BARGE
DESIGN SOLUTIONS

ENGINEERING REPORT
2020-2024 CAPITAL IMPROVEMENTS PLAN

Prepared For: Columbus Water Works

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1.0 INTRODUCTION AND BACKGROUND

Columbus Water Works (CWW) intends to obtain Georgia Environmental Finance Authority (GEFA) loans and other funding mechanisms for specific capital improvements during the years 2020-2024 related to its water, wastewater, or administrative facilities. This includes 26 capital improvement projects (CIP), with a total project cost of approximately $74,000,000, that have been identified as being necessary to maintain the high level of service which CWW has provided to the Columbus-Muscogee County area and other surrounding communities for many years. A map of Columbus indicating the locations of these projects is provided with this report, located in Appendix A. CWW has purposefully aligned its strategic vision to its Capital Improvement Program. As a result, not all 88 projects identified for this (2020-2024) planning horizon (approximately $200,000,000 in total project costs) will be implemented at this time. Those projects not identified as being necessary during this planning horizon will be re-evaluated based on CWW's strategic initiatives for the next planning horizon. CWW's current strategic initiatives are:

- The Customer Experience – We are committed to building strong relationships with our customers by delivering an experience that meets or exceeds their expectations.
- The Employee Experience – We are committed to cultivating a work environment that reflects fairness, respect, equality, and understanding. We will actively listen and respond to the needs of our team members to create "A Great Place to Work for All".
- The Environmental Focus – We are committed to protecting the environment and working to ensure the health and sustainability of our natural resources for future generations.

CWW has had in place a Capital Improvement Program for well over 20 years. It has been updated at least every five years, namely by the preparation of a Facilities Master Plan Update report. CWW has developed a systematic approach to its capital improvement planning process based on the methodology originally developed by the American Water Works Association Research Foundation (AWWARF) *Capital Planning Strategy Manual* (AWWARF 2520) and now found on The Water Research Foundation website as Project #2520 Capital Planning Strategy Manual[1]. Section 5 of this report describes in more detail the process with which CWW uses to identify and prioritize its CIP's during each planning horizon.

Barge Design Solutions, Inc. (Barge) has been contracted by CWW to prepare this report which summarizes:

- A Description of CWW and its Existing Facilities
- Recent Awards and Other Recognition for the Operation of CWW's System
- Service Area Population Growth and Water Demand Projections
- CIP Identification and Prioritization Process
- 2020-2024 CIP List and Schedule

Barge has compiled information from various sources in the preparation of this report. These sources include:

- Barge staff knowledge of CWW's facilities
- 2018 Facilities Master Plan Update report, dated June 2019
- 2019 Information Technology Master Plan
- CWW's CIP scoring sheet
- 2019 Capital Improvement Plan with CWW project scoring criteria guidelines and analysis

1 https://www.waterrf.org/research/projects/capital-planning-strategy-manual

worksheet

2.0 DESCRIPTION OF CWW AND ITS EXISTING FACILITIES

CWW provides water and wastewater service to over 200,000 residents of the Columbus, Georgia region, including Fort Benning, as well as parts of Harris and Talbot Counties. The original water system was developed beginning in 1839. The Board of Water Commissioners (Board) was formed in 1903 and the original water treatment plant (WTP) was constructed in 1915. In 1956, the Board assumed responsibility for the sanitary sewer system and the first wastewater treatment plant (WWTP) was constructed in 1964. CWW has also been a steward for watershed protection in the region. This has been demonstrated by its assistance in founding and continued involvement with the Riverkeeper group, an organization committed to river protection. During the 1990's, CWW further demonstrated its commitment to watershed protection and service to the community by consolidating 16 combined sewer overflow facilities into two modernized treatment facilities which included the construction of an associated interceptor sewer. The construction of this interceptor sewer was expanded by CWW to include a Riverwalk along the Chattahoochee River, which is a recreational and scenic attraction to residents and visitors of Columbus. CWW's most recent significant change to the services provided to the region was the acquisition of Fort Benning's water and wastewater systems in 2004 under a 50-year contract.

Organizationally, CWW is an executive branch of the Columbus Consolidated Government. The Board consists of five members, which include the Mayor of Columbus and four other members who are appointed by the City Council of Columbus. The President of CWW reports to the Board and manages the executive team. Currently, CWW employs over 270 water professionals.

2.1 Water Supply and Treatment Facilities

Most of CWW's water treatment capacity is provided by the North Columbus Water Resource Facility (NCWRF). This facility treats water from Lake Oliver, an impoundment on the Chattahoochee River. The permitted capacity is 90 MGD. Fort Benning is served both by water coming through the CWW system from the NCWRF, as well as by the Fort Benning WTP (FBWTP). The FBWTP has a permitted treatment capacity of 8 MGD and its source water is the Chattahoochee River. In addition to the surface water withdrawals that supply NCWRF and the Fort Benning WTP, Fort Benning also has several wells that serve transient non-community systems in some areas of the base that are remote from the main water system. Figure 2.1 presents an aerial view of the NCWRF.

Figure 2.1 Aerial View of the NCWRF

2.2 Water Distribution System

When described, CWW's distribution system is most often divided between the Columbus Water Distribution System and the Fort Benning Distribution System.

The Columbus water distribution system is fed by the NCWRF. The water is pumped and gravity fed into the distribution system which currently consists of approximately 1,170 miles of water mains ranging in size from 2-inches through 48-inches in diameter. The Columbus water distribution system is divided into three separate primary pressure zones. In addition to the primary pressure zones, there are approximately a dozen additional sub-zones which serve smaller areas (Schatulga Road and Ivy Park are two examples of these smaller sub-zones). The three primary pressure zones are:

- Gravity System
- High Service System
- North Columbus System

The pressure zones are separated by isolation valves and operate as independent systems.

The Fort Benning water distribution system serves the U.S. Army's Fort Benning Military Reservation in southern Muscogee County, Georgia, northern Chattahoochee County, Georgia, and Russell County, Alabama. The Fort Benning water distribution system is fed by both the Fort

Benning WTP and four connections to the Columbus water distribution system High Service System pressure zone. These connections are located at the following locations:

- Santa Fe Road
- Old Cusseta Road
- St. Mary's Road
- Buena Vista Road

The Fort Benning water distribution system consists of approximately 235 miles of water mains ranging in size from 2-inches through 30-inches in diameter. The Fort Benning distribution system is divided into five service areas with four different pressures zones. The pressure zones are divided as follows:

- Sand Hill, Patton Village, McGraw Manor, Custer Terrace, Upatoi Terrace, Martin Army Hospital and Cape Hart cantonment areas
- Main Post cantonment area
- Davis Hill/Kelly Hill cantonment area
- Harmony Church cantonment area

2.3 Wastewater Collection System

The wastewater collection system (the combined Columbus wastewater collection system and the Fort Benning wastewater collection system) consists of approximately 1,146 miles of gravity sewers with pipe sizes ranging up to 90-inches in diameter, and also includes 87 sanitary sewer lift stations and associated force mains. The wastewater collection system conveys flows from approximately 200,000 people to the WWTP, which is called the South Columbus Water Resources Facility (SCWRF). The service area of the wastewater collection system includes much of Columbus-Muscogee County (exceptions include the northern and northeastern portions of the county), the Fort Benning cantonment areas, and a connection from Harris County. In addition to the sanitary sewer system, approximately 3% of the Columbus-Muscogee County service area is served by a combined sewer collection system. During low flow, or dry-weather conditions, the flows collected in the combined sewer collection system are conveyed to the SCWRF. In high flow, or wet-weather conditions, a portion of the flow continues to be conveyed to the SCWRF while the remainder passes through one of the two Combined Sewer Treatment Systems (CSO facilities) which are described in Section 2.4.

2.4 Wastewater and Combined Sewer Treatment Facilities

CWW treats all the wastewater collection system flows at the SCWRF. The SCWRF has a discharge permit with mass loading limits based on a monthly average discharge flow of 42 MGD, but it operates to treat additional flows during wet-weather periods of up to 84 MGD. Treated effluent is released to the Chattahoochee River and dewatered biosolids are land applied by a contractor.

CWW also treats combined sewer flows at two CSO facilities called the Uptown Park and the South Commons Combined Sewer Overflow Treatment Facilities. These facilities treat flows from

the combined sewer system which serves the Uptown Columbus area. The South Commons CSO Treatment Facility is located on the Chattahoochee River and has a capacity of 74 MGD. The treatment facilities remain offline until flows in the sanitary interceptor (to the SCWRF) reach a specified level. Similarly, the Uptown Park CSO Treatment Facility, which is located approximately two miles north of the South Commons CSO facility in Columbus, has a permitted capacity of 48 MGD and its treatment facilities remain off line until flows in the sanitary interceptor reach a specified level. The two CSO treatment facilities are a part of an integrated collection and treatment system which is operated to maximize treatment first at the SCWRF and then by the CSO treatment facilities. Grit and screenings from both CSO treatment facilities are hauled to a landfill. Figure 2.2 presents an aerial view of the SCWRF.

Figure 2.2 Aerial View of the SCWRF

2.5 Other Facilities

In addition to the facilities described above, CWW also has administration, customer service, laboratory, and operations/field services facilities. The administration and customer service facility is a building located at 1421 Veterans Parkway, Columbus, Georgia. The laboratory and primary operations/field services facility is located at 1335 Alexander Street, Columbus, Georgia. An adjacent facility, located at 135 Challenger Court, Columbus, Georgia serves as CWW's Managed Maintenance office. Lastly, a smaller operations/field services facility is also located at 7301 Marne Road, Fort Benning, Georgia.

3.0 RECENT AWARDS AND OTHER RECOGNITION

CWW has an excellent record of regulatory compliance, community and organizational involvement, and interest in leveraging industry advancements. Honors awarded to CWW substantiate this record, in addition to validating CWW's high level of service to its customers. The following summarizes awards or other recognition provided to CWW or its staff between July 2018 and the present.

LOCAL

Columbus Chamber Partners in Education Gold Award

STATE

GAWP President's Award 2017-2019 – William Kent (July 2018)
GAWP Honorary Membership Award – Becky Butts (July 2018)
GAWP Honorary Membership Award – CWW Retiree Lynn Campbell (July 2018)
GAWP Collection System of the Year (October 2018)
GAWP Distribution System of the Year Award (October 2018)
GAWP Safety Award: Certificate of Merit - NCWRF, FBWTP (October 2018)
GAWP Golden Manhole Society Nomination – Kumar Burkley (November 2018)
GAWP Best Operated Water Plant of the Year Surface Water 5 MGD-14.99 MGD – FBWTP (April 2019)
GAWP Best Operated Water Plant of the Year Ground Water less than 1 MGD – Camp Darby Range (April 2019)
GAWP Best Operated Water Plant of the Year Certificate of Achievement – Good Hope Range (April 2019)
GAWP Best Operated Water Plant of the Year Certificate of Achievement – Griswold Range (April 2019)
GAWP Best Operated Water Plant of the Year Certificate of Achievement – Leyte Range (April 2019)
GAWP Best Operated Water Plant of the Year Certificate of Achievement – McKenna Mount Range (April 2019)
GAWP Best Operated Water Plant of the Year Certificate of Achievement – Tricolor Range (April 2019)

GAWP Best Operated Water Plant of the Year Certificate of Achievement – NCWRF (April 2019)
GAWP District 4 Top Water Operator – Jason Clifton (April 2019)
GAWP Platinum Compliance Award – Good Hope Well (April 2019)
GAWP Platinum Compliance Award – McKenna 1-9 Well (April 2019)
GAWP Platinum Compliance Award – Leyte Well (April 2019)
GAWP Platinum Compliance Award – Tricolor Well (April 2019)
GAWP Platinum Compliance Award – Camp Darby Well (April 2019)
GAWP Platinum Compliance Award – Carmouche Well (April 2019)
GAWP Platinum Compliance Award – Hastings Well (April 2019)
GAWP Platinum Compliance Award – Griswold 1-9 Well (April 2019)
GAWP Platinum Compliance Award – FBWTP (April 2019)
GAWP Platinum Compliance Award – NCWRF (April 2019)
GAWP Gold Compliance Award – McKenna Mount #2 Well (April 2019)
GAWP Master Plan Spotlight Award (July 2019)

NATIONAL

NACWA Utility of the Future Award – Watershed Stewardship (April 2018)
Government Finance Officers Association (GFOA) - Certificate of Achievement for Excellence in Financial Reporting (January 2018)
GFOA – Individual Award of Financial Reporting Achievement – Danthea Hill (January 2018)

4.0 SERVICE AREA POPULATION GROWTH AND WATER DEMAND PROJECTIONS

Population, water demand, and wastewater flow projections were developed from historical data for CWW, published reports and standards for the region, and data gathered during meetings with CWW and regional utilities during the preparation of the 2018 Facilities Master Plan Update report. Planning horizons established in this report for population, and therefore water demand and wastewater flow projections, were forecasted for near-term (2019-2023), mid-term (2023-2028), and long-term (2028-2043).

4.1 Population Projections

Population projections for the 2018 Master Plan were developed by performing a Monte Carlo simulation based on historical population data for Muscogee County from 1969 to 2017. The historical population values were obtained from the U.S. Census estimates, U.S. Department of Commerce, the Bureau of Economic Analysis, and the Georgia Regional Economic Analysis Project. It was assumed that Ft. Benning population was included in these county estimates.

A Monte Carlo simulation is a mathematical technique that accounts for risks in quantitative analysis and decision making. It is a technique used by professionals in a wide variety of fields such as finance, energy, engineering, insurance, and the environment. The simulation provides decision makers with a range of possible outcomes and their relative probabilities.

For the purposes of projecting population for the 2018 Master Plan, statistical information including the mean growth rate, variance, standard deviation, and drift rate from the Muscogee County historical population data was used to set the boundaries for the population projection. A log normal distribution was then used to project population through 2043 within the set boundaries of the historical data. This simulation was performed 5,000 times and statistics for each planning year were analyzed.

The Monte Carlo simulation's 95th percentile population projection was chosen for the purposes of this master planning effort. This value limits the risk that population, and subsequent water demands and wastewater flows, grow at a higher rate than projected (statistically, a 5 percent chance). The 95th percentile projections are provided in Table 4.1

Table 4.1 Muscogee County Population Projections

Planning Horizon	Population Projections
Existing (2017)	194,058
Near-Term (2023)	212,000
Mid-Term (2028)	220,483
Long-Term (2043)	245,070

In 2017, the Georgia Environmental Protection Division (EPD) / Department of Natural Resources (DNR) published updates to the Regional Water Plans for ten regions of Georgia, including the Middle Chattahoochee Planning Region – which includes Muscogee County. Because of the importance and regional acceptance of this plan, the 2018 Master Plan population projections were compared to the updated Middle Chattahoochee Regional Water Plan projections. It was also prudent to compare the projections to the previous CWW 2013 Master Plan projections. Figure 4.1 shows the 95th percentile population growth rate compared to the CWW 2013 Master Plan projections and Muscogee County population projections provided in the Regional Water Plan.

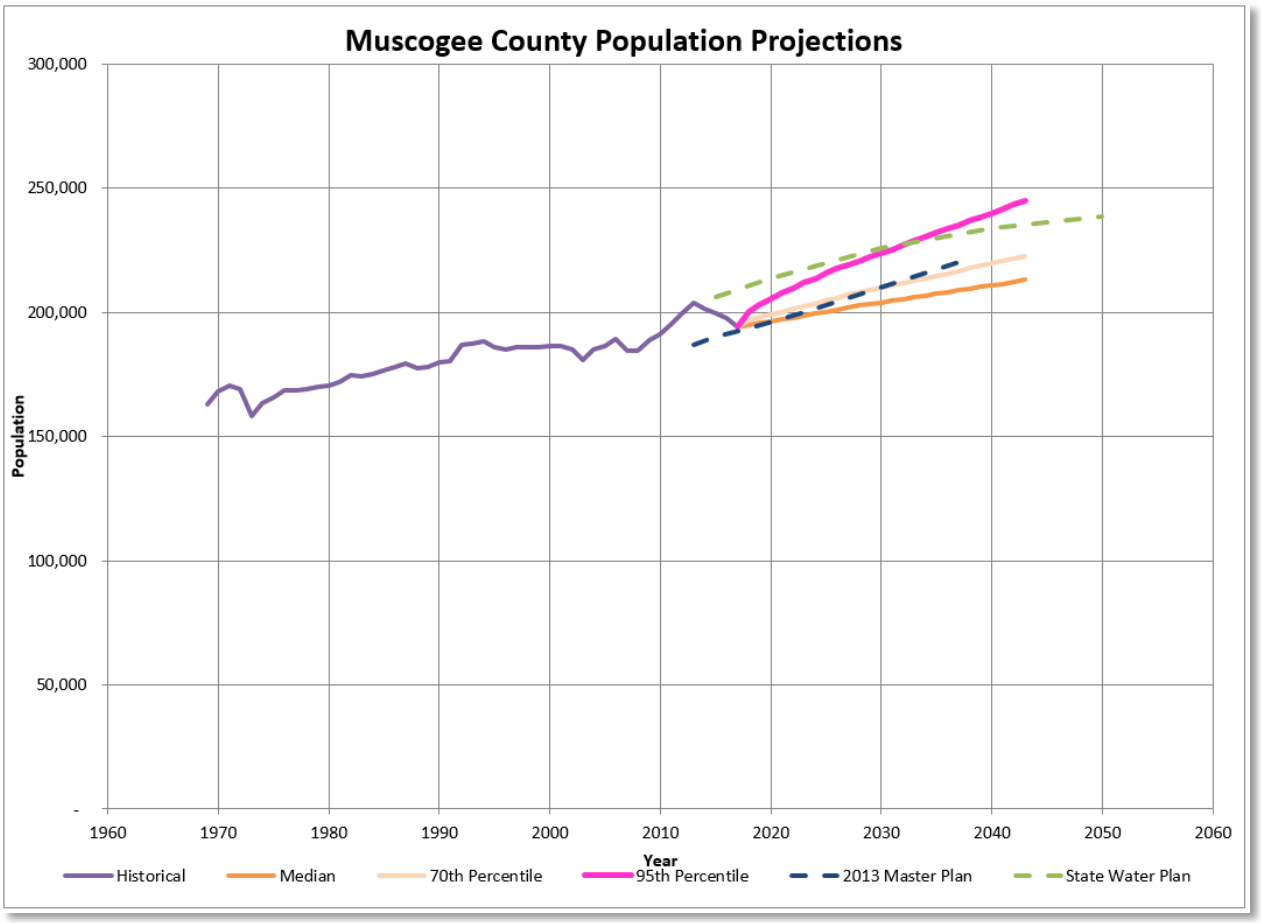


Figure 4.1 Muscogee County Population Projections

4.2 Water Demand Projections

The population projections described above were used to project future water demands. The projected water demands for CWW's existing wholesale customers and surrounding counties not currently served by CWW were based on information provided through discussions with regional utilities and local planning projections. The corresponding water demand projections are summarized in the Table 4.2. Peak day demands (PDD) for Fort Benning were assumed to be 22 million gallons per day (MGD), which is the maximum contractual flow. The future Fort Benning annual average day demands (AADD) were assumed to be 8.8 MGD (using a 2.5 peak day multiplier), while the 2018 AADD for Fort Benning was set to 3.33 MGD to better evaluate water age under existing demand conditions.

Table 4.2 Summary of Water Demand Projections

Year	Municipal Service Area		Wholesale Customers		Fort Benning Service Area		CWW Service Area Total		CWW Service Area Total with Emergency/ Contractual Demand[1]	
	AADD (MGD)	PDD (MGD)	AADD (MGD)	PDD (MGD)	AADD (MGD)	PDD (MGD)	AADD (MGD)	PDD (MGD)	AADD (MGD)	PDD (MGD)
2018	29.88	44.81	0.72	2.02	3.33	22.0	33.93	68.83	41.93	76.83
2023	31.65	47.48	1.65	3.20	8.8	22.0	42.10	72.68	50.10	80.68
2028	33.05	49.57	3.67	6.95	8.8	22.0	45.52	78.52	53.52	86.52
2043	37.11	56.66	7.47	14.94	8.8	22.0	53.38	93.60	61.38	100.60

1. Emergency demand includes 8 MGD to Phenix City.

4.3 Wastewater Demand Projections

Wastewater flow projections were developed independently for the SCWRF and the collection system. The SCWRF was evaluated based on flow projections developed using annual average flows, which incorporate all effluent flow data including wet-weather and dry-weather conditions. The collection system was evaluated based on dry-weather flow projections. The table below summarizes the wastewater flow projections for the SCWRF.

Table 4.3 Summary of Wastewater Flow Projections for the SCWRF

Year	Total SCWRF Wastewater Flow Projections		
	Annual Average Daily Flow (MGD)	Maximum Month Flow (MGD)	Peak Day Flow (MGD)
2020	36.1	54.1	79.4
2023	36.9	55.3	81.2
2028	38.0	56.9	83.5
2043	41.0	61.5	84.0

5.0 CIP IDENTIFICATION AND PRIORITIZATION PROCESS

CWW's Capital Improvement Program project list is derived from multiple sources. These sources include:

- 2018 Facilities Master Plan Update report, dated June 2019
- CWW's Asset Management Program
- 2019 Information Technology Master Plan
- CWW's Project Champions (CWW staff)
- CWW Strategic Teams (Teams of CWW staff focused on specific strategic initiatives)

These sources have developed a list of 88 projects for the 2020-2024 planning horizon at an estimated cost of $200 million. Regardless of the source, the identification and prioritization of

projects is based on sustainability. Specifically, prioritization of a project is based on a systematic evaluation approach, with the primary components of analysis being a Triple Bottom Line Analysis, Strategic Alignment, and Risk Assessment. Each of the 88 projects had a project champion, who was intimately familiar with each project. The champions used the prioritization approach to score projects alongside engineering. The prioritization approach is briefly described below:

- **Triple Bottom Line (TBL) Analysis** - The TBL Analysis scored projects based on expected environmental, social, and economic impacts. A score of "1" is a negative impact, a score of "2" is a neutral impact, and a score of "3" is a positive impact.
- **Strategic Alignment** - Projects were scored (initially, between 1 and 60 and adjusted to a 1 to 10 scale) based on their alignment with CWW's three strategic initiatives – The Customer Experience, The Employee Experience, The Environmental Focus.
- **Risk Assessment** - Projects were scored (between 1 and 9) based on likelihood of failure and the consequence of failure.

The total score was obtained by multiplying the Triple Bottom Line * Strategic Alignment * Risk Assessment, for a possible total of up to 270 points. There are additional factors which escalate project prioritization for automatic CIP funding approval. These are:

- Required by regulatory changes
- Have a return on investment (ROI) of less than 3 years
- Project is directed by the Board

Below is the scoring sheet for project prioritization based on these factors and scoring criteria.

CIP Project Scoring Analysis	
Project Title:	
Required Completion Date:	

If ANY boxes below are checked, project is automatically approved for CIP funding
Note: If Project is less than $100,000.00 then Project is NOT in CIP

1) Is Project required by Regulatory Changes.	
2) Is Return on Investment Less than 3 years.	
3) Is Project Board Directed	

Triple Bottom Line Analysis (TBL)	
Note: Evaluation of Projects in this Section Should be Done from the Perspective of what Impact the COMPLETED Project will Yeild	Rating (1-3)
A) Environmental Impact Score	
B) Social Impact Score	
C) Economic Impact Score	
TBL Average Score (A+B+C)/3	0.00

Strategic Alignment	
	Rating (0-20)
Strategic Initiative No.1 - The Customer Experience - See Utility Curve for Rating	
Strategic Initiative No.2 - Our Employee Experience - See Utility Curve for Rating	
Strategic Initiative No.3 - Our Environmental Focus - See Utility Curve for Rating	
Strategic Alignment Sub-Total 0-60 Points	
	Final Rating (1-10)
Average Strategic Alignment Score (Sub-Total)/6	0.00

Risk Alignment	
Part 1 - Likelyhood of Failure	Rating (1-3)
A) If Project is NOT Done Failure is likely within 2 years (3 Pts)	
B) If Project is NOT Done Failure is Likely within 2 to 7 years (2 Pts)	
C) If Project is NOT Done Failure is likely beyond 7 years (1 Pt)	
Likelyhood of Failure Rating	0
Part 2 - Consequence of Failure	Rating (1-3)
A) If Project is NOT Done Conseqence of Failure Will Result in *Major Event (3 Pts)	
B) If Project is NOT Done Consequence of Failure Will Result in *Mild Event (2 Pts)	
C) If Project is NOT Done Conseqence of Failure Will Result in *Minor Event (1 Pt)	
Conseqence of Failure Rating	0

**Major/Mild/Minor Events to be defined by Level of Increased Cost, Permit Violation Conseqence, Safety Hazard Conseqence, etc.*

Total Risk Assesment Score (Part 1)x(Part 2)	0
TOTAL PROJECT SCORE = (TBL x Strategic Alignment x Risk Assessment)	

CIP Project Scoring Analysis Continued		
Project Title:		
Required Completion Date:	0	

The Customer Experience		
Ensure Financial Sustainability (Award 1 Point For Each Met)	1. Use sound financial planning and management practices	
	2. Deliver information technology capabilities efficiently and effectively	
	3. Maintain a sustainable CIP/AM program	
	4. Maintain competitive and affordable rate structures for all customers	
	5. Ensuring reliable infrastructure to meet/exceed our customer needs	
	Section Total	0
Provide the Highest Level of Service (Award 1 point if only one objective is met, 3 points if two objectives are met, and 5 points if all three objectives are met)	1. Understand our customer's perceptions and expectations	
	2. Meet or exceed all regulatory compliance standards	
	3. Respond to customer requests in a timely manner	
	Section Total	
Wow the Customer (Award 2 point if only one objective is met, 6 points if two objectives are met, and 10 points if all three objectives are met)	1. Ensure meeting customer's needs	
	2. Ensuring an acceptable wait time	
	3. Acknowledge that all CWW employees are customer service representatives	
	Section Total	

Our Employee Experience		
Employee Focused (Award 2 Point For Each Met)	1. Recruit, retain, engage dynamic, diverse, motivated workplace	
	2. Enhance fairness (avoidance favoritism in hiring and promotion)	
	3. Enrich development by creating environment for personal professional growth	
	4. Optimize overall employee benefits, compensation, wellness and safety programs	
	Section Total	
Employee Communication (Award 2 Point For Each Met)	1. Boost effective two way communication dialogue across the organization	
	2. Enhance collaboration between employees and management	
	3. Optimize competence of management by coordinating people and resources effectively, overseeing employee's work and enacting a clear vision	
	Section Total	
Safety (Award 2 Point For Each Met)	1. Improve/enhance the overall safety of employees	
	2. Improve/enhance the safety of the public	
	3. Does the project eliminate a known or existing safety concern or hazard	
	Section Total	

Our Environmental Focus		
0% Consumptive Water Use (Award 4 points)	Does the project reduce consumptive water use (Award 4 points)	
Net Positive Impact on the Watershed (Award 4 Points)	Does the project help reduce our environmental impacts on watershed	
0% Carbon Footprint (Award 3 Points)	Does the project reduce our carbon footprint	
100% Renewable/Sustainable Energy Use (Award 3 points)	Does the project improve our renewable/sustainable energy use	
Redesign of Supply Chain (Award 3 Points)	Does the project influence our supply chain to provide products friendly to the environment	
0% Waste (Award 3 Points)	Does the project reduce waste	
	Section Total	0

6.0 2020-2024 CIP LIST AND SCHEDULE

The CIP identification and prioritization process resulted in a total of 26 projects in need of being funded and completed within the 2020-2024 timeframe. These are projects which are aligned with CWW's strategic initiatives and are necessary to meet future water and wastewater needs in the CWW service area. The estimated total cost of these projects is approximately $74,000,000. This section includes the project name, the CWW project number, the project code designator from the 2018 Facilities Master Plan Update (FMPU) (if applicable), a brief description of project, and the estimated project cost for each of the 26 projects. The identified projects are grouped into five categories: Water Supply and Treatment Facilities, Water Distribution System Improvements, Wastewater and Combined Sewer Treatment Facilities, Wastewater Collection System, and Miscellaneous. Projects identified in the "Miscellaneous" category are those that do not relate solely to one of the previous four categories.

6.1 Water Supply and Treatment Facilities (NCWRF and Fort Benning WTP) Improvements

6.1.1 NCWRF Chemical Feed Improvements – Phase I (2018 FMPU # 18-W06)

This project includes studying the compatibility of pretreatment chemicals to optimize points of injection for each chemical, and to replace the existing pressure gaseous chlorine system with a safer technology. The pretreatment chemical study is needed to evaluate the impact of concurrent chemical additions (such as PAC with alum and EarthTec with ClO_2) and to identify optimal locations for specific chemical addition to reduce pretreatment overuse. The change from the existing pressurized chlorine gas system is to improve safety at the NCWRF and involves upgrading the existing pressure system to one that does not rely on pressure transmission. In addition, this would include the installation of new scales for the twelve (12) 1-ton chlorine gas cylinders that must be online and adding an emergency scrubber to prevent accidental release of chlorine due to a failed cylinder. The estimated cost of this project is $2,300,000.

6.1.2 NCWRF Finished Water Pump Station Improvements – Phase I (2018 FMPU # 18-W13)

This project includes replacing the North Columbus Pump Station (NCPS) Finished Water Pump No. 1 with a new 9,000 gallons per minute (gpm) pump including upgrading the associated motor starter. With the addition of the 9,000 gpm pump, the capacity of the NCPS with one of the three 6,000 gpm pumps offline is 21,000 gpm or 30 MGD. These replacements are required to regain firm pumping capacity (as the existing NCPS Pump No. 1 has been permanently damaged) and maintain the overall reliability of the system. Also included in this project are electrical upgrades or replacement of switchgear to provide secondary feedlines to minimize single point of failure risk. The estimated cost of this project is $4,800,000.

6.1.3 NCWRF Structural Assessment and Rehabilitation (2018 FMPU # 18-W08B)

This project includes conducting a structural assessment of basins and rehabilitation of deteriorated concreted in flocculation channels and sediment basins. It is assumed this study includes a complete structural assessment and (for budgetary purposes) that 15% of the basins require maintenance. Structural deterioration should be addressed as soon as possible. The estimated cost of this project is $600,000.

6.2 Water Distribution System Improvements

6.2.1 Distribution System Cleaning and Lining (2018 FMPU # DS0A)

This project will address the need to clean and line areas of the Distribution System to help enhance the capacity of the system and extend the life of existing water mains. Sections 6.2.1, 6.2.2, and 6.2.5 include projects grouped together as Project DS0 in the 2018 FMPU. The estimated cost of this project is $7,500,000.

6.2.2 Distribution System Small Line Replacement (2018 FMPU # DS0B)

This project includes replacing existing distribution mains 4-inches and smaller with 6-inch or larger pipes based on the Distribution System Pipe Rehabilitation and Replacement Strategy detailed in the 2018 FMPU. These replacements are needed to maintain system reliability and levels of service. Sections 6.2.1, 6.2.2, and 6.2.5 include projects grouped together as Project DS0 in the 2018 FMPU. The estimated cost for this project is $5,000,000.

6.2.3 Distribution System - System Wide Flow Monitoring (CWW Proj. # DS0C)

This project involves system-wide water quality monitoring, especially focusing on total trihalomethane (TTHM) formation in the distribution system. CWW will monitor water quality across the system, focusing on TTHM, chlorine residual, and temperature. Results of the monitoring, in coordination with use of the calibrated hydraulic distribution system model, will identify CWW system-specific TTHM formation potential curves as well as potential areas of remediation. While this project was not identified in the 2018 FMPU, water age model results and increasing focus on water quality identified the need for this project shortly after completion of the 2018 FMPU. The estimated cost for this project is $225,000.

6.2.4 Distribution System Flow Improvements (CWW Proj. # DS0D)

The 2018 FMPU identified several areas that currently do not meet desired level of service for flow based solely on model results. There were five areas identified by the model for investigation. The most critical area appears to be near the SCWRF. These five identified areas and improvements were designated as projects FF1 through FF5 in the 2018 FMPU. Due to recent findings of previously undocumented closed valves that would impact flow to this area and subsequent opening of those valves, it was decided to perform flow testing in all five identified areas to verify model results and assign funding to the most critical area. The estimated cost for this project is $1,400,000.

6.2.5 Distribution System Pressure Improvements (2018 FMPU # DS0E)

This project involves improving areas of low pressure through the installation of localized booster pump stations or by switching these areas to a higher-pressure zone/hydraulic gradient, as needed. These pressure zone changes often involve new piping and valving. These improvement projects should be combined with the pipe replacement program, where practical. Sections 6.2.1, 6.2.2, and 6.2.5 include projects grouped together as Project DS0 in the 2018 FMPU. Because of the nature of this project, a well-defined scope and budget cannot be established. However, for programming purposes $200,000 is being established for the 2020-2024 planning horizon.

6.2.6 Columbus Tank Inspections (CWW Proj. # 18-M02)

This project includes tank inspections and cleaning for 12 existing water storage tanks over two inspection periods within the next 5-year planning horizon. The 2021 inspection period includes five tanks – Luna Drive, Bunker Hill, Warm Springs, Wash Water (NCWRF), and Schatulga Road. The 2023 inspection period includes seven tanks – County Line Road, Benning Hills Front, Benning Hills Back, Park Hill, Cody Road Front, Cody Road Back, and Veteran's Parkway Reservoir. The estimated cost of the 2021 Tank Inspections is $45,200 and the estimated cost of the 2023 Tank Inspections is $85,000. Both costs are escalated for their respective years.

6.2.7 Columbus Tank Improvements (CWW Proj. # 18-M03A)

This project includes reconditioning of the County Line Road Tank in 2019 and the Schatulga Road and Cody Road Back tanks in 2020. The exterior of the County Line Road Tank needs abrasive blast cleaning and a new exterior coating system. The Schatulga Road and Cody Road Back tanks need both interior and exterior cleaning and coating as well as replacement of several appurtenances. The estimated cost of the 2019 Tank Improvements is $125,000 and the estimated cost of the 2020 Tank Improvements is $958,000.

6.3 Wastewater (SCWRF) and Combined Sewer (Uptown Park and South Commons) Treatment Facilities Improvements

6.3.1 BioWin Model and Pump Coordination (CWW Proj. # 18-WW22A)

This project includes updating and calibrating the existing BioWin computer model and to study the pumps throughout the biosolids, FOG, COGEN, PFR, and digester systems. The updated BioWin model will be used to address capacity and nutrient removal needs as well as the potential to improve operational efficiency. The purpose of the pump coordination study would be to identify or confirm the correct pumps for each leg of the process and balance flows to prevent or reduce overflows, backups, and shutdowns which currently occur on a regular basis. Additionally, the pump coordination study includes assessing and confirming optimal grit pumps at the Uptown Park CSO as there is a long history of catastrophic failure when installing new pumps. The estimated cost for this project is $200,000.

6.3.2 SCWRF Headworks Improvements (CWW Proj. # 13-WW13)

This is a continuation of a project recommended in the 2013 FMPU, portions of which have been completed. The remaining portions, to be completed under this project, will include replacing existing influent screens with finer screens (or rehabilitating existing screens and installing new, finer screens downstream). Additionally, this project includes re-working the influent channels to eliminate the bypasses, adding electric actuators to each of the inlet structure gates, and structural repairs to the existing structure. The estimated cost of this project is $5,200,000.

6.3.3 SCWRF Solids Handling Building (2018 FMPU # 13-WW14)

This project consists of a new 6,000 square foot building, sludge feed pumps, new/relocated GBT's, polymer feed system, new/relocated dewater equipment, new cake pumps, electrical room, truck loading area, and covered solids storage area. Alternatively, depending on the physical space available in the building, it may be feasible to re-purpose the odor control building. This project was originally proposed for the 2018-2023 planning period as the existing dewatering building is nearing the end of its potential operational life. The estimated cost of this project is $10,000,000.

6.3.4 SCWRF Backup Power Improvements (2018 FMPU # 18-WW15)

This project includes adding emergency/backup power capability either through upgrade of the backup Georgia Power distribution circuit, rehabilitation of two ARES generators, or adding new permanent standby generators and paralleling switchgear. Also included in this project will be the wildlife protections on overhead distribution circuits and within the plant. This project will address a critical single point of failure in the SCWRF power system. The estimated cost for this project is $5,000,000.

6.3.5 Uptown Park CSO Grit System Improvements (2018 FMPU # 18-WW21)

This project consists of modifying the existing grit pump discharge piping, removing the existing ball check valve and associated piping from the connection at the pump discharge elbow to the wall penetrations in the underground pump pits. A new vertical riser, new piping, new check valves, and isolation valves will eliminate the need for confined space entry, addressing existing maintenance and safety concerns. The estimated cost for this project is $805,000.

6.3.6 SCWRF Structural Assessment and Repair (CWW Proj. # 18-WW24A)

This project includes conducting a structural assessment of various locations around SCWRF and to perform rehabilitation of deteriorated concrete found. It is assumed this study includes a complete structural assessment and that 15% of the basins require maintenance. Structural deterioration should be addressed as soon as possible. The estimated cost of this project is $600,000.

6.4 Wastewater Collection System Improvements

6.4.1 Sewer Basin Upgrades - Phase I (2018 FMPU # C2A)

This project consists of performing comprehensive flow monitoring to confirm the need for collection system projects identified in the 2018 FMPU. The identified needs will be addressed or repaired as part of this project. As part of the 2018 FMPU, the sewer model was used to identify pipes that have approximately 1/3 of its flow carrying capacity remaining during dry weather peak flow conditions. As these areas were based solely on dry weather model conditions and not conditional assessments, monitoring of three priority basins are recommended. Phase I includes monitoring in the Cooper Creek Basin. The estimated cost of this project is $400,000.

6.4.2 Sewer Basin Upgrades - Phase II (2018 FMPU # C2B)

This project consists of performing comprehensive flow monitoring to confirm the need for collection system projects identified in the 2018 FMPU. The identified needs will be addressed or repaired as part of this project. As part of the 2018 FMPU, the sewer model was used to identify pipes that have approximately 1/3 of its flow carrying capacity remaining during dry weather peak flow conditions. As these areas were based solely on dry weather model conditions and not conditional assessments, monitoring of three priority basins are recommended. Phase II includes monitoring in the Standing Boy Creek and Little Heiferhorn Basins. The estimated cost of this project is $400,000.

6.4.3 Bull Creek Capacity Upgrade (2018 FMPU # C11)

This project includes installing 15,400 linear feet of 54-inch sewer main to replace one of the existing 30-inch mains along Bull Creek and connect to the other existing sewer main. This project is needed to alleviate flow from the existing main and limit the potential for sanitary sewer overflows during rainfall events. The estimated cost of this project is $13,500,000.

6.4.4 Collection System Rehabilitation (2018 FMPU # CS-REHAB)

This includes collection system rehabilitation projects for the purposes of addressing inflow and infiltration (I & I) and structural defects of collection system piping. Specific projects will be performed based on a list of sewer segments with deficiencies that is being compiled for both rehabilitation and replacement as part of the ongoing I & I program. The estimated cost of this project is $5,000,000.

6.4.5 Can Station Replacement – Phase I (2018 FMPU # C35)

This project consists of replacing three of the six remaining can stations with submersible lift stations. The stations proposed to be replaced include Lindon Point, Quail Creek, and Sedgewick Drive at 21st Street. Existing can-style lift stations pose safety risks with confined space entry when there is a need to perform preventive maintenance. Additionally, the infrastructure is out of date and these stations fail frequently due to age. The estimated cost of this project is $1,200,000.

6.5 Miscellaneous Improvements

6.5.1 2023 Facility Master Plan Update (CWW Proj. # 18-M01)

This project consists of developing a plan to analyze the CWW system under near-term, mid-term, and long-term horizons for the purpose of planning and funding. The estimated cost of the project is $1,250,000.

6.5.2 GDOT Highway Relocation Projects (2020-2024) (CWW Proj. # CWW-GDOT)

This project consists of relocation of water and sewer mains for various Georgia Department of Transportation (GDOT) Highway Improvement Projects. The estimated cost for this project is $2,200,000.

6.5.3 New Administration Building Site Prep & Planning (CWW Proj. # 18-M04)

This project is to complete the architectural and engineering design for the relocation of the CWW Administration functions from the current site to a newly constructed building potentially at another site. The design will include drawings and front-end documents (including the contract). The project will also include 30%, 60%, and 90% design review packages, of which will include demolition plans of existing structures, as applicable. The current building has reached the end of its useful life and there are numerous issues reported with HVAC, plumbing, electrical, accessibility, roofing, and cracks in the basement. This will also provide the opportunity to house all personnel under one roof, as they are currently divided between three different buildings due to lack of space in the main building. The estimated cost of this project is $1,500,000.

6.5.4 Geospatial Platform Improvements (CWW Proj. # 18-IT08)

The Geospatial Platform Improvements consist of six projects related to improvements to the hardware, software, architecture, and applications for the Geographic Information System (GIS) and Unmanned Aerial System (UAS) programs. These projects address the replacement of obsolete software and hardware while strategically implementing projects identified in the 2019 Information Technology Master Plan and the 2017 GIS HealthCheck and System Architecture Review. The estimated cost of these improvements is $683,900.

6.5.5 Asset and Work Management Improvements (CWW Proj. # 18-IT16)

This project is to improve asset management processes, data integrity, and maintenance tracking of infrastructure to maintain a high level of service and protect the environment from SSO's and plant permit violations. This project would help to prevent outages, maintain high water quality and infrastructure quality, and maintain treatment capacity to attract industry and maintain revenue stability. The estimated cost of this project is $2,572,193.

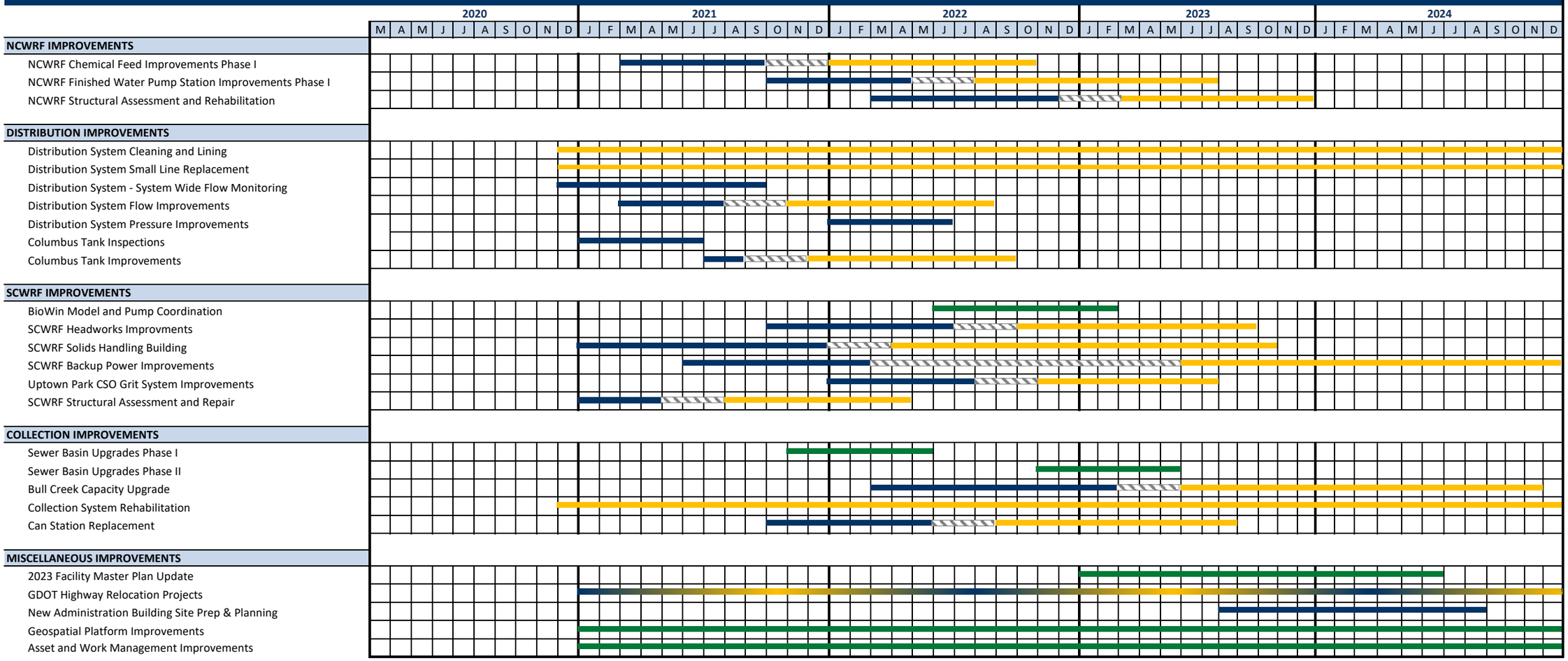
The following table summarizes the above listed projects.

GEFA Loan 2020-2021 CIP Summary					
Project No.	**Project Title**	**Score**	**Budget**	**Type**	**GEFA Fund**
18-W06	NCWRF Chemical Improvements – Phase I	216.0	$2,300,000.00	Rehab/Rep	Drinking Water
18-M02	Columbus Tank Inspections	198.0	$130,200.00	Inspection	Drinking Water
18-M03A	Columbus Tank Improvements	198.0	$1,083,000.00	Rehab/Rep	Drinking Water
18-W13	NCWRF Finished Water Pump Station Improvements – Phase I	166.5	$4,800,000.00	Rehab/Rep	Drinking Water
DS0A	Distribution System Cleaning and Lining	157.5	$7,500,000.00	Rehab/Rep	Drinking Water
DS0B	Distribution System Small Line Replacement	157.5	$5,000,000.00	Rehab/Rep	Drinking Water
DS0C	Distribution System - System Wide Flow Monitoring	157.5	$225,000.00	Study (Risk Mitigation)	Drinking Water
DS0D	Distribution System Flow Improvements	157.5	$1,400,000.00	Upgrade (Risk Mitigation)	Drinking Water
		Total Budget	**$22,438,200.00**		
		Drinking Water	**8**		
Project No.	**Project Title**	**Score**	**Budget**	**Type**	**GEFA Fund**
13-WW13	SCWRF Headworks Improvements	229.5	$5,200,000.00	Rehab/Rep	Clean Water
13-WW14	SCWRF Solids Handling Building	229.5	$10,000,000.00	Upgrade	Clean Water
18-WW15	SCWRF Backup Power Improvements	180.0	$5,000,000.00	Upgrade (Risk Mitigation)	Clean Water
C2A	Sewer Basin Upgrades – Phase I	175.5	$400,000.00	Rehab/Rep	Clean Water
C2B	Sewer Basin Upgrades – Phase II	175.5	$400,000.00	Rehab/Rep	Clean Water
C11	Bull Creek Capacity Upgrade	175.5	$13,500,000.00	Rehab/Rep	Clean Water
18-WW21	Uptown Park CSO Grit System Improvements	171.0	$805,000.00	Rehab/Rep	Clean Water
C35	Can Station Replacement – Phase I	144.0	$1,200,000.00	Rehab/Rep	Clean Water
		Total Budget	**$36,505,000.00**		
		Clean Water	**8**		

Funding Breakout Projects 2020-2024 CIP Summary					
Project No.	**Project Title**	**Score**	**Budget**	**Type**	**Division**
18-W08B	NCWRF Structural Assessment and Rehabilitation	144.0	$600,000.00	Rehab/Rep	NCWRF
		Total Budget	**$600,000.00**		
		NCWRF Projects	**1**		
Project No.	**Project Title**	**Score**	**Budget**	**Type**	**Division**
DS0E	Distribution System Improvements – Pressure Improvements	157.5	$200,000.00	Upgrade (Risk Mitigation)	Distribution System
		Total Budget	**$200,000.00**		
		DS – Projects	**1**		
Project No.	**Project Title**	**Score**	**Budget**	**Type**	**Division**
18-WW22A	BioWin Model and Pump Coordination	270.0	$200,000.00	Study (Regulatory)	SCWRF
18-WW24A	SCWRF Structural Assessment and Repair	144.0	$600,000.00	Rehab/Rep	SCWRF
		Total Budget	**$800,000.00**		
		SCWRF Projects	**2**		
Project No.	**Project Title**	**Score**	**Budget**	**Type**	**Division**
CS-REHAB	Collection System Rehabilitation	157.5	$5,000,000.00	Rehab/Rep	Collection System
		Total Budget	**$5,000,000.00**		
		CS – Projects	**1**		
Project No.	**Project Title**	**Score**	**Budget**	**Type**	**Division**
CWW-GDOT	GDOT Highway Relocation Projects (2020-2024)	270.0	$2,200,000.00	Rehab/Rep	MISC
18-M01	2023 Facility Master Plan Update	252.0	$1,250,000.00	Expansion	MISC
18-M04	New Administration Building Site Prep & Planning	229.5	$1,500,000.00	Upgrade	MISC
18-IT08	Geospatial Platform Improvements	180.0	$683,900.00	Upgrade	MISC
18-IT16	Asset and Work Management Improvements	153.0	$2,572,193.00	Upgrade	MISC
		Total Budget	**$8,206,093.00**		
		MISC Projects	**5**		

A preliminary schedule for the execution of each project is included on the following page as well.

Columbus Water Works
GEFA Loan and Bond Funded CIP Project Schedule



Attachment A – Project Locations

Attachment A

Sewer Basin Upgrades - Phase II

NCWRF Chemical Improvements - Phase I
NCWRF Finished Water Pump Station Improvements - Phase I
NCWRF Structural Assessment and Rehabilitation

New Admin Building Site Preparation & Planning

Sewer Basin Upgrades - Phase I

Can Station Replacement

Can Station Replacement

Uptown CSO Grit Piping Improvements

Distribution System - Cleaning & Lining

Bull Creek Capacity Upgrade

Can Station Replacement

Distribution System Flow Improvements

SCWRF Headworks Improvement
SCWRF Solids Handling Building
SCWRF Back-up Power
Biowin Model and Pump Coordination Study
SCWRF Structural Assessment and Repair

Projects Occurring System-wide:
Tank Inspections
Tank Improvements
Distribution System Wide Flow Monitoring
Distribution System Pressure Improvements
Distribution System Small Line Replacement
Collection System Rehabilitation
GDOT Highway Relocation Projects (2020-2024)
Facilities Master Plan Update
Geospatial Platform Improvements
Asset and Work Management Improvements

3.5 1.75 0 3.5 Miles

N