Clean Water 2020

Columbia's Clear Vision For Clean Water

Executive Summary for Columbia's Clean Water 2020 Program

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Acronyms

CMMS – Comprehensive Maintenance Management System
CW2020 – Clean Water 2020
CWA – Federal Clean Water Act
EPA – US Environmental Protection Agency
FOG – Fats, Oils and Grease
IMS – Information Management System
Metro WWTP – Metro Wastewater Treatment Plant
MGD – Million Gallons Per Day
NPDES – National Pollutant Discharge Elimination System
O&M – Operation and Maintenance
PMT – Program Management Team
SCDHEC – South Carolina Department of Health and Environmental Control
SORP – Sewer Overflow Response Plan
SSO – Sanitary Sewer Overflow
WEASC – Water Environment Association of South Carolina
WCTS – Wastewater Collection and Transmission System

EXECUTIVE SUMMARY

The City of Columbia is embarking on an ambitious program of projects and initiatives developed for the City-owned and operated wastewater system. This multi-year program, called the Clean Water 2020 Program (CW2020), is designed to improve water quality and protect the safety and health of citizens by focusing on wastewater system assessment, infrastructure renewal and upgrades, and operational improvements.

The CW2020 Program will result in reviewing and upgrading a significant portion of the wastewater collection system, numerous pumping stations and portions of the City's wastewater treatment plant that discharges into the Congaree River. These improvements are intended to increase the wastewater system's operational capability, efficiency and reliability.

A major focus of the program is to greatly reduce occurrences of Sanitary Sewer Overflows (SSO). These overflows of wastewater can be the result of undersized infrastructure, wet-weather events allowing rain water to enter leaky pipes, and other common operational problems such as sewer blockages caused by roots, grease or sewer collapses.

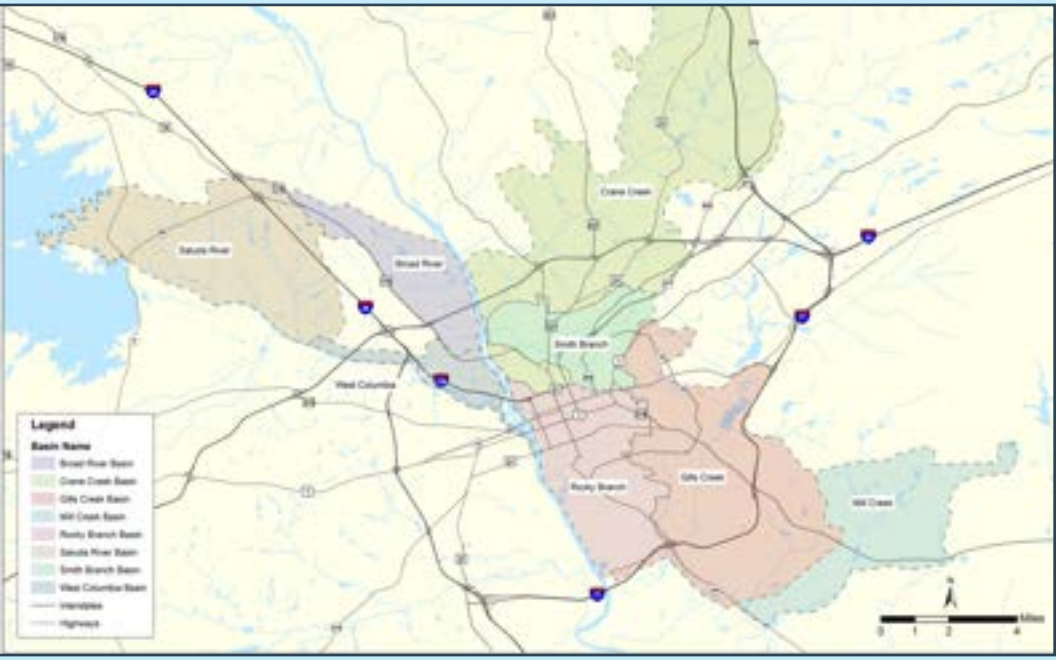
The CW2020 Program will formally respond to the Environmental Protection Agency (EPA) and the South Carolina Department of Health and Environmental Control (SCDHEC) regulations under the Federal Clean Water Act (CWA). The City of Columbia plans to invest significant resources into the program with a majority of its improvements to be completed over the next 10 years. The program is an ongoing effort that will result in upgraded maintenance and asset management practices and business process improvements that will continue to improve the City's systems for many years to come.

CITY OF COLUMBIA'S EXISTING WASTEWATER SYSTEM

The City's wastewater system serves approximately 60,000 customers and covers an area of roughly 120 square miles. It maintains more than 1,000 miles of wastewater collection system piping, over 50 pump stations, nearly 30,000 manholes, and operates a 60 million gallon-per-day (MGD) wastewater treatment plant.

The wastewater system consists of two major components: the Metro Wastewater Treatment Plant (Metro WWTP) and the wastewater collection system of piping networks and pump stations. It should be noted that the storm drainage system is a separate system and is not a part of the wastewater collection system.

City of Columbia Wastewater Service Area Map



This map shows the City of Columbia Wastewater Service Area and the eight sewer basins. Not shown are service areas of major contributors such as the City of West Columbia, Palmetto Utilities (Northeast), and Fort Jackson.

Metro WWTP

Columbia's regional wastewater treatment facility was first constructed in 1974 with a capacity of 20 MGD, which included plans for growth. Subsequent expansions to the plant occurred in 1979, 1983, and again in 1996. The treatment plant is now capable of treating up to 60 MGD.

Managing and operating a wastewater system is an evolving challenge. Operation and maintenance is a daily effort that includes checking pump stations, cleaning sewer lines, and operating the Metro WWTP. Other efforts include the long-term management and planning of the Metro WWTP and collection system assets.

A significant portion of the wastewater system consists of aging infrastructure that must be replaced, rehabilitated, or is in need of additional capacity. Having the correct technology, data, and management systems for efficient operation and decision-making is imperative to the future of the system.

Treatment Train #1 40 MGD

Treatment Train #2 20 MGD

Area for Potential Future Expansion

Administration Building

New Headworks and Influent Pump Station (Under construction at time of photo)

A recent aerial view of the 60 MGD Metro WWTP along the Congaree River. The activity in the lower right section of the site shows the recently completed $40 million WWTP Headworks Improvement Project.

Sanitary Sewer Overflows

An extreme case of a wet-weather related SSO on the Columbia collection system

State and Federal regulations require cities and sewer agencies to reduce overflows and meet the CWA requirements.

A sanitary sewer overflow (SSO) is a discharge of raw sewage, sometimes mixed with stormwater during wet weather, that overflows from a sewer onto the ground or into local streams and rivers. SSOs occur when wastewater exceeds the capacity of the sewer system, pump station, or treatment plant particularly after heavy rain storms.

SSOs have a variety of causes including inadequate sewer capacity, blockages, line breaks, sewer defects that allow stormwater and groundwater to overload the system, lapses in sewer system operation and maintenance, power failures, and vandalism. The untreated sewage from these SSOs contaminate area water bodies, causing potential serious health risks.

A significant portion of the City's collection system is aging, and much of the older system was constructed of clay pipes, which are particularly susceptible to wet-weather events. As this valuable infrastructure ages, the importance of assessing the system and replacing or rehabilitating infrastructure increases.

Cracked Pipe

Plant roots entering pipe

Sludge/grease filled pipe

Section of missing pipe that has broken away, exposing the surrounding soil

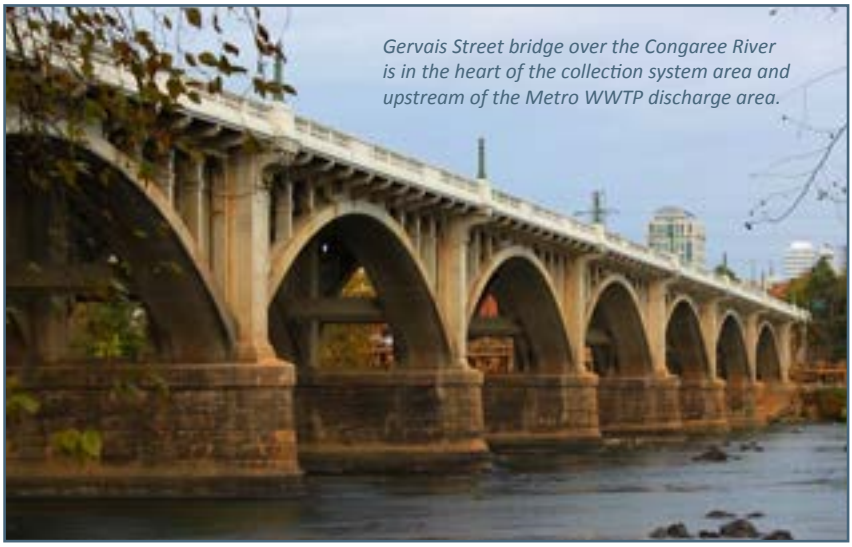
FEDERAL CLEAN WATER ACT

The EPA was established on December 2, 1970 to consolidate, in one agency, a variety of federal research, monitoring, standard-setting and enforcement activities to promote a cleaner, healthier environment.

The Clean Water Act (CWA) establishes the basic structure for regulating discharges of pollutants into the waters of the United States and regulating quality standards for surface waters. The basis of the CWA was enacted in 1948 and was called the Federal Water Pollution Control Act, but the Act was significantly reorganized and expanded in 1972.

Under the CWA, EPA has implemented pollution control programs such as setting wastewater standards for industry. Water quality standards for common contaminants in surface waters were also developed and implemented as national standards.

The CWA made it unlawful to discharge any pollutant from a point source (a discharge pipe) into streams, creeks, rivers or lakes unless a permit was obtained. EPA's National Pollutant Discharge Elimination System (NPDES) permit program monitors and controls these discharges. The City of Columbia has an NPDES permit for its Metro WWTP and collection system. However, discharges of untreated wastewater, such as by an SSO, are not permitted discharges.



Gervais Street bridge over the Congaree River is in the heart of the collection system area and upstream of the Metro WWTP discharge area.

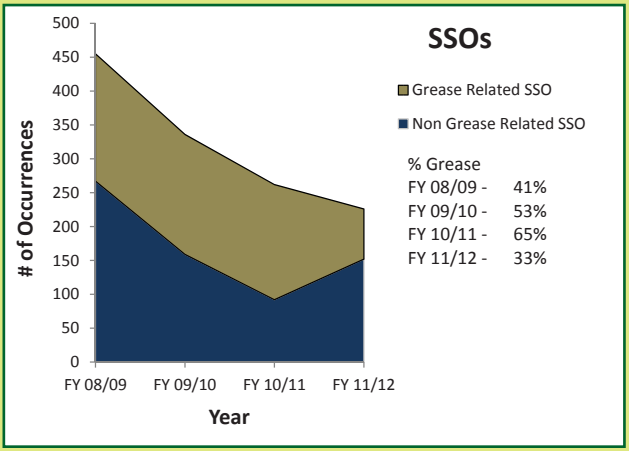
CITY EFFORTS TO DATE

The City's wastewater divisions have been working to reduce the occurrences of SSOs from an infrastructure and operational approach. SSOs have been greatly reduced since 2008, through the dedication of City staff.

In 2008, the City began recording detailed information about all SSOs. For example, in 2010, 277 SSOs were recorded. It was estimated that 70% of those SSOs were caused by grease and/or roots clogging pipelines. Recognizing the need to reduce grease related SSOs, the City launched its Fats, Oils, and Grease (FOG) program in 2009. A "Trash the Grease" educational campaign was developed, and since its inception, the FOG staff has performed 5,520 inspections. This program, along with capital improvements to the wastewater collection system, has resulted in the significant reduction of grease-related SSOs.

Technician installing screw pumps in the new headworks facility at Metro WWTP

The City has also recently demonstrated a commitment to move forward and continue to make improvements to the wastewater system's physical infrastructure and upgrade the City's management systems required to effectively and efficiently operate the system.



Comparison of grease-related and non-grease related SSOs from 2008-2012

CITY EFFORTS TO DATE

Examples of the City's commitment to upgrade infrastructure over the past few years include:

- Rehabilitation and capacity enhancements to the City's five major pump stations
  - Saluda River pump station and storage facility
  - West Columbia pump station
  - Broad River pump station
  - Mill Creek pump station
  - North Columbia pump station

- Sewer line infrastructure
  - Crane Creek Phase II improvements
  - Three miles of new 30-inch gravity sewer
  - 42-inch force main

- Initiation of a hydraulic model and capacity allocation program for the collection system

- Metro WWTP Improvements
  - New headworks facility
  - Clarifier improvements
  - Alternative disinfection project to eliminate liquid chlorine

- System-wide sewer improvements including sanitary sewer evaluation studies, gravity sewer system rehabilitation, and pump station upgrades and rehabilitation

- Rehabilitation of 48, 54, and 60-inch sanitary sewer mains including the downtown portion of the major interceptor to the Metro WWTP

- System Assessment and Mapping
  - Major manhole inventory, survey, and field assessments

- Started the Customer Care Center by combining customer service and emergency calls to a single 24/7/365 operation

AWARDS:

- **2013 – Jody Harley**
  Golden Manhole Award – Water Environment Association of South Carolina (WEASC)

- **2013 – David Mackey**
  Golden Manhole Award – Water Environment Association of South Carolina (WEASC)

- **2013 – By-Pass Project (joint with URS)**
  National Recognition Award – American Council of Engineering Companies (ACEC)

- **2012 – Metro Plant**
  2012 Collection System Excellence Award – WEASC

- **2012 – Ashley Dove/FOG program**
  2011 Collection System Award – Capital District of WEASC

2012 WEASC FOG Award Staff photo

The purpose of the City of Columbia's CW2020 Program is to rebuild and modernize the sewer collection system and treatment facilities. It is an accelerated program of projects and activities designed to further improve water quality and ensure compliance with the CWA, EPA and SCDHEC.

The CW2020 Program is designed to:

- Make the City's wastewater collection and treatment systems more efficient and reliable
- Provide long-range planning and implementation support for significant capital improvement projects
- Provide support for technology upgrades and business process improvements to the City's wastewater divisions

Local resident fly fishing in the Congaree River.

CW 2020 Mission Statement

The CW2020 will provide the City and its customers with a sustainable, well-maintained, and reliable wastewater system that fully complies with regulatory requirements. The Program implementation will be efficient, well-documented, and effectively communicated to meet internal and external stakeholder expectations.

In order to achieve the goals of CW2020, the City of Columbia has contracted with a program management firm specializing in water and wastewater design and management. The Program Management Team (PMT) will report to the City's Utility Management Team and provide specialized staff as needed to meet the requirements of the program. It is expected to take approximately 10 years to achieve the goals of the program. The PMT will be performing key initiatives for CW2020 as discussed on the following pages.

Program Management and Specialized Support

Construction of the new headworks facility at the Metro WWTP

The PMT will provide staff resources and technical specialist support to enable the accelerated nature of the CW2020 Program. For seamless collaboration throughout the project, the PMT will mobilize a CW2020 program office, which will accommodate City staff along with the PMT. The PMT will update existing business procedures that reflect the City's business practices and policies. The CW2020 PMT will be responsible for developing budgets, master program schedules, cost estimates, document controls, reports, and an information management plan.

Capital Improvement Projects

Research and investigations into the existing wastewater treatment and collection system's condition will provide the foundation for prioritizing capital infrastructure and operational improvements. Capital improvements often require significant financial resources and must be focused on the most critical elements such as aging or undersized infrastructure components that are unreliable and may lead to a compliance or regulatory problem.

Properly assessing the existing systems will require several different initiatives aimed at developing cost-effective solutions. A few examples of these initiatives are listed below:

- A hydraulic model of the large diameter sewer lines (15-inch and larger) will be developed to determine the required capacity of the existing pipe network during dry and wet weather. This tool will allow engineers to properly identify problematic areas and examine multiple scenarios to help resolve problems and better ensure pursuit of a long-term, cost-effective solution.

- Continuing Sewer Assessment Plan and Sanitary Sewer Evaluation Studies will involve inspections and investigations into portions of the existing sewer collection system to determine the integrity of existing infrastructure. This allows the City to invest infrastructure renewal dollars where they are needed most.

- Assessments of the Metro WWTP from both a short- and long-term perspective will provide a comprehensive plan for upgrading

the facility's infrastructure for efficiency and to meet regulatory requirements.

The Capital Improvements Program list will be an evolving, prioritized list of sewer system improvement projects to be developed and completed over the next 10 years. Typical capital improvement projects anticipated as part of the CW2020 Program include sewer lining and replacement to extend a pipe's useful life, pump station rehabilitation, collection system capacity expansion, Metro WWTP process upgrades and rehabilitation, and technology and information management system (IMS) improvements.

Wastewater Collection and Transmission System (WCTS) Program

The efficient operation and management of the City's wastewater collection system assets is critical to minimizing performance failures and potential adverse effects. Under the CW2020 Program, the City will conduct a full assessment of the current WCTS operation and maintenance program. From this assessment, the City will address the following areas:

Training, Investing in our Employees

The City will adopt and implement a comprehensive training program that will focus on skill-based training to ensure the proper operation and maintenance of the WCTS City wastewater collection system. The training will emphasize the need for employees to stay informed about new operational standards, professional development, and technological advances.

Representative Joseph Neal and a delegation of Ghanaian and Tanzanian government officials and entrepreneurs take a tour of the Metro WWTP

Information Management Systems (IMS) to Track our Performance

Under the CW2020 Program, an IMS will be developed and maintained on the current system to provide reliable and accurate information for wastewater collection system personnel. Keeping records of maintenance activities is essential to track performance, optimize maintenance and identify areas requiring frequent attention. In today's environment, maintenance management is moving away from handwritten documents to computer software programs.

Sewer Overflow Response Plan (SORP)

As part of the CW2020 Program, a comprehensive sewer overflow

response plan (SORP), will be in place, and staff will receive annual training on the implementation of the SORP. The SORP will provide the necessary resources to effectively respond, control, report, and mitigate an event.

Operation and Maintenance (O&M) of the WCTS

The O&M of the WCTS will allow wastewater to be safely conveyed to the Metro WWTP. The CW2020 O&M Program will develop a schedule for the inspection, maintenance, cleaning and continued repair of the system.

WWTP O&M Training Program

The City's Metro WWTP is implementing comprehensive O&M Training Programs for both of the wastewater divisions' operations and maintenance sections. The two programs are built around organizational position assessments for each of the divisions staffed positions, which call for establishment of core competencies and certification requirements, and development and implementation of training programs that address the competency and certification needs of the staff.

The Operator Training Program consists of a comprehensive set of modular courses. The courses will reinforce fundamental treatment concepts and theories, use Metro WWTP data and facilities, and include supervised practical application of the theories and concepts covered by Metro WWTP operations in the classroom and field.

Government and entrepreneurial guests from South Korea tour the Metro WWTP laboratory

WWTP Process Controls Program

The Metro WWTP has implemented a Process Controls Committee whose members include plant operations, laboratory, administration, and management staff, as well as the CW2020 O&M team. The Process Controls Committee has achieved many milestones core to its mission, including the development of a first-of-its-kind comprehensive Metro WWTP Operations Manual and Data Management System.

WWTP Maintenance Management Program

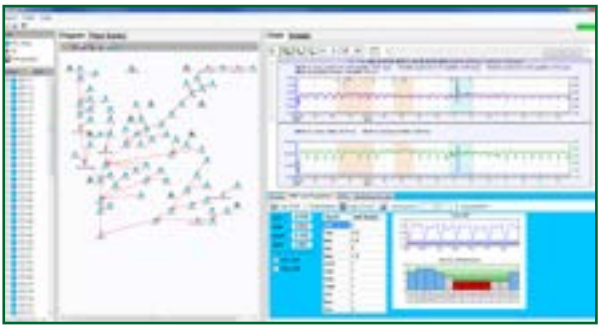
The CW2020 PMT is currently expanding the City's use of Cityworks to include all of the wastewater treatment plant and collection system assets. Cityworks is a proven system of maintenance management that has been successfully used in several areas of the city and will allow maintenance staff the ability to easily group assets (equipment) by location, type, age, or other key parameters.

The City's objectives in implementing a proactive program of maintenance management using the Cityworks Comprehensive Maintenance Management System (CMMS) is to ultimately decrease reactive maintenance through preventive maintenance, to better plan and forecast maintenance parts, resources and costs, and to implement industry leading best management practices.

The City of Columbia's Metro WWTP represents one of the City's greatest investments. The addition of this CMMS is an extremely important tool that the City can use to ensure proper maintenance is planned, performed, tracked, and reported on in support of maintaining one of its most valuable assets.

Information Management System Development

The City of Columbia has invested in state of the art information systems like its Geographic Information System over the last decade. This investment will continue as part of the CW2020 Program. The IMS will be expanded to track data and the progress of all projects being conducted through CW2020. The IMS will be integrated with existing and future City computer applications and systems to ensure that information will flow into and out of the CW2020 Program to support management and O&M activities.



Hydraulic modeling software displays the City of Columbia's wastewater collection system data.

How can the Citizens of Columbia Help?

As the City of Columbia continues to implement CW2020 to maintain and extend the life of Columbia's sewer infrastructure **while securing the health and safety of Columbia's citizens**, every household and/or business can do its part to ensure this success.

Keep Sewers Healthy:

Keep sewers free from clogs and backups by being mindful of materials that may cause problems if flushed, poured down the drain, or dumped directly into a sewer or stormwater inlet.

To find out how to best dispose of household hazardous waste contact the following:

If you are inside City limits:
- Call 803.545.3300
- Ask to speak with the Solid Waste Division

If you are outside City limits:
- Visit the SCDHEC Land & Waste Management website at: *www.scdhec.gov/environment/lwm/*

SCDHEC
24 HR Hotline to report chemical and oil spills: 803.253.6488

SCDHEC Recycling Office:
1.800.SO USE IT (768.7348)

SCDHEC
Environmental Quality Control Region 3:
803.896.0620

- Trash the grease! When cooking anything that leaves grease in the skillet (e.g., bacon), soak up the grease with paper towels or pour it into a container and throw the grease soaked paper towels or container in the trash. Don't pour grease down the kitchen sink drain. Keep Fats, Oils, and Grease (FOG) out of drains. FOG can clog sewer lines. Clogged sewers can result in sewer backups into your home or spills into local rivers and streams.
- Properly dispose of household hazardous waste like cleaning products, motor oil, paints, insecticides/herbicides, etc.
- Do not flush or dump trash into the sewer system. Items like cotton balls, cotton swabs, diapers, straws, rags, paper towels, tooth picks, feminine products, dental floss, or any plastic items go in the trash.
- Do not flush disposable wipes down your toilet. Put them in your trash instead.

Maintain Your Private Sewer Line:

Your private sewer line is the underground sewer pipe that connects your plumbing to the public sewer system. Property owners are responsible for maintaining and repairing sewer pipes in their buildings and within their property lines.

Help keep your private sewer lines in good working condition. Avoid planting trees, shrubs, or bushes on your property near the sewer lines. Roots from plants and trees can enter, block and even cause damage to sewers.

Get Involved!

We can all make our local waterways cleaner and healthier. Consider the following:

- Join a Watershed group – You can become involved with several local groups, including:

  - Gills Creek Watershed Association - *http://www.gillscreekwatershed.org/*

  - Rocky Branch Watershed Alliance of Sustainable Midlands - *http://www.sustainablemidlands.org/rocky-branch-watershed-alliance*

  - Congaree Riverkeeper - *http://congareeriverkeeper.org/*

- Report water quality issues – Call Columbia's Customer Care Center at 803.545.3300 and make them aware of any water quality issues you may encounter. See it, Smell it, Tell it! This call can be made 24/7/365.

CLEAN WATER 2020 PROGRAM TEAM

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Follow CW2020 as we keep everyone informed of our initiatives, progress and activities. Annual reports and updates will be provided so that everyone will be able to see the advancements and improvements that are being made on behalf of our customers and citizens.

www.CleanWater2020.com

If you have a suggestion or question regarding the Clean Water 2020Program, please contact:

Email: info@CleanWater2020.com

CITY of COLUMBIA, S.C.
JUSTITIA VIRTUTUM REGINA

We Are Columbia