2015 Service Delivery Plan Update: Infrastructure Element

Prepared for

Athens-Clarke County Public Utilities Department

Public Utilities
water. wastewater. conservation.

Approved by Athens-Clarke County Mayor and Commission on November 3, 2015

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Acronyms and Abbreviations

7Q10	the lowest average discharge during 7 consecutive days, occurring once every 10 years on average
AADD	average annual daily demand
ACC	Athens-Clarke County
ACCUG	Unified Government of Athens-Clarke County
BOD_5	5-day biological oxygen demand
cfs	cubic feet per second
d/D	the ratio of peak flow depth during the design storm event divided by the diameter of the pipe
GAEPD	Georgia Environmental Protection Division
GIS	geographic information system
gpd	gallons per day
GWI	groundwater infiltration
M&C	Mayor and Commission
MDD	maximum day demand
mg/L	milligrams per liter
MG	million gallons
MGD	million gallons per day
MMAD	maximum month average day
N/A	not applicable
PUD	Public Utilities Department
RDII	rainfall-derived inflow and infiltration
SDP	Service Delivery Plan
SPLOST	special-purpose local-option sales tax
SSES	sanitary sewer evaluation survey
TP	total phosphorus
UGA	University of Georgia
UV	ultraviolet
WRF	water reclamation facility
WTP	water treatment plant

SECTION 1

Introduction

The Unification Charter of the Unified Government of Athens-Clarke County (ACCUG) required a plan for providing water and wastewater services to all residents to be developed and adopted by January 14, 1995. In accordance with this requirement, the Athens-Clarke County (ACC) Public Utilities Department (PUD) developed a Service Delivery Plan (SDP) that consisted of three major elements:

- Infrastructure Element, which evaluates the water and wastewater system needs over a 20-year planning period and identifies improvements to address these needs
- Capital Improvements Element, which prioritizes the recommended improvements
- Financial Element, which outlines a schedule and financial plan for implementing the identified improvements

PUD's goal is to update the SDP on a 5-year cycle, or in response to regulatory drivers or to the adoption of updated Future Development Maps by ACC Mayor and Commission (M&C). The 2015 SDP Infrastructure Element was developed using a phased approach:

1. Review ACC PUD goals and objectives for water and wastewater service, as well as strategies to accomplish these goals (Section 1).
2. Assess existing water and wastewater system (Section 2).
3. Identify future water and wastewater system needs (Section 3) based on:
    - The official Future Development Map of ACC (adopted by M&C in February 2014) and associated population projections developed by the ACC Planning Department; and
    - An evaluation of existing infrastructure's capability to meet existing and projected future needs.
4. Identify System alternatives and improvements to address existing and future needs (Section 4).

1.1 Service Delivery Plan Goals and Objectives

The goals of the SDP, as defined by PUD, are to:

- Comply with the Unification Charter that requires ACCUG to adopt a plan to provide water and sewer services to all residents.
- Develop a plan that supports water and wastewater needs, as determined by the ACC Comprehensive Plan adopted by M&C, and associated fire protection services.
- Provide water and wastewater services to the ACC population using an infrastructure design that will protect or improve water quality, protect public investments including conservation and recreational green spaces, and avoid impacts to environmentally sensitive areas, including wetlands, buffers, and floodplains.
- Plan expansions and extensions of service according to ACC's Future Development Map, recognizing that infrastructure influences long-term development patterns.
- Support existing Watershed Protection Programs with the intent to maintain or improve water quality standards.

1.2 Water and Wastewater Service – Definition and Goals

The M&C have approved the following definitions of water and wastewater service.

Water Service is defined as the provision of treated (potable) water supply through ACC-owned, operated, and maintained transmission and distribution lines located outside of developments, along identified major roadways. Additional ACC-owned, operated, and maintained feeder and service lines will be required to establish customer connections. Feeder and service lines are typically funded by the property owner/developer and are not included in the SDP.

PUD's goal is to provide water service to all residents by expanding service in existing areas and new growth areas.

Wastewater Service is defined as the provision of wastewater collection and treatment through sewage treatment facilities, trunk and interceptor lines, and major pump stations and force mains in identified major drainage basins and specified sub-basins. Additional collector and service lines to establish individual customer connections are not included in the SDP. Privately owned individual treatment systems (septic tanks) that meet the ACC Health Department requirements may satisfy the provision for wastewater service planned for low-density development of two units per acre or less.

PUD's initial goal was to provide wastewater service to all residents; however, M&C determined that privately owned individual treatment systems (i.e., septic tanks) that meet the ACC Health Department requirements may better serve areas of low-density development. Therefore, PUD's goal for wastewater service is to provide public wastewater collection and treatment to the greatest extent practicable, based on population densities and cost-effectiveness.

1.3 Strategies to Accomplish Service Goals

To accomplish its **water service goals**, PUD will use the SDP to outline an approach to:

- Install Transmission and Distribution Lines along major roadways, especially in areas not currently served by the distribution system but are planned for growth in the Future Development Map
- Evaluate the water system based on PUD minimum pressure and velocity operating criteria
- Evaluate elevated water storage to support future needs, enhance water system operations, and sustain fire protection
- Provide water service through Feeder Lines and eliminate dead-end Feeder Lines

To accomplish its **wastewater service goals**, PUD will use the SDP to define a plan to:

- Install Trunk Lines, Interceptor Lines, and Major Pump Stations/Force Mains within the M&C approved public sewer Service Area,
- Provide wastewater service through Collector Lines to approximately 90 percent of ACC residents (approximately 10 percent of residents, located in rural land use areas, may be better served by onsite systems based on population density and cost effectiveness)
- Improve the existing system by expanding pipes, if predicted flows are greater than 75 percent of the pipe's capacity
- Provide service to the upper 200 acres of each sub-basin

- Identify and correct areas of high infiltration and inflow (groundwater and stormwater) into the system.

1.4 Implementation Guidelines

ACC PUD plans, designs, and constructs water and wastewater infrastructure with the goal of being dependable, safe, operationally efficient, and easily maintained. Throughout this process, multiple approvals are required by M&C, including project concept and design development, engineering consultant selection, preliminary construction plans, easement acquisitions, and construction bid award. As such, PUD has developed engineering guidelines/recommended practices for various phases of project implementation. These guidelines, summarized below, build upon lessons learned from past projects and from PUD's commitment to avoiding, minimizing, and mitigating environmental impacts.

1.4.1 Conceptual Planning

PUD utilizes the following guidelines during conceptual planning for water and wastewater improvements:

- The SDP provides for flexibility to deliver wastewater service. Gravity sewers are preferred as the long-term, most cost effective design option for wastewater systems. Alternative designs (including pump stations and force mains) may be considered to avoid environmentally sensitive areas or other constraints on a project-by-project basis.
- Design options for wastewater service will be evaluated during the Preliminary Engineering Design phase. The results of this evaluation will be subsequently presented to the M&C for approval.
- Pump stations, cluster septic systems, or other decentralized wastewater treatment systems may be considered as a service solution in areas where public wastewater is not available and existing developments are currently experiencing or are expected to experience septic system failures. For communities with failing septic systems, ACC PUD will develop a specific method of providing wastewater service to the subject area, though property owners are responsible for funding their connection to the wastewater system, through collector or service Lines.

1.4.2 Preliminary Engineering Design

PUD utilizes the following guidelines during the preliminary engineering design phase for water and wastewater improvements:

- Design infrastructure improvements in such a way as to avoid or minimize impacts to environmentally sensitive areas, public investments such as land conservation or recreational green spaces, and to protect the overall water quality. Proposed routes will be surveyed under the guidance of an ecologist or other environmental professional to identify these sensitive areas. Environmental impacts that cannot be avoided will be mitigated.
- Review pump station and force main design options that may apply to the project.
- Review alternative construction strategies and technologies to minimize areas of impact.
- Conduct a Public Outreach Program to solicit input from impacted property owners and the community.
- Conduct coordination meetings with ACCUG departments, the University of Georgia (UGA), and other appropriate agencies.
- Develop a funding recommendation for the project.

1.4.3 Final Engineering Design

PUD utilizes the following guidelines during the final engineering design phase for water and wastewater improvements:

- Continue the coordination of design activities with ACCUG departments, UGA, and other appropriate agencies.
- Stream crossing design goals are to:
  - Evaluate the potential to relocate aerial crossings to below the streambed.
  - Minimize impact area by using appropriate construction strategies and technologies.
  - Restore stream banks to a condition that is equal or superior to the previous existing conditions prior to construction.
  - Purchase any required mitigation credits.
- Wetlands encroachment goals are to:
  - Minimize the impact area through the evaluation and implementation of appropriate construction strategies and technologies.
  - Purchase any required mitigation credits.
- Land disturbance goals are to:
  - Minimize impact area by limiting the constructed width and length of open trenches and other excavations.
  - Use Best Management Practices for erosion, sedimentation, and pollution control in compliance with permit requirements.

1.4.4 Construction

During the construction phase, PUD not only meets permit requirements, but also places more stringent limitations on the contractor (e.g., restrictions of no more than 1,000 feet of simultaneous construction disturbance and a construction width of no more than 50 feet). PUD complies with the ACC Community Tree Management Ordinance (ACCUG Code Title 8, Chapter 8-7) and completes additional riparian restoration efforts, including grassing and tree planting where construction encroaches on protected buffers.

SECTION 2

Assessment of the Existing Water and Wastewater System

The first step of evaluating whether existing infrastructure is sufficient to meet existing and future needs is to assess the existing system. The following sections outline the PUD water and wastewater system. This will form the basis for identifying future water and wastewater needs (Section 3) and recommended improvements to meet these needs (Section 4).

2.1 History of the Water System

From the founding of the City of Athens, in 1800, to the year 1880, water supply for domestic use and fire protection was only available from wells and a limited number of cisterns in the downtown area. A private water company constructed the first water works in the city in 1880. By the early 1890s, the City of Athens terminated the private company's franchise and constructed a municipal water works. This municipal system was a filter plant with an initial capacity of 1 million gallons per day (MGD), a 175,000-gallon treated water storage tank, and 16 miles of water lines.

During the mid-1930s, the original filter plant was abandoned and a new water treatment facility was constructed at the site of the current J.G. Beacham Water Treatment Plant (WTP). The new facility had a capacity of 3 MGD and included settling basins, sand filters, and mechanical equipment for chemical dosing. The City of Athens also constructed a raw water pumping station on the North Oconee River, additional distribution lines, and an elevated storage tank. From 1950 through the 1980s, water system projects included a series of expansions and improvements to the WTP, construction of additional raw water intakes and pump stations on the North Oconee and Middle Oconee Rivers, and continuous installation of water mains and elevated storage tanks throughout ACC. During this time, water service was extended to the cities of Winterville and Bogart and to Oconee, Jackson, Madison, and Oglethorpe counties.

Before the 2015 SDP Update, major improvements to the water system were completed, including construction of new water mains throughout ACC, a new rapid mix basin, new finished water pumping, raw water pumping improvements, backup diesel generators, improved treatment process facilities, chemical storage and feed facilities, two elevated finished water storage tanks, improvements to the lagoon drain structure and embankments, and operations building remodeling. Additionally, significant improvements to the water distribution system have been made, using funds from a special-purpose local-option sales tax (SPLOST). PUD has recently replaced approximately 90 percent of water distribution lines in downtown ACC, due to age and/or condition, to improve water quality and increase fire protection. To date, water distribution lines have been constructed on every public roadway with a structure in ACC.

2.2 Existing Water System

The ACC water system today has a design capacity of 36 MGD and a permitted peak day capacity of 34.75 MGD. The system produces high quality drinking water that complies with all current federal and state standards to a majority of ACC residential, commercial, governmental, and industrial customers within its political boundaries. Approximately two percent of the population maintains private wells for water supply, and another small portion receives water from one of ten private community water

systems in operation, serving a total population of approximately 2,300 individuals[1]. The existing municipal water system, as well as the locations of the private water systems, are shown on Figure 2-1. Details of the water system are provided below.

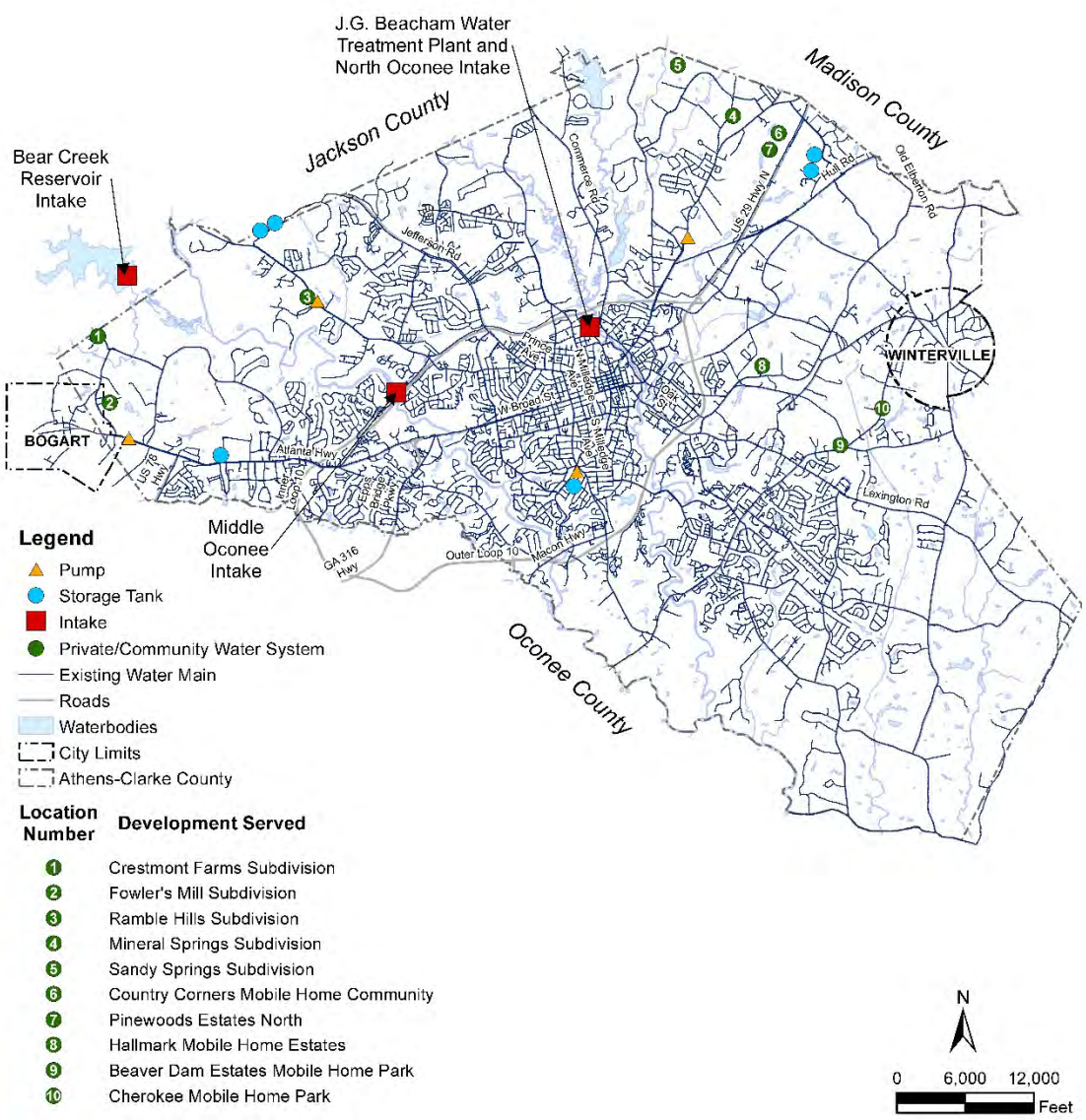


FIGURE 2-1
Existing Municipal and Private Water Systems
2015 Service Delivery Plan: Infrastructure Element

2.2.1 Water Supply

Raw water for the ACC water system is withdrawn from the North Oconee River and Middle Oconee River and, during periods of low flow, from the Bear Creek Reservoir (Figure 2-1). ACC is permitted to withdraw a total of 34.75 MGD from these sources (Table 2-1).

[1] Source: https://epd.georgia.gov/watershed-protection-branch-lists (2013)

ACC is permitted to withdraw from the North Oconee River, at the J.G. Beacham WTP, when flow is greater than the 7Q10 (i.e., the 7Q10, or the lowest average discharge during 7 consecutive days, occurring once every 10 years on average) of 31.6 cubic feet per second (cfs). ACC's permitted withdrawal from the North Oconee River is 34.75 MGD maximum day, 25.5 MGD monthly average.

ACC is permitted to withdraw from the Middle Oconee River, just upstream of U.S. Highway 29, when flow is greater than the 7Q10 (i.e., 44.4 cfs). ACC's permitted withdrawal from the Middle Oconee River is 16 MGD maximum day, 16 MGD monthly average.

The Bear Creek Reservoir was constructed in June 2002 and provides off-stream storage for ACC, as well as for Barrow, Jackson, and Oconee counties. The Bear Creek Reservoir was designed to provide low flow protection to the Middle and North Oconee Rivers and must be operated to pass flows equal to 4.0 cfs (the 7Q10 downstream of the reservoir) or greater at all times. The permitted yield of the Bear Creek Reservoir is a monthly average 58 MGD and a maximum day 79 MGD. The ACC allotment of this yield is 44 percent (i.e., monthly average 25.5 MGD and maximum day 34.75 MGD).

TABLE 2-1
Permitted Raw Water Withdrawal
2015 Service Delivery Plan: Infrastructure Element

Permitted Withdrawal (Permit Number)	Permitted Monthly Average (MGD)	Permitted Maximum Day (MGD)
Middle Oconee River (029-0304-02)	16.0	16.00
North Oconee River (029-0301-03)	25.5	34.75
Bear Creek Reservoir (078-0304-06)	25.5	34.75
Permitted Total	**N/A[a]**	**34.75[b]**

[a] The ACC water system does not have a cumulative monthly average permit limit; however they can only withdraw 25.5 mgd (monthly average) from the Bear Creek Reservoir under drought conditions, when flows in the Middle and North Oconee Rivers are less than the 7Q10.
[b] The ACC water system can withdraw raw water from three sources but can withdraw a combined maximum of 34.75 mgd (maximum day).
N/A – not applicable

2.2.2 Water Treatment

The J.G. Beacham WTP, located adjacent to the North Oconee River on Barber Street, is the only facility operated by ACC PUD for potable water treatment. The plant was originally constructed in 1935 and has been expanded and upgraded several times. In 2009, major improvements to the WTP were completed, including expansion to peak day design capacity of 36 MGD. These improvements were designed to meet future demands and to ensure performance reliability and regulatory compliance with current and future drinking water regulations. In 2011, the permitted capacity of J.G. Beacham WTP was increased to 34.75 MGD.

Figure 2-2 provides a site plan of the J.G. Beacham WTP. Note that the site plan includes the proposed location of the recommended future solids handling facility, which is discussed in Section 4. Current treatment processes include removal of suspended particles through flocculation, filtration through multimedia filters, ultraviolet (UV) disinfection, and fluoridization. Finished water is stored in the two 3.5 million gallon (MG) clearwells before being pumped to the distribution system. The WTP has a pair of 2.0-megawatt backup diesel generators that supply emergency power during outages.

Table 2-2 summarizes J.G. Beacham WTP water production between 2006 and 2013. Between 2007 and 2008, water production substantially decreased, and has since remained fairly stable. The decrease in water production can be attributed to water conservation efforts taken in response to drought conditions, as well as an economic downturn. These production values were used to develop a water use profile for ACC and associated water demands, which are discussed in more detail in Section 3.3.

TABLE 2-2
Water System Production
2015 Service Delivery Plan: Infrastructure Element

Year	Annual Average Daily Production (MGD)	Maximum Daily Production (MGD)
2006	17.2	25.4
2007	16.2	27.6
2008	13.6	18.0
2009	13.4	17.9
2010	13.1	16.8
2011	13.2	17.4
2012	12.3	15.5
2013	11.3	15.2

2.2.3 Solids Handling

Solids generated by the JG Beacham WTP are treated passively using a 3-acre, onsite lagoon. The WTP processes generate solids from two major sources: chemical precipitates that settle in the sedimentation basins, which are a result of mixing alum, lime, and potassium permanganate with raw water, and solids in the filter backwash. These solids are produced at an approximate rate of 500 pounds per million gallons of water and are discharged into the WTP's lagoon. As settlement occurs, clear water is decanted and discharged into the North Oconee River. The lagoon is periodically dredged to remove the accumulation of solids. Currently, there are no facilities at the WTP to mechanically dewater waste solids generated by the treatment process.

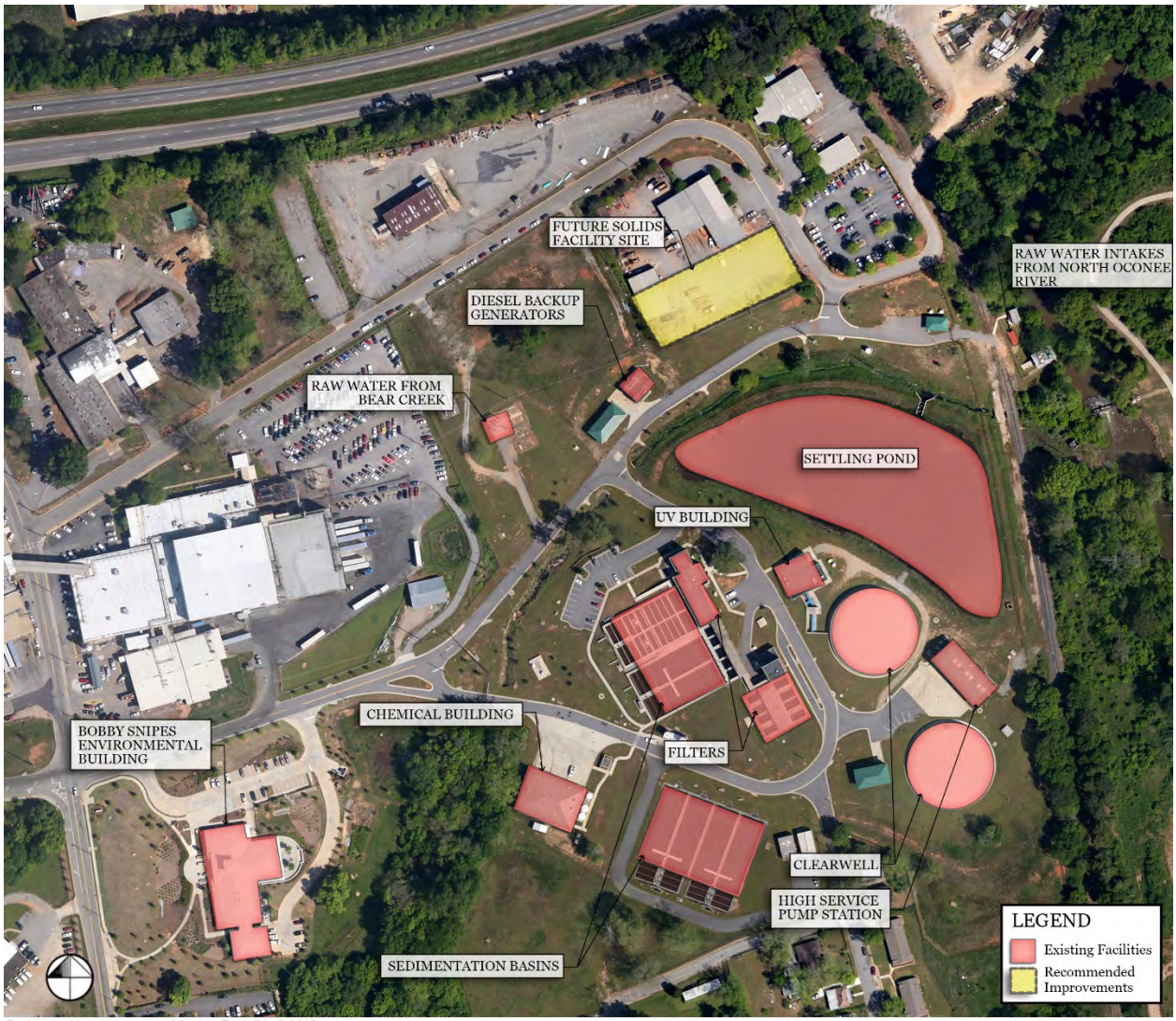
2.2.4 Water Distribution

The ACC PUD water distribution system (Figure 2-1) consists of approximately 805 miles of water lines and supplies service to approximately 40,000 customer accounts. The system consists of water transmission and distribution mains with associated feeder and service lines connecting to individual customers. The pipes range in size from 2 to 36 inches in diameter. PUD owns, maintains, and operates all of the water lines. However, feeder and service lines are typically funded by property owners or

developers; therefore, recommendations for new or improved feeder or service lines are not included in the SDP.

Five elevated storage tanks (two Northwest Tanks, two Northeast Tanks, and the Atlanta Highway Tanks) and one ground storage tank (Five Points Tank) are located throughout the system with a cumulative storage volume of 4.35 MG. Four booster pump stations service the water system. One pump station (Five Points Pump Station) is located at the ground storage tank, two pump stations (Northeast and Northwest Pump Stations) deliver water to the elevated tanks located in the northeastern and northwestern portions of the service area, and one station (Bogart Pump Station) serves the Bogart area.

The detailed hydraulic analysis of the distribution system that was completed for the 2010 SDP indicated that the existing distribution system could satisfy current residential, commercial, and industrial demands. Hydraulic analysis completed for the 2015 Update of the SDP is summarized in Section 3.3.4.



Background image courtesy of Google Earth Pro © 2015

FIGURE 2-2
JG Beacham Water Treatment Plant Site Plan
2015 Service Delivery Plan: Infrastructure Element

2.3 History of the Wastewater System

Wastewater collection sewer pipes were first installed in the City of Athens and Clarke County in the late 1880s, around the same time that the water system was being established. The first sewer pipes were installed in the downtown area of the City of Athens and were primarily constructed of vitrified clay, in 2- to 3-foot segments. Early, small-scale wastewater treatment systems included private septic tanks, oxidation ponds, and package plants. These systems were often independent from one another and scattered throughout ACC until the early 1980s.

In 1962, the City of Athens constructed a water reclamation facility (WRF) on the North Oconee River to serve its central business district and industrial areas northeast of the city. In 1964, the City constructed a second WRF on the Middle Oconee River. In 1979, the Cedar Creek WRF was constructed, primarily to treat wastewater from the southeastern portion of Clarke County. Since construction of the WRFs, several improvements have been made to wastewater infrastructure in ACC. During the 1970s, the City of Athens extended sewer inceptors to 27 oxidation ponds and package plants, some of which were not treating wastewater to current standards. Additionally, each of the three WRF facilities have been expanded or replaced. Replacement of the North Oconee WRF was completed in March 2012, and replacement of the Cedar Creek WRF was completed in July 2011. Upgrades and expansions of the Middle Oconee WRF were completed in August 2012. ACC WRF improvements included the influent pump stations, headworks facilities, advanced secondary activated sludge systems, secondary clarifiers, ultraviolet (UV) disinfection, post-aeration, aerated sludge holding, centrifuge dewatering systems, and odor control systems for each WRF.

Each of the three WRFs were initially operated to provide secondary treatment with trickling filters, with a total capacity of 9 MGD (Table 2-3). With the most recent upgrades and expansions, the combined capacity of the three facilities is 28 MGD (Table 2-3).

TABLE 2-3
Initial and Expanded Capacity of ACC WRFs
2015 Service Delivery Plan: Infrastructure Element

Water Reclamation Facility	Initial Capacity (MGD)	Expanded Capacity (MGD)
North Oconee WRF	5	14
Middle Oconee WRF	2	10
Cedar Creek WRF	2	4
Total	**9**	**28**

2.4 Existing Wastewater System

The ACC PUD currently provides wastewater collection and treatment to ACC industrial and commercial users and to approximately 75 percent of the residential population. The following sub-sections detail the ACC wastewater system, as well as private wastewater systems and areas served by private septic systems. As wastewater collection is influenced by the natural drainage of the land, a discussion of the drainage basins in ACC is provided first.

2.4.1 Drainage Basins

With the exception of a small portion in the northeastern corner (Sulphur Springs), land within ACC drains to the Oconee River Basin. Drainage basins separate ACC into 15 major drainage basins and 73 drainage sub-basins (Figure 2-3). Of the 73 sub-basins, 70 are included in either the North Oconee, Middle Oconee, or Cedar Creek drainage basins. Three sub-basins (i.e., Little Bear Creek, Sulphur Springs, and Big Creek), and portions of other sub-basins, are located in low-density development areas that have been identified as being better served by onsite septic system.

The North Oconee drainage basin includes approximately 50,000 people (based on 2010 census data) and encompasses 40 square miles. The drainage basin includes the downtown business district, UGA, and all of the major industrial districts. The Middle Oconee drainage basin includes approximately 43,000 people and encompasses 33 square miles. The drainage basin includes mostly residential and commercial developments. The population of the Cedar Creek drainage basin is nearly 22,500 people and encompasses 31 square miles. It is the least populated of the three basins and is comprised primarily of residential areas.

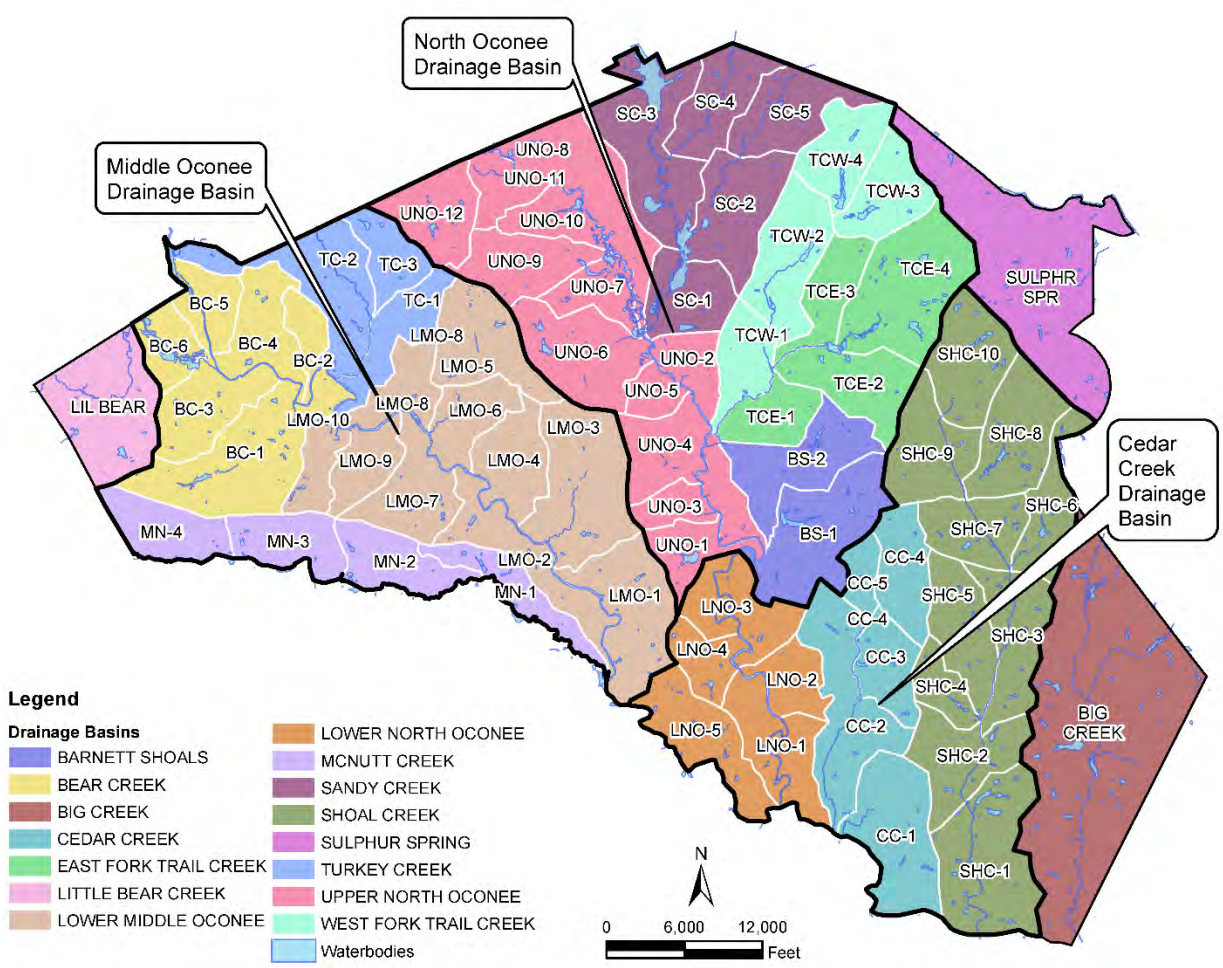


FIGURE 2-3
ACC Drainage Basins
2015 Service Delivery Plan: Infrastructure Element

2.4.2 Wastewater Collection

2.4.2.1 Public Wastewater

Wastewater Collection

ACC PUD wastewater Service Area is comprised of three major Service Areas: North Oconee, Middle Oconee, and Cedar Creek WRF Service Areas (Figure 2-4). The ACC PUD wastewater collection system consists of approximately 480 miles of gravity sewers and one pump station (Weatherly Woods Pump Station), which serves approximately 2.5 miles of force main piping. Gravity sewer pipes range in size from 6 to 54 inches in diameter and include trunk lines (i.e., pipes along the Middle Oconee, North Oconee, or Oconee River), interceptors (i.e., pipes along streams or as outfalls), and smaller collectors and service lines, which are required to establish customer connections. Because collectors and services lines are typically funded by the property owner/developers, new collector or service lines are not included as recommendations in the SDP.

Figures 2-5 through 2-7 provide the layout of the North Oconee, Middle Oconee, and Cedar Creek Service Areas, including all of the trunks, interceptors, and collectors. The North Oconee WRF Service Area includes approximately 169 miles of gravity sewer lines, ranging in size from 6 to 54 inches in diameter. The Middle Oconee WRF Service Area includes approximately 229 miles of gravity sewer, ranging in size from 6 to 42 inches in diameter. The Cedar Creek WRF Service Area was originally developed to eliminate several small treatment systems. Within the Cedar Creek WRF Service Area there are 82 miles of gravity sewer pipe ranging from 8 to 36 inches in diameter. Additionally, a pump station located at the Weatherly Woods Subdivision transfers wastewater flow via 2.5 miles of force main from the Upper Shoals Creek Basin to the Cedar Creek Interceptor.

Rainfall Derived Inflow and Infiltration and Groundwater Infiltration

In addition to wastewater collected from customers, some amount of rainfall-derived inflow and infiltration (RDII) and groundwater infiltration (GWI) into the wastewater collection system is unavoidable. Inflow refers to stormwater flow that enters manholes and gravity sewers through direct flow into the sewer from the surface. Infiltration can originate from either rainfall or groundwater. Rainfall-derived Infiltration refers to stormwater flow that filters thorough pavements or soils before entering the sewer system. In some cases, RDII may come from non-surface sources such as customer foundation drains, roof leaders, or cellar area drains. GWI refers to groundwater that enters the wastewater collection system through defective joints, broken pipes, or cracked manholes. Excessive amounts of RDII or GWI can have detrimental effects on system performance including surcharging pipes, sanitary sewer overflows, and/or increased consumption of hydraulic capacity at WRFs.

PUD conducted flow monitoring studies in 2002, 2010, and 2012 to quantify RDII and GWI in its wastewater system. Most recently, comprehensive flow monitoring in the sanitary sewer system was performed from February 2 through April 23, 2015, to evaluate dry and wet weather flow in the wastewater collection system. Capturing a significant wet weather event during the study was critical to evaluating volumes of RDII and GWI. The study utilized 51 flow meters and 10 rain gauges installed in select locations in the three major WRF service areas. Active flow monitoring occurred during dry and wet weather periods to collect sufficient data to identify dry weather flows and characterize the relationship between precipitation and sewer system flow.

Data gathered during the 2015 flow monitoring period were analyzed to identify the following for each flow meter basin: rainfall summary, average daily dry weather flow, infiltration, and inflow components

of the total flow, net RDII and GWI, hydraulic performance evaluation, and capacity indicators at each meter. Results of the analysis were used to prioritize recommended improvements to the sewer collection system, as will be discussed in Section 4.

2.4.2.2 Private Wastewater

Currently, three private oxidation ponds are in ACC (Figure 2-4), with a combined capacity of 0.14 MGD. ACC PUD has completed sewer extension projects to two of these ponds (Country Corners Mobile Home Community and Pinewoods Estates North). Extension of public sewer to the other oxidation pond, at Hallmark Mobile Home Estates, is addressed in the 2015 SDP.

2.4.2.3 Septic Systems

In areas planned for low-density development, privately owned treatment systems (septic tanks) may satisfy the provision of wastewater service. Wastewater in the remainder of the unsewered areas is treated onsite by proprietary septic systems. The area designated as the ACC Rural Zone (Figure 2-4) includes low-density development that has been identified as being better served by onsite septic systems.

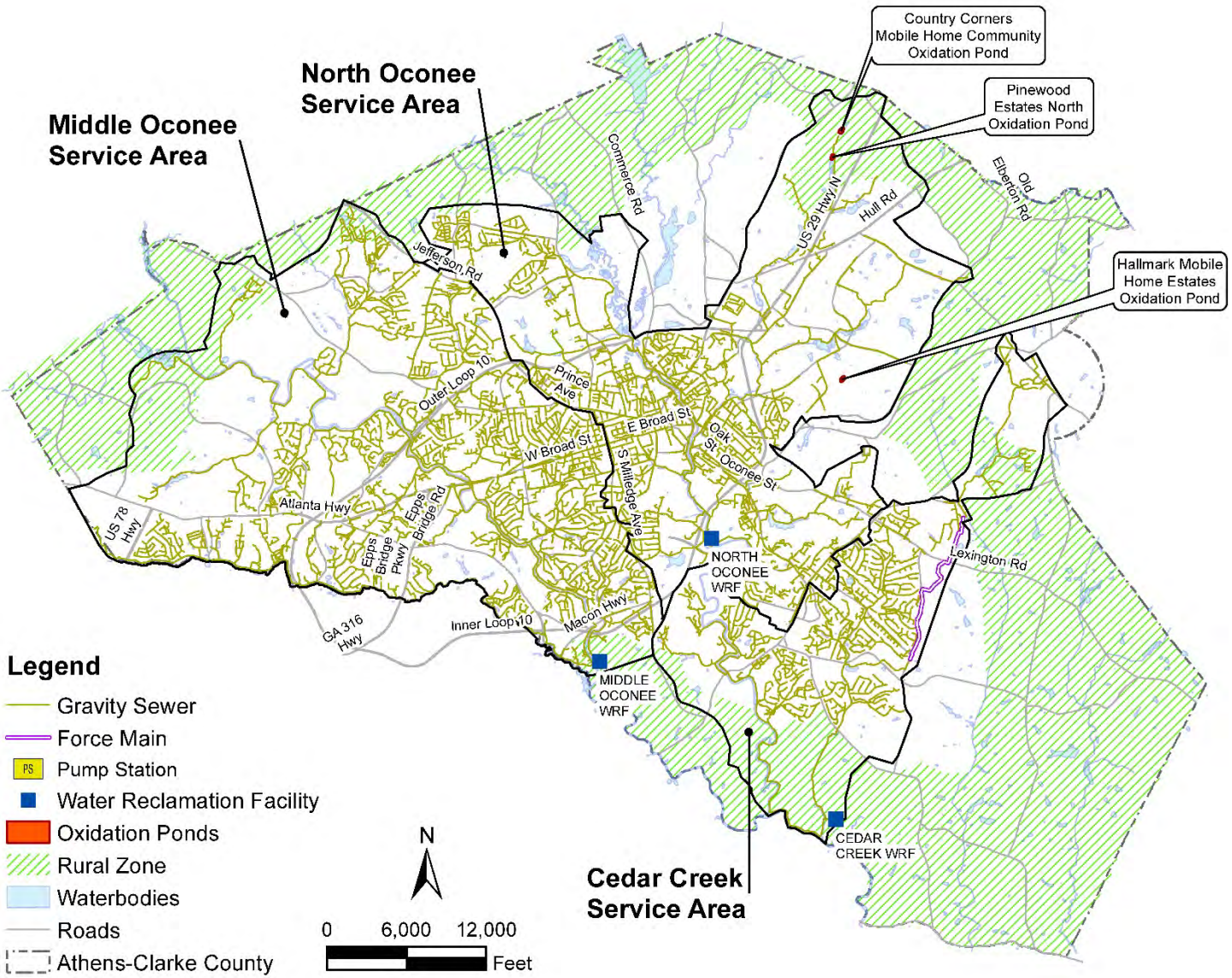


FIGURE 2-4

Existing Municipal and Private Wastewater Service Areas

2015 Service Delivery Plan: Infrastructure Element

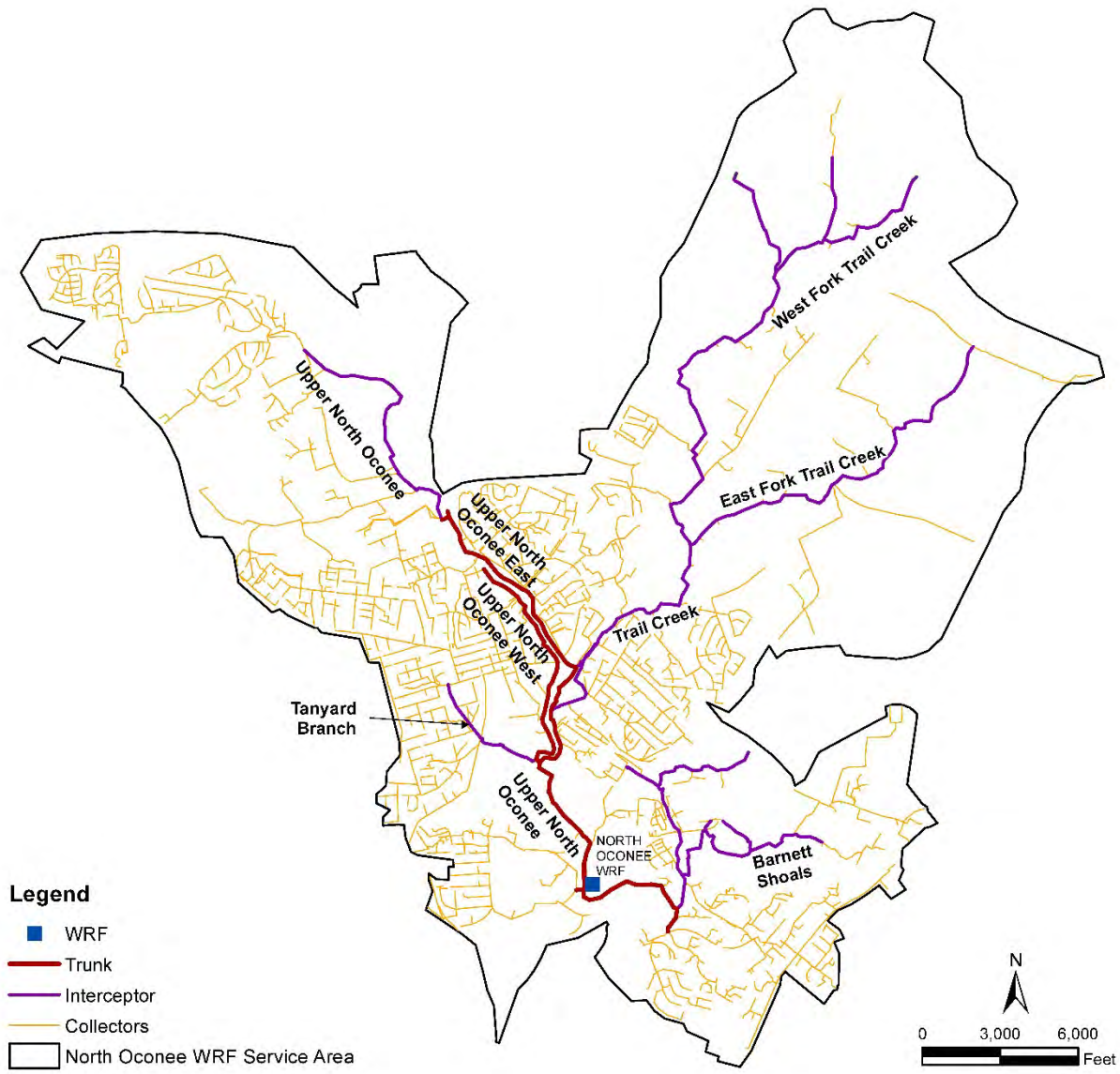


FIGURE 2-5
North Oconee WRF Service Area - Wastewater Collection System
2015 Service Delivery Plan: Infrastructure Element

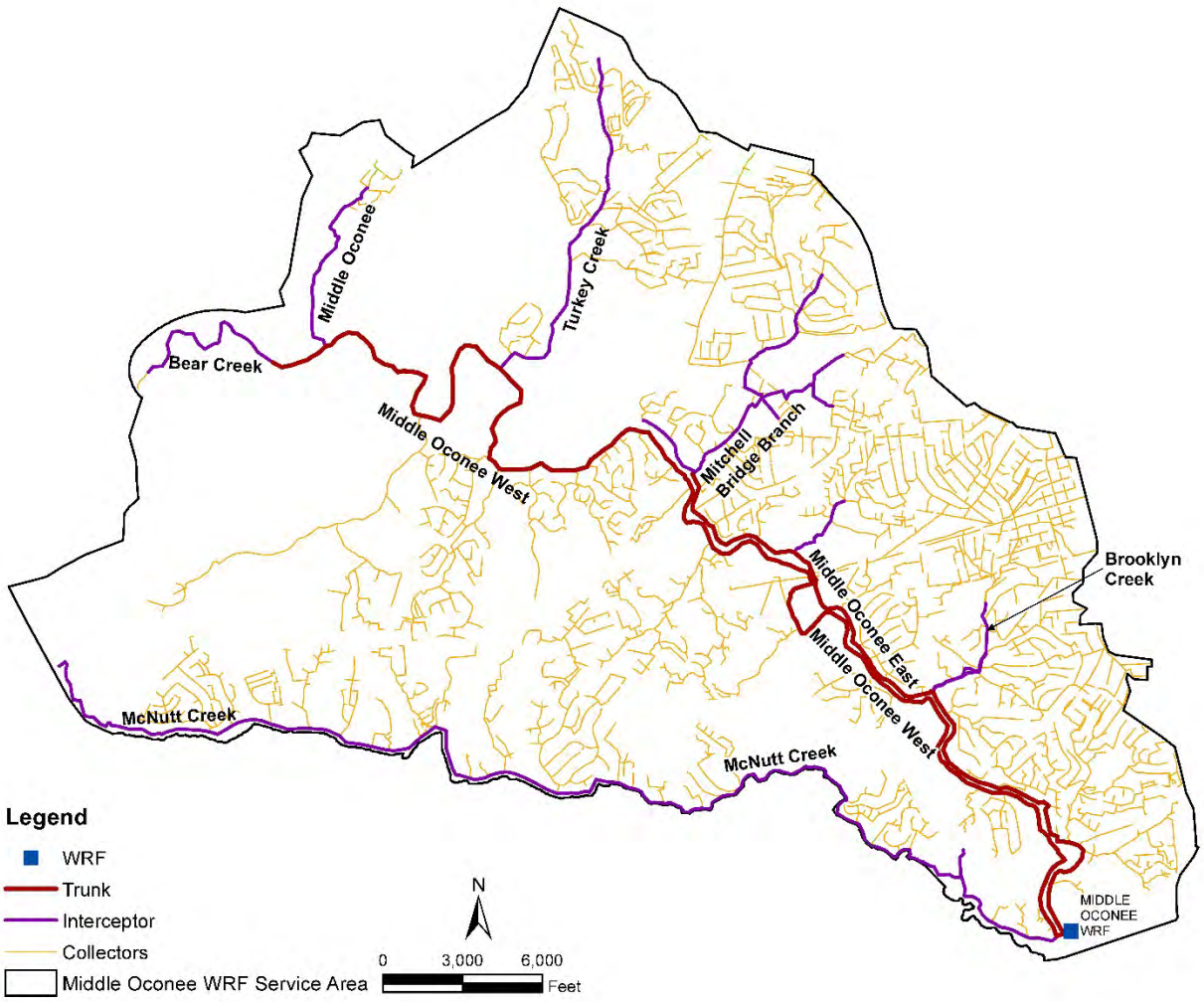


FIGURE 2-6

Middle Oconee WRF Service Area - Wastewater Collection System

2015 Service Delivery Plan: Infrastructure Element

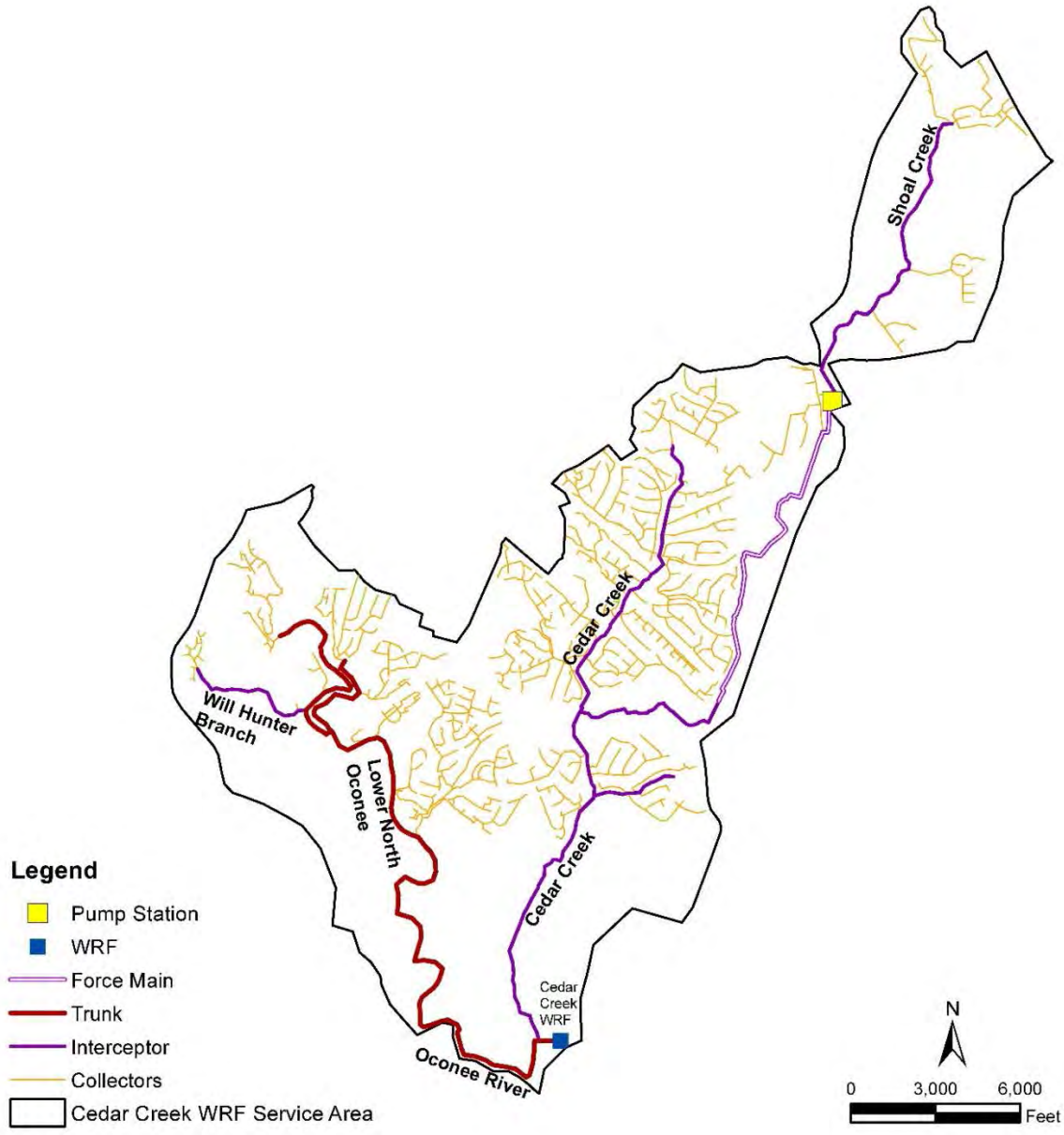


FIGURE 2-7
Cedar Creek WRF Service Area - Wastewater Collection System
2015 Service Delivery Plan: Infrastructure Element

2.4.3 Water Reclamation Facilities

The PUD maintains three WRFs, with a total capacity of 28 MGD. Following the completion of major improvements (renovations and new construction) during 2011 and 2012, the North Oconee WRF capacity is 14 MGD, Middle Oconee WRF capacity is 10 MGD, and Cedar Creek WRF capacity is 4 MGD. Overall site plans are shown on Figures 2-8 through 2-10. Note that the site plans include the proposed location of recommended projects that are identified in Section 4 of the 2015 Infrastructure Element.

All three WRFs treat wastewater using screening and grit removal; biological treatment through advanced activated sludge systems that provide biological degradation, nitrification, and phosphorus removal; settling and clarification; and UV disinfection. Cascade re-aeration is used at the North Oconee and Cedar Creek WRFs. Odor control and noise abatement systems have been implemented at each plant because of proximity to institutions and residential areas.

Each of the WRFs is regulated by the Georgia Environmental Protection Division (GAEPD). The monthly average permitted effluent limits are summarized in Table 2-4.

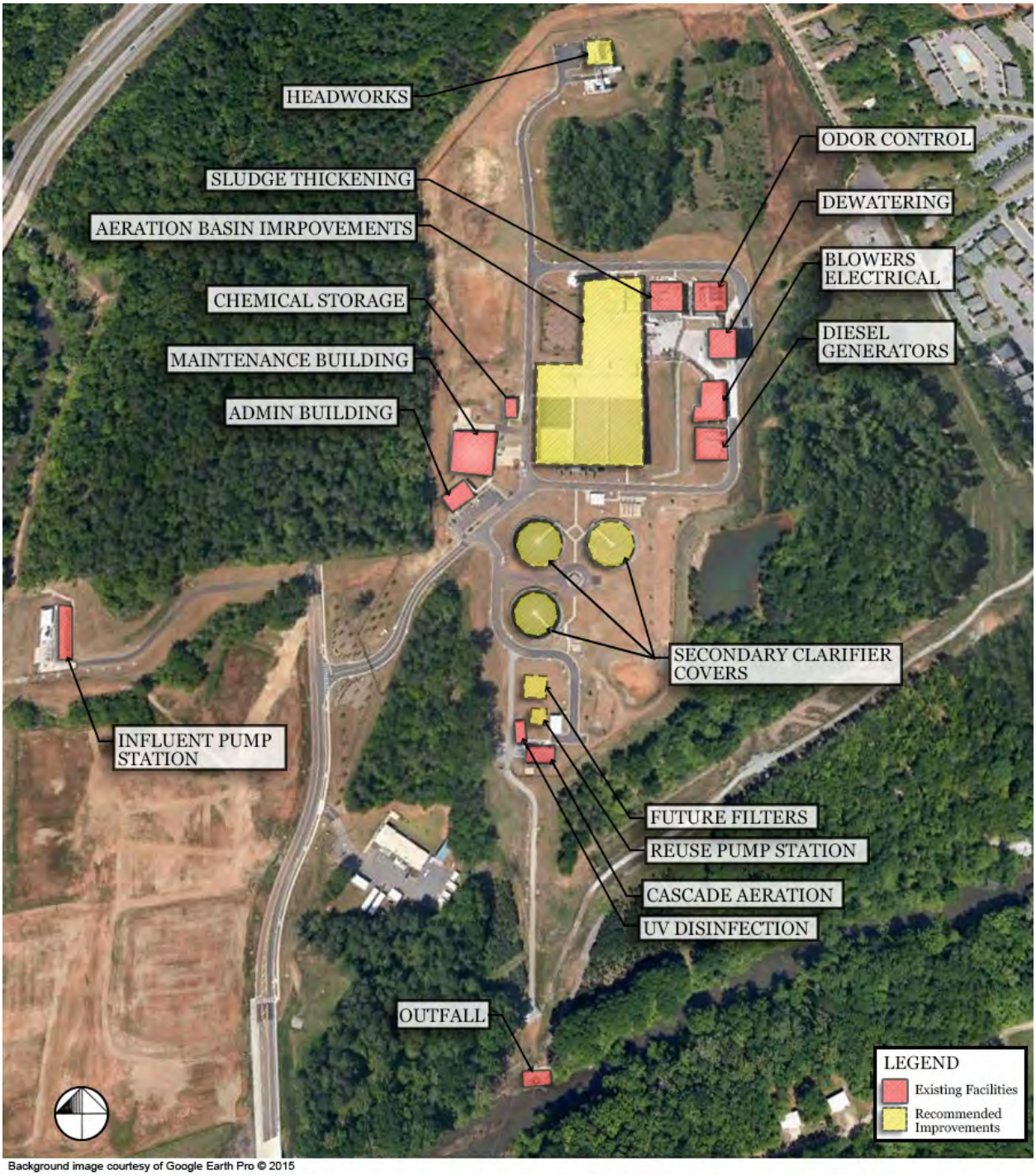
TABLE 2-4
Effluent Permit Limits
2015 Service Delivery Plan: Infrastructure Element

Parameter	North Oconee WRF	Middle Oconee WRF	Cedar Creek WRF
	Monthly Avg.	*Monthly Avg.*	*Monthly Avg.*
Receiving Waters	North Oconee River	Middle Oconee River	Oconee River
Flow (MGD)	14.0	10.0	4.0
BOD_5 (mg/L)			
May-October	8.0	20.0	21.0
November-April	30.0	30.0	30.0
Total Suspended Solids (mg/L)	20.0	20.0	20.0
Ammonia (mg/L)			
May-October	2.0	7.5	6.0
November-April	17.4	17.4	17.4
Dissolved Oxygen (mg/L)	6.0 [a]	6.0 [a]	6.0 [a]
Fecal Coliform Bacteria (#/100 mL)	200	200	200
Total Phosphorus (mg/L)	1.0	1.0	1.0

[a] Minimum value or higher. Final effluent monitored by analyzing grab samples taken seven days per week.
BOD_5 – 5-day biological oxygen demand
mg/L – milligrams per liter

2.4.4 Wastewater Solids Handling

Wastewater solids accumulated at the three WRFs are temporarily stored onsite in aerobic sludge holding tanks. The solids are centrifugally dewatered to a solids concentration of 22 to 28 percent. The current disposal method is to transport dewatered solids to the compost facility at the ACC Municipal Solid Waste Landfill. At this location, part of the solids are mixed with shredded wood waste and composted using static piles.



Background image courtesy of Google Earth Pro © 2015

FIGURE 2-8
North Oconee WRF Site Plan
2015 Service Delivery Plan: Infrastructure Element

Background image courtesy of Google Earth Pro © 2015

FIGURE 2-9
Middle Oconee WRF Site Plan
2015 Service Delivery Plan: Infrastructure Element

Background image courtesy of Google Earth Pro © 2015

FIGURE 2-10
Cedar Creek WRF Site Plan
2015 Service Delivery Plan: Infrastructure Element

SECTION 3

Identification of Future System Needs

The development of projected future water demands and wastewater flows in the ACC Service Area, including the methodology and results, is detailed in this section. Population projections and a historical water use profile provide the primary basis for future water demand and wastewater flow projections. These forecasts are a key component in identifying and evaluating future system needs. The future needs of the ACC water and wastewater systems were determined by comparing the existing system (Section 2) to PUD's service goals (Section 1) and projected future water demands and wastewater flows.

3.1 Population Projections

Projecting future conditions, or forecasting, is a critical activity to determine a water/wastewater utility's need to plan, design, and construct capital-intensive infrastructure, such as major water supply and treatment facilities. Forecasting is also an essential component of evaluating current and future capacity limitations and creating a timeline for new supplies and infrastructure needs. Future water demands and wastewater flows are typically projected through evaluation of population projections and historical system demands and flows. Therefore, the first step in forecasting future water demands and wastewater flows for the 2015 SDP Update was to project the future residential population in each of ACC's drainage basins (Figure 2-3).

For the 2015 SDP Update, the ACC Planning Department developed population projections for ACC's 73 drainage sub-basins, using the following methodology:

- Block Group level population data were converted into drainage basin areas by creating 851 unique polygons resulting from the overlay of the 2010 Census block group boundaries, drainage sub-basin boundaries, and existing zoning geographic information system (GIS) layers. Examining each of these polygons made it possible to convert block group data into basin boundary data.
- Using 2010 Census data as the statistical starting point, four separate categories of population projections (medium, high, medium-adjusted, and high-adjusted) were created for 2015, 2020, 2025, 2030, 2035, 2040, 2045, and 2050. The medium and high projections were developed by applying the uniform growth rates presented in the ACC 2008 Comprehensive Plan to the extrapolated 2010 Census date assigned to each sub-basin. The medium-adjusted and high-adjusted projections were determined by taking the existing population and the following factors into account:
    - Existing development patterns
    - Constrained lands
    - Remaining available developable land
    - Existing zoning
    - Household size and household size trends
    - Future land use classification

The high-adjusted population projection was used moving forward for developing the water demand and wastewater flow forecasts. The adjusted population projections were considered for utilization in developing the water demand and wastewater flow forecast because they represent a detailed analysis of specific development patterns and land use classifications, reflecting development potential within

each individual sub-basin. Of the two adjusted projections, the high-adjusted was selected as its higher estimate of future population yielded slightly more conservative water supply and infrastructure planning needs.

Figure 3-1 presents the change in population, from the high-adjusted projection, for the year 2035, which is the end of the planning period for the SDP. Table 3-1 summarizes the high-adjusted projected population change for each of PUD's major sewer basins, as well as unsewered areas of ACC.

Historical Census based population data provided by the ACC Planning Department indicate the overall population in ACC has been growing at a rate of approximately 1 percent annually. This trend is expected to continue, with an average annual growth of 1.2 percent projected for the next 20 years (Table 3-1). Growth in the primary service areas ranges from 1.3 percent for the Middle Oconee Drainage Basin to 0.8 percent for the Cedar Creek Basin. For these areas, the greatest increase in population is projected to be in the Middle Oconee Drainage Basin (primarily in the upper portion of the McNutt Drainage Basin, BC-1 in Bear Creek, and portions of the Lower Middle Oconee Drainage Basin), and then in the North Oconee Basin (primarily in the Trail Creek West sub-basins and downtown ACC [UNO-4 and UNO-5]).

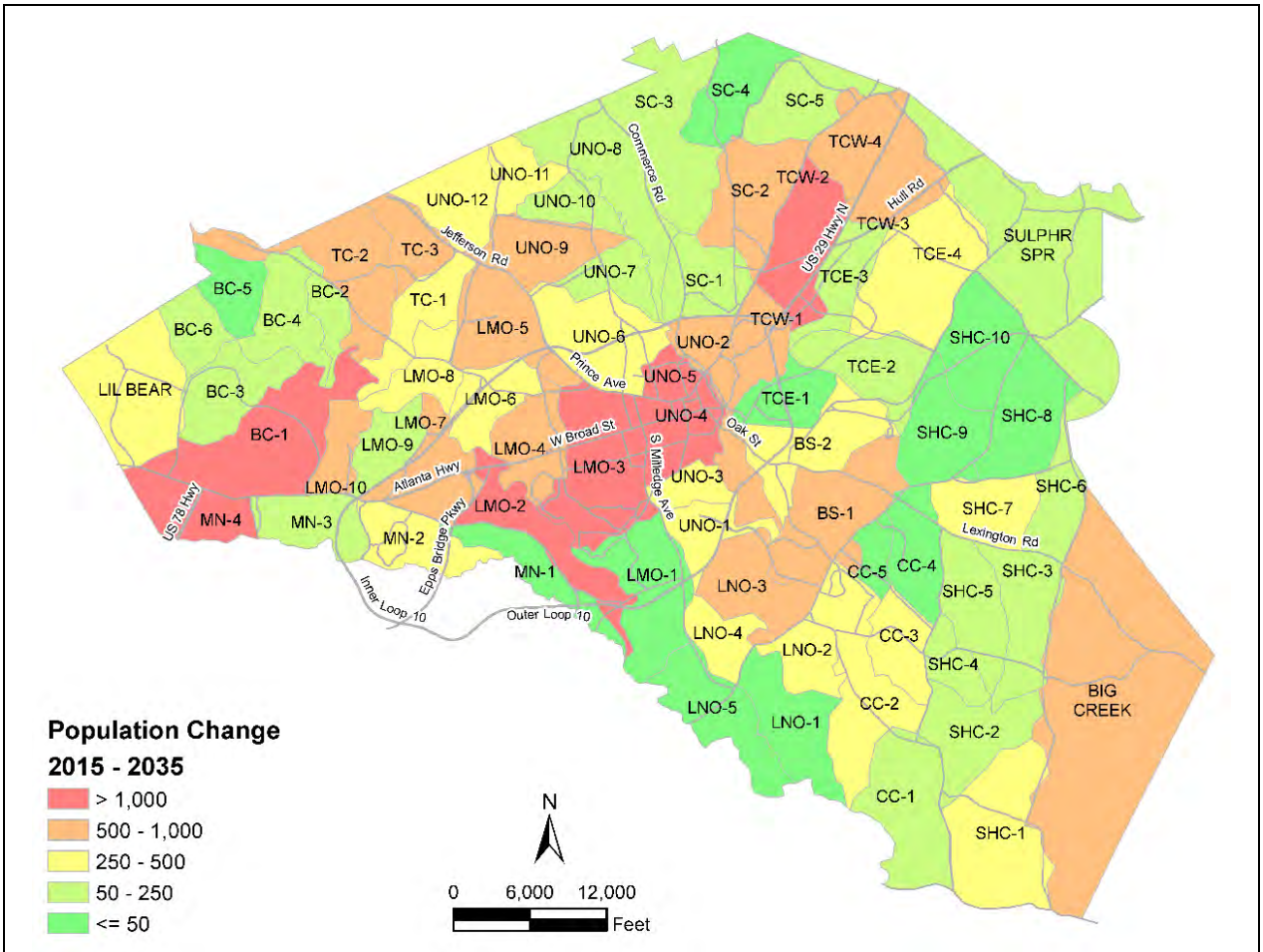


FIGURE 3-1
Projected Change in Population (2015 to 2035)
2015 Service Delivery Plan: Infrastructure Element

TABLE 3-1
High-Adjusted Population Projections by Drainage Basins
2015 Service Delivery Plan: Infrastructure Element

Drainage Basins	Actual	Projected						
	2010	2015	2020	2025	2030	2035	Average Annual Change 2015-2035	Total Change 2015-2035
North Oconee Drainage Basin	49,776	52,370	56,373	59,982	63,445	66,600	1.2%	27%
Middle Oconee Drainage Basin	43,144	44,667	48,002	51,719	54,426	57,886	1.3%	30%
Cedar Creek Drainage Basin	22,485	22,971	23,938	24,979	25,811	26,646	0.8%	16%
Little Bear Creek, Sulphur Springs, Big Creek Drainage Basins	1,820	1,961	2,238	2,521	2,834	3,069	2.4%	57%
Total	**117,225**	**121,969**	**130,551**	**139,201**	**146,516**	**154,200**	**1.2%**	**26%**

3.2 Water Use Profile

The second step in projecting future water demands and wastewater flows is to conduct a detailed analysis of the water customer base. Therefore, a historical water use profile was developed using data from the period 2006 through 2013, including water and wastewater historical flows and system data, water and sewer customer billing data, population statistics, precipitation records, and GIS data. The analysis provided a historical summary of water system production and consumption demands, as well as the customer demographics and use.

The average annual daily demand (AADD) and the maximum day demand (MDD) of the ACC water system from 2006 to 2013 are shown on Figure 3-2. Between 2006 and 2013, the AADD decreased by 28 percent, and the MDD decreased by 39 percent. This trend can be attributed to the conservation rate structure for water billing and water conservation practices that were implemented by ACC in response to severe drought during the early 2000s, as well as economic downturns.

Figure 3-3 shows AADD for the five ACC customer categories developed in the water use profile: Commercial, Industrial, Institutional, Multi-Family Residential, and Single Family Residential. For the study period (2006 through 2013), an overall decreasing trend in water demand is observed for all customer categories. As a percentage, the most significant reductions in demand have occurred in the Industrial use category (44 percent reduction) and the Institutional use category (27 percent reduction). Multi-Family Residential has seen the least amount of reduction over the period analyzed at 14 percent, and all other categories have experienced a downward trend similar to the pattern observed in the overall demand shown on Figure 3-2.

In 2013, Single Family Residential comprised the highest percentage of overall demand, and all other customer categories made up a similar percentage of demand (Figure 3-3). The top 25 customers' total consumption accounted for 33.5 percent of the total system demand (AADD) in 2006 and 25.4 percent in 2012. Throughout the study period, Pilgrim's Pride Poultry Plant (Industrial use) remains the top user

with at least 11 percent of the AADD each year. The second largest single user is Certain-Teed Products (Industrial use) with about 2 percent of the AADD. Other customers consistently having the highest consumptions of about 1 percent of the AADD are the Housing Authority (Multi-Family Residential/ Single Family Residential), Noramco Inc. (Industrial use), and Athens Regional Medical Center (Institutional use).

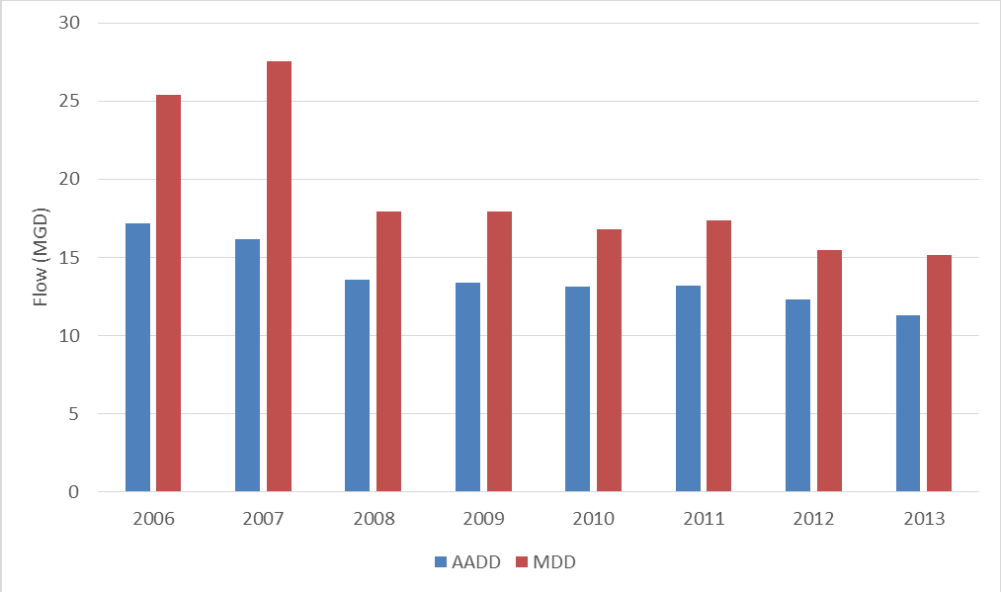


FIGURE 3-2
Average Annual Day and Maximum Day Water System Demands
2015 Service Delivery Plan: Infrastructure Element

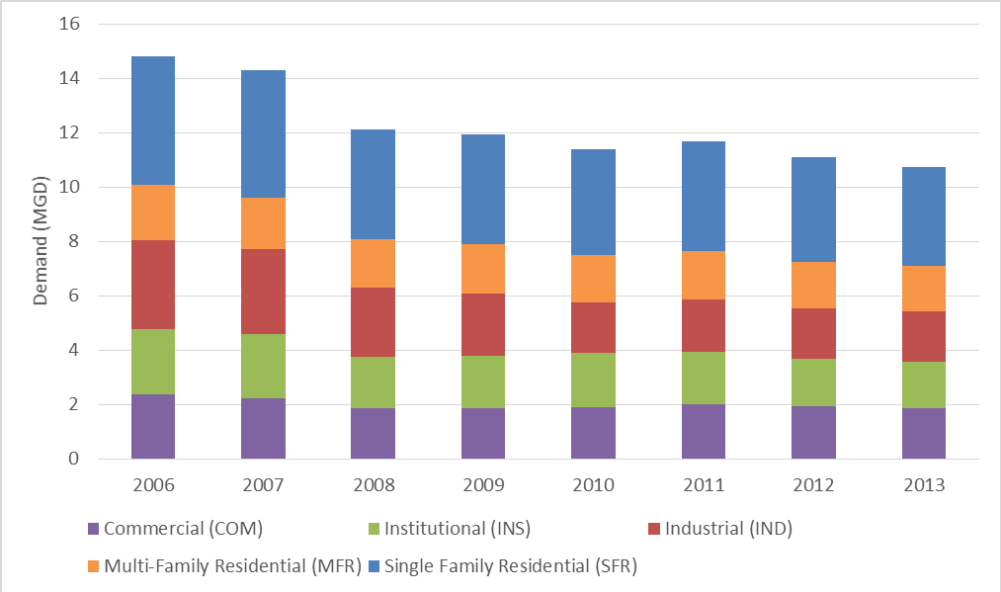


FIGURE 3-3
Annual Average Daily Demand by Customer Category
2015 Service Delivery Plan: Infrastructure Element

3.3 Water System

Identifying future water system needs involved evaluating the existing water system to projected future needs. This analysis is summarized below and forms the basis for a subset of the recommended water system improvements (Section 4.1).

3.3.1 Water Demand Projections

Projected ACC PUD Service Area water demands were developed based on the high-adjusted population projection developed by the ACC Planning Department and unit consumption demands (based on historical data) for residential, commercial, and institutional (excluding UGA) land uses. Additional assumptions were made for water demands from UGA and new industrial areas (discussed below), 12 percent for non-revenue water (e.g., unauthorized usage, leakage) and reductions in demand due to implementation of water conservation strategies. (assumed savings by 2050, 10 percent system level savings on average).

3.3.1.1 Finished Water Demand

Average Day Demand

Unique system unit demand factors were used to develop projected water demand for residential use (50 gallons per capita per day), commercial use (16.4 gallons per capita per day) and institutional (non-UGA) use (5.4 gallons per capita per day) sectors. These unit demand factors were developed as part of the water use profile (Section 3.2).

Future water demand for UGA was estimated through discussions with ACC PUD, ACC Planning Department, and UGA staff. UGA's overall annual water usage declined from roughly 570 MG in 2006, to a low of less than 420 MG in 2009. In recent years, its water usage has remained fairly stable around 480 MG. These reductions were achieved while there were significant increases in overall activities; however, it is assumed that UGA will not be able to gain water efficiencies much beyond those already realized. Therefore, future water demand from UGA was based on an assumed 2 percent annual increase in demand from 2013 levels.

For industrial uses, the projection of new major industrial demand was exclusive to two specific drainage basins: McNutt and Trail Creek (East and West) basins. For the McNutt Basin, a new industrial demand 250,000 gallons per day (gpd) was assumed. For the Trail Creek Basin, it was assumed that there was a 25 percent annual probability of one new major industrial customer coming online (equating to a one new major industrial customer every 4 years), with an average demand of 250,000 gpd. The demand was split evenly between the Trail Creek East and Trail Creek West basins. Within these, the sub-basin split was determined based on 2013 water demand.

Maximum Month and Maximum Day Demands

As ACC permit limits are based on monthly averages (raw water supply) and maximum day (raw water supply and treatment capacity), projections for finished water maximum month average day (MMAD) and MDD were developed by applying "peak factors" to the average day demand. Table 3-2 summarizes the finished water projections. A discussion of the probabilistic approach to develop this median (50th percentile) projection is provided in Section 3.3.1.3.

The "peak month factor" is the ratio of MMAD to ADD. This number has historically been 1.2 for the ACC water system but declined after the 2007 drought. Based on historical data, a peak month factor of 1.1 was used to estimate the MMAD.

The "peak day factor" is the ratio of MDD to AADD and typically varies between 1.2 and 2.0 for most systems. For ACC, the peak day factor in 2006 was 1.5, and the peak day factor in 2007 was 1.7. However, water conservation measures taken in response to the drought conditions in 2007 has reduced peak day factors to a maximum of 1.35 since 2008. The peak day factor has held fairly steady since 2008. Based on these results, a peaking factor of 1.4 was applied to annual average demand to estimate maximum day demands. ACC's low peak day and peak month factors, relative to average utility peak day factors, demonstrates the significant strides that ACC has made in water conservation.

TABLE 3-2
Median (50th Percentile) Projected Finished Water Demand (MGD)

Year	Annual Average Day	Maximum Month Average Day	Maximum Day
2015	14.1	15.4	19.5
2020	15.3	16.7	21.1
2025	16.3	17.8	22.6
2030	17.2	18.9	23.9
2035	18.0	19.8	25.0
	Peak Factor	1.1	1.4

3.3.1.2 Raw Water Demand

After finished water demand was estimated, raw water demands (ADD, MMAD, and MDD) were estimated as finished water demand plus non-revenue water. Table 3-3 summarizes the median (50th percentile) raw water projections.

To determine the total raw water demand, finished water demands were increased by the non-revenue water factor. For water demand projections, non-revenue water focused on real losses only. Based on results of the water use profile, water production and consumption steadily declined between 2006 and 2013, and the difference between the two (i.e., water loss) did not change significantly. A non-revenue water factor of 12 percent, representing only real losses, was determined for the ACC system. A 12 percent factor for real losses is not excessive, and according to data from water audits submitted to GAEPD from 2011 to 2014, water loss in the ACC system is not increasing. However, a leak detection program would help ACC reduce the percentage of system water loss.

TABLE 3-3
Median (50th Percentile) Projected Raw Water Demand (MGD)

Year	Annual Average Day	Maximum Month Average Day	Maximum Day
2015	15.2	18.0	20.9
2020	16.4	19.5	22.7
2025	17.5	20.8	24.2
2030	18.5	22.0	25.6
2035	19.4	23.1	26.9

3.3.1.3 Probabilistic Finished Water and Raw Water Demands

After water demands were estimated, factors that contribute to future variation in demand were integrated into the forecasts to account for uncertainty related to future conditions. This probabilistic

forecast provides a range of possible forecasts, to ensure that sufficient and reliable supply and treatment capacity will be available to meet the needs of the community. The factors used to create the probabilistic forecast model are:

- Unit consumption
- Growth rate
- Future major industrial and UGA growth
- Future water conservation (assumed savings by 2050, 10 percent system level savings on average)
- System factors (non-revenue water, WTP system process water loss, maximum day water demand peaking factors, wastewater return ratios, and MMAD wastewater flow peaking factors)

Using the probabilistic water demand forecast, the range of values calculated were for the 95th percentile, 75th percentile, 50th percentile (median), 25th percentile, and 5th percentile. The 50th percentile represents a reasonable probability forecast and is typically the range that long-term planning is based on. However, utilities may choose to base certain decisions on other probabilities depending on the severity of a decision's consequence. For example, a decision with a much higher consequence or longer lead time may be based on a lower probability of risk (e.g., the decision to expand water treatment capacity may be based on a 25 percent chance of not being able to provide finished water to customers); whereas a less severe outcome may be based on a 50 percent probability.

Figure 3-4 shows the projected change in finished water demand between 2015 and 2035 for each of the drainage sub-basins. Water demand projections are similar to population projections, with the largest growth in upper Bear Creek and Trail Creek East and West basins. However, a relatively high increase in demand is also projected for areas of downtown ACC (i.e., UNO-3 and UNO-4). Demands greater than 850,000 gallons per day are projected for multiple drainage sub-basins in downtown ACC, as well as industrial areas of the North Oconee WRF Service Area (Trail Creek East and West).

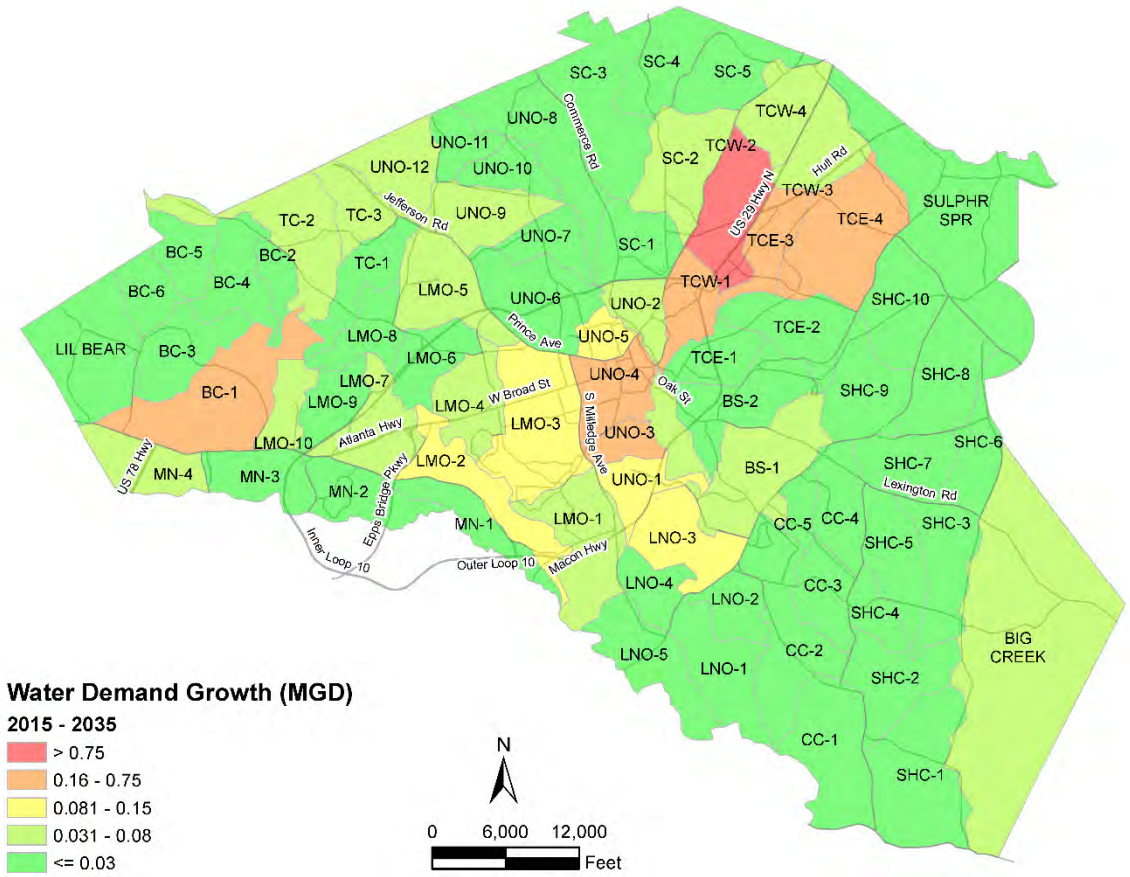


FIGURE 3-4

Median (50th Percentile) Projected Change in Finished Water Demand (2015 to 2035)

2015 Service Delivery Plan: Infrastructure Element

3.3.2 Water Supply Capacity Analysis

Because of the long-range planning requirements for possible new water supply sources, the evaluation of raw water supply capacity was extended beyond the 20-year timeline of the SDP. Projected maximum day raw water demands (95th, 75th, 50th, 25th, and 5th percentiles), through 2050, were compared to ACC's total permitted maximum day withdrawal limit of 34.75 MGD (Figure 3-5). While ACC does not have a total permitted water withdrawal monthly average limit, projected MMAD demands were compared to ACC's permitted monthly average withdrawal from the Bear Creek Reservoir (25.5 MGD), the only source from which ACC could withdraw during drought conditions and river flows less than 7Q10 (Figure 3-6).

Based on projected raw water demands, raw water supply capacity will likely need to be expanded before 2050. There is a 25 percent chance that the maximum day demand for raw water will exceed the cumulative permit limit (34.75 MGD) by the year 2042 (see (1) on Figure 3-5). Additionally, there is a 25 percent chance that the monthly average day withdrawal limit for the Bear Creek Reservoir (25.5 MGD) will be exceeded during the maximum month by the year 2029 (see (1) on Figure 3-6), and there is a 50 percent chance it will be exceeded by the year 2049 (see (2) on Figure 3-6).

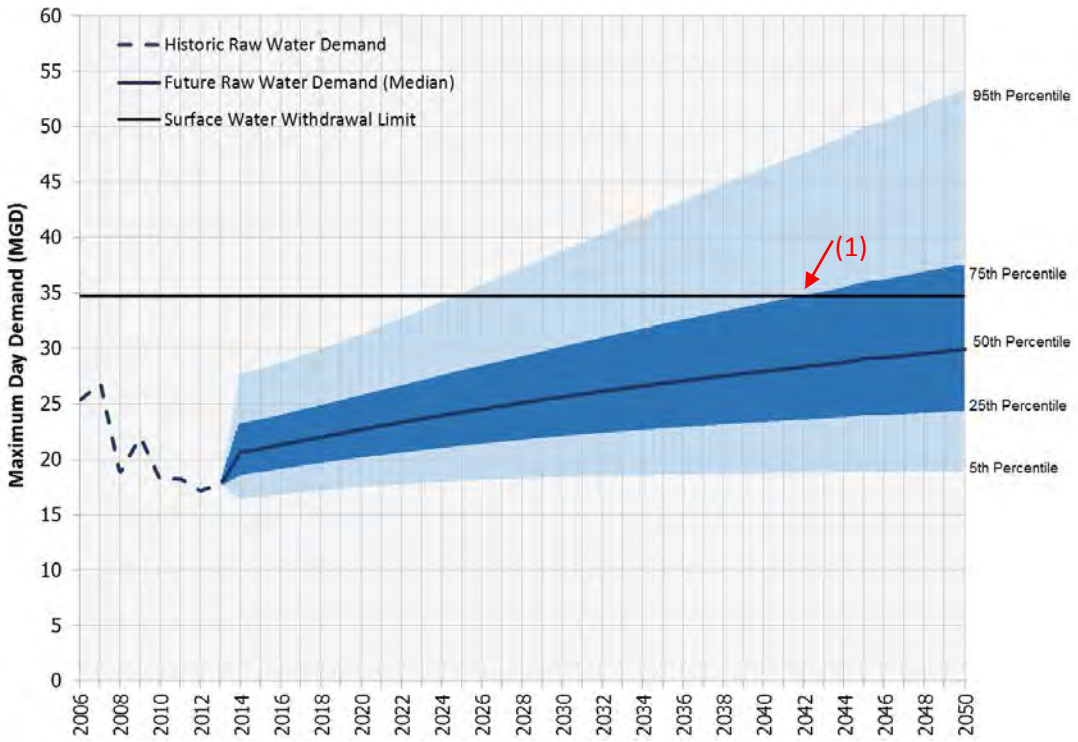


FIGURE 3-5

Projected Raw Water Maximum Day Demand

2015 Service Delivery Plan: Infrastructure Element

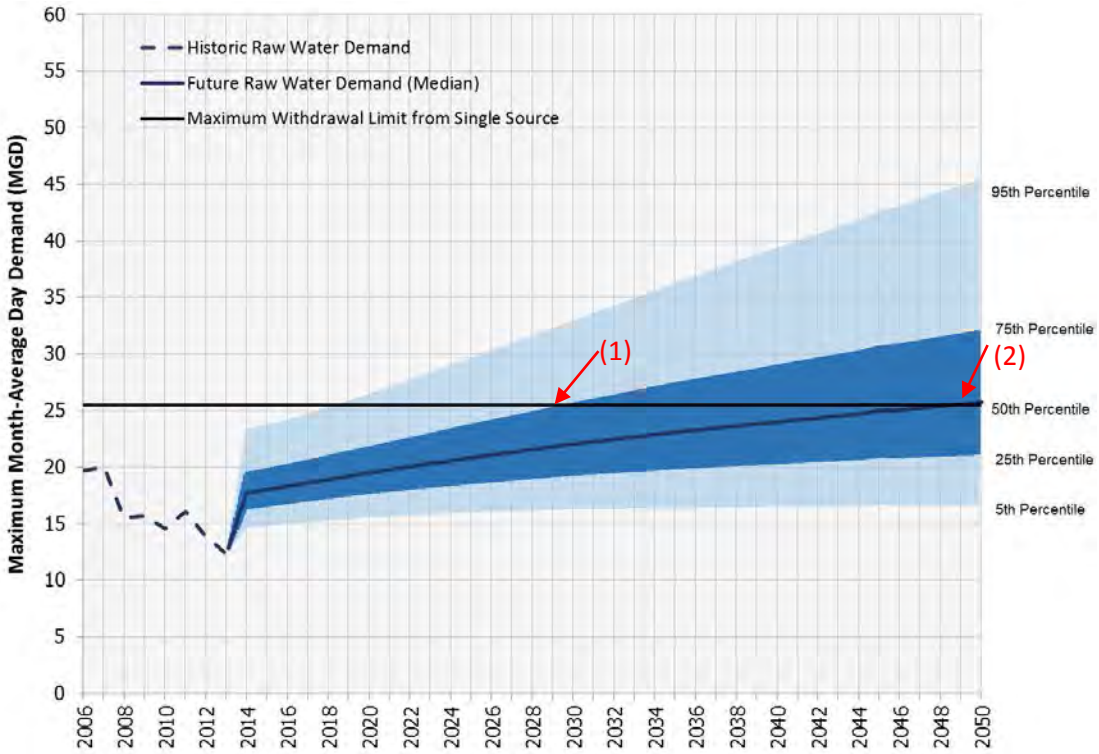


FIGURE 3-6

Projected Raw Water Maximum Month-Average Day Demand

2015 Service Delivery Plan: Infrastructure Element

ACC PUD is collaboratively developing a risk-based tool to evaluate the needs for a future water supply source. The risk-based tool considers factors beyond future water demands, such as the risk of entering drought conditions requiring strict water reductions, additional water conservation, water reuse, and construction of a new reservoir. ACC PUD plans to present the results of the risk-based tool to M&C upon completion. These results will provide further basis for determining whether a future water supply source is needed for ACC residents.

3.3.3 Water Treatment Capacity Analysis

The water system capacity was evaluated by comparing projected future finished water demands to existing capacity. Figure 3-7 shows the projected range of average day finished water demand. Figure 3-8 compares the projected maximum day finished water demands, through 2035, to the J.G. Beacham WTP design capacity (36 MGD, maximum day) and permitted capacity (34.75 MGD, maximum day). There is a greater than 75 percent probability that the WTP capacity will be sufficient for the finished water demand through the year 2035 (see (1) on Figure 3-8).

3.3.4 Water Distribution System

The ACC water distribution system was evaluated using a hydraulic model that was initially developed in 1984 and most recently calibrated in 2009. The hydraulic model was updated in 2015 to include all water lines except for the service lines; however, no new calibrations or verifications were performed for the 2015 SDP Update. During the design phase of any major water distribution improvements, the model should be calibrated and re-run.

To identify potential water distribution improvements, a hydraulic model of the ACC PUD water distribution system was run to evaluate the following criteria:

- System pressure
- Operational requirements for the J.G. Beacham WTP
- System velocity and head loss
- Fire flow availability
- Water age
- Water storage requirements
- Water tank turnover rate
- System reliability
- Demand and requirements for critical customers (customers for which potable water is necessary to maintain life and/or public health or safety, such as hospitals)

Results of the water distribution system against the criteria outlined above were used to develop water distribution improvements for the 2015 SDP.

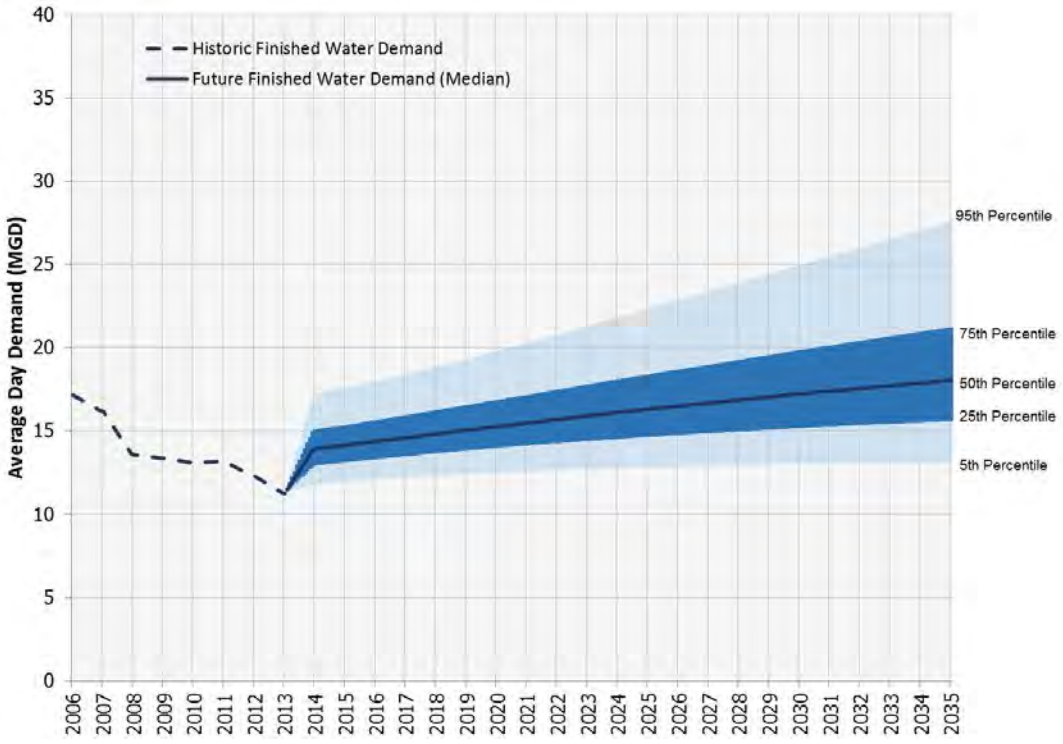


FIGURE 3-7

Projected Finished Water Annual Average Day Demand

2015 Service Delivery Plan: Infrastructure Element

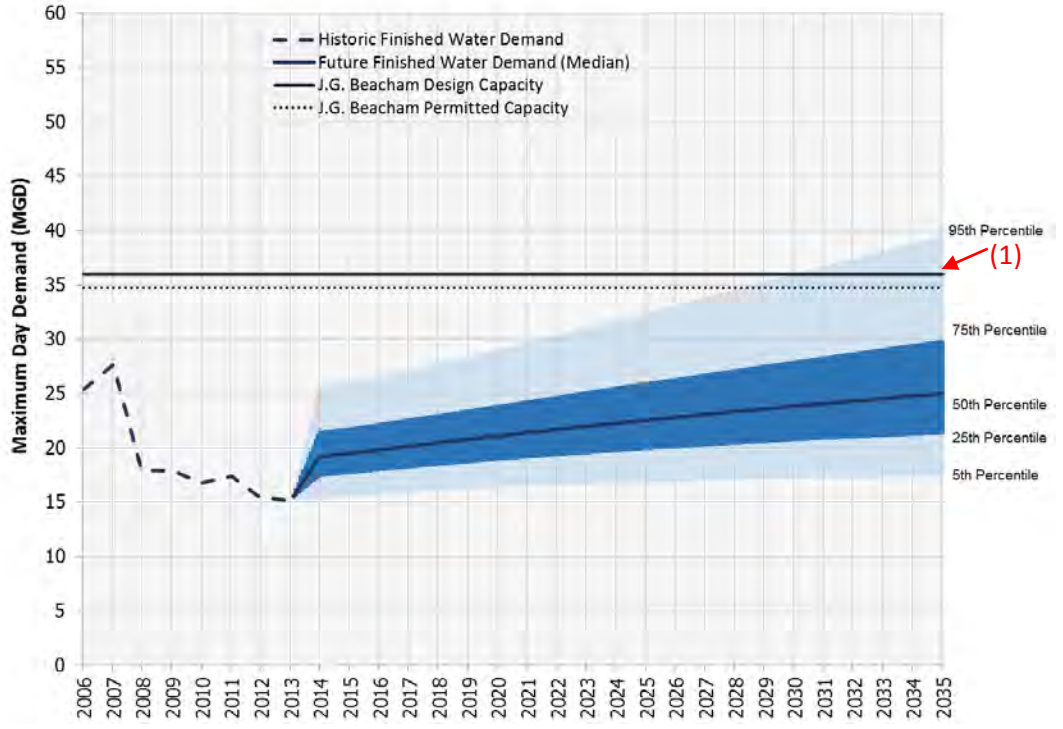


FIGURE 3-8

Projected Finished Water Maximum Day Demand

2015 Service Delivery Plan: Infrastructure Element

3.4 Wastewater System

The identification of future wastewater system needs involved evaluating the existing wastewater system to projected future needs. This analysis is summarized below and forms the basis for a subset of the recommended wastewater system improvements (Section 4.2).

3.4.1 Wastewater Flow Projections

Projected wastewater flows were developed by applying a wastewater return flow ratio to the water demands developed in Section 3.3.1. A wastewater return flow ratio is the percentage of finished water delivered to ACC PUD customers that is returned to the WRF as wastewater. The wastewater flow ratio is specific to the service area (i.e., North Oconee, Middle Oconee, or Cedar Creek) and is based on historical data provided by ACC PUD.

The return flow ratio was calculated as the percentage of average day WRF flow to the average day billed water consumption within the WRF service area. The return ratios were developed based on WRF flow data from October 2013 (assumed to be a normal flow month) and billed water consumption during the same month. Water customers that use onsite septic systems or private wastewater systems reduce the return ratio, since billed water is not returned to the wastewater system. However, RDII and GWI increase the return ratio, as they result in stormwater and groundwater is sent to the water reclamation facilities. Based on historical data, the following return flow ratios were developed for the three service areas:

- North Oconee WRF: 1.17
- Middle Oconee WRF: 1.16
- Cedar Creek WRF: 0.91

The wastewater return ratios were multiplied by the finished water demand by sub-basin, draining to each respective WRF, to determine the average day wastewater flows. Service area-specific peaking factors were then applied to average day flows to estimate maximum month average day flows. The peaking factors were determined from historical influent flow data to each WRF from 2010 through 2013. The following peak month factors were developed for ACC WRFs:

- North Oconee WRF: 1.19
- Middle Oconee WRF: 1.26
- Cedar Creek WRF: 1.32

Similar to the water demand forecasts, use of a probabilistic method resulted in a range of results, with a magnitude and likelihood of each result. The probabilistic methodology for wastewater flow used the same list of factors for identifying uncertainty as previously discussed for water demand. The range of flow values calculated were for the 95th, 75th, 50th (median), 25th, and 5th percentiles.

The estimates for current and future wastewater flows (median) are presented in Table 3-4 for the year 2015 through 2035. Figure 3-9 shows the median projected change in wastewater flows for each of the drainage sub-basins. Trends in projected wastewater flow are similar to trends in projected water demand.

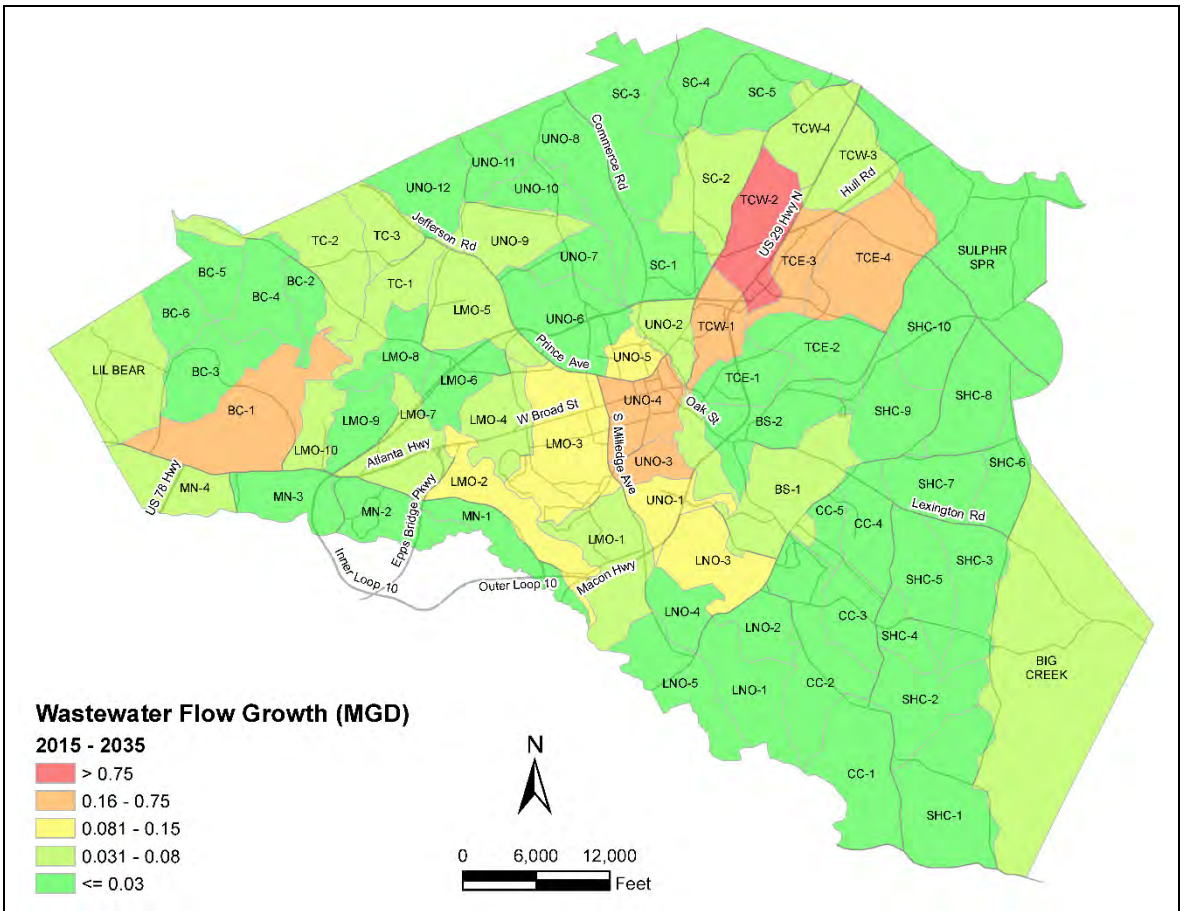


FIGURE 3-9

Median (50th Percentile) Projected Change in Wastewater Flows (2015 to 2035)

2015 Service Delivery Plan: Infrastructure Element

TABLE 3-4

Median (50th Percentile) Projected Wastewater Flows

Year	Annual Average Day (MGD)	Maximum Month-Average Day (MGD)			
	ACC PUD Service Area	North Oconee WRF Service Area	Middle Oconee WRF Service Area	Cedar Creek WRF Service Area	ACC PUD Service Area
2015	14.0	8.7	5.2	1.6	15.5
2020	15.4	9.7	5.5	1.7	16.9
2025	16.8	10.6	5.9	1.8	18.4
2030	18.0	11.5	6.2	1.8	19.7
2035	19.4	12.4	6.6	1.9	21.1

3.4.3 Water Reclamation Capacity Analysis

Projected maximum month average day wastewater flows (95th, 75th, 50th, 25th, and 5th percentiles), through 2035, were compared to ACC's total permitted monthly average wastewater treatment limit (Figure 3-10). Projected wastewater flows within each WRF service area were compared to the permitted capacity of each WRF (Figures 3-11 through 3-13).

Based on projected wastewater flows, there is a high probability ACC PUD has sufficient total permitted WRF treatment capacity beyond 2035 (Figure 3-10); however, there are flow scenarios where capacity is exceeded in one of the WRF service areas. For the Middle Oconee and Cedar Creek WRFs, there is a low probability (less than 5 percent chance) that the permitted capacities will be exceeded through the year 2035 (Figures 3-12 and 3-13). High-growth areas of the North Oconee WRF service area could result in capacity limitations. However, the median (50th percentile) forecast for the North Oconee WRF does not show a capacity limitation prior to 2035.

3.4.4 Wastewater Collection Capacity Analysis

Identification of sewer expansion projects involved dynamic wet-weather modeling for a portion of the PUD Service Area, and a schematic capacity analysis for the remainder of the Service Area (Figure 3-14) as described below.

3.4.4.1 Dynamic Wet-Weather Modeling

For the McNutt, Brooklyn, Tanyard Branch, and Middle Oconee East basins, dynamic wet-weather modeling was conducted using InfoSWMM software under dry and wet weather existing and projected future flow conditions. Existing dry weather flows were based on results of the 2012 flow monitoring study, and future dry weather flows were approximated based on wastewater flow projections (Section 3.4.1). After the model was fully calibrated for dry and wet weather flow conditions, computer simulations for all scenarios were performed. To model wet weather flow conditions, synthetic storm unit hydrographs were used to create design storms with region specific intensity distributions. The model was evaluated using the 2-year, 24-hour design storm because of the low intensity storm monitored. Wet weather flow during the years 2015, 2020, 2025, 2030, and 2035 was evaluated using the dynamic wet-weather model.

In the past, PUD used 0.75 d/D (the ratio of peak flow depth during the design storm event divided by the diameter of the pipe) as its limiting criterion for identification of pipe expansion needs. However, PUD has revised this criterion to 0.9 d/D for basins with calibrated dynamic models, where there is a more complete understanding of a basin's hydraulics. Therefore, system expansion and renewal projects were identified based on d/D greater than 0.9, for basins that were included in the dynamic wet-weather models.

For system expansion and renewal projects, new pipe size recommendations were made based on d/D ≤ 0.9, during the 2035 wet weather flow simulation, assuming no RDII reduction. An RDII sensitivity analysis was performed to make an RDII reduction assumption. Based on the relative insensitivity of d/D to RDII reduction and the limited flow data available during development of the 2015 SDP, future flows used to size new pipes for the 2015 SDP assumed no RDII reduction for all sewer basins. Dynamic model updates are underway and will incorporate a RDII reduction for the purposes of recommending future pipe sizes.

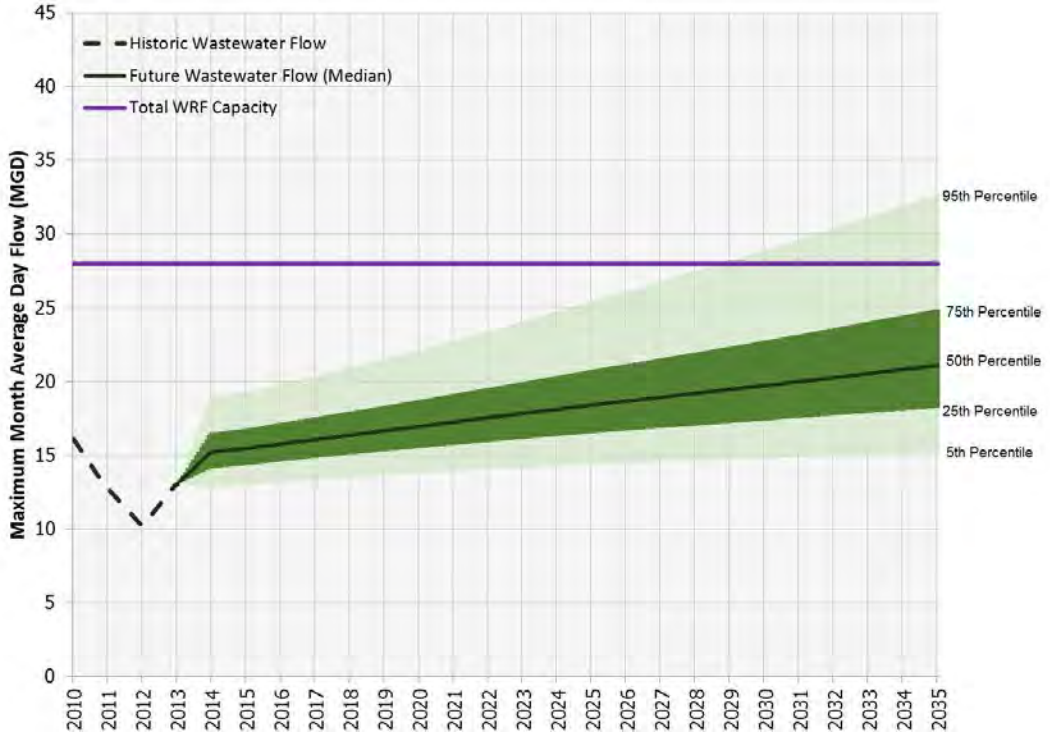


FIGURE 3-10

Projected Maximum Month Average Day Wastewater Flows

2015 Service Delivery Plan: Infrastructure Element

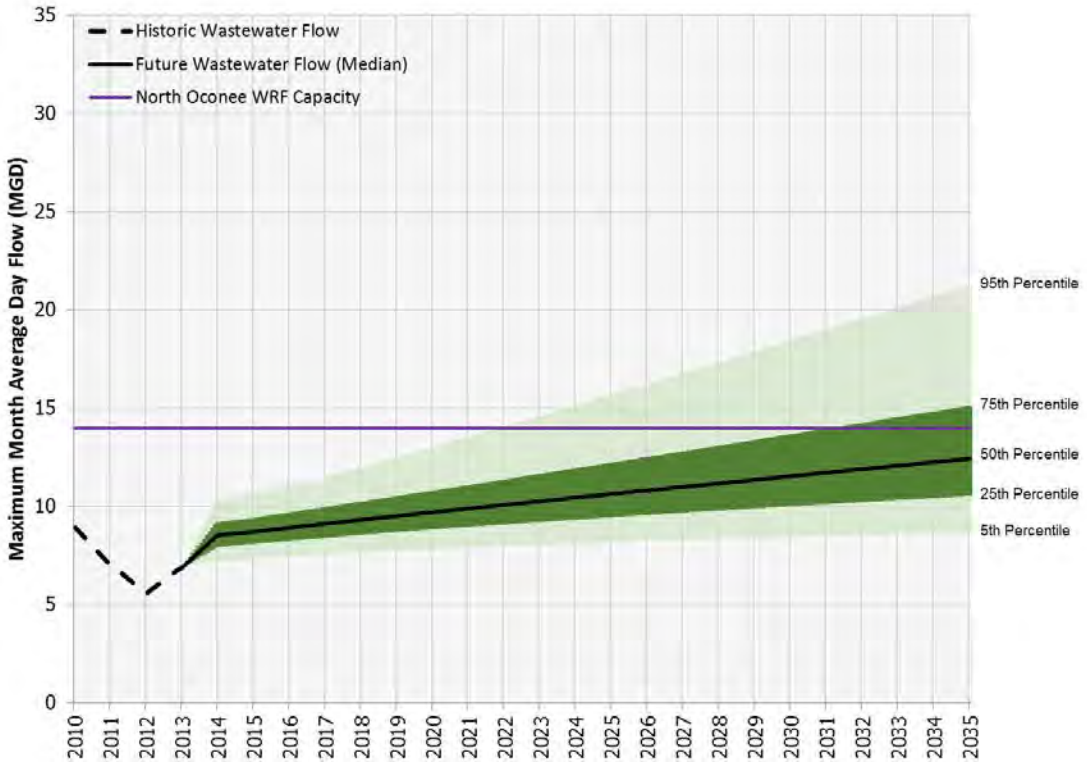


FIGURE 3-11

Projected Maximum Month Average Day Wastewater Flows – North Oconee Basin

2015 Service Delivery Plan: Infrastructure Element

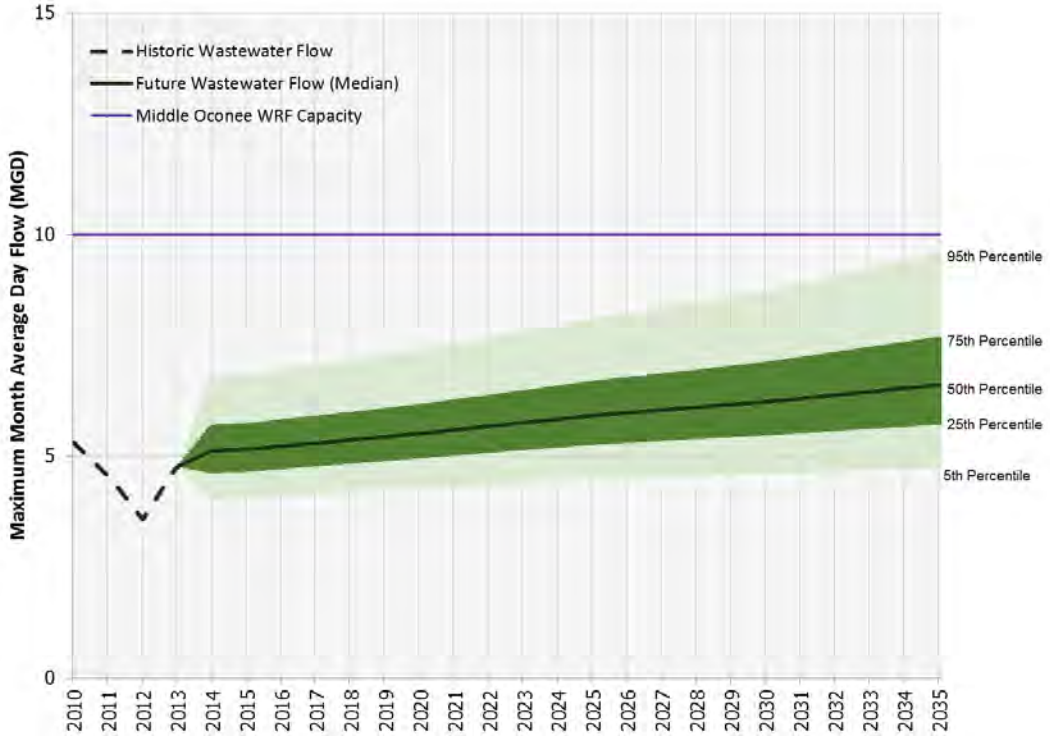


FIGURE 3-12

Projected Maximum Month Average Day Wastewater Flows – Middle Oconee Basin

2015 Service Delivery Plan: Infrastructure Element

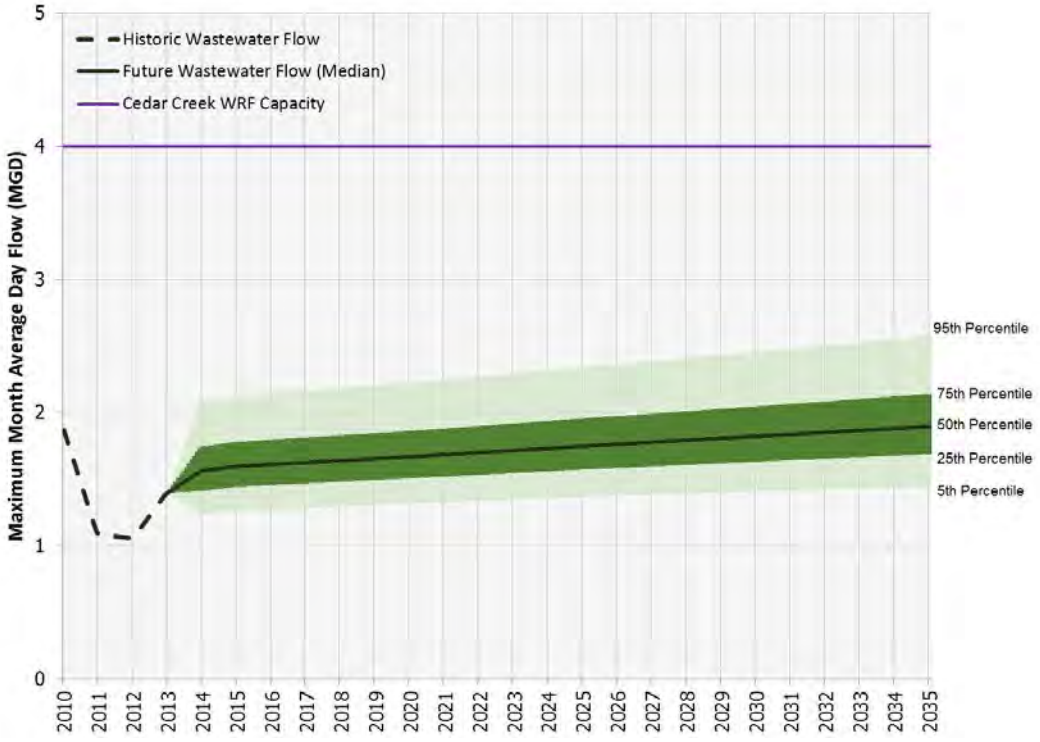


FIGURE 3-13

Projected Maximum Month Average Day Wastewater Flows – Cedar Creek Basin

2015 Service Delivery Plan: Infrastructure Element

3.4.4.2 Static Schematic Capacity Analysis

For all other sewer basins, a static schematic capacity analysis was conducted, using InfoWorks under both dry weather and peak flow conditions. The analysis included all pipes greater than 10 inches in diameter, with the addition of some smaller pipes to provide for connectivity in the system. Unknown manhole inverts were interpolated between known manhole inverts, and contours were used as assumed "top of manhole" elevations. Existing (2015) dry weather flows were based on the results of the 2015 flow monitoring study (Section 2.4.1.4), and future dry weather flows were approximated based on wastewater flow projections (Section 3.4.1). Dry-weather and peak flow conditions were evaluated on 5-year intervals, during the period 2015 through 2035.

Unlike the dynamic wet weather modeling referenced above, the static schematic capacity analysis tool was not calibrated. To analyze peak flow conditions, a basin-specific peaking factor, developed from the 2015 flow monitoring study, was applied to dry weather flow in each basin. Peak flows during the years 2015, 2020, 2025, 2030, and 2035 were evaluated using the schematic capacity analysis. Afterwards, system expansion and renewal projects were identified based on d/D greater than 0.75. For system expansion and renewal projects, new pipe size recommendations were made based on d/D ≤ 0.75, during the 2035 peak flow conditions, assuming no RDII reduction. ACC PUD plans to develop dynamic wet-weather models for all of its sewer basins, and therefore the results of the schematic capacity analysis will be refined.

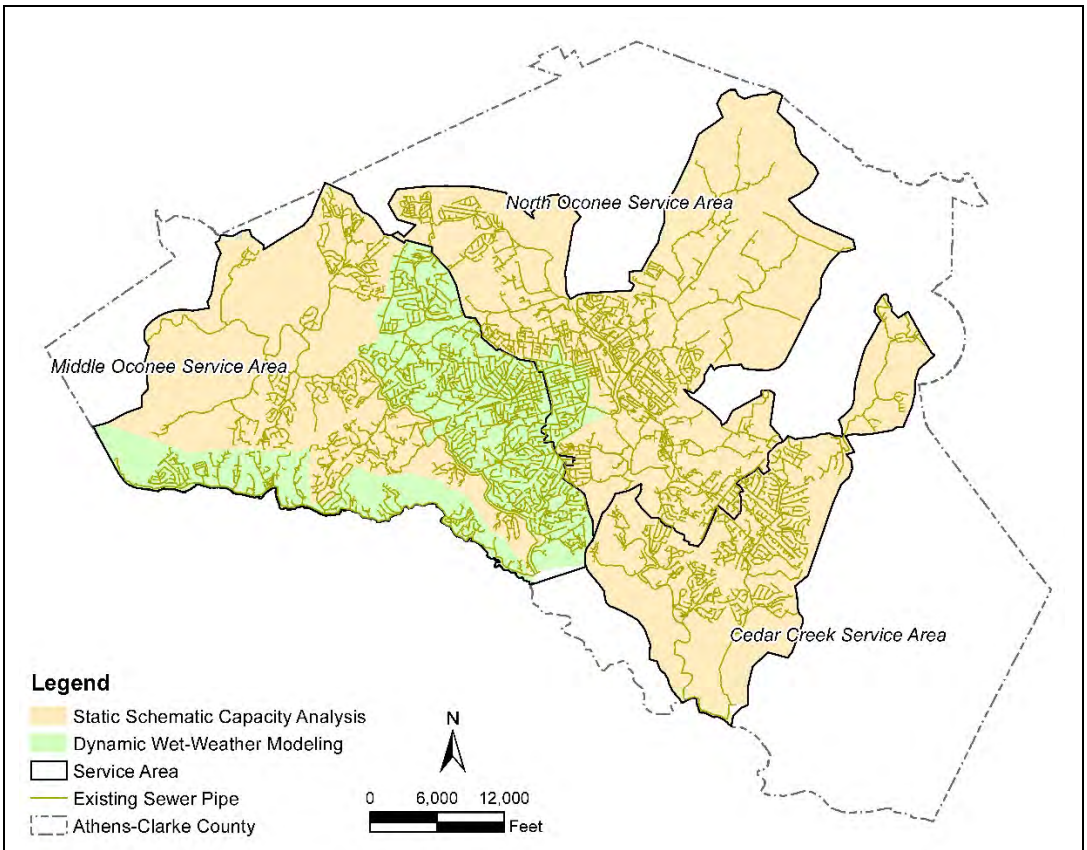


FIGURE 3-14
Methods of Analyzing Capacity of Sanitary Sewer Pipes
2015 Service Delivery Plan: Infrastructure Element

SECTION 4

Development of Water and Wastewater Improvements

This section summarizes recommended improvements to the water and wastewater system to be implemented in the 20-year planning period. The development of recommended improvements involved a review of future system needs (Section 3), as well as multiple other studies and reviews. These improvements will be carried forward to the Capital Improvements Element for prioritization. Recommended improvements are noted at the beginning of each subsection, followed by a description of the selection rationale.

4.1 Water System

Identification of water system improvements involved reviewing future system needs (Section 3.3), water treatment facilities, evaluating current water treatment processes, and evaluating the water distribution system's ability to meet PUD's water service goals (Section 1.2). These analyses and the resulting recommended improvements are summarized in the following sections.

4.1.1 Raw Water Supply

Table 4-1 summarizes the recommended improvement related to raw water supply. Details are provided below.

TABLE 4-1
Water System Recommended Improvements – Raw Water Supply

Project Name	Details
Raw Water Supply Preliminary Engineering and Land Acquisition	Allocation of funds for preliminary engineering and acquisition of land for future water supply storage

As previously mentioned, there is a 25 percent chance that the monthly average day withdrawal limit for the Bear Creek Reservoir (25.5 MGD) will be exceeded during the maximum month, by the year 2029, and there is a 50 percent chance it will be exceeded by the year 2049. Additionally, there is a 25 percent chance that the maximum day demand for raw water will exceed the cumulative permit limit (34.75 MGD) by the year 2042.

ACC PUD is collaboratively developing a risk-based tool to evaluate the needs for a future water supply source. The risk-based tool considers factors beyond future water demands, such as the risk of entering drought conditions requiring strict water reductions, additional water conservation, water reuse, and construction of a new reservoir. ACC PUD plans to present the results of the risk-based tool to M&C upon completion. These results will provide further basis for determining whether a future water supply source is needed for ACC residents. Based on preliminary results and given that the development and permitting of water supply sources is time-intensive, costs associated with preliminary engineering and acquisition of land for a potential future water supply are included in the 2015 SDP, to account for long-term financing. Any decision to move forward with the purchase of land for construction of a water supply source would require separate approval by M&C.

4.1.3 Water Treatment

Table 4-2 summarizes recommended improvement related to the J.G. Beacham WTP. Details are provided below.

TABLE 4-2
Water System Recommended Improvements – Water Treatment

Project Name	Details
J. G. Beacham Water Treatment Plant Solids Handling	Backwash and drain water recovery and solids dewatering

4.1.3.1 Water Treatment Capacity

There is a greater than 75 percent likelihood that the maximum day demand for finished water will not exceed the J.G. Beacham WTP maximum day permitted capacity of 34.75 MGD by 2035. Therefore, no recommended improvements are related to meeting future demands. Additionally, continued implementation of the water conservation program is expected to maintain the capacity of the WTP. Future system improvements related to capacity will depend on future growth in ACC.

4.1.3.2 Water Treatment Processes

The identification of other needs related to the J.G. Beacham WTP involved communications with WTP staff and a review of regulatory drivers with the potential to affect the water system.

PUD Management consistently communicates with WTP staff to determine plant needs. To that end, a workshop was held on June 13, 2015 to identify plant improvements that would be appropriate for inclusion in the SDP 2015 Update. Based on feedback provided at this workshop and on a review of the existing system, the only issue identified for the WTP, appropriate for inclusion in the SDP, was solids handling.

As previously mentioned, there are no facilities at the WTP to mechanically dewater waste solids. Solids generated by the J.G. Beacham WTP are treated passively using a 3-acre, onsite lagoon. This lagoon was dredged in 1994, 2004, and 2011. Since expansion of the J.G. Beacham WTP (in 2009), it is anticipated that the lagoon will need to be dredged every 6 to 8 years. Depending on the future operating philosophies and future regulations related to backwash water and sludge removal, a solids handling facility at J.G. Beacham WTP may be desired and/or required. In addition, if solids generation begins to require dredging of the lagoon more frequently, it may be more cost-efficient to develop and operate a solids handling facility. Concepts for a backwash and drain water recovery and solids dewatering system have been developed. The system would include a backwash/drain pump station, backwash recovery basin, gravity thickener, thickened sludge pump station, and a dewatering building with two centrifuges.

4.1.5 Water Distribution

Table 4-3 summarizes recommended improvements related to the water distribution system. Details are provided below.

TABLE 4-3
Water System Recommended Improvements – Water Distribution

Project Name	Details
Atlanta Highway Tank and Booster Pump Station	Elevated Storage Tank and Booster Pump Station to develop high pressure zone in western portion of ACC
Small Diameter Water Main Replacement	Replacement of water mains less than 6 inches in diameter with 8-inch water mains to improve water quality and fire protection
Water Main Connections for Improved Water Quality and Fire Protection	Install new water lines to connect areas of existing service, eliminating pipe dead ends and increasing system redundancies by creating loops
Rehabilitation of Aging Water Mains	Evaluation and rehabilitation of water mains due to age and/or condition
Leak Detection Program	Activities to increase data validity of the annual Water Audit, such as finished water meter testing, as well as cost-effectiveness studies of the individual water loss control projects, such as leak detection.

4.1.5.1 Atlanta Highway Elevated Storage Tank and Booster Pump Station

Based on results of the hydraulic water model, an elevated storage tank and booster pump station in the western portion of ACC is recommended to develop a high-pressure zone west of Loop 10. The project would involve construction of a 1.25 MG elevated storage tank and 5,000 gallon per minute booster pump station and demolition of the existing 0.5 MG Atlanta Highway Tank and the Bogart Booster Pump Station (Figure 4-1). The higher-pressure zone would provide more consistent water pressures to the western portion of Atlanta Highway, as well as the City of Bogart. Additionally, the storage tank would provide an additional 0.75 MG of storage (accounting for the demolished 0.5 MG tank), which would serve an anticipated industrial development.

4.1.5.2 Water Main Replacement

Water main replacement needs were determined by identifying small diameter (i.e., less than 6-inch diameter) pipes greater than 300 linear feet in length throughout the system. A total of 22 miles of pipes were identified using the ACC PUD GIS database. ACC PUD's goal is to replace these small diameter pipes with 8-inch pipes, to improve pressure and flow to water customers and to improve fire protection.

4.1.5.3 Water Main Connections for Improved Water Quality and Fire Protection

As previously mentioned, one of PUD's key strategies to meet its water service goals is to eliminate dead-end feeder lines in the system. Dead-end lines were identified using the GIS database. PUD will install new water lines to connect areas of existing service and increase system redundancies by creating loops. These improvements will improve water quality and fire protection in the service area.

4.1.5.4 Inspection and Rehabilitation of Aging Water Mains

Water main rehabilitation projects include the repair of existing pipe in the water distribution system. Water mains may require repair due to pipe age and/or condition. Water main inspection and rehabilitation projects were prioritized based on pipe age, to account for assumed pipe material and pipe condition. The GIS database was used to identify pipes installation date. It is recommended that

pipes installed prior to 1940 (likely unlined cast iron) be rehabilitated with cured-in-place pipe lining. Pipes installed between 1940 and 1980 (likely lined cast iron) will then be prioritized for inspection and rehabilitation with cured-in-place pipe lining, when needed.

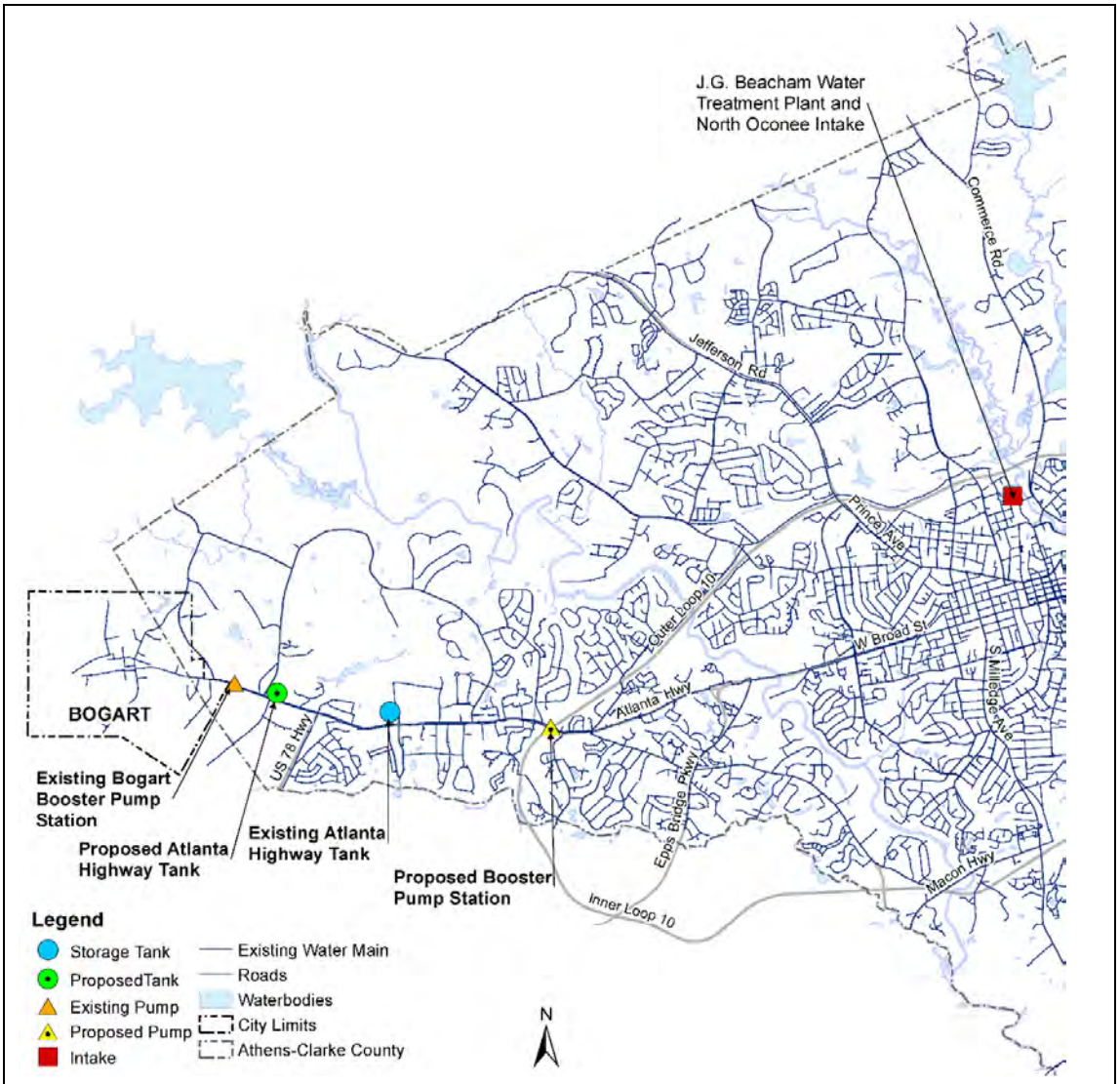


FIGURE 4-1
Recommended Elevated Storage Tank and Booster Pump Station
2015 Service Delivery Plan: Infrastructure Element

4.1.5.5 Leak Detection

Detecting and repairing system leaks is one of the main components of water conservation. ACC has been submitting annual water audits to GAEPD since 2011. According to these reports, the trend from 2011 to 2014 is that the real water loss is not increasing. The current level of real losses reported in 2014 is approximately 440 MG, down from 460 MG in 2011. The real losses in 2014 represent a value of $138,000. The data validity score in 2014 was 63, and it is recommended that water loss program activities for ACC should include activities to increase data validity of the audit, such as finished water

meter testing, as well as cost-effectiveness studies of the individual water loss control projects, such as leak detection.

4.2 Wastewater System

Identification of wastewater system needs involved a review of future system needs (Section 3.4), Risk-Based Prioritization activities, a review of WRF processes, and a detailed flow monitoring study. These analyses and the resulting recommended improvements are summarized in the following sections.

4.2.1 Water Reclamation

Table 4-4 summarizes recommended improvements related to the water reclamation facilities. Details are provided below.

TABLE 4-4
Wastewater System Recommended Improvements – Water Reclamation

Water Reclamation Facility	Project Name	Details
North Oconee WRF	Aeration Basins	Installation of valve actuators at drop down points and dissolved oxygen probes will allow for better process control and reduce energy cost considerably.
	Secondary Clarifier Launder Covers	Installation of launder covers on the existing secondary clarifiers to eliminate algae growth in the launders. Install catwalks for access to launders for inspection/repair.
	Influent Grinder	Installation of grinder to: protect the pumps from ragging to ensure efficient operation and reduce maintenance; minimize blockages from larger items on the influent band screens to improve flow throughput; and reduce clogging and re-ragging in the screenings washer/compactor to improve flow throughput and reduce maintenance.
	Total Phosphorus Polishing	Installation of fabric (cloth media) filtration technology to reliably meet the anticipated future effluent Total Phosphorus limit of 0.3 mg/L.
	Reuse Facility	Includes the construction of a reuse pump station at the North Oconee WRF, and a storage tank and force main, to possibly serve the University of Georgia Golf Course and other locations on the UGA campus.
Middle Oconee WRF	Enhanced Biological Phosphorus Removal (EBPR) Basin Cover	Installation of covers to prevent odors, which come naturally with EBPR process and could become an issue with surrounding residents.
	Sludge Thickening Building	Repair of thickening sludge electrical and thickening process needs to reduce costs associated with removing bio-solids to the landfill and to reduce costs associated removing bio-solids such as chemicals, dewatering, hauling, and energy cost.
	Influent Grinder	Installation of grinder to: protect the pumps from ragging to ensure efficient operation and reduce maintenance; minimize blockages from larger items on the influent band screens to improve flow throughput; and reduce clogging and re-ragging in the screenings washer/compactor to improve flow throughput and reduce maintenance.
	Total Phosphorus Polishing	Installation of fabric (cloth media) filtration technology to reliably meet the anticipated future effluent Total Phosphorus limit of 0.3 mg/L.

TABLE 4-4
Wastewater System Recommended Improvements – Water Reclamation

Water Reclamation Facility	Project Name	Details
Cedar Creek WRF	Influent Grinder	Installation of grinder to: protect the pumps from ragging to ensure efficient operation and reduce maintenance; minimize blockages from larger items on the influent band screens to improve flow throughput; and reduce clogging and re-ragging in the screenings washer/compactor to improve flow throughput and reduce maintenance.
	Total Phosphorus Polishing	Installation of fabric (cloth media) filtration technology to reliably meet the anticipated future effluent Total Phosphorus limit of 0.3 mg/L.
	Solar Energy Facility	Installation of a solar energy generation facility to augment energy utilized at the Cedar Creek WRF.
All WRFs	Alternative Energy Source Evaluation	Evaluation of alternative energy sources that could be produced and used at the WTP and/or WRFs.

4.2.1.1 Capacity

As previously discussed, there is a low probability (less than 5 percent chance) that the permitted capacities of the Middle Oconee and Cedar Creek WRFs will be exceeded through the year 2035. There is a less than 50 percent chance that the North Oconee WRF will require additional capacity prior to 2035. Therefore, there are no WRF capacity expansions included in the 2015 SDP Update.

4.2.1.2 Reuse System

GAEPD encourages the use of reclaimed water as a substitute for potable water for uses such as agricultural irrigation (feed crops), residential/commercial landscape irrigation, dust control, etc. Urban water reuse is a term generally applied to the use of reclaimed water for the beneficial irrigation of areas that are intended to be accessible to the public, such as golf courses, residential and commercial landscaping, parks, athletic fields, and roadway medians. An urban water reuse system provides benefits to both the potable water and wastewater utilities, and it is recommended that ACC evaluate potential reuse systems.

Each of ACC's three WRFs were designed to be easily modified for implementation of reuse projects. It is recommended that ACC evaluate developing a reuse system at the North Oconee WRF to possibly supply treated reclaimed water for irrigation at the UGA golf course and other locations on the UGA campus.

4.2.1.3 Treatment Processes

GAEPD issued a wasteload allocation for all three WRFs between 2004 and 2006. The typical wasteload allocation issued in this watershed at the time allowed for a total suspended solids concentration of 20 milligrams per liter (mg/L), 5-day biological oxygen demand (BOD_5) concentration of 8.0 mg/L, and a total phosphorus (TP) concentration of 1.0 mg/L between May and October of each year. Based on the WRFs' current operation, these limits are being met with consistency. However, GAEPD is developing numeric nutrient criteria for lakes, rivers, estuaries, and wetlands (natural), which are expected to impact TP effluent limits in the Oconee River Basin within the next 5 years. While there are several technology approaches to meeting a more stringent TP limit, fabric (cloth media) filtration following the

secondary clarifiers provides a cost- effective approach to reliably meet the anticipated effluent TP limit of 0.3 mg/L. It is recommended that these filters be installed at each of the WRFs (Table 4-4).

PUD Management consistently communicates with WRF staff to identify facility needs. In addition, a workshop was held on June 13, 2015, to identify plant improvements that would be appropriate for inclusion in the SDP 2015 Update. The recommended improvements identified are summarized in Table 4-4, along with the purpose for the recommended improvement.

4.2.1.4 Solar Energy Facility

PUD is interested in the use of renewable energy generation technologies, which could be used to augment energy sources used to power WTP and/or WRF processes, and/or to provide additional revenues for local municipalities. Solar energy generation is a cost-effective method of generating and utilizing energy, as solar energy is reaching grid parity with utility costs. Additionally, solar deployment would reduce the environmental impact of operations. Installation of a solar power facility at the Cedar Creek WRF is included as a recommended improvement in the 2015 SDP Update, based on the amount land available for installing solar arrays.

4.2.1.5 Alternative Energy Source Evaluation

As part of the SDP, it is recommended that PUD evaluate renewable energy generation technologies. These technologies could be generated by PUD and be used to power WTP and/or WRF processes. Additionally, energy generation could provide additional revenues for local municipalities. Alternative energy sources that could be evaluated include sewage biogas conversion and solar power.

4.2.2 Existing Wastewater Collection System

Recommended wastewater collection improvements include sanitary sewer evaluation survey (SSES), pipe rehabilitation, and pipe replacement. Analytical methods used to identify each type of improvement are summarized in the following subsections. Table 4-5 summarizes the recommended improvements that resulted from these analyses. Figures 4-2 through 4-4 show the location of site-specific rehabilitation and replacement projects (note that expanded sewer Service Areas are also shown on these figures and will be discussed in the next section). It should be noted that ACC's goal is to conduct SSES and necessary rehabilitation on all of its sewer system; therefore, any pipes not highlighted on Figures 4-2 through 4-4 are included in one of the recommended improvements that cover pipes not identified as specific rehabilitation or replacement projects. These improvements include Targeted RDII Reduction – SSES and Rehabilitation and Long-term SSES and Rehabilitation Program (Table 4-5).

TABLE 4-5
Wastewater System Recommended Improvements – Existing Wastewater Collection

Project Name	Drainage Sub-basin	Project Details
System-wide		
System-wide Flow Monitoring	Throughout Service Area	Comprehensive flow-monitoring study to be conducted every 10 years
Targeted RDII Reduction - SSES and Rehabilitation	Throughout Service Area	SSES and rehabilitation (where needed) in flow monitoring basins with high RDII volumes (30 of 51 flow meter basins)
Long-term SSES and Rehabilitation	Throughout Service Area	SSES and rehabilitation (where necessary) on all sewer pipes not included under a separate project
North Oconee Basin (Figure 4-2)		
Tanyard Creek Interceptor Improvements	UNO-4	Rehabilitation – 2,900 LF Replacement – 3,300 LF
Upper North Oconee West Trunk Improvements	UNO-4, UNO-4, UNO-5	SSES and rehabilitation (where needed) – 10,200 LF Replacement – 175 LF
Upper North Oconee Interceptor – Phase 2C	UNO-6,UNO-7	Replacement – 11,000 LF
Sanford Stadium Interceptor	UNO-4	Rehabilitation – 1,700 LF Replacement – 1,000 LF
Upper North Oconee/Highway 29 Interceptor	UNO-6	Replacement – 4,500 LF
Middle Oconee Basin (Figure 4-3)		
Brooklyn Creek Interceptor Improvements	LMO-3	Rehabilitation – 3,000 LF Replacement – 10,300 LF
Middle Oconee East Trunk Improvements	LMO-1, LMO-3, LMO-4, LMO-6	Rehabilitation – 19,400 LF Replacement – 8,700 LF
Middle Oconee West Trunk Improvements	LMO-2, LMO-7, LMO-9, LMO-10, BC-1	SSES and rehabilitation (where necessary) – 58,000 LF
Turkey Creek Interceptor	TC-1, TC-3	SSES and rehabilitation (where necessary) — 6,400 LF
Hampton Park Interceptor	LMO-4	Replacement – 3,000 LF
Kingswood Collector	MN-2	Replacement – 2,200 LF
McNutt Interceptor Improvements	MN-1	Replacement – 2,400 LF SSES and rehabilitation (where necessary) – 38,000 LF
Cedar Creek Basin (Figure 4-4)		
Cedar Creek Interceptor Improvements	CC-2, CC-3, CC-4, CC-5	SSES and rehabilitation (where necessary) – 24,700 LF
Lower North Oconee Trunk Improvements	LNO-1, LNO-2, LNO-3, LNO-4	SSES and rehabilitation (where necessary) – 23,000 LF

LF – linear feet

4.2.2.2 SSES and Rehabilitation

SSES and rehabilitation were prioritized on approximately 37 miles (195,000 linear feet) of sanitary sewer pipe. Additionally, SSES and rehabilitation were prioritized on approximately 260 miles (1,370,000 linear feet) of sanitary sewer pipe based on flow monitoring analysis results (Section 2.4.2.4). Details of SSES and rehabilitation, and the methodology for project identification, are detailed below.

SSES are bottom-up asset group assessments that includes field inspections of sanitary sewer pipe using the following methods:

- Cleaning (assume less than 25 percent asset blockage)
- Closed-circuit television video recording
- Smoke testing
- Manhole condition assessment

Pipe rehabilitation projects include the repair of existing pipe in the wastewater collection system. The mode of repair is assumed to be cured-in-place pipe lining. This improvement is recommended because of pipe age and condition.

To identify areas of the sanitary sewer system that should be prioritized for SSES, a comprehensive assessment of the condition and operational quality of the sanitary sewer system was conducted. A multifaceted approach was used to evaluate the system, which included a Risk-Based Prioritization to identify high risk assets, a flow monitoring study (Section 2.4.2.4) to analyze system efficiency in terms of RDII and GWI, and wastewater collection capacity analysis (Section 3.4.3). PUD's goals is to conduct SSES (and rehabilitation, where necessary on all of its wastewater collection assets). However, results of these studies allowed PUD to prioritize assets for initial SSES and to make assumptions on the percentage of surveyed assets that may need rehabilitation.

The Risk-Based Prioritization involved developing a risk score for all trunks, interceptors, and collectors. Trunks and interceptors were grouped according to a perceived change in the severity of failure, change in pipe characteristics, or where a project may naturally divide (e.g., road crossing, etc.), and collectors were grouped according to the sewer sub-basin. Ultimately, 14 trunk asset, 41 interceptor assets, and 69 collector asset groups were developed and named. Risk scores were assigned to each of the 124 assets, by rating the following criteria: Consequence of Failure (Financial Viability and Impact, Customer Satisfaction, Compliance/Health, Public Service and Image) and Likelihood of Failure (Physical Factors, Operational Factors, Environmental Factors, and Mechanical Factors). Based on the results of the study, 10 asset groups were categorized as High Priority Assets. SSES and rehabilitation of these assets are included as specific projects in Table 4-5. Additionally, the risk score for each of these projects will be used to prioritize the recommended improvements in the Capital Improvements Element.

Results of the 2015 flow monitoring study (Section 2.4.2.4) were used to rank basins according to their "R" value (the ratio of rainfall to RDII). Results of the study indicate that more than 80 percent of the RDII enters the wastewater system in 30 of the 51 flow meter basins. SSES and rehabilitation of these basins is included as a recommended improvement (Table 4-5). This includes approximately 260 miles (1,370,000 linear feet) of sanitary sewer pipe, which are not included in other site-specific projects. While the site-specific projects primarily include trunks and interceptors, this project is primarily comprised of collectors. Additionally, flow monitoring is recommended every 10 years to evaluate the success of wastewater collection improvements and to evaluate RDII and GWI in the system (Table 4-5).

Dynamic wet-weather modeling and schematic capacity analysis (Sections 3.4.3) were used to identify pipes that should be the focus of rehabilitation efforts. Pipe segments that exceeded the project identification criteria (d/D > 0.75 [dynamic modeling] or d/D > 0.9 [schematic capacity analysis]) during peak flow or wet-weather conditions were most often identified as rehabilitation projects, to focus on RDII.

4.2.2.3 Sewer Replacement

Pipe replacement was recommended on 46,575 linear feet (Table 4-5). Whereas rehabilitation is recommended for pipes that are deteriorating but have sufficient capacity, pipe replacement projects include replacing existing sewer pipe because of either severe condition or insufficient capacity. As previously mentioned, new pipe size recommendations were made based on:

- d/D ≤ 0.75, during the 2035 peak flow conditions, assuming no RDII reduction, for areas included in the static schematic capacity analysis, or
- d/D ≤0.9, during the 2035 wet-weather conditions, assuming no RDII reduction, for areas included in the dynamic wet-weather model.

Pipe replacement projects were determined to be either same-trench replacement or pipe bursting, depending on the surrounding land use.

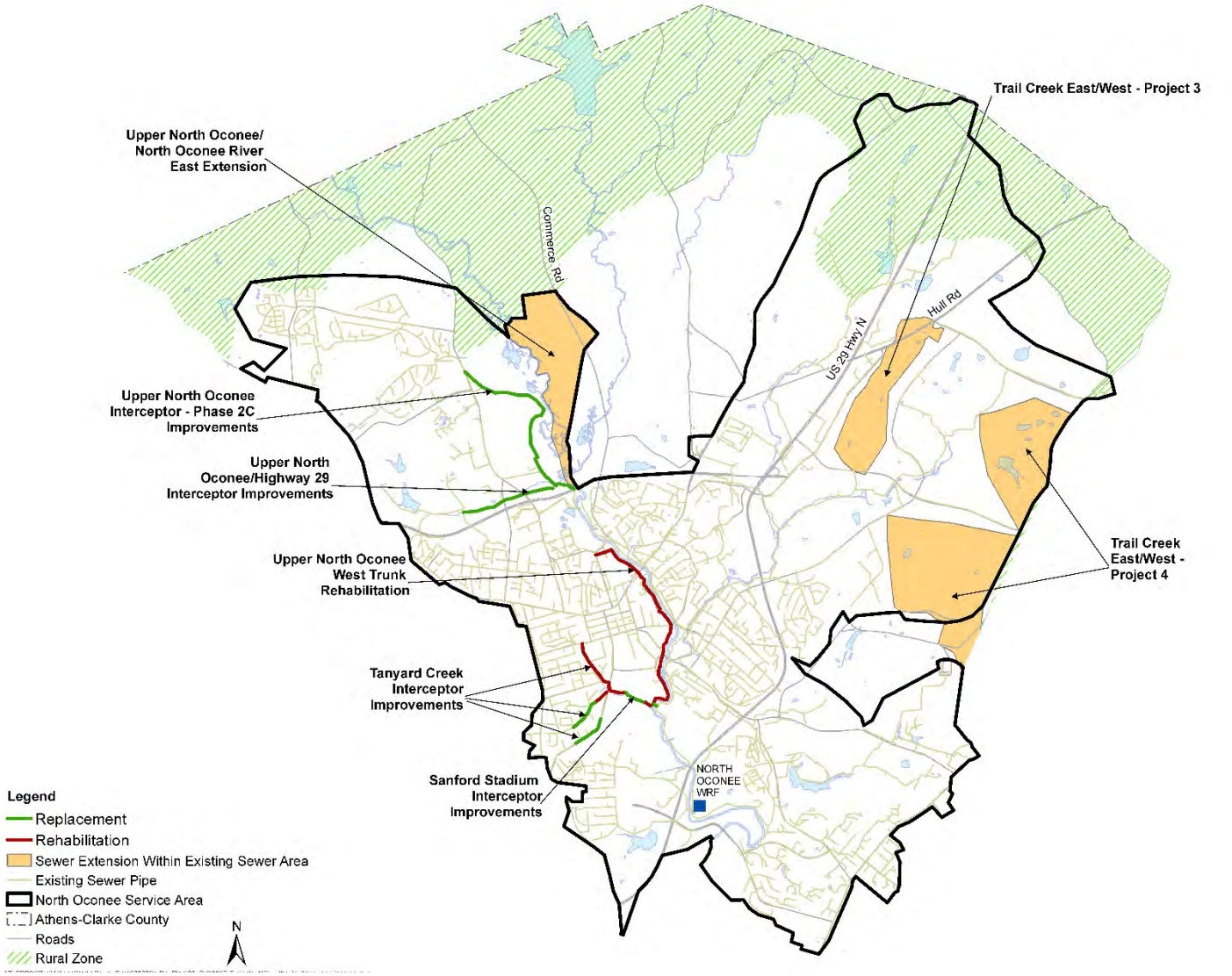


FIGURE 4-2

Recommended Wastewater Collection Improvements - North Oconee WRF Service Area

2015 Service Delivery Plan: Infrastructure Element

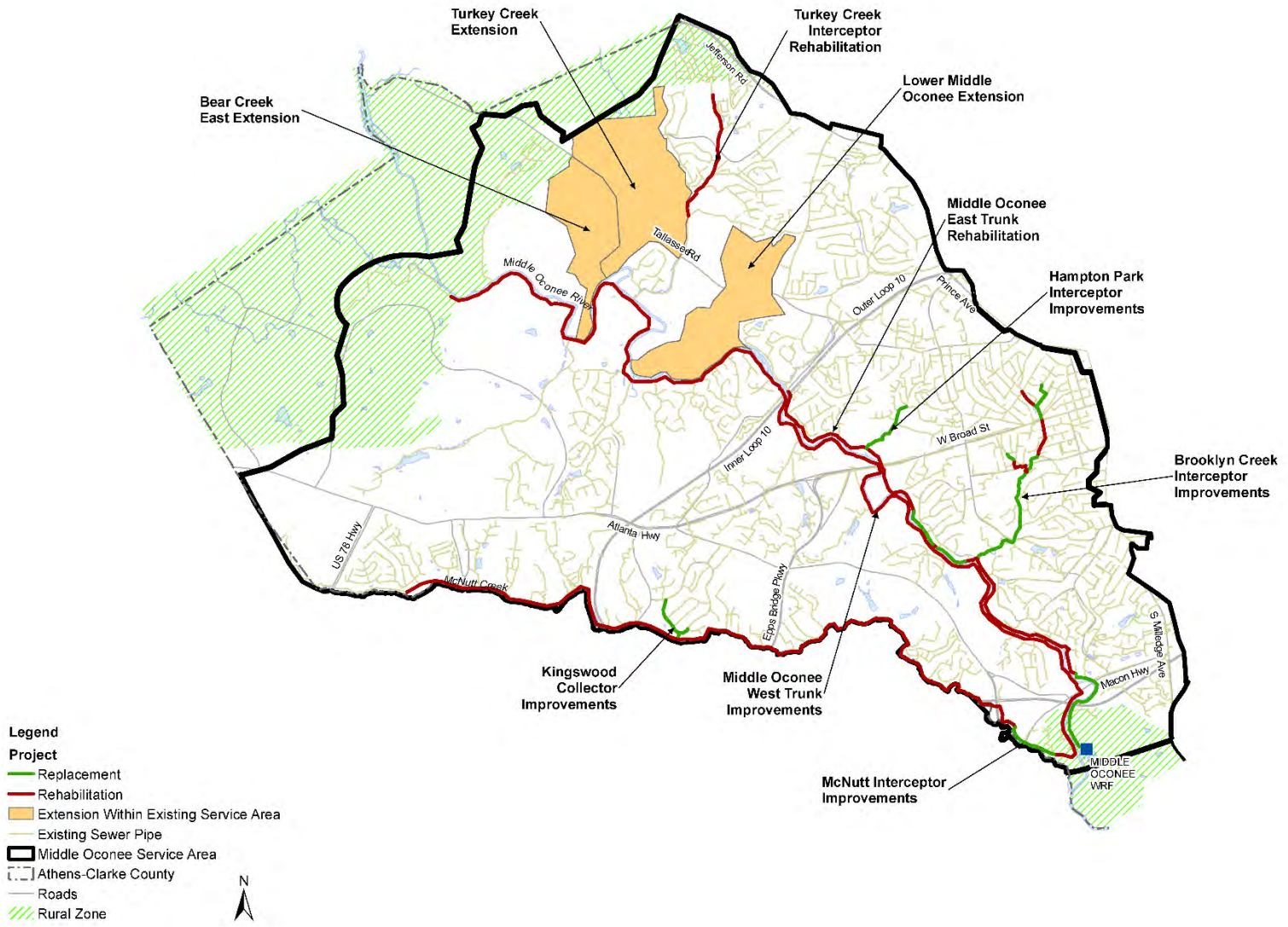


FIGURE 4-3

Recommended Wastewater Collection Improvements - Middle Oconee WRF Service Area

2015 Service Delivery Plan: Infrastructure Element

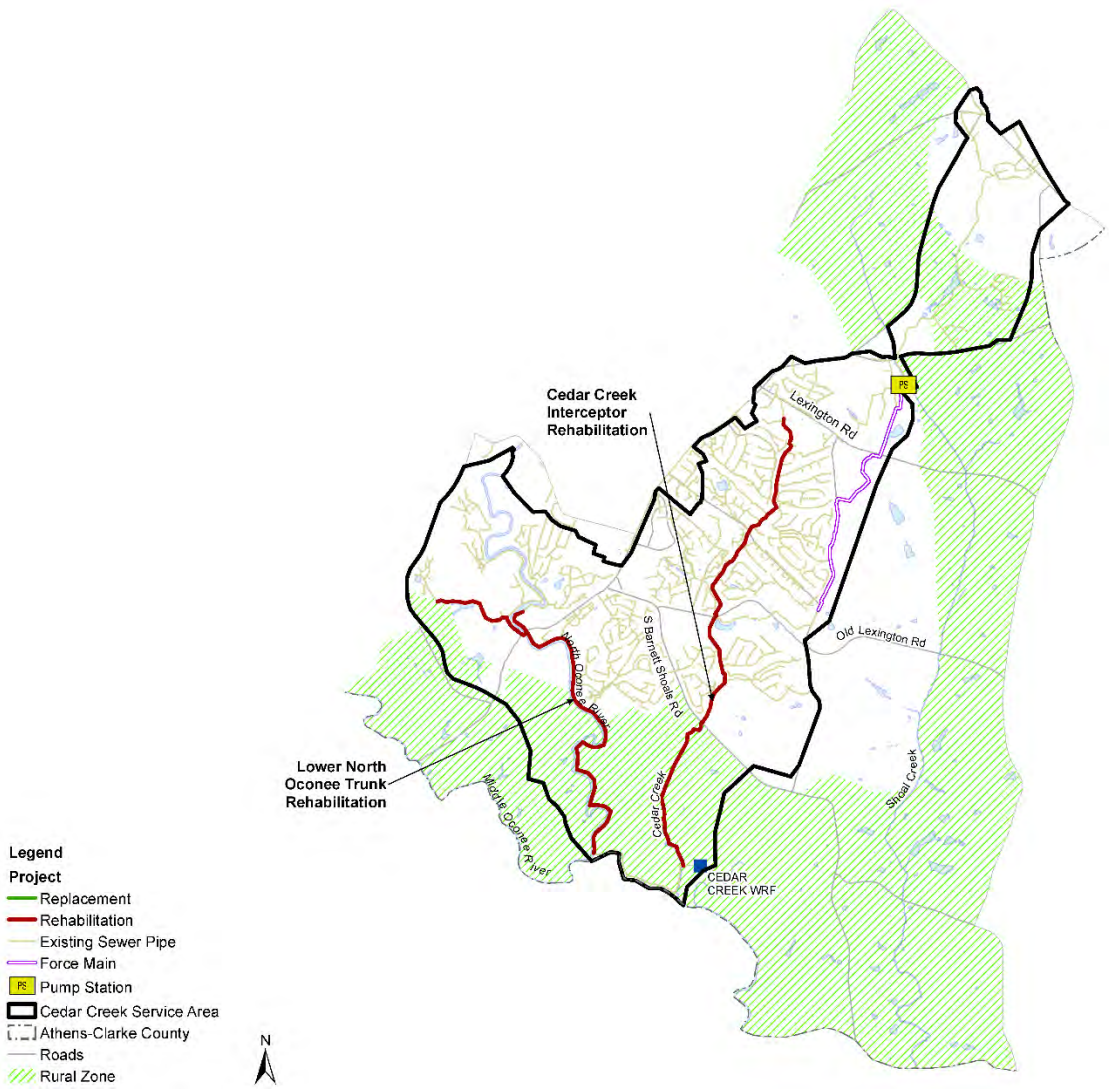


FIGURE 4-4

Recommended Wastewater Collection Improvements – Cedar Creek WRF Service Area

2015 Service Delivery Plan: Infrastructure Element

4.2.3 Future Wastewater Collection System

For the 2015 SDP Update, two types of future wastewater collection projects were identified: those that extend wastewater collection within the Service Area and those that would require a revision to the existing public wastewater Service Area. Figure 4-5 shows the projected future (2035) wastewater flows and the existing sanitary sewer pipe. This map was used to evaluate the extension of future sewer service with consideration to PUD's goals for sewer service, to:

- Provide wastewater service to 90 percent of ACC residents (approximately 10 percent of residents, located in rural land use areas, may be better served by on-site systems based on population density and cost effectiveness)
- Provide service to the upper 200 acres of each sub-basin and in 200-acre areas adjoining each trunk or interceptor

4.2.3.1 Extension of Wastewater Collection within Service Area

Table 4-6 summarizes recommended projects to extend wastewater collection within the existing Service Area. These projects are shown on Figure 4-2 (North Oconee Service Area) and Figure 4-3 (Middle Oconee Service Area). The projects include extending wastewater service in 3,050 acres of the Trail Creek, Bear Creek, Turkey Creek, Upper North Oconee, and Lower Middle Oconee drainage basins for future customers.

TABLE 4-6
Wastewater System Recommended Improvements – Extension of Wastewater Collection within Service Area

Project Name	Drainage Sub-basin	Details
North Oconee Service Area (Figure 4-2)		
Trail Creek East/West – Project 3	TCE-3	Extension of sewer service to 300 acres in the Trail Creek East drainage basin
Trail Creek East/West – Project 4	TCE-2, TCE-4	Extension of sewer service to 1000 acres in the Trail Creek East drainage basin
Upper North Oconee/North Oconee River East Extension	UNO-8	Extension of sewer service to 350 acres in the Upper North Oconee drainage basin
Middle Oconee Service Area (Figure 4-3)		
Bear Creek Extension	BC-2	Extension of sewer service to 300 acres in the Bear Creek drainage basin
Turkey Creek Extension	TC-2	Extension of sewer service to 600 acres in the Turkey Creek drainage basin
Lower Middle Oconee Extension	LMO-8	Extension of sewer service to 500 acres in the Lower Middle Oconee drainage basin

4.2.3.2 Expanded Public Sewer Service Area

Expanded sewer service to the Lower Shoal Creek basin was removed by M&C in 2004, and expanded service to Sandy Creek was removed by M&C in 2010. Aging septic systems currently provide wastewater service in these areas, with the average age of these systems greater than 20 years, reaching or extending beyond the average life expectancy of a septic system (i.e. 25 years). In the Sandy Creek drainage area, outside of the rural zone, there are more than 1200 septic tanks, with an average age of 26 years. In the Shoal Creek drainage area, there are more than 1100 septic tanks, with an

average age of 21 years. The large amount of septic tanks that are densely clustered in the drainage basins, and the aging condition of these systems, could adversely impact public health and water quality. Therefore, expanded wastewater service is recommended in the Sandy Creek and Lower Shoal Creek basins, in areas outside the rural zone. Based on the motion approved by M&C in 2015, expanded service in these areas shall utilize solutions other than gravity sewer lines, shall avoid environmentally sensitive areas, and shall serve only existing structures or lots of record. Expanded service would be implemented only after approval by M&C. The recommended future public sewer Service Area is shown on Figure 4-6, and recommended improvements are summarized in Table 4-7.

TABLE 4-7

Wastewater System Recommended Improvements – Expanded Sewer Service Area

Project Name	Drainage Sub-basin	Details
North Oconee Basin (Figure 4-2)		
Sandy Creek Basin	SC-1, SC-2, SC-3, SC-5	Expansion of the public sewer service to existing developments in the Sandy Creek drainage basin; sewer expansion shall utilize solutions other than gravity sewer lines, shall avoid environmentally sensitive areas, and shall serve only existing structures or lots of record
Cedar Creek Basin (Figure 4-4)		
Shoal Creek Basin	SHC-2, SHC-3, SHC-4, SHC-5, and SHC-7	Expansion of the public sewer service to existing developments in the Shoal Creek drainage basin; sewer expansion shall utilize solutions other than gravity sewer lines, shall avoid environmentally sensitive areas, and shall serve only existing structures or lots of record

TABLE 4-7

Wastewater System Recommended Improvements – Expanded Sewer Service Area

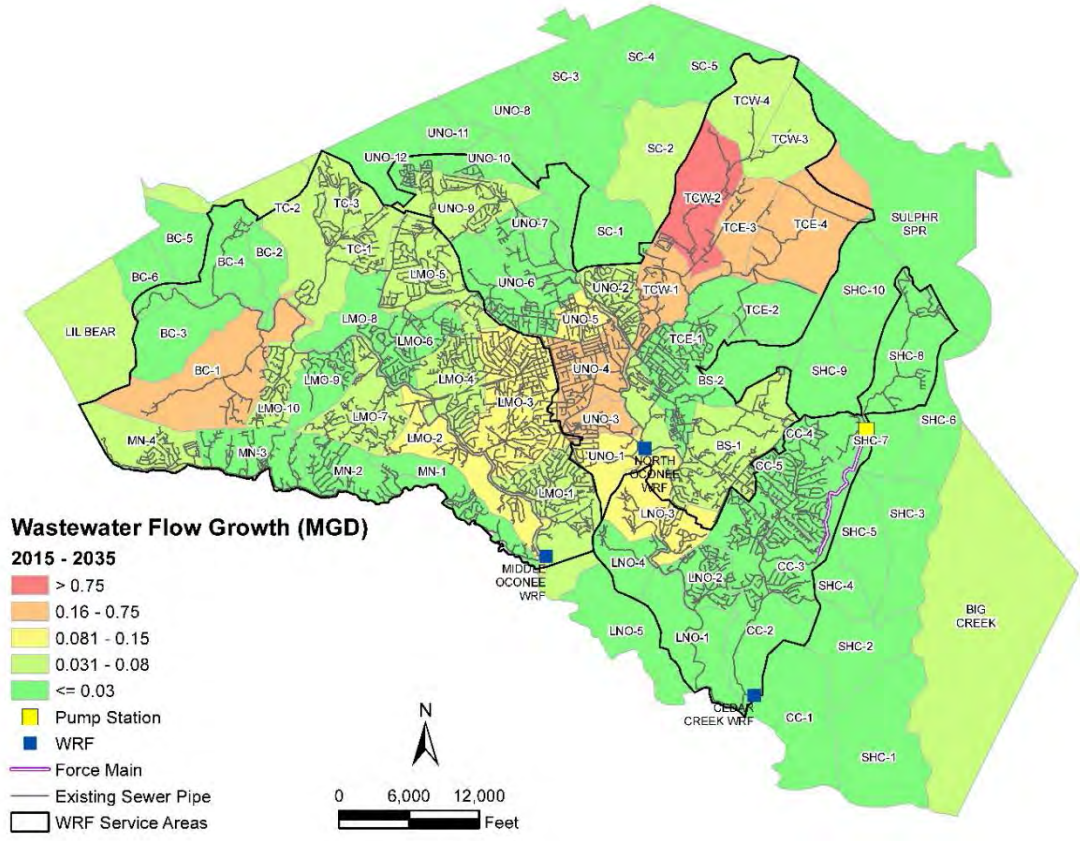


FIGURE 4-5

Comparison of Existing Sewered Areas to Projected Wastewater Flow Growth

2015 Service Delivery Plan: Infrastructure Element

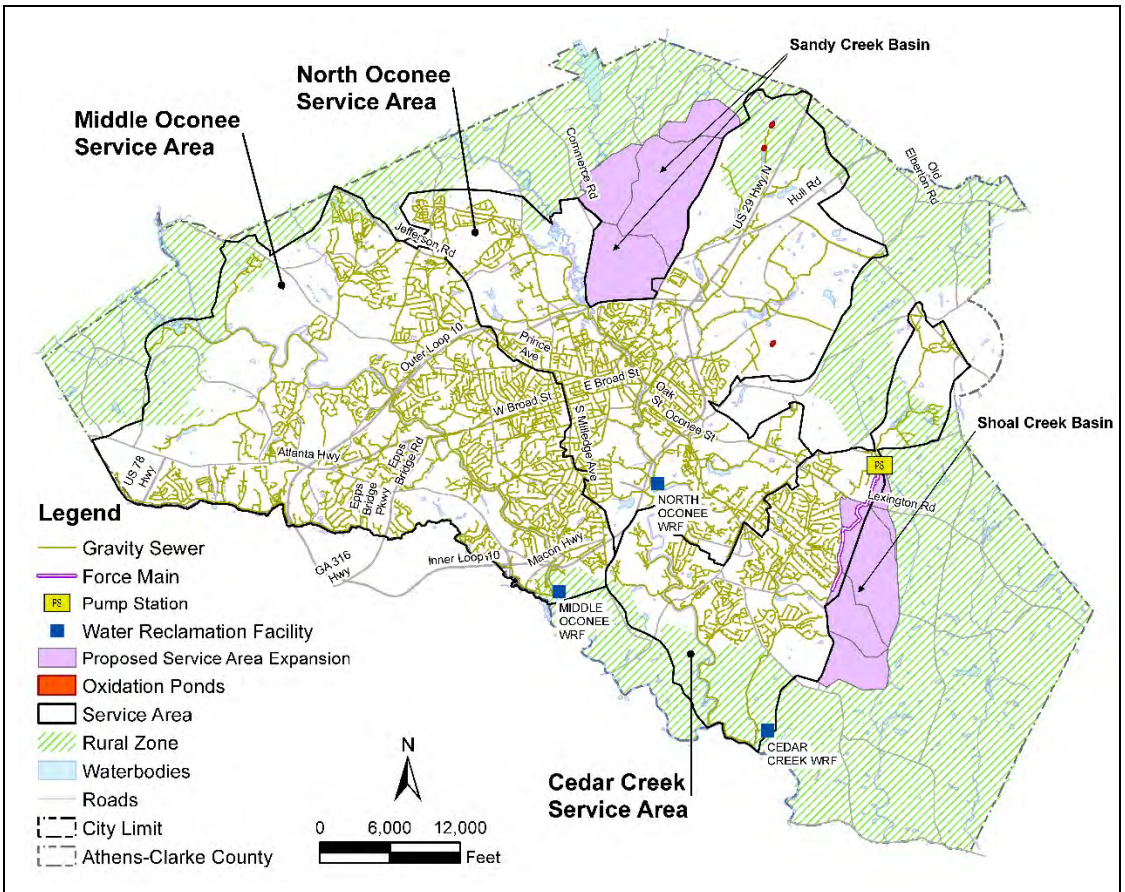


FIGURE 4-6
Existing and Proposed Expanded Service Areas
2015 Service Delivery Plan: Infrastructure Element

4.3 Facility and Space Planning

Table 4-8 summarizes recommended improvements related to facility and space planning. As part of the assessment for future facility needs, conceptual space planning has been completed for the Meter Management and Cross Connection and the Water and Sewer Construction and Maintenance sections, as well as the J.G. Beacham WTP. Planning included anticipating current and future staff levels by both quantity and type, using the ACC space standards by employee type, available property, and potential efficiency improvements through facility upgrades. Two conceptual master plan site layout options were developed based on the space needs. Cost estimates were also developed for each option. This information was taken into consideration when selecting projects for this 2015 SDP update.

TABLE 4-8
Facility and Space Planning Recommended Improvements

Project Name	Details
Water and Sewer Building – Short-term Renovations	Expansion of W&S Department building to accommodate current staff space needs as per ACC space standards
Combined Meter Management/Water and Sewer Facility	Construction of W&S/MM/CC Building to accommodate increase in staff in the next 5 to 10 years

SECTION 5

Summary of Recommended Improvements

Table 5-1 summarizes the water and wastewater improvements that were identified in Section 4. Planning-level cost estimates were developed for this final list of projects, which were carried forward and prioritized in the Capital Improvements Element.

TABLE 5-1
Summary of Recommended Improvements and Estimated Cost (2015 Dollars)

Project Name	Planning-Level Estimated Cost (2015 Dollars)
Water System	
J. G. Beacham Water Treatment Plant Solids Handling	$16,800,000
Atlanta Highway Elevated Storage Tank and Booster Pump Station	$8,300,000
Small Diameter Water Main Replacement	$10,800,000
Water Main Connections for Improved Water Quality and Fire Protection	$1,600,000
Raw Water Supply Preliminary Engineering and Land Acquisition	$20,000,000
Rehabilitation of Deteriorating Water Mains	$23,400,000
Leak Detection Program	$1,000,000[a]
Water System Subtotal	*$81,900,000*
Wastewater System	
Alternative Energy Source Evaluation	$100,000
Bear Creek Extension (BC-2)	$960,000
Brooklyn Creek Interceptor Improvements	$6,390,000
Cedar Creek Interceptor Improvements	$2,490,000
Cedar Creek WRF - Influent Grinder	$270,000
Cedar Creek WRF – Solar Energy Facility	$1,000,000
Cedar Creek WRF - Total Phosphorus Polishing	$4,250,000
Hampton Park Interceptor	$850,000
Kingswood Collector	$930,000
Long-term SSES and Rehabilitation Program	$19,740,000
Lower Middle Oconee Extension (LMO-8)	$1,860,000
Lower North Oconee Trunk Improvements	$2,670,000
McNutt Interceptor Improvements	$2,730,000
Middle Oconee East Trunk Improvements	$7,840,000
Middle Oconee West Trunk Improvements	$9,490,000
Middle Oconee WRF - Enhanced Biological Phosphorus Removal (EBPR) Basin Cover	$500,000
Middle Oconee WRF - Influent Grinder	$440,000
Middle Oconee WRF - Sludge Thickening Building	$100,000
Middle Oconee WRF - Total Phosphorus Polishing	$7,850,000
North Oconee WRF - Aeration Basins	$170,000
North Oconee WRF - Influent Grinder	$860,000
North Oconee WRF - Reuse Facility	$4,600,000

TABLE 5-1
Summary of Recommended Improvements and Estimated Cost (2015 Dollars)

Project Name	Planning-Level Estimated Cost (2015 Dollars)
North Oconee WRF - Secondary Clarifier Launder Covers	$1,200,000
North Oconee WRF - Total Phosphorus Polishing	$8,950,000
Sandy Creek Basin	$5,000,000
Sanford Stadium Interceptor	$2,550,000
Shoal Creek Basin	$3,000,000
System-wide Flow Monitoring [b]	$400,000
Tanyard Creek Interceptor Improvements	$1,620,000
Targeted RDII Reduction - SSES and Rehabilitation	$35,470,000
Trail Creek East/West – Project 3 (TCE-3)	$1,020,000
Trail Creek East/West – Project 4 (TCE-2, TCE-4)	$1,290,000
Turkey Creek Extension (TC-2)	$2,060,000
Turkey Creek Interceptor	$690,000
Upper North Oconee Interceptor – Phase 2C	$4,260,000
Upper North Oconee West Trunk Improvements	$1,300,000
Upper North Oconee/Highway 29 Interceptor	$2,480,000
Upper North Oconee/North Oconee River East Extension (UNO-8)	$1,880,000
Wastewater System Subtotal	*$149,260,000*
Facility and Space Planning	
Water and Sewer Building – Short-term Renovations	$866,000
Combined Meter Management/Water and Sewer Facility	$8,500,000
Facility and Space Planning Subtotal	$9,366,000
Total	**$240,526,000**

[a] Leak detection program cost assumes $50,000 per year for 20 years

[b] System-wide flow monitoring cost assumes flow monitoring and analysis be conducted twice during the 20-year planning period, with a cost of $200,000 for each analysis