# Sustaining the Future

## The Georgia Institute of Technology (GIT) plans to reuse storm water for irrigation

***By Brad Crouch***

The unnamed tributary draining the northern portion of campus is but a distant memory to most GIT alumni. It has been routed underground for many years, but an aggressive part of the 2004 campus master plan will revive this long paved-over drainage basin. With a combination of environmentally friendly space usage and innovative storm water management, this is one urban university that is transforming itself for the environmental sustainability long haul.

### The Low-Down on LID

Although low-impact development (LID) is hardly a new phenomenon, it has been gaining significant momentum in the world of storm water best management practice (BMP) design throughout the U.S. This migration is due, in part, to the maturing market forces in the post-construction BMP community, the work of research professionals and U.S. Environmental Protection Agency leadership.

In the most basic definition from the Low Impact Development Center, LID is defined as a "comprehensive land planning and engineering design approach with a goal of maintaining and enhancing the predevelopment hydrologic regime of urban and developing watersheds." Without question, strategic planning and micromanagement techniques such as bioretention, water reuse and constructed wetlands are some of the best pollutant-removal practices.

The difficult questions arise when storm water professionals begin to look at the long-term effectiveness of

*GIT's new cistern can store more than 40,000 gal of water.*

these more complex systems in light of the poor to nonexistent cleaning and maintenance practices demonstrated by most eventual owners. In addition to performance concerns, long-term cost for consistent cleaning and maintenance is a fundamental component of the many factors affecting the long-term sustainability of innovative practices.

Based on the pollutant load in the real world of storm water, professionals have had to make a break mentally from the traditional concept of first flush. "The first flush certainly exists for dissolved and very small particles," said John Moll, chief executive officer for CrystalStream Technologies, "but the mass of sediment and related pollutants tend to mobilize in higher flows."

This "second flush," which transports heavier sediment, trash and vegetative material, can have a profound impact on the life cycle of a BMP designed to handle only dissolved and small particles. As industry professionals approach the realization that all BMPs

need constant attention, it is with an eye toward sustainability that they look at the increased use of LID practices, plus the pollutants transported to them.

## A Sustainable Campus

Located in the fully developed midtown Atlanta area, the GIT campus is bordered by a primary highway artery and a popular midtown district. The challenges the university faced when evaluating a comprehensive storm water plan were daunting, to say the least.

The 2004 campus master plan highlighted many initiatives, including a storm water management plan. Many goals (i.e., water reuse and sustainability) were provided by an 80-acre eco-commons providing open spaces, storm water management and education opportunities. The centerpiece is a restoration project of the stream flowing through the center of campus which drains much of the new development. Two of the buildings closest to the eco-commons, the new Nanotechnology Research Center and the molecular science building, were required to restrict storm water discharges to a rate of natural vegetation.

The massive, comprehensive project is being handled by Don Alexander, P.E., a 25-year GIT facilities engineering veteran. “Economics certainly plays a role, as well as the appeal of the campus,” Alexander said. The project encompasses strategic planning and individual management to achieve its goals. An important micromanagement technique of the design is its water reuse system; the elimination of potable water as a means of irrigation was integral to overall goals.

## Reuse for Irrigation

The system, which will provide irrigation with treated storm water, has been designed to include a 110-ft-long, 10-ft-deep cistern with 40,000 gal of irrigation storage, plus additional storage for detention requirements.

The cistern will be used to provide irrigation for the entire 3-acre Nanotechnology Research Center site and comply with limited discharge requirements. Protecting the reuse system from storm water pollutants is a CrystalStream Model 1266, designed to capture potentially damaging trash, debris and sediment.

## Underground Pretreatment

The advantages to integration of underground vault BMPs and LID practices were realized about a year ago on a training program site. The LID practice was a constructed wetland treating a big-box retail development in North Carolina. The wetland looked to cover about one acre and had a 500-sq-ft open sediment fore bay overrun with sediment and trash. Its banks were showing signs of erosion and destabilization. I considered the advantages of an underground pretreatment system:

***Land use or misuse.*** The fore bay area could have served better purposes. First, add more green space to the site, and although more utilitarian, the area could have been incorporated into the plan for additional development.

***Trashing the system.*** The visual aspect of pollutants is only one of the negatives of treating trash in this manner.

Despite popular industry statements about trash being a floatable, in a wet system, trash sinks, rots and decomposes; this will ultimately release all chemicals and other pollutants contained on the trash—notable exceptions being plastic foam and closed plastic bottles. Most wet vaults have a floating strategy for trash and fail to be effective unless the maintenance cycle is set to coincide with every storm event.

***LID effectiveness.*** The nature of LID systems requires that they infiltrate or perform very fine filtration of storm water to meet pre-existing site conditions. This is the fundamental reason these systems can be effective at removing pollutants and benefit an entire watershed. The same qualities that make the system advantageous render it sensitive to gross pollutants carried by storm water.

Data collected in the field by Storm System Services has yielded results indicating that an average 5,000 lb of sediment per acre per year is being discharged from commercial sites in the southeastern U.S. This level of sediment can be fatal for an infiltration system designed to handle small particles and dissolved material. As sediment accumulates, performance suffers.

***Long-term cost.*** It has been a commonly held view in the storm water treatment community that the cost of cleaning and maintaining a land-based system such as a wet pond is lower than the cost of doing the same for an underground structure. This is incorrect if both are cleaned and maintained properly.

This disconnect occurs because most land-based systems are not inspected or cleaned on a regular basis. As land-based systems become more complicated and the focus turns to infiltration and detention, maintenance requirements cannot be ignored.

## For the Long Haul

These advantages will help achieve the long-term goals of a sustainable LID system. This focus on long-term impacts of current design decisions should become the norm in the land development and project review communities. The most positive removal rates in the scientific community can be erased and all the money spent rendered useless if the simple act of BMP cleaning is not performed.

As GIT moves toward a sustainable LID infrastructure and full development of the planned eco-commons, project leaders will focus not only on water quality and reuse but also how the next generation of students will benefit from their planning. SWS

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