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Appendix M – Economic Evaluation Case Studies

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PROJECT OVERVIEW

The Kirkwood Water and Sewer Infrastructure Update in Camden, South Carolina demonstrates how targeted reinvestment in aging water infrastructure can improve system reliability, reduce long-term water loss, strengthen neighborhood resilience, and support broader watershed sustainability goals. Rather than focusing solely on increasing water supply capacity, the project addressed inefficiencies within existing infrastructure systems by replacing deteriorating water and sewer lines that had become increasingly vulnerable to leaks, service interruptions, infiltration, and maintenance failures.

Located within one of South Carolina's oldest inland cities, the Kirkwood neighborhood faced growing challenges associated with aging infrastructure that no longer met the operational demands of the community. Frequent water main failures, inconsistent water pressure, deteriorating sewer pipes, and elevated risks of sewer overflows threatened both public health and long-term neighborhood stability. Many of the existing pipes had been in service for decades and were contributing to unnecessary system water losses, rising maintenance costs, and increased operational strain on Camden's broader water and wastewater systems.

The project modernized critical infrastructure throughout the neighborhood by replacing more than 13,400 linear feet of aging drinking water lines and rehabilitating nearly 17,000 linear feet of wastewater sewer pipe. Improvements included replacing outdated two-inch cast iron water mains with new six-inch PVC mains, installing new hydrants and gate valves, upgrading water service lines, and rehabilitating aging sewer infrastructure to reduce infiltration and inflow during heavy rainfall events.

Importantly, the Kirkwood project illustrates how addressing water loss and deferred maintenance can serve as a core resilience strategy for utilities across the Catawba-Wateree watershed. Investments in repairing aging infrastructure reduce unnecessary strain on water supplies, lower emergency repair costs, improve operational efficiency, and enhance long-term reliability without requiring new water withdrawals or major supply expansions. Reducing leakage and infiltration also decreases energy and treatment demands across the broader utility system, generating both financial and environmental benefits.

The project was completed through a blended financing approach combining a $500,000 South Carolina Rural Infrastructure Authority (SC RIA) grant with low-interest State Revolving Fund (SRF) loans for both drinking water and wastewater improvements. This funding structure allowed Camden to complete critical upgrades while minimizing financial burdens on residents and stabilizing long-term utility costs.

Beyond immediate infrastructure improvements, the project strengthened system-wide resilience by reducing the likelihood of sewer overflows, improving fire protection capacity, lowering long-term maintenance needs, and extending the lifespan of essential public infrastructure. The rehabilitation of sewer lines also helps reduce infiltration into wastewater systems, limiting unnecessary treatment costs and reducing overflow risks during extreme precipitation events that are expected to become more frequent under future climate conditions.

The Kirkwood project demonstrates how infrastructure modernization can simultaneously improve public health, reduce water system inefficiencies, strengthen neighborhood stability, and support long-term watershed sustainability. As communities across the Catawba-Wateree basin confront aging infrastructure, population growth, and increasing climate pressures, projects like Kirkwood provide a model for proactive reinvestment strategies that enhance both utility resilience and environmental stewardship.

PROJECT OVERVIEW

The McAlpine Creek Wastewater Management Facility (WWMF) Combined Heat and Power (CHP) project demonstrates how wastewater infrastructure investments can simultaneously improve operational resilience, reduce greenhouse gas emissions, lower long-term utility costs, and strengthen watershed sustainability. Implemented between 2016 and 2017, the project captures anaerobic digester gas generated during wastewater treatment and converts it into usable electricity and thermal energy, transforming a waste byproduct into a renewable energy resource.

As the largest of Charlotte Water's six wastewater treatment facilities, McAlpine Creek WWMF plays a critical role in managing wastewater flows across the rapidly growing Charlotte metropolitan region and broader Catawba-Wateree basin. The facility treats up to 64 million gallons of wastewater per day and serves more than one million regional customers through Charlotte Water's extensive collection system.

The CHP project reflects a broader shift toward multi-benefit infrastructure investments that address both immediate operational needs and the underlying drivers of future climate and infrastructure stress. Rather than flaring methane gas produced during treatment, the system now captures and converts the gas into energy, significantly reducing greenhouse gas emissions while improving long-term operational efficiency and energy resilience.

Since implementation, the project has generated more than 35.7 million kilowatt-hours of clean energy and returned more than $1.76 million in gross revenue to Charlotte through energy sales. The facility now produces approximately 1 megawatt of electricity through recovered biogas, with generated power exported to the Duke Energy grid. Thermal energy produced through the CHP process is also reused on-site for digester heating operations. Supported through a $4.6 million Clean Water State Revolving Fund (CWSRF) 0% interest loan, the project demonstrates how strategic public investment can advance both infrastructure modernization and environmental stewardship.

The McAlpine CHP system also highlights the growing importance of climate mitigation and resilience planning within wastewater management. By reducing methane emissions—a potent greenhouse gas—the project contributes directly to Charlotte Water's sustainability objectives while diversifying the facility's operational energy portfolio and reducing vulnerability to future energy price volatility and grid disruptions.

In addition to energy and operational benefits, wastewater treatment facilities remain important actors in watershed nutrient management. Publicly Owned Treatment Works (POTWs) contribute nitrogen and phosphorus loads to receiving waters, making continued monitoring and management of nutrient discharges critical to long-term watershed health. Within the Catawba-Wateree basin, the Lower Catawba Dischargers Group has led collaborative nutrient management efforts among regional wastewater utilities for more than a decade. Continued efforts to understand and track nutrient loading impacts from wastewater dischargers will remain essential to maintaining water quality and ecosystem resilience across the basin.

The success of the McAlpine Creek CHP project demonstrates how wastewater infrastructure can serve as both essential public utility infrastructure and a strategic climate resilience investment. As utilities across the Catawba-Wateree watershed confront aging infrastructure, population growth, and increasing climate pressures, projects like McAlpine provide a model for integrated investments that improve system performance while advancing broader watershed sustainability goals.