Kansas City faces the same sewage and stormwater challenges as nearly 800 other cities. Modern sewer systems have separate conveyance networks for sanitary waste and stormwater flow. But the oldest sewers — built a century or more ago in places like Omaha, Neb.; Kansas City, Mo.; St. Louis; Toledo, Ohio; and Washington, D.C. — were constructed in an era before sewage treatment was required. At the time, combining wastewater and stormwater into a single pipe (a combined sewer system, or CSS) and transporting it out of sight to a river discharge, seemed like the most sensible, cost-effective and sanitary solution.

Times change. As urban populations grew and regulations evolved, those old-fashioned CSSs were soon discharging untreated waste in quantities that could no longer be ignored. As technology developed, wastewater reclamation facilities were integrated into the CSS frameworks. These treatment facilities worked as intended to treat normal levels of sewage flow, but they could not accommodate the combined surge of sewage and stormwater that raged through the system during heavy rains. In those cases, combined sewer overflows (CSOs) of stormwater and untreated sewage still had to be dumped straight into the environment.

In some cities, the CSS could handle fairly significant rain storms without resorting to CSOs. In other cases, even small rain events could trigger a CSO. Because each system reacts differently to rain events, each city requires a unique solution to address its CSO issues.

In 1994, the U.S. Environmental Protection Agency (EPA) published a CSO Control Policy to guide communities with CSOs on meeting their legal responsibilities under the Clean Water Act. Since then, many CSO communities have negotiated state or federal consent decrees that lay out a framework and
a timeline under which these communities agree to bring their sewage and wastewater systems into compliance with the CSO Control Policy and Clean Water Act. These overflow control programs (OCPs) typically include flow reduction, storage, separation, high rate treatment, green infrastructure or some combination of these strategies to minimize CSO events.

**Negotiating the Timeline**

Practically every city knows implementing its consent decree will be expensive, time-consuming and technically difficult. "Cities want to come into compliance," says John Mitchell, Burns & McDonnell wastewater practice director. "Cities understand that water quality is an important priority. We all live downstream from someone else. But in terms of budgets, police, fire, roads and schools are important priorities, too. There has to be a balance in how limited resources are expended. Consent decrees have to recognize that need for balance and determine reasonable schedules and strategies that result in compliance. Cities also need to be able to afford to implement them."

In Kansas City, Burns & McDonnell provided technical engineering guidance that helped the city negotiate a landmark consent decree that incorporates innovative green infrastructure elements that seek to reduce stormwater volume at the source. By catching, holding and treating water through rain gardens and bioswales, the green infrastructure reduces stormwater flows and reduces the need to expand traditional gray infrastructure downstream.

"Kansas City’s consent decree, signed just over a year ago, changed the approach to addressing combined sewer overflows," says Ron Coker, vice president of the Burns & McDonnell Water Group. "Kansas City was able to demonstrate that in order for cities to try innovative new approaches, like green infrastructure, longer durations were needed to prove their effectiveness. The cost of addressing combined sewer overflow regulations is simply too great without the opportunity to also provide significant ancillary benefits to the community." The EPA agreed, and Kansas City ended up with an unprecedented 25-year time frame in which to accomplish its goal of reducing CSO incidents.

**Green Pilot Plays Key Role in Integrated Planning**

For the Kansas City OCP, Burns & McDonnell is helping create the nation’s first large-scale green infrastructure pilot program addressing CSO control. In total, the pilot program covers approximately 740 acres of land — more than a square mile — in the Marlborough neighborhood, a region also known as the Middle Blue Basin. The first 100-acre phase of the program will be complete in summer 2012.

"The goal of the pilot is to utilize distributed green infrastructure to manage and reduce stormwater volume in order to minimize the occurrence of CSO incidents," Mitchell says. "Using information we gain from the pilot, we can adapt and revise the installation of green infrastructure in the next pilot area. Then repeat that iterative process for the final phases of the 700-acre watershed. The pilot will demonstrate the most effective green techniques to improve water quality while containing costs. We’ll also learn the best methods of using green infrastructure to enhance the community quality of life, so we can apply those lessons to other suitable candidate watersheds in the system."

Community development is a key part of Burns & McDonnell’s integrated planning approach to stormwater management. Installing traditional infrastructure still plays a significant role in building solutions to combined sewer overflow control; however, green infrastructure not only offers the potential to provide amenities for communities with green space, rain gardens, trails, parks and restored wildlife habitat, it also moves the solution above ground where rate payers and citizens can see their investment.

**BIG BENEFITS FROM MICROTUNNELING**

Fifteen or 20 years ago, trenchless microtunneling got a bad reputation when telecom companies used the method to pull wire and ended up hitting other utilities. Today, Burns & McDonnell project manager Rick Besancon says microtunneling technology has improved considerably. Costs also have dropped, making it a technology that deserves a closer look from municipalities seeking to minimize the social disruption and safety risks associated with traditional open-trench construction projects.

Microtunneling involves the use of robotic equipment controlled remotely by human operators on the surface. Even the “micro” in microtunneling has become somewhat of a misnomer, since the technology can be used for anything from an 8-inch diameter tunnel up to a 12-foot diameter pipe.

Instead of digging an open trench and tearing up an entire street, microtunneling allows utilities to simply place a hole every 500 feet. Where accuracy and keeping the digging line on a consistent grade were problems in the past, pilot tube technology now enables operators to control the microtunneling machines with impressive precision. “I have experienced projects where, while waiting for the microtunneling machine to emerge into a receiving pit, a worker spray-painted a circle on the side of the pit and the microtunneling probe popped out right through that circle,” Besancon says. “That accuracy is key for a gravity-based system like a stormwater or sanitary sewer. Thanks to these sorts of advances, microtunneling deserves the interest it is getting, especially in urban areas.”
Mitchell points out that the city of Atchison, Kan., has already had success building infrastructure to manage stormwater upstream from where it enters the CSS. Atchison built a series of watershed dams that become mini lakes that hold water during the dry season, giving the community valued opportunities for fishing, recreation and wildlife habitat.

The green infrastructure component of an OCP can also play an important educational function. "When part of the improvements are above ground, people can see them, and they serve as a reminder that the program is reducing CSOs, reducing stormwater runoff, and creating a benefit for the community and the environment," Mitchell says. "Even if green infrastructure is only a piece of bigger CSO-mitigation efforts taking place out of sight, the green part of the program can still serve as a symbol for the overall project and for our accomplishments in improving water quality."

In the era of Facebook and Twitter, community members have high expectations that they will be kept in the loop on utility projects. "I would not even consider starting a CSO separation project without having a robust community relations program in place to disseminate information," says Burns & McDonnell project manager Rick Besancon.

The city established a website to give citizens updates on project information. Beyond that, Burns & McDonnell helped develop and implement an ambitious and comprehensive community outreach program to feed what turned out to be an immense desire among community members for information on the Country Club Neighborhood Sewer Separation Project. "We attended every homeowners association meeting to answer questions and provide a quick progress update," says Besancon. "We thought they would get tired of hearing from us, but they always wanted more information."

Knowing how to communicate is important, but cities also need to know what to communicate. Engineers may want data and spreadsheets on every project detail, but most residents and business owners just want the big picture on construction schedules and how their individual lives will be affected. Cities that haven’t held public meetings recently on a utility projects should recognize that some participants might use the occasion to vent years of pent up frustrations.

More and more cities are supplementing their communication campaigns with Internet-based virtual public meetings. The virtual meetings solicit public feedback and help obtain demographic data on the community members who are attending or contributing to the online meeting. Online meetings also allow cities to expand public participation to participants who might not have the flexibility to attend meetings in person.

"People can finish work, put the kids to bed, then log onto the Internet at 10 p.m. to see a public presentation and give feedback," says Besancon. "Community members appreciate the convenience of being able to participate in a meeting on their own terms at a time they find most convenient."
Adaptive Management and Community Relations

In its OCP work in Kansas City and elsewhere, Burns & McDonnell has helped clients reap the benefits of adaptive management strategy (AMS), a flexible approach that gives utilities and governments the ability to incorporate technological advances while responding to the evolving needs of the community. "One of the fatal strategic mistakes a utility or a government can make in implementing a CSO consent decree is not listening to the priorities of the community," Mitchell says. "Rate payers are really the most important stakeholders here. They are the ones who are paying the bill. Their priorities will change over time. The regulatory environment will change. The available technologies and the community’s financial resources can also change over the two decades or more that it takes to implement these programs. These are all factors that municipalities need to balance in an AMS."

When determining and responding to the priorities of the community, it is critical to establish open and transparent communication channels. In Omaha’s Country Club neighborhood, Burns & McDonnell has taken a proactive approach to fostering public involvement in that city’s plan to minimize CSOs. "The normal approach is to have a public meeting at the beginning of a CSO project and a public meeting at the end," says Rick Besancon, Burns & McDonnell project manager. "In Omaha, we got deeply involved in the fabric of the community. Along with our subconsultant for public relations, we attended almost every homeowners association meeting over the past two years just to get input and provide updates on the CSO plan. We even met with homeowners one-on-one to explain the project and solicit their feedback."

To date, Burns & McDonnell’s community relations efforts have had the intended effect. By preparing and educating residents about the need to reduce CSOs and the related improvements to water quality, Omaha gained the support and patience of the rate payers. When the city had to remove some mature trees recently in the Country Club neighborhood, all that upfront time and effort building goodwill in the neighborhood paid off: Neither the mayor nor the local city council received a single complaint from the residents who were affected.

For more information, contact John Mitchell, 816-822-3357.

In Omaha, a rain garden design (above) for a neighborhood island is rendered as a passer-by will view it (left).