

Crisis Averted

Intelligent solutions help mitigate damage caused by urban flooding

By Alan Gartner

When the Mississippi and Missouri rivers overflowed their banks last spring, the resulting floods were among the worst in the century, rendering 2011 a new record year of billion-dollar weather disasters in the U.S.

In addition to personal tragedies, extensive property damage, and traffic and business interruptions, combined sewer overflows (CSOs) became a major concern for cities because of the health risks to citizens already coping with disaster. The city of Omaha, Neb., alone was forced to release 6 million gal of raw sewage per day into the Missouri River, as rising waters threatened to encroach on a sewage treatment plant.

Given these recent events and the prediction of changing weather patterns that could lead to increased flooding, municipalities and cities are desperately seeking ways to mitigate street flooding, optimize wastewater treatment plant operations and reduce CSOs. In June 2011, the U.S. Environmental Protection Agency (EPA) released a report highlighting the problem of sewage

pollution and CSOs, and outlining its CSO control policy and best practices in New York and New Jersey.

Intelligent Systems

At the heart of any successful flood management plan is a set of dedicated applications that monitor and optimize a community's complete water supply system. Public works officials can choose from a number of storm water management solutions that are available as software or as an online service, some of which can be tailored to individual utilities.

To find the most suitable solution for their specific needs, water and wastewater utility managers should look for systems that combine real-time information with forecasting and simulation tools that generate timely and accurate alerts to help manage the complex operations associated with critical rainfall events and storm water/sewer system blockages.

Intelligent storm water management systems offer water utilities and public works employees the opportunity to proactively and adequately prepare for flooding events. These early flood mitigation efforts, in turn, save considerable time and money by focusing efforts on high-risk locations and operations. When crisis looms, these management systems help employees quickly implement best practices and deploy valuable human resources when and where they are needed most.

Perhaps most importantly, using an integrated storm water decision support system (DSS) for storm water management and hydrology helps municipal agencies respect the strict safety and compliance regulations set forth by the EPA. This is of particular concern because regulations/compliance and storm water management/flood control are the two most important topics the industry faces, as illustrated in

Storm Water Solutions' 2011 State of the Industry Report.

When CSOs can be averted, municipalities not only operate more safely but also are perceived more favorably by citizens, enhancing their trust and satisfaction. Having these highly sophisticated tools demonstrates to regulators and the general public that the municipal agency is proactive in addressing its mandate to protect the community from CSOs.

What to Look For

A DSS consists of several components that must work together to provide guidance before and during a storm. First, it includes a precipitation forecasting model, which needs to be both localized and sufficiently accurate to allow for the modeling of each drainage district.

The second component is a runoff model, which takes into account that saturated soils generate significantly more runoff than dry soils. Furthermore, this model needs to accurately predict the increase in flows in the storm drains based on precipitation and the monitoring of detainment basins.

The third component is a hydraulic model that examines the connection between basins and the potential for overflows and other predictable events when the system is operating at or over capacity.

Finally, the DSS should be enhanced with real-time monitoring because verifying the predicted model and monitored data is critical to identifying errors in the forecast or in the model.

When considering a DSS, it is important to remember that the performance level of any storm water solution relies both on the accuracy of forecasting and the quality of the simulation model. Generally available weather information is not accurate enough nor sufficiently detailed to



Combining real-time information with forecasting and simulation tools yields an ideal solution.

provide a model of the runoff into the system. Severe weather events usually are extremely localized and might not affect all drainage districts equally, even when they are located next to each other. The modeling found in most publicly available systems generally lacks the specificity in both the models and the forecasts, which leads to overly generalized predictions of overflows.

Drier Communities

It is more reassuring and cost-effective for communities to know the exact path of a storm, how much precipitation it will bring to an exact location, how that will affect the saturation levels of the area and the resulting flooding potential. State-of-the-art industry solutions provide accurate modeling of storm water and wastewater operations and the predicted effects of weather and pollution on urban drainage systems, city streets and receiving water bodies.

These models not only predict the flooding locations, extent and severity; they also provide dynamic flow calculations through the urban drainage system. This simulation capability can be critical for planning and engineering organizations to properly design modifications and extensions to sewer and storm water systems. The model should generate alarms whenever there is an impending overflow and provide guidance on operating lift stations, retention facilities, treatment facilities and outfalls to prevent overflows.

Intelligent storm water management systems also predict the location of CSOs, quantification, flood potential and infrastructure monitoring to support the maintenance of storm water detention basins, wet wells and dry ponds. Obtaining comprehensive, customized, real-time storm water management information allows water management professionals to gain a dynamic understanding of the effects of heavy rainfall, pipe infiltration and ground permeability conditions. Because public works officials must be mobile, advanced industry solutions issue customized warnings and alert services and can be accessed through computer and smartphone Web browsers.

Training and proper knowledge management are critical to the long-term success of public works organizations, so advanced solutions allow for both hypothetical scenario development and simulations based on historical data, which can be used to educate staff and streamline operations in advance of real events.

Flood preparedness and storm water management are critical elements of any community's crisis response plan. As communities struggle to overcome the tremendous impact of spring flooding, they can look to real-time IT solutions and information providers to help them design a safer, more predictable future along America's floodplains. SWS

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