.
   c. All other projects maintained rank.
   d. Interpretation: this weighting adjustment yielded an overall minimal effect. This adjustment caused Project 3 to switch rank order with Project 2 because Project 3 has slightly higher potential community impacts.
8. Excess Capacity Index weight = 3; all other criteria weights = 1
   a. All projects maintained rank.
   b. Interpretation: the potential projects for this region are not sensitive to excess capacity weighting, which is expected because all potential projects received a score of 3.

The sensitivity analysis results demonstrate that most criteria are generally insensitive to weighting. Criterion 2 and Criterion 4 are somewhat sensitive to weighting. Initially assigned weights were retained because sensitivity analysis results are meant to be informative rather than correctional.