



Enhancing stormwater infrastructure with asset management in Columbia, S.C.

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According to the American Society of Civil Engineers' latest report card, America's stormwater infrastructure deserves a grade of D. Earning a better score would require cities to perform course corrections, something to which the city of Columbia, S.C., is committed.

How Columbia operates its storm drainage system is similar to other communities. Its roads and drainage department cleans and maintains the system, while its engineering department identifies and implements capital projects. In most cases, these projects are determined by system failures, most of which happen because of structural problems. However, capacity issues also

arise and cause damage through localized flooding.

In Columbia, floods impact several residential communities, including the Five Points area, an important commercial and entertainment district. In 2017, the city issued a capital improvement bond and began a \$95 million investment in drainage infrastructure to protect its citizens and commerce.

"The city has embarked on an aggressive capital program," said Woolpert Engineering Project Manager Amanda Douglas. "Leadership is utilizing 10 professional design firms and the bond program manager (Woolpert) to identify, design and construct stormwater improvements across Columbia."

Given the magnitude of the investment, the city has implemented a safeguarding strategy to reduce the likelihood of needing another substantial financial commitment. That strategy is an asset management program.

As a result of asset evaluation, the city now has a clearly prioritized list of work for its roads and drainage department.

Implementing an asset management program

Developing an asset management program required several important steps. The first ones were the most foundational: reviewing city and stormwater program goals and determining the

extent and replacement value of the storm drainage system.

“Defining the objectives helps establish a clear and appropriate direction for the asset management program and align it with the city’s goals and regulatory requirements,” Douglas said. “Estimating the system’s value would also help inform the needed expenditures for annual condition assessments and repair costs.”

After laying the groundwork, the city identified the data and tools needed in an asset management program and compared them with available resources. Completing this step enabled the city to discover multiple gaps, including:

- Available—but potentially inaccurate—inventory data.
- A lack of understanding about the condition of the drainage system.
- An overwhelmed maintenance staff.

The good news? With the support of City Council, Columbia began developing a comprehensive asset management program. The bond program manager created standard operating procedures to help update the city’s inventory and ensure design firms collected data in a consistent manner. Afterward, the city conducted condition assessments of the stormwater system.

“Condition data was collected using a simplified scoring system that quickly identified which assets needed immediate attention and which ones should be evaluated further using CCTV,” Douglas said. “During this phase, the city found that only 12% (approximately) of its storm drainage system needed additional evaluation, leading to significant savings in CCTV costs.”

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The department's crews are working on the infrastructure needing immediate attention, and the assets needing additional cleaning and CCTV evaluation are being assessed by subcontractors.

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As workers complete their tasks, the municipality is reviewing its use of Cityworks to ensure effective project management and repair/replacement documentation initiatives. Leadership is also continuing to collect, manage and evaluate inventory and condition data.

Immediate and long-term effects

While Columbia's asset management program is still maturing, the city is already seeing immediate benefits.

“We can now identify areas in our system that we know will need additional attention in the next couple of decades,” said Frances Bryan, PE, assistant city engineer at the Columbia Department of Engineering. “We can

also identify areas in our system that are in good shape and won't need significant attention in the next several years.”

Another immediate benefit is that leadership has discovered that its data helps identify potential utility conflicts that may arise with other projects.

“If we know we're going to extend a sanitary sewer line, we can look at our updated inventory and quickly identify that we might have a major conflict with another storm drainage project,” Bryan said. “From that perspective, the data helps us get a handle on how difficult projects may be.”

On top of pinpointing the potential challenges of utility projects, the asset management program is helping the city navigate emergencies.

“When a pipe collapses, we can look quickly at the preliminary condition assessment data we've collected in that area and get a sense of whether the pipe collapse was an isolated instance of failure or a larger-scale problem,” Bryan explained.

Leadership will continue to notice many advantages of its asset management program as time goes on. For example, moving forward, the city can create data-backed maintenance budgets to justify the need for more funding. Additionally, city leaders can expect the program to help them

become more proactive, an advantage that will increase financial savings and level of service.

“We're currently in the process of transitioning from a reactive approach to a more proactive one,” said Dana Higgins, PE, LEED AP, director of engineering at the Columbia Department of Engineering. “The further we go down this path, the more we hope to shift our workload until we're almost entirely proactive and greatly reduce reactive circumstances that come up.”

Challenging, but worth it

Of course, putting in the work to see immediate and long-term benefits hasn't been easy for the city. Applying asset management practices and principles to stormwater infrastructure can be complex and challenging. However, it's not as complicated as one would think, making the effort well worth it.

“While implementing an asset management program may be hard, cities will realize benefits from day one,” Douglas said. “Municipalities can phase this program in over time to fit whatever budget, schedule and resources they have to strengthen their storm drainage systems.”

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