

Estimating the Statewide Water and Wastewater Capital Spending Plans of North Carolina's Local Governments

June 2021

**Report to the North Carolina Department of
Environmental Quality Division of Water Infrastructure**

This report was prepared for the North Carolina Department of Environmental Quality by the University of North Carolina, Chapel Hill. The principal investigators and authors are listed on the inside cover of this report and are all faculty members of the University of North Carolina, Chapel Hill. The principal investigator is Dr. David M. Brown, Director of the Environmental Finance Center. The report was prepared under the leadership of Dr. David M. Brown, Director of the Environmental Finance Center. The report was prepared under the leadership of Dr. David M. Brown, Director of the Environmental Finance Center.

Analysis funded by the North Carolina Department of Environmental Quality Division of Water Infrastructure.

This report is a product of the Environmental Finance Center at the University of North Carolina, Chapel Hill. Findings, interpretations, and conclusions included in this report are those of the authors and do not necessarily reflect the views of the North Carolina Department of Environmental Quality, the University of North Carolina, or the UNC School of Government.

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Executive Summary

In this report, we develop and implement a simple methodology to estimate local governments' spending plans for water and wastewater infrastructure across the State of North Carolina in the next five and twenty years. The estimates are determined from a statistically representative sample of 75 local governments' Capital Improvement Plans and extrapolated to all other local government utilities of similar sizes, after adjusting for inflation.

We estimate that the local government utilities in the state would collectively face **about \$10.7 – 13.7 billion in water and wastewater capital projects over five years**, within a 90% confidence interval, in 2020 dollars. This estimate assumes that all local government utilities in the state have, or should have, planned capital expenses at similar levels to their peer utilities with Capital Improvement Plans that were analyzed. Since a small number of utilities, particularly smaller systems, may not be planning any capital expenses, this estimate is likely marginally higher than what is actually planned across the state over the next five years, and likely higher than what will actually be spent on capital projects in the coming years. Nonetheless, the estimate represents what utilities in the state would be planning to spend if all local government utilities planned for water and wastewater capital projects similar to their peer utilities.

Extrapolating to 20 years of planned capital expenses adds uncertainty because most Capital Improvement Plans do not cover twenty years. Assuming that the trends in Capital Improvement Plan projects continue or repeat through 20 years with a 2%/year cost inflation factor, we estimate that local government utilities in the state would collectively face about \$36 – 44 billion in water and wastewater capital projects over 20 years, within a 90% confidence interval, in 2020 dollars. This estimate may be high considering that several of the analyzed Capital Improvement Plans include short-term projects that would likely not be repeated again within twenty years, although many large-scale projects in the latter years may also have not been identified in the analyzed plans. There is a lower degree of confidence in estimating local governments' planned capital expenses over twenty years than in the five year estimates.

Introduction

All water and wastewater utilities have infrastructure capital needs. Replacement and rehabilitation of aging infrastructure, expansions and extensions of service, changes to treatment to meet regulatory or water quality needs, interconnections to other systems, projects to reduce water loss and inflow and infiltration, and modifications to improve physical and cybersecurity resiliency to changing conditions are examples of common capital projects. No water or wastewater utility can avoid capital projects for many years and maintain adequate levels of service.

Capital projects are expensive and can be funded in several ways. While many local governments fund some of their capital projects from their own revenues, reserves or through bonds, others rely on grants and subsidized loans to assist in funding capital projects. It is necessary to estimate the capital needs and spending plans of local government utilities across a state in order to understand their financing needs.

In 2017, water and wastewater 20-year infrastructure needs for North Carolina were estimated to be between \$17 billion and \$26 billion in the *North Carolina's Statewide Water and Wastewater Infrastructure Master Plan: The Road to Viability*. These estimates were extrapolated from the US Environmental Protection Agency's (EPA) 2011 Drinking Water Infrastructure Needs Survey and Assessment (DWINSA) and 2012 Clean Watersheds Needs Survey (CWNS), modified by comparisons to a sample of Capital Improvement Plans (CIPs). With a larger and more up-to-date sample of CIPs, North Carolina local government utilities' infrastructure needs may be updated.

Unfortunately, the methodology that was used in 2017 to estimate the state's infrastructure needs could not be accurately replicated this year. The CWNS was not updated since 2012, which was the same version of the survey that was used to estimate wastewater needs in 2017 and would not have provided a more up-to-date reference point for analysis. The DWINSA was updated in 2015. However, the methodology employed by the state in completing the DWINSA in 2015 differed from the methodology used in the 2011 iteration, making it impossible to compare individual utilities' assessed needs to their CIP and replicate the methods used in 2017 to extrapolate statewide drinking water needs. As such, the \$17 billion to \$26 billion infrastructure needs estimate could not be updated at this time.

Nevertheless, with a large sample of up-to-date Capital Improvement Plans, a new methodology was used to estimate local governments' spending plans for water and wastewater infrastructure across the State of North Carolina in the next five and twenty years. The estimates are determined from a statistically representative sample of 75 local governments' Capital Improvement Plans and extrapolated to all other local government utilities of similar sizes, after adjusting for inflation. The methods and findings are described in this report.

Local Government Utilities in North Carolina

In North Carolina, most of the residential population receives drinking water and wastewater services from utilities owned by local governments: municipalities, Counties, Sanitary Districts, Water and Sewer Authorities, and Metropolitan Water or Sewerage Districts. As of December 2020, there were 446 local government drinking water utilities and 417 local government wastewater utilities active in the state of North Carolina, excluding wholesale-only utilities. Most of the utilities (383) provided both water and wastewater services. More than 7 million North Carolinians are estimated to be connected to local government water and/or local government wastewater utilities. Some utilities own more than one distinct water system or more than one distinct wastewater system in different locations, but since they are financially managed by the same staff and board, they are assessed in this report as a single utility.

Utility service populations vary from the very small (fewer than 100 people) to the large (more than 1,000,000 people). Table 1 lists the number of utilities by service population sizes. While the majority of utilities are small, the majority of the service population is served by 16 large utilities.

Table 1 Active Local Government Utilities in North Carolina at the Time of Analysis

Service Population Size	Water utilities		Approx. water service population		Wastewater utilities		Approx. wastewater service population	
	Number	%	Number	%	Number	%	Number	%
More than 100,000	16	4%	4,210,000	54%	16	4%	4,100,000	56%
20,001 - 100,000	50	11%	1,930,000	25%	44	11%	1,700,000	23%
5,001 - 20,000	122	27%	1,260,000	16%	106	25%	1,070,000	15%
Up to 5,000	258	58%	440,000	6%	251	60%	420,000	6%
Total	446		7,840,000		417		7,290,000	

Service population size is often used as an indicator for the physical size of the water or wastewater systems and is usually highly correlated with utility expenses, both capital and operational expenses. Large utilities may operate with budgets in the tens of millions of dollars, while smaller utilities' budgets may be in the tens of thousands of dollars. In order to estimate the capital spending plans of all local government utilities in the state, the spending plans of all sizes of utilities must be included.

Sampling Capital Improvement Plans

Many local government utilities have developed multi-year Capital Improvement Plans that specify capital projects and their associated costs that are needed or planned for in the next few years. Most CIPs cover at least a five-year planning horizon, while many cover at least 10 years. Some of the CIPs are developed in conjunction with Asset Management Plans. In fact, many small local governments made use of the state's Asset Inventory and Assessment grants to conduct a study on their infrastructure condition and develop an Asset Management Plan and Capital Improvement Plan to invest in their

assets. Most of the CIPs analyzed in this report for small local governments were developed as a result of the Asset Inventory and Assessment grants.

The Environmental Finance Center (EFC) collected recent CIPs of utilities of all sizes by downloading them from local governments’ websites – some as standalone documents and others as attachments to other budget-related documents – and from the set of CIPs that were completed by all Asset Inventory and Assessment grant recipients in recent years, supplied to the EFC by the Division of Water Infrastructure. The EFC ensured that more than ten CIPs were included for each of the four service population size groups shown in Table 1 in order to be able to employ a stratified weighting to statistically extrapolate capital spending plans for all utilities of all sizes within a given margin of error.

After excluding CIPs that did not cover at least the 2020 or 2021 years and CIPs from which drinking water and wastewater capital spending plans cannot be distinguished from other general government capital spending, CIPs from 75 local government utilities – 59 water and 62 wastewater – were used as the sample for this analysis as shown in Table 2.

Table 2 Sampled CIPs in the Analysis

Service Population Size	Water utilities			Wastewater utilities		
	In the state	Sampled CIPs	% Sampled	In the state	Sampled CIPs	% Sampled
More than 100,000	16	16	100%	16	16	100%
20,001 - 100,000	50	13	26%	44	13	30%
5,001 - 20,000	122	17	14%	106	15	14%
Up to 5,000	258	13	5%	251	18	7%
Total	446	59	13%	417	62	15%

Because large utilities’ capital spending plans dominate the share of capital spending statewide and vary considerably from utility to utility, CIPs of all 16 large utilities were included in the analysis rather than employing a sampling methodology that would significantly widen the margin of error in the analysis. For all other service population size groups (“strata”), a sample of CIPs was assessed, with a greater proportion of sampling used in the larger utility size groups to minimize the overall margin of error. In total, 43 water CIPs and 46 wastewater CIPs were sampled for the utilities serving under 100,000 people, and all CIPs of utilities serving more than 100,000 people were included in the analysis.

Determining 5-Year and 20-Year Capital Spending Plans from Sampled CIPs

Each local government’s capital spending on projects were extracted from the CIP for each planning year individually. Water and wastewater capital plans were identified and separated from each other, and all non-water and non-wastewater projects excluded from the analysis. Where CIPs combined water and wastewater project costs together, the project descriptions and labels were used to distinguish between water and wastewater projects for as many capital costs as possible, and the remainder divided equally

between water and wastewater. As a result, each local government's capital spending plans were determined for water projects and wastewater projects separately and annually from their CIPs.

All of the assessed CIPs included at least five years of capital plans that included fiscal year 2020 or fiscal year 2021. Most of the plans included more years after 2020 and 2021, while some CIPs' planning periods began before then. All annual estimates were adjusted to 2020 dollars using the Consumer Price Index for years prior to 2020, and the average of the Consumer Price Index between 2015 and 2020 (1.78%/year on average) for all years after 2020. All amounts reported henceforth are in 2020 dollars unless specified otherwise.

The total water and wastewater spending plans for a five-year period around the years 2020 and 2021 were calculated for each sampled CIP. Where possible, the five-year period included the fiscal years 2020 through 2024 or fiscal years 2021 through 2025, but a few included earlier periods depending on the availability of capital spending data in each CIP. The capital spending estimates in this report, therefore, are for five-year (and twenty-year) periods that start close to, but not precisely on, fiscal year 2020 or 2021.

The twenty-year spending plans were then estimated or extrapolated from the CIPs for the sampled utilities. Only 10 CIPs included a 20+ year planning period, and the water and wastewater capital spending plans were determined for those twenty years directly from the CIP in the same manner that the five-year spending plans were determined. All other CIPs included planning periods between 5 years and 12 years, and did not specify capital spending plans beyond those years, or at least not in a way that a 20-year estimate could be derived. To estimate the potential capital spending plans beyond the planning period of the CIP, it was assumed that the trends in capital spending during the latter part of the CIP period would continue up to year 20, while being inflated to account for rising capital costs. More specifically, the last few years' capital spending estimates in the CIP were assumed to be repeated for the remaining years up to year 20, but inflated at 2%/year from their original CIP years to match recent Construction Cost Index rates. The Construction Cost Index has averaged 2.7%/year in the last five years and has been below 2%/year in the last two years.

The assumption that capital spending trends, as specified in the sampled CIPs, would continue up to year 20, with rising capital costs, adds uncertainty to the 20-year estimates. Assuming that spending trends would continue might produce higher-than-actual estimates considering that several of the projects identified in the CIPs are short-term projects that would likely not be repeated again within twenty years. On the other hand, there may be many large-scale and more costly projects that will occur in the years after the CIPs' planning period and within 20 years, for which their costs are underestimated in this analysis because of the assumption that spending trends would continue as recorded in the CIP. It is difficult to tell whether the operating assumption in this analysis produces higher-than-actual or lower-than-actual capital spending estimates for the 20-year period. Because of this uncertainty, there is a lower degree of confidence in estimating local governments' planned capital expenses over twenty years in this analysis than in the five year estimates.

In sum, the 59 sampled water CIPs totaled approximately \$2.8 billion in five-year planned capital spending for water projects in 2020 dollars. The 62 sampled wastewater CIPs totaled approximately \$4.0 billion in five-year planned capital spending for wastewater projects in 2020 dollars. The 20-year estimates under the operation assumption are \$10.3 billion for water projects and \$14.6 billion for wastewater projects for these sampled utilities. The next step is to extrapolate these findings to include all other local government utilities whose CIPs were not sampled.

Extrapolating Capital Spending Plans to All Utilities in the State

The capital spending plans of the 16 large local government utilities serving more than 100,000 people were determined directly from their CIPs as specified above. These totaled \$5.8 billion over five years and approximately \$21 billion over 20 years for water and wastewater projects combined, in 2020 dollars.

Approximately 10% of the local government utilities serving fewer than 100,000 people had been sampled and their CIPs included in the analysis: 43 sampled out of 430 water utilities and 46 sampled out of 401 wastewater utilities of that size. Assuming that the sampled CIPs are statistically representative of the CIPs of all of the utilities serving fewer than 100,000 people, statistical analysis was used to compute the total capital spending plans for this group of utilities within a 90% margin of error. The margin of error accounts for the fact that there is variability in the capital spending amounts from one CIP to the next, and that the sampled CIPs is one of many samples that may have been used from the group of utilities serving fewer than 100,000 people. In other words, the margin of error accounts for the variations in spending amounts within the group of smaller utilities and the fact that not every utility's CIP was sampled.

This analysis assumes that all local government utilities in the state have (or should have) planned capital expenses. Specifically, that all utilities serving fewer than 100,000 people have or should have capital spending plans at similar levels to their peer utilities whose CIPs were analyzed. No local government utility is assumed to have no capital spending plans for the next five or twenty years. If some of the smaller utilities that were not sampled are actually not planning any capital spending at all, the calculated estimates below may be high. However, fewer than 6% of local government water and wastewater utilities had no capital outlays over a five-year period between fiscal years 2015 and 2019. Thus, overestimation of capital spending plans across the state as a result of this assumption is likely to be small.

Statewide Estimates of Capital Spending Plans on Water and Wastewater

We estimate that the local government utilities in the state would collectively face **about \$10.7 – 13.7 billion in water and wastewater capital projects over five years**, within a 90% confidence interval, in 2020 dollars. This estimate assumes that all local government utilities in the state have, or should have, planned capital expenses at similar levels to their peer utilities with Capital Improvement Plans that

were analyzed. Table 3 displays the estimated totals for water and wastewater capital spending. More than half of the total planned capital spending occurs by the 16 large utilities which serve a little more than half the service population in the state. The small and medium sized utilities in the state face plans to spend between \$4.9 – 7.9 billion over five years for water and wastewater infrastructure projects.

Table 3 Estimated 5-Year Capital Spending Plans for Local Government Utilities in North Carolina

Service Population Size	Number of utilities		Estimated 5-year planned capital projects (90% confidence interval, in 2020 dollars)		
			Water projects	Wastewater projects	Water and Wastewater total
More than 100,000	16	16	\$2.3 billion	\$3.5 billion	\$5.8 billion
Up to 100,000	430	401	\$2.4 - 3.9 billion	\$2.5 - 4.0 billion	\$4.9 - 7.9 billion
Total statewide	446	417	\$4.7 - 6.2 billion	\$6.0 - 7.5 billion	\$10.7 - 13.7 billion

Assuming that the trends in capital spending continue or repeat through 20 years with rising costs, we estimate that local government utilities in the state would collectively face **about \$36 – 44 billion in water and wastewater capital projects over 20 years**, within a 90% confidence interval, in 2020 dollars, as shown in Table 4. As explained previously, there is additional uncertainty with this estimate given the assumption that capital spending trends would continue. Thus, there is a lower degree of confidence in the 20-year estimates than in the five-year estimates.

Table 4 Estimated 20-Year Capital Spending Plans for Local Government Utilities in North Carolina

Service Population Size	Number of utilities		Estimated 20-year capital projects assuming current continuing trends in project plans (90% confidence interval, in 2020 dollars)		
			Water projects	Wastewater projects	Water and Wastewater total
More than 100,000	16	16	\$9 billion	\$12 billion	\$21 billion
Up to 100,000	430	401	\$8 - 12 billion	\$7 - 11 billion	\$15 - 23 billion
Total statewide	446	417	\$17 - 21 billion	\$19 - 23 billion	\$36 - 44 billion

Comparisons to Needs Estimates and Actual Spending

Local government utilities are planning to spend \$10.7 – 13.7 billion on water and wastewater infrastructure projects in five years, and perhaps \$36 – 44 billion over twenty years.

These amounts are higher than what has been estimated in past infrastructure needs surveys. EPA’s Drinking Water Infrastructure Needs Survey and Assessment in 2015 estimated \$16.7 billion of water infrastructure needs over 20 years, and the Clean Watersheds Needs Survey in 2012 estimated just \$5.3

billion of wastewater infrastructure needs over 20 years. Combined, and adjusted to 2020 dollars, the state's water and wastewater utilities had approximately \$24 billion of infrastructure needs over a twenty-year period. The 2017 *North Carolina's Statewide Water and Wastewater Infrastructure Master Plan: The Road to Viability* provided a range of 20-year infrastructure needs estimates of \$17 – 26 billion (or \$18 – 27 billion in 2020 dollars).

By comparison, this analysis estimates planned capital spending of more than \$36 billion over twenty years, assuming that capital spending will continue or repeat as currently planned till year 20. However, it is difficult to contrast the results of this analysis to the needs estimates of previous studies. The methodology used in this report is significantly different from the methodologies used in the needs assessments. While the previous studies focused on estimating infrastructure needs, this report focuses on estimating what local governments are planning to spend. The types of projects that are included in the analysis are different, with more types of projects likely to be included in this analysis than in the needs assessments. Lastly, as explained, the assumption that trends in capital spending plans will continue until year 20 could produce higher-than-likely estimates if local governments are front-loading large capital projects in their current CIPs. Despite difficulties in comparisons to previous studies, \$36 – 44 billion is the most up-to-date estimate on what local governments may be planning to spend on water and wastewater projects in the next twenty years while maintaining the rate of spending specified in their CIPs and with rising costs.

There is a greater degree of confidence in the five-year estimates because they are derived more directly from existing CIPs. The 16 Collectively, local government utilities may be planning \$10.7 – 13.7 billion in water and wastewater capital projects over five years. Practically, however, many of the projects planned in the CIPs may end up delayed, downsized, or deleted. Local governments facing challenges in funding or financing capital projects, or shifting priorities and conditions, may not implement their projects as planned. *Actual* spending, therefore, may be different from *planned* spending.

In fact, planned spending estimates for the next five years greatly exceed the actual capital spending of a recent past five years. Between fiscal years 2015 – 2019, capital outlays among all local government water and wastewater utilities in North Carolina totaled around \$1 billion per year on average, while the 16 large utilities serving more than 100,000 people, in their own published CIPs, identified \$5.8 billion worth of capital projects within five years, averaging more than \$1 billion per year on their own.

The scope of this analysis was intentionally focused on estimating that local governments *plan* to spend on water and wastewater capital projects, not predict what *will* be spent. Estimating what local governments plan to spend includes a more comprehensive outlook on the total capital funding that is needed to implement all of the capital projects that were identified by the local governments as necessary.

Funding the Planned Capital Expenses

Funding all of the planned capital projects for the next five years at more than \$10 billion (more than \$2 billion per year) across the state is challenging with current resources. Capital outlays – financed in various ways – average a little over \$1 billion per year currently. Operating revenues for local government utilities total over \$3.2 billion per year, but more than \$2.6 billion per year is spent on operations, maintenance, and existing debt service, leaving little to fund new capital projects from cash. An EFC analysis of debt capacity in 2019 estimated that all local government water and wastewater utilities in North Carolina could collectively issue between \$14.9 – 23.4 billion of new debt over twenty years (less than \$1 billion per year) under two financing strategies, but that the debt capacity of small local governments is very limited. The loans and grants funding programs administered by the Division of Water Infrastructure, the U.S. Department of Agriculture, and various other state and federal agencies, Foundations and non-profit organizations provide a critical source of funding to local government utilities. However, combined, they do not currently fund \$10 billion of projects in a five-year period. Additional funds from the state or federal government would provide much needed assistance to fund planned capital projects and prevent further delays, downsizing or deletion of those projects due to lack of funding options.