

Integrated Programs Protect Against Flooding While Improving Water Quality

Storm water management is no longer just improving flood control. Integrating storm water management with water quality improvements is now on the minds of many municipalities and regulators. Municipalities and flood control agencies are realizing that applying best management practices (BMPs) not only attenuates flows to control flooding, but also can have the dual benefit of improving water quality. Low-impact development (LID) procedures also provide solutions for managing flooding and water quality in newly developing areas. Carollo Engineers helps clients utilize an integrated storm water management approach to address flooding through total maximum daily load (TMDL) development.



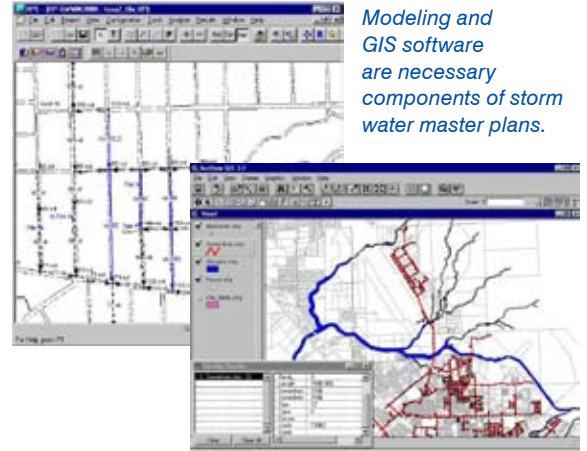
Regulatory Requirements

A storm water management program typically results from the need to meet regulations based on existing practices or because of increased development that creates additional runoff. Flood control agencies typically need to meet FEMA and U.S. Army Corps of Engineers requirements. Municipalities are also faced with meeting water quality requirements through the National Pollutant Discharge Elimination System (NPDES) Phase I or Phase II storm water permit program, and may even be involved with meeting TMDL requirements if they discharge into listed water bodies. Carollo helps clients navigate through the regulatory process to provide results that meet or exceed client expectations.

Monitoring and Modeling

Carollo has successfully completed both monitoring and modeling programs to quantify wet weather flows. Depending on the type of project, our engineers measure flows/stages, as well as conventional

and exotic pollutants. We use geographical information systems (GIS) to manage collected data as well as to interface with modeling software. This data provides the basis for hydrologic, hydraulic, and water quality models to quantify watershed flows and loads. We work with clients to identify which model will be most appropriate for each individual project. Carollo has used models such as SWMM, HEC-RAS, and HSPF for a variety of clients throughout many different regions of the country. We also apply receiving water models on an as-needed basis. We have applied these and other models to watersheds that range from mountainous snow-covered basins to meandering deltas that are tidally influenced.



Modeling and GIS software are necessary components of storm water master plans.

Structural vs. Non-structural Solutions

Many storm water projects still require conventional flood control facilities (i.e., culverts, pipes, channels, basins, etc.) to manage existing flows. However, the current trend is to manage storm water upstream before it becomes a problem downstream. This is where BMPs and LID come into play. By attenuating wet weather flows as they develop within a basin, downstream flooding is minimized while infiltration and residence time is increased. Increased infiltration and residence time provide water quality improvements. BMPs are an effective tool for existing developments, whereas LID provides a means of managing storm water in a newly developed area at the source—before it becomes a problem downstream. BMPs and LID can greatly reduce erosion and sediment within stream corridors. Carollo's experience includes assisting the U.S. EPA in the development of new modeling tools to better assess the impacts of BMPs and LID on water quantity and quality.

"Dedicated to creative, responsive, quality solutions for those we serve."



Distributed small-scale BMPs are the key to low impact development.

Financing

Financing is typically necessary to implement storm water improvements. If a municipality has not established a financing source, one alternative is to create a municipal storm water utility. Developing a storm water utility typically involves addressing legal issues (i.e., ordinances) and setting rates. However, it is also necessary to include public involvement, management, and assessment of current and future resources. Carollo helps clients create storm water utilities for their specific needs.

Carollo successfully applies an integrated storm water management approach to assist our clients through the life cycle of starting a municipal storm water utility, as well as implementing flood protection and water quality improvements. Whatever your stage in the process of protecting municipal storm water resources, we can help.

Recent Experience

City of Morgan Hill, California - Storm Drainage Master Plan

Due to progressive growth, the City of Morgan Hill retained Carollo to prepare a storm drainage master plan, as well as concurrent master plans for water and sewer systems. Utilizing GIS, Carollo developed HEC-1 and SWMM Extran models to evaluate existing/future storm water impacts due to changes in landuse. These central tools helped to identify improvements to serve anticipated growth and provided a basis for recommendations for enhancing system operations. Morgan Hill will use the master plan to guide their expansion of municipal facilities and enhance existing system operations. This project allows Morgan Hill to maintain consistency with their General Plan while providing superior service to existing rate payers.

Salt Lake City Public Utilities, Utah - Storm Water Utility and Master Plan

For the City of Salt Lake, Carollo coordinated the work efforts of the Citizen's Advisory Committee and the City Council to formulate a storm water utility. Work included developing the single-family residential equivalent service unit, providing the impervious surface area measurement for nonresidential commercial sites from aerial photographs, orchestrating the implementation of the utility with the billing cycle, and responding to site visit verifications and complaints on behalf of the city.



Carollo's master planning efforts for Salt Lake City eliminated storm water trouble spots throughout the city.

Carollo also refined and updated Salt Lake City's storm drainage master plan. The project involved the use of the HEC models to project runoff hydrographs and route flows within highly-urbanized parts of the system. Carollo also evaluated alternative system improvements to verify effectiveness and prepared cost estimates for proposed improvements. The project included the analysis of BMPs and storm water discharge monitoring. Work involved conducting hundreds of site inspections to evaluate structural controls and facilities that would improve water quality, and to detect and eliminate illegal connections into the storm sewer system.