

EXISTING CONDITIONS ASSESSMENT

City of Tuscaloosa Water and Wastewater Systems

REVISED DRAFT
FEBRUARY 14, 2019

This document represents part of the strategic analysis for the Tuscaloosa Comprehensive Plan and Zoning Code Update. It covers the City of Tuscaloosa's water and wastewater systems including an inventory of the infrastructure and plans to provide for their maintenance and expansion. It is based on review of past plans, studies, operations information and interviews with city officials.

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Summary

The water and wastewater infrastructure assessment blends findings from previous analyses and the review of previous plans and studies, supplemented by discussions with the City. The intent is to identify water and wastewater infrastructure issues and needs—with particular focus on conveyance, treatment, distribution/storage and regulatory compliance—to establish a baseline understanding of operations and infrastructure in Tuscaloosa as a precursor to assessing the future needs which will be determined based on the Comprehensive Plan’s draft future land use element. This assessment is organized to separately discuss the City’s water and wastewater infrastructure since each system has unique needs.

OVERALL WATER SYSTEM CHALLENGES AND OPPORTUNITIES

- Vulnerabilities related to the potential catastrophic loss of Lake Tuscaloosa or the Raw Water Main.
- To address these major vulnerabilities, the City needs to develop a written and Alabama Department of Environmental Management (ADEM)-approved contingency plan to obtain an emergency source of raw water from the Black Warrior River.
- The City’s goal to improve the reliability and resiliency of the water treatment, storage and distribution systems.

SUMMARY OF WATER SYSTEM MAPS AND EXHIBITS

The water system assessment is supported by the following maps, which are included in this memo. These maps include:

- Raw Water System Overview map
- Finished Water production graph from 2006 to 2018
- Finished Water system storage and distribution map

OVERALL WASTEWATER SYSTEM CHALLENGES AND OPPORTUNITIES

- Increasing cost-of-growth due to the need to reduce the concentration of pollutant discharges from the wastewater treatment plant amid increasing wastewater flows into the plant
- Vulnerability related to an aging wastewater treatment plant
- Continual needs related to rehabilitation, repair and replacement of the conveyance infrastructure
- Continue with management and enforcement tools to reduce the number of avoidable sanitary sewer overflows.

SUMMARY OF WASTEWATER SYSTEM MAPS AND EXHIBITS

The wastewater system assessment is supported by the following maps, which are included in this memo. These maps include:

- Wastewater Sewer Map
- Wastewater Influent Flow to the Hilliard N. Fletcher Wastewater Treatment Plant

Overview

Context

The City's water and wastewater systems, which serve residential, institutional, commercial and industrial customers in the service area, are providing good customer service and in substantial compliance with environmental regulations and permits. In an effort to improve the reliability and resiliency of the systems, the City has implemented various infrastructure improvements projects that include rehabilitation, repair and replacement activities.

The Tuscaloosa water and wastewater systems are managed by the City's Infrastructure and Public Services Department. This department is responsible for adaptively improving and expanding the systems based on customer service issues/complaints, inspections and growth projections/patterns. To provide the information needed to prepare a listing of and prioritize infrastructure improvement projects, the City uses its own staff and consultants to review issues and provide improvement recommendations. Based on this information, the projects are prioritized and listed in proposed annual budgets for approval by the mayor and city council.

What We Heard

A series of meetings and correspondence with the City was completed to gain a better understanding of the current condition and needs of the water and wastewater systems. Key takeaways related to both systems are provided below:

- The City has potential vulnerabilities related to each system.
- Cost-of-growth for the wastewater treatment system will be significant.
- The City needs to prepare a written, ADEM-approved contingency plan for an emergency raw water source at the Black Warrior River.

Water System Assessment

Raw Water Sources

Lake Tuscaloosa is the primary source of water for Tuscaloosa and holds over 40 billion gallons of water with a capacity of 200 MGD (million gallons per day). Lake Nicol and Harris Lake are smaller, alternate sources of water for the City but are not capable of meeting the water supply needs of the City. Harris Lake is used for industrial water customers.

KEY TAKEAWAYS

- The water quality in Lake Tuscaloosa is managed, in part, by the City's Watershed Management Plan but implementation of recommendations related to the Plan needs to be determined.
- Additional water quality monitoring in Lake Tuscaloosa should be performed to proactively identify water quality trends that would require revisions of the Plan to better protect current and future water quality.
- Through its Land Development Permit (LDP) process, the City has implemented a city-wide impervious surface limitation for developments and a requirement that developers/builders hold a current Qualified Credentialed Inspector (QCI) certification.
- A contingency plan needs to be prepared and approved by ADEM to use the Black Warrior River as a temporary emergency raw water source. The plan should also include structural and equipment mobilization strategies.

Adequacy and Level of Service. Lake Tuscaloosa provides the quantity and quality of raw water required by the City's two water treatment plants. With a reported capacity of 200 MGD, Lake Tuscaloosa will meet the City's raw water needs for many years in the future.

Environmental Compliance. The City has prepared and maintains a Source Water Assessment as required by the ADEM Drinking Water Regulations. The three lakes each have the required ADEM Water Use Classification of Public Water Supply. Treatment strategies at the water treatment plants are matched with the raw water quality by frequent testing by the water treatment plant operators.

Additional Topics. (1) Lake Tuscaloosa has been placed on the Clean Water Act Section 303(d) list for metals (mercury). The source of this is historic atmospheric deposition from coal-fired power plants and it does not represent a water quality concern for drinking water in the future. (2) The potential for a loss of Lake Tuscaloosa as a raw water supply would cause a significant reduction in the amount of water that would be available to the City's customers and the outage could last for an extended time.

Raw Water Transmission Mains

The raw water transmission mains convey water from the water intake tower in Lake Tuscaloosa to the two raw water pumping stations.

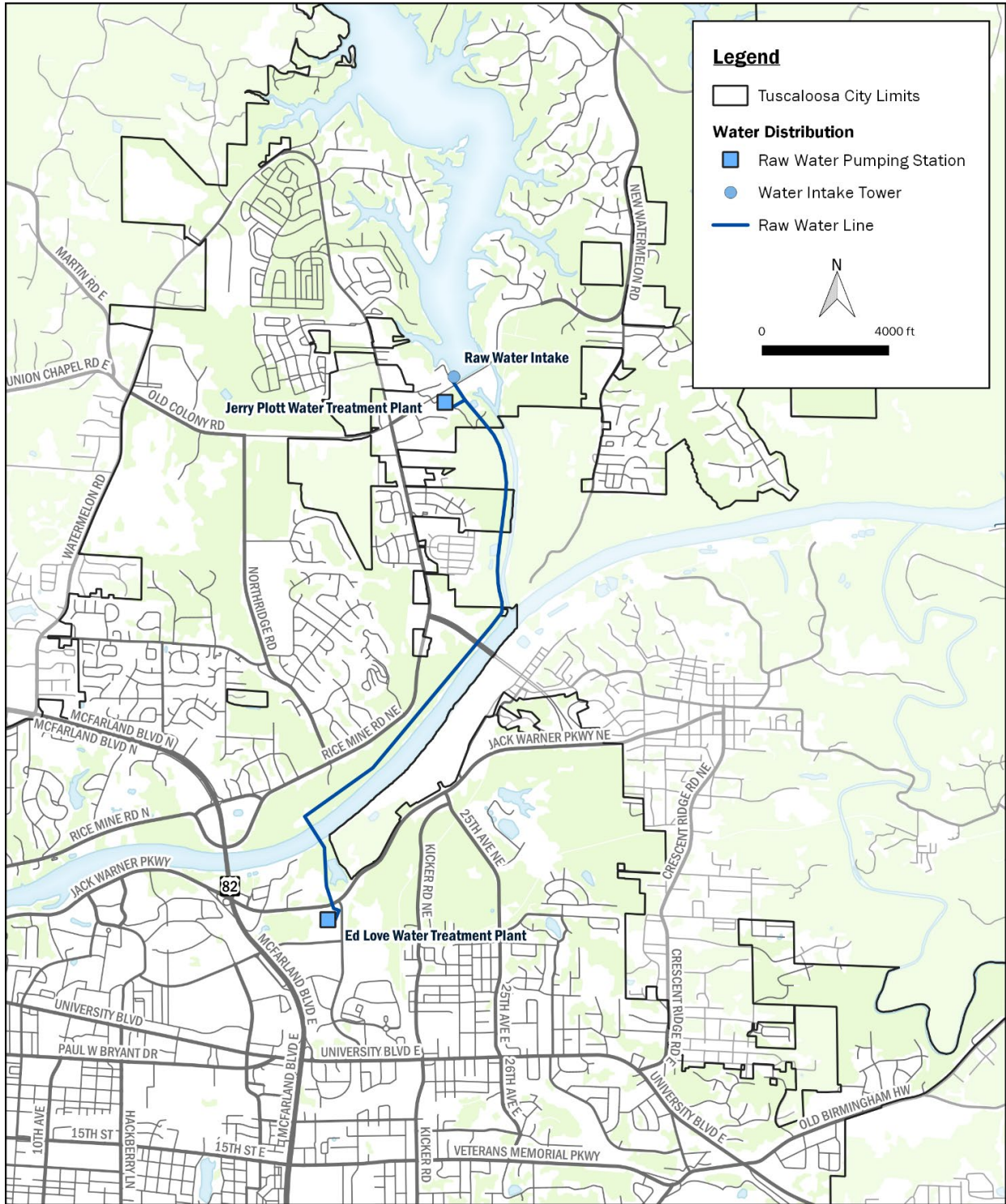
KEY TAKEAWAYS

- A comprehensive condition assessment of the raw water supply system, including the transmission mains, was recommended in the Ed Love Filter Plant Raw Water Pump Station – Evaluation, Recommendations, Contingency and Optimization report (November 2017) but has not yet been performed.
- Loss of one of the parallel raw water mains should not jeopardize the ability to supply raw water to the City assuming the City’s water demand does not exceed 22.5 MGD.
- The raw water delivery system from Lake Tuscaloosa is dependent upon large diameter mains. The mains should be reviewed and inspected.
- Existing watermains crossing the Black Warrior River are necessary for the overall system and should be inspected.

Adequacy and Level of Service. The raw water conveyance system from Lake Tuscaloosa to the City’s two water treatment plants is adequate. A comprehensive inspection program of each component of the raw water delivery system needs to be completed so that proactive corrective actions can be implemented.

Environmental Compliance. There are no environmental compliance issues related to the raw water conveyance system.

Additional Topics. None noted.



Raw Water System Overview Map

Ed Love Raw Water Pump Station (RWPS)

The Ed Love RWPS, which conveys water from the raw water conveyance system to the Ed Love WTP, was originally constructed in 1976 and has been through subsequent upgrades.

KEY TAKEAWAYS

- The latest assessment report of the RWPS was completed in November 2017.
- The original pumps and associated electrical equipment are old, obsolete and should be replaced.
- Based on the recommendations of the November 2017 report, the City has identified specific upgrades to address current deficiencies and increase the reliability and reliance of the RWPS.

Adequacy and Level of Service. The Ed Love RWPS is dedicated to the Ed Love WTP and is adequate to meet the raw water requirements of the facility. Proposed projects to address reliability and resiliency of the RWPS are identified in a report completed in November 2017. Several projects have been issued by the City for implementation.

Environmental Compliance. There are no environmental compliance issues related to the Ed Love RWPS.

Additional Topics. None noted.

Ed Love Water Treatment Plant (WTP)

The Ed Love Water Treatment Plant (WTP) is the older of the two water treatment plants in the Tuscaloosa water system. Since around 1976, the Ed Love WTP has been producing drinking water for the Tuscaloosa area using conventional treatment technology. The permitted capacity of this facility is 45.7 MGD. Since January 2007 to the present, this WTP has been operating at approximately 44 percent of its capacity based on documented average daily flow.

KEY TAKEAWAYS

- The Ed Love WTP is operated in compliance with the ADEM Primary and Secondary Drinking Water Standards and the conditions of the ADEM Public Water Supply (PWS) Permit Number 2015-541 (PWSID Number AL0001313).
- A facility condition assessment report dated April 30, 2018 concluded that the current year condition of the Ed Love WTP is good (satisfactory as-is).
- The treatment equipment and structures are aging so additional investments will be needed in the future.

Adequacy and Level of Service. The Ed Love WTP was designed and is operated for the treatment of the Lake Tuscaloosa raw water so that safe drinking water is available for the customers. Since August 2008, when the Jerry Plott WTP came on-line, this facility has provided approximately 86-percent of the total drinking water needs for the City. The City has identified upgrades to improve the reliability and resiliency of the Ed Love WTP.

Environmental Compliance. As documented in the 2018 Annual Water Quality Report, the facility is in compliance with the ADEM drinking water regulations and the PWS permit.

Additional Topics. None noted.

Jerry Plott Raw Water Pump Station (RWPS)

The Jerry Plott RWPS, which conveys water from the raw water delivery system to the Jerry Plott WTP, was constructed in 2008 in conjunction with the Jerry Plott WTP.

KEY TAKEAWAYS

- The RWPS is in good condition and has been operating satisfactorily.
- Routine maintenance and equipment replacement will be needed in the future.
- No major expansion nor improvements have been identified by the City.

Adequacy and Level of Service. The Jerry Plott RWPS is dedicated to the Jerry Plott WTP and is adequate to meet the raw water requirements of the facility.

Environmental Compliance. There are no environmental compliance issues related to the Jerry Plott RWPS.

Additional Topics. None noted.

Jerry Plott Water Treatment Plant (WTP)

The Jerry Plott WTP is the newer of the two water treatment plants in the Tuscaloosa water system. Since it came on-line in August 2008, this facility, in combination with the Ed Love WTP, have been providing drinking water to the Tuscaloosa customers using the membrane filtration technology. The permitted capacity of this facility is 14.0 MGD. Since August 2008 to the present, this WTP has been operating at approximately 20-percent of its capacity based on documented average daily flow.

KEY TAKEAWAYS

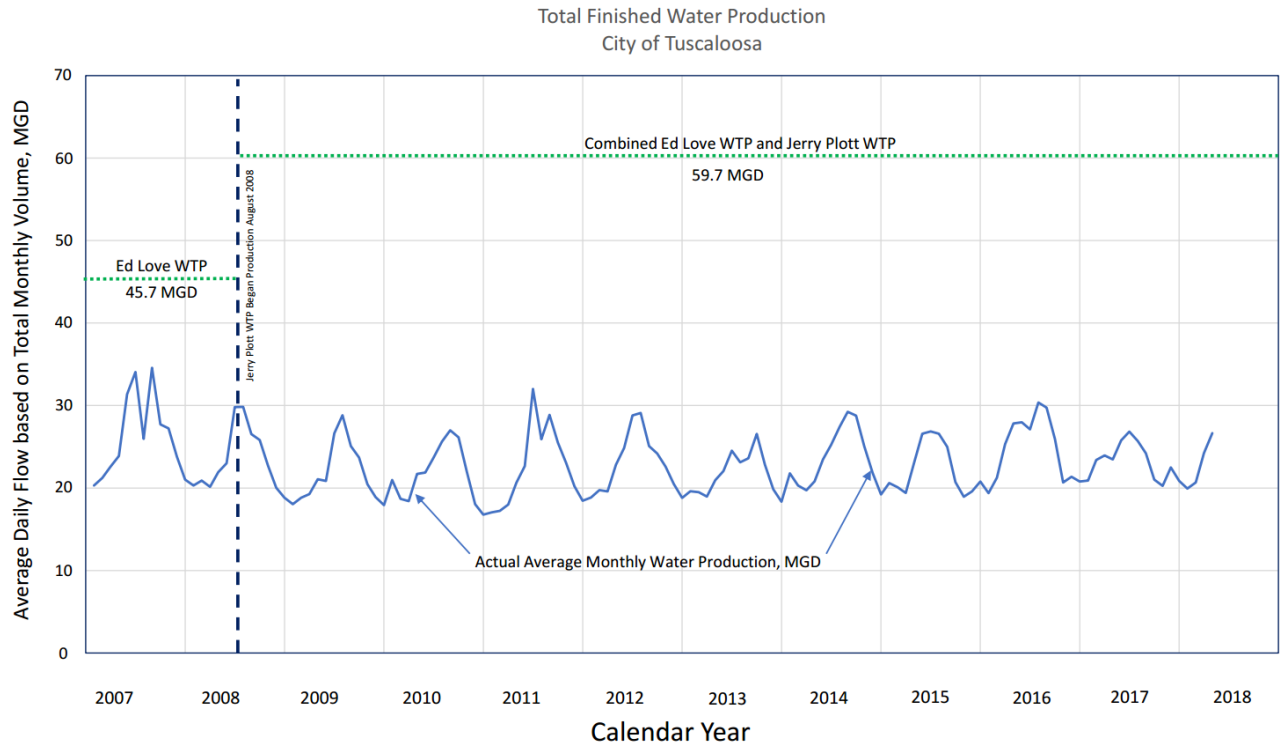
- The WTP is operated in substantial compliance with the ADEM Primary and Secondary Drinking water standards and the conditions of the ADEM PWS Permit.
- A facility condition assessment report dated April 30, 2018 concluded that the current year condition of the facility is good (satisfactory as-is).
- The equipment and structures are aging so additional investments will be needed in the future.

Adequacy and Level of Service. The Jerry Plott WTP was designed and is operated to treat Lake Tuscaloosa raw water so that safe drinking water is available for the City's customers. Since August 2008, this facility has provided approximately 14-percent of the total drinking water needs for the City.

Environmental Compliance. As documented in the 2018 Annual Water Quality Report, the facility is in compliance with the ADEM regulations and the PWS permit.

Additional Topics. None noted.

Total Finished Water Production Graph



Water Distribution Storage Tanks

The Tuscaloosa water system includes 13 water storage tanks of various capacities and styles with a total storage capacity of 25.4 million gallons. Four of the system tanks are ground storage and the remainder are elevated. These tanks stabilize pressures within their respective pressure zones and provide for sufficient water volume for emergency conditions such as firefighting.

KEY TAKEAWAYS

- The existing tanks appear to be in good condition and adequate to service the needs of each pressure zone. Tanks that need rehabilitation have been identified by the City and projects will be authorized to address the needs of the tanks.
- Periodic tank maintenance and rehabilitation will be needed in the future.
- New tanks may be added as the water demand increases and/or the service areas expand.

Adequacy and Level of Service. The water system tanks collectively are providing the level of service needed by the City. There does not seem to be an issue with generation of disinfectant byproducts due to excessive storage volume.

Environmental Compliance. As documented in the 2018 Annual Water Quality Report, there are no environmental compliance issues related to the water storage tanks.

Additional Topics. None noted.

Water Distribution System

The City's water distribution consists of approximately 602 miles of pressurized water mains, 91-percent of which are cast/ductile iron pipe. Most of the remainder of the mains are constructed of PVC with a small amount of 2-inch galvanized steel pipe in the system. The water distribution system also includes nine booster pump stations. The diameter of the distribution mains varies with the hydraulic capacity needed to maintain acceptable water pressure for each service area.

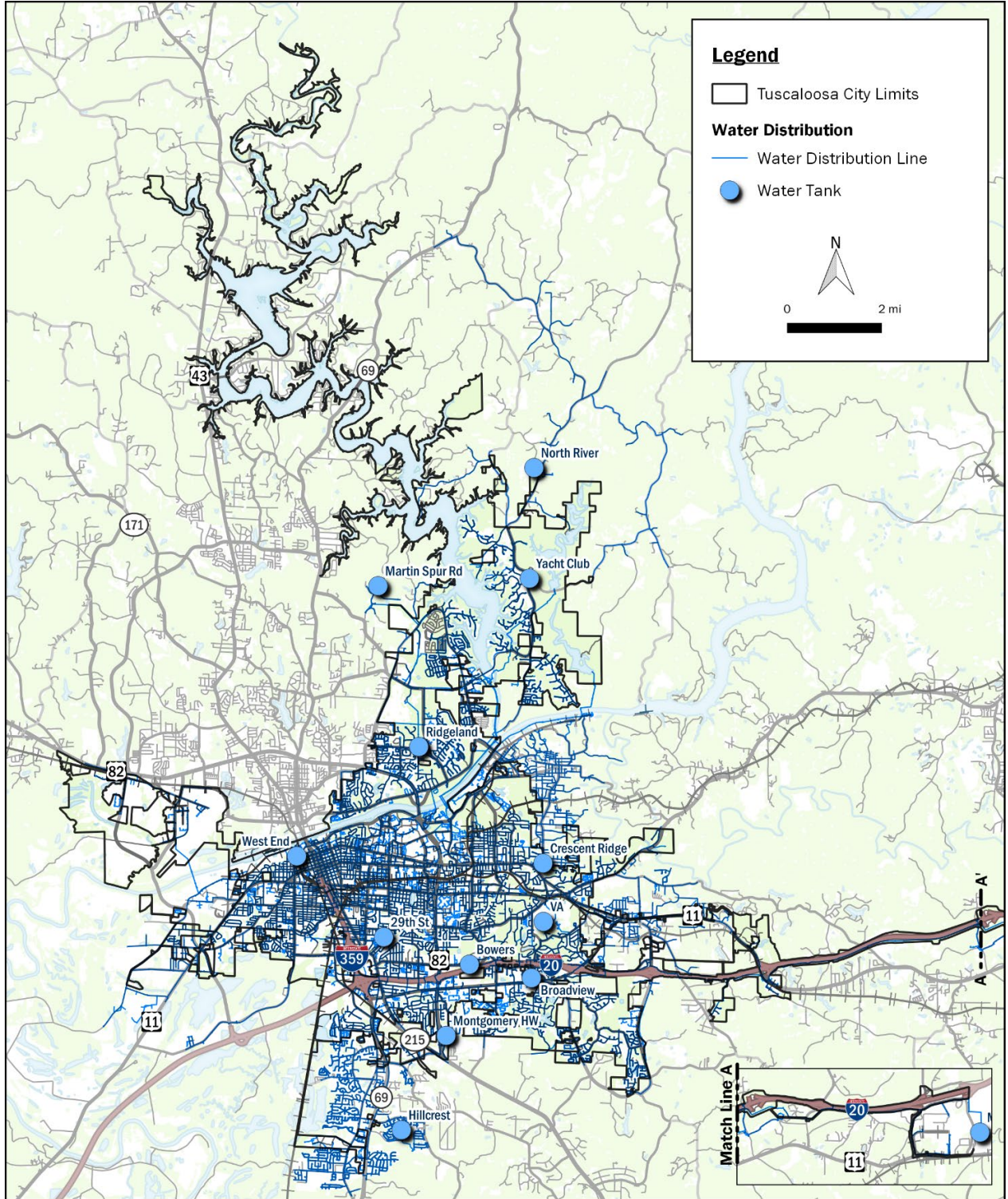
KEY TAKEAWAYS

- The water distribution system is working well. In some areas, the mains need to be reinforced (larger mains installed) to serve the growing water demands.
- The non-revenue, unaccounted for water percentage has averaged 17-percent which is at a reasonable level for a city the size of Tuscaloosa. Unaccounted for water is an indicator of distribution system leaks and unmetered (non-revenue) water.
- There are 2-inch diameter galvanized steel lines in the distribution system that need to be replaced to reduce the number of leaks and provide adequate hydraulic conditions in the area.
- The City has a flushing program which insures that all water distribution mains are flushed on a regular basis. In addition, mains are flushed when water quality complaints are received.

Adequacy and Level of Service. The water distribution system provides the level of service needed by the City's customers. To improve hydraulic conditions in certain areas of the City, main reinforcements are planned for implementation. The City has a flushing program and treatment chemicals are added to address potential internal pipe corrosion and control copper and lead in the drinking water.

Environmental Compliance. As documented in the 2018 Annual Water Quality Report, there are no environmental compliance issues related to the water distribution system.

Additional Topics. None noted.



Water System Storage and Distribution System Map

Water Meters

Sufficient revenue is needed by the City to adequately manage its water and wastewater operations. As a water meter ages, the volume of water that is measured decreases which results in customers getting an extra amount of water without paying for it (unaccounted for water). Approximately 35-percent of the water meters in the distribution system are more than 15 years old.

KEY TAKEAWAYS

- The City is in the process of implementing a systematic meter replacement program which would replace old, obsolete meters with new efficient meters. This will reduce the non-revenue, unaccounted for water.
- The City is planning to implement an Advanced Metering Infrastructure (AMI) which will increase the meter reading efficiency. Funding has been approved for AMI infrastructure and software and for replacement over an 8-year period.

Wastewater System Assessment

Wastewater Collection Systems – Gravity Sewers including Manholes

Most of the City's wastewater collection system consists of gravity sewers and associated manholes. The gravity sewer system consists of more than 550 miles of gravity sewers and over 13,000 manholes. The gravity sewer pipes are constructed of vitrified clay, concrete or lined ductile iron pipe. Sections of the gravity sewer system may be susceptible to hydrogen sulfide-induced internal corrosion. Infiltration/Inflow (I/I) of stormwater and groundwater occurs in the City's gravity sewer system.

KEY TAKEAWAYS

- The City has a gravity sewer/manhole rehabilitation/point repair/replacement program to maintain the integrity of the gravity sewer system.
- Preventable Sanitary Sewer Overflows (SSOs) are managed, in part, by the implementation of Fats, Oil, and Grease (FOG) Program which addresses blockages due to grease accumulation in the gravity sewers and a Gravity Line Preventative Maintenance Program which addresses blockages due to roots and structural defects.
- The City requires sanitary sewer flow studies for developments and/or redevelopments within identified areas of concern.

Adequacy and Level of Service. The gravity sewer system provides the level of service needed by the City's wastewater customers. But there are sanitary sewer capacity concerns for areas north of the Black Warrior River and in the downtown area that flows to Lift Station No 3. To improve hydraulic conditions in these and other areas of the City, larger gravity sewers may be required.

Environmental Compliance. SSOs are unpermitted discharges of untreated or partially treated wastewater and represent a continual compliance issue for municipal wastewater systems, including Tuscaloosa. When an SSO is discovered, the City responds with corrective actions and report occurrences to ADEM in accordance with the City's Sewer Overflow Response Plan. There are no additional environmental issues related to the gravity sewer system. The City enforces its Sewer ordinance which specifies discharge prohibitions and restrictions which are intended to reduce interferences with wastewater treatment processes and to protect the wastewater infrastructure.

Additional Topics. None noted.

Wastewater Collection Systems – Lift Stations

Due to the topography, sewer lift stations are needed at certain locations to convey wastewater to a gravity sewer.

KEY TAKEAWAYS

- Due to the various electrical and mechanical components, wastewater lift stations are maintenance-intensive and the components are susceptible to hydrogen sulfide-induced corrosion.
- The City's Lift Station Management Staff have conducted detailed inspections and identified the older lift stations that need repair. The City is in the process of rehabilitating the older lift stations and/or providing onsite storage capabilities to attenuate the required peak flow to be pumped.
- The rehabilitation activities have been completed on lift stations 2, 3, 4 and 21. Lift stations 5, 6 & 7 were abandoned and replaced by regional Lift station 62.
- Future maintenance and replacement of components will be required to keep the lift stations in good operating condition.
- Additional lift stations will likely be needed as future growth develops.

Adequacy and Level of Service. The wastewater lift stations provide the level of service needed to convey wastewater to the gravity sewers.

Environmental Compliance. There are no environmental issues related to the wastewater lift stations. The City enforces its Sewer ordinance which specifies discharge prohibitions and restrictions which are intended to reduce interferences with wastewater treatment processes and to protect the wastewater infrastructure.

Additional Topics. None noted.

Wastewater Collection Systems – Force Mains

Force mains are pressurized pipes that convey wastewater from the lift stations to a gravity sewer or to a consecutive lift station. Force mains are constructed of lined ductile iron, PVC or HDPE. PVC and HDPE are resistant to corrosion. Wastewater leaks from compromised force mains is considered a non-permitted discharge and represents a threat to water quality and biological integrity. Such incidences must be reported in a timely manner to ADEM per the City's Sewer Overflow Response Plan. Force mains are sized to match the hydraulic conditions of the lift station and final force main discharge.

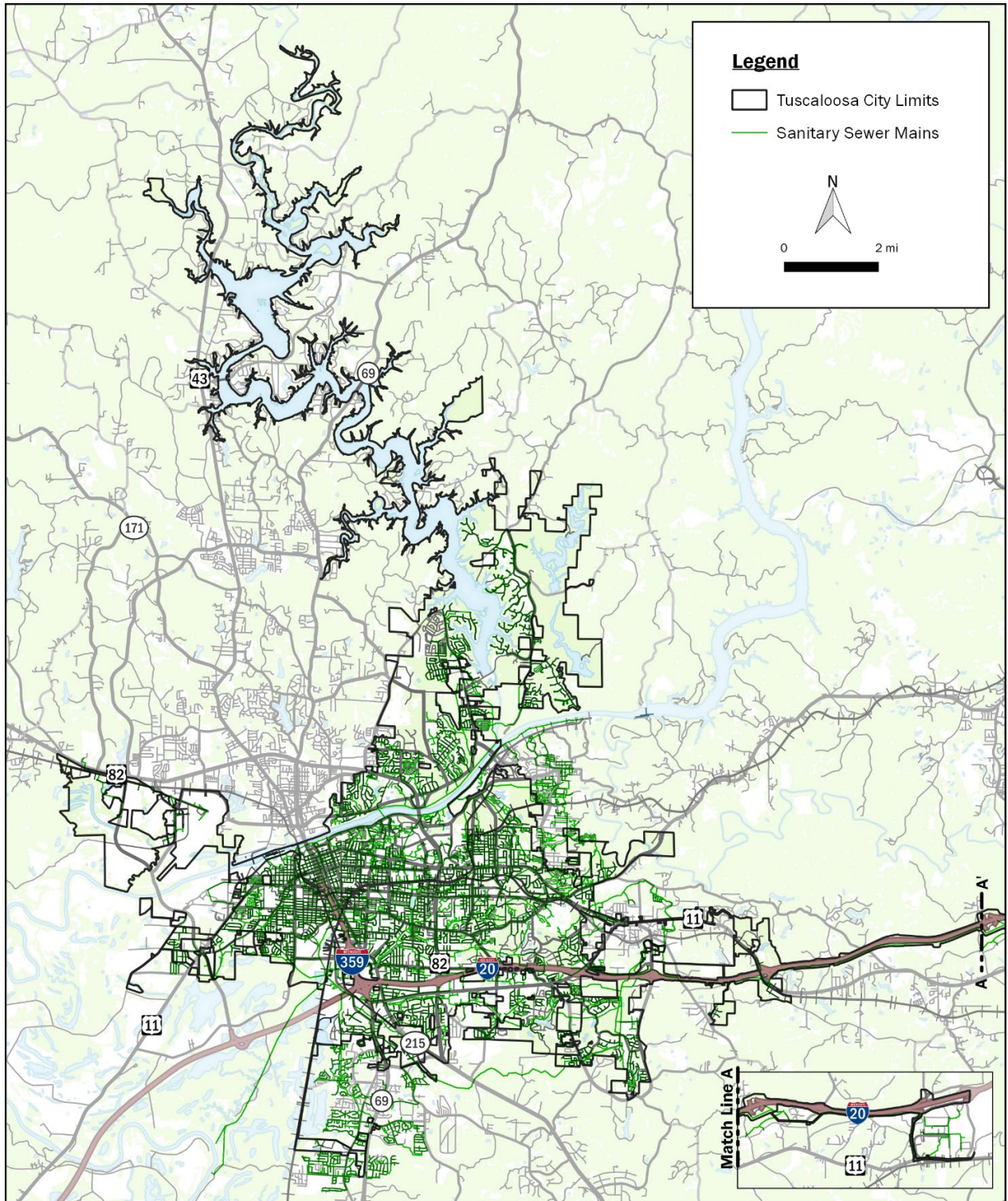
KEY TAKEAWAYS

- The City has identified sections of force mains that have been compromised by hydrogen sulfide-induced corrosion. These sections are being addressed or will be addressed by the City.
- A maintenance program is needed to assess the condition of the force mains and to inspect air release valves and replace those which are not operating satisfactorily.

Adequacy and Level of Service. The force mains provide the level of service needed to convey wastewater to a gravity sewer or to a consecutive lift station.

Environmental Compliance. There are no environmental issues related to the force mains except when SSOs occur due to leaks. The City reports such incidents to ADEM and reactively addresses the deficiency. The City enforces its Sewer ordinance which specifies discharge prohibitions and restrictions which are intended to reduce interferences with wastewater treatment processes and to protect the wastewater infrastructure.

Additional Topics. None noted.



Wastewater Sewer Map

Hilliard Fletcher Wastewater Treatment Plant (WWTP)

This wastewater treatment plant treats the wastewater for discharge to the Black Warrior River or Cribbs Mill Creek in compliance with National Pollutant Discharge Elimination System (NPDES) Permit number AL002713. This facility is the City's only WWTP and it has a permitted capacity of 24 MGD. In calendar year 2017, the average daily flow to the facility was 16.75 MGD with 85 percent of the wastewater emanating from residential customers and 15 percent from industrial. Reports have indicated that the WWTP will be able to meet the 2028 projected flows.

KEY TAKEAWAYS

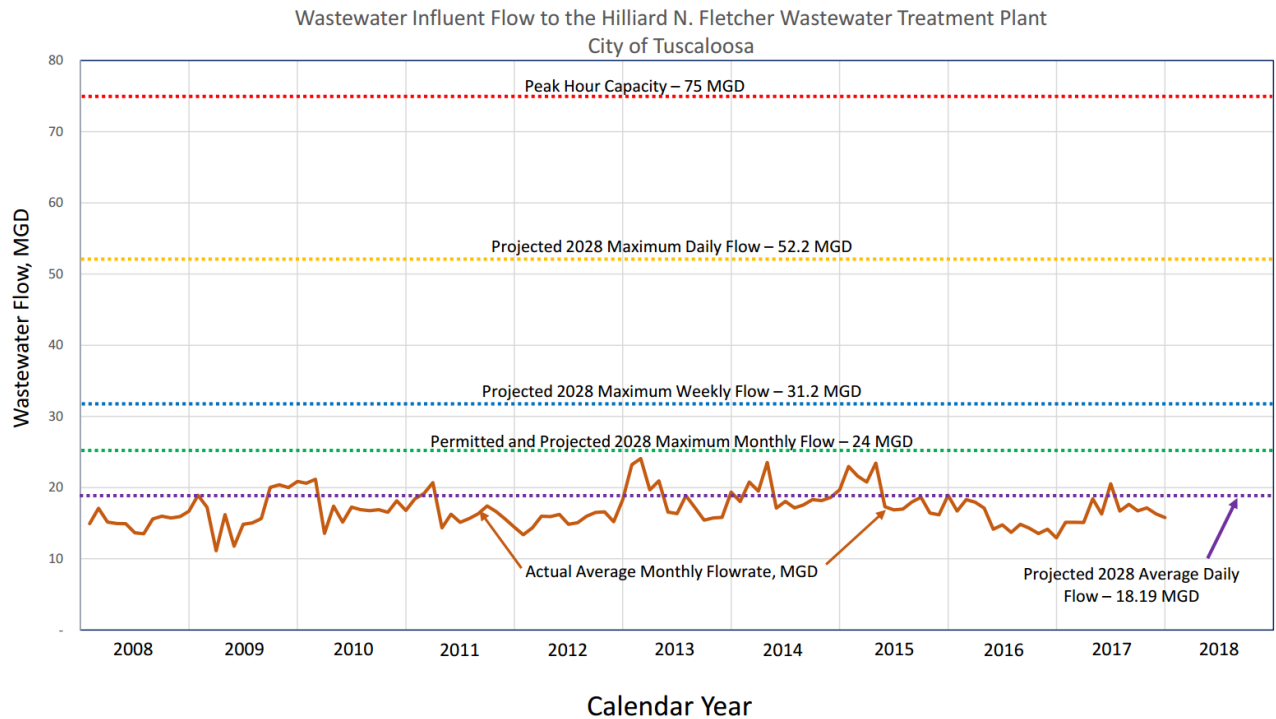
- Since there is a lack of wastewater treatment redundancy, the City's WWTP is a critical asset since a major failure of this facility would result in serious environmental, public health and permit compliance consequences. The facility and its components are aging so future maintenance, rehabilitation and replacement activities will be needed.
- All major equipment items have preventive maintenance plans in the City's Lucity Maintenance Management Software System. The system automatically generates work orders for the maintenance tasks when required.
- The ADEM Waste Load Allocation (WLA), which is the maximum load of pollutants allowed to be released into a segment of a particular waterway, has been consumed by Tuscaloosa, Hunt and other smaller point source discharges within the reach of the Black Warrior River where this plant discharges. As the population growth continues, so will the flow the WWTP. Its current, permitted capacity is 24 MGD. When it is necessary to modify the NPDES permit to include an increase flow due to growth, the permitted level of pollutant releases will likely remain the same as current levels. Therefore, the concentration limits of the new permitted discharge will need to decrease accordingly which means the WWTP will need to use more advanced and costly treatment strategies. This condition would be the same if an additional WWTP was constructed to better serve the northern part of Tuscaloosa, which was not recommended in the Wastewater Treatment Master Plan (May 2010) due to high costs and other factors.

Adequacy and Level of Service. The WWTP provides the level of service needed to treat the domestic and industrial wastewater in compliance with the NPDES permit.

Environmental Compliance. As documented in the Calendar Year 2017 Municipal Water Pollution Prevention Annual Report to ADEM, the WWTP is operated in substantial compliance with the referenced NPDES permit so there are no environmental compliance issues related to the facility. The City enforces its Sewer ordinance which specifies discharge prohibitions and restrictions which are intended to reduce interferences with wastewater treatment processes and to protect the wastewater infrastructure.

Additional Topics. The current NPDES permit references the potential for future nutrient limits which would further increase the cost of treatment.

Wastewater Influent Flow to the Hilliard N. Fletcher Wastewater Treatment Plant Graph



References

Water Infrastructure

- Ed Love Filter Plant Raw Water Pump Station – Evaluation, Recommendations, Contingency and Optimization November 2017
- Water and Wastewater Master Plan prepared by CH2M in the 1990s.
- Tuscaloosa Water Supply Watershed Protection Plan October 2001
- ADEM Intensive Water Quality Survey of Black Warrior River Reservoirs, 2002
- Black Warrior River Watershed Management Plan
- ADEM Water Supply Permit PWSID Number AL0001313
- Water Production from the Love WTP and Plott WTP – January 2006 to June 2018
- Water & Wastewater System Comprehensive Plan Update 1998
- City of Tuscaloosa Rate Study Overview April 6, 2012
- Project list and Priorities
- 2017 Water Distribution System Engineering Standards – November 2017
- Ed Love Facility Assessment
- Jerry Plott Facility Assessment
- Campus Area Water Distribution System Analysis – December 2017
- ADEM Administrative Code R. 335-6-10-.11(b)4 – Lake Tuscaloosa
- ADEM 2012 Tuscaloosa Reservoir Report dated July 2014
- 2018 Annual Water Quality Report
- Monthly Surface Plant Operation Data Report to the Alabama Department of Environmental Management
- Consumer Confidence Report Certification Form
- Water Resources, Conservation, and Emergency Plan, PWSID: 0001313, January 2017
- ADEM 2018 Integrated Water Quality Monitoring and Assessment Report
- ADEM's 2018 Section 303(d) List Fact Sheet
- ADEM's 2018 Section 303(d) list

Wastewater Infrastructure

- Wastewater Treatment Master Plan – May 2010
 - Technical Memorandum 1: Hillard and Northern Wastewater Treatment Plants Flow Projections for 2028
 - Technical Memorandum 2: Regulatory Review for the Wastewater Treatment Options
 - Technical Memorandum 3: Northern Wastewater Treatment Plant Conceptual Design
 - Technical Memorandum 4: Hilliard N. Fletcher Wastewater Treatment Plant Capacity Evaluation

- Hilliard N. Fletcher Wastewater Treatment Plant Flow Evaluation
- Water and Wastewater Master Plan prepared by CH2M in the 1990s.
- Latest water and wastewater rate study
- Water & Wastewater System Comprehensive Plan Update 1998
- City of Tuscaloosa Rate Study Overview April 6, 2012
- Project list and Priorities
- Vulnerability Projects
- Fats, Oil, and Grease (FOG) Management Program, March 2018
- Sewer Overflow Response Plan (SORP), November 2017
- 2010 City of Tuscaloosa Sanitary Sewer Design Manual
- ADEM Sanitary Sewer Overflow (SSO) Notification emails
- NPDES Discharge Permit No. AL0022713 for the Hilliard N. Fletcher Wastewater Treatment Plant
- Calendar Year 2017 Municipal Water Pollution Prevention Annual Report to ADEM – City of Tuscaloosa – Hilliard N. Fletcher Wastewater Treatment Plant – NPDES Permit No. AL0022713
- City of Tuscaloosa Sewer Ordinance