COMPREHENSIVE STORMWATER MANAGEMENT PLANS ON UNIVERSITY CAMPUSES

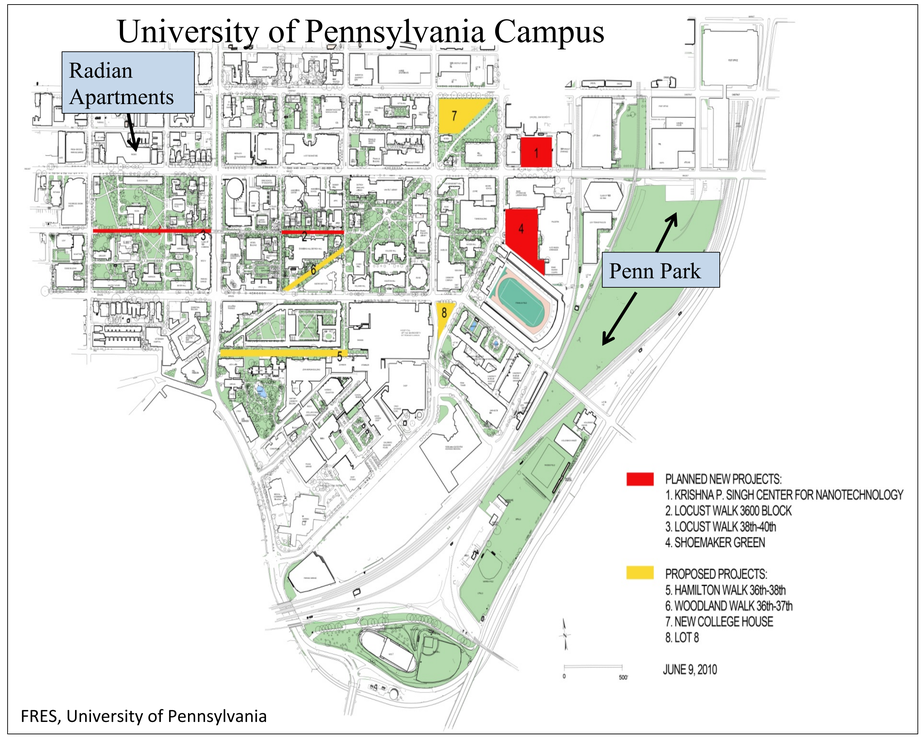
By Steven R. Gillard, Master of Environmental Studies, Class of 2011
Readers: Professor John Keene and Howard Neukrug

ABSTRACT

Under the Clean Water Act, Philadelphia is required to reduce its Combined Sewer Overflow volume by 85% (PWD, 2009). Other cities have constructed massive underground storage tunnels to capture overflows, but the Philadelphia Water Department has proposed a plan that places a fee on impervious cover and relies heavily on green infrastructure.

There is an opportunity for the University of Pennsylvania to become a model institution for stormwater management and also to save money on Philadelphia's stormwater charge. Sporadic green infrastructure projects will have some effect, but in order to be as efficient as possible in meeting the two aforementioned goals, it is necessary to coordinate green infrastructure projects through a stormwater management plan. This type of plan is a relatively new idea for universities and the University of Pennsylvania is in the process of developing its own plan. To be successful, the landscape and existing infrastructure of a campus must be characterized and stormwater management efforts integrated with larger campus development goals.

This study describes the current stormwater management efforts being made at the University of Pennsylvania. It also examines the efforts of other universities in developing their own stormwater management plans, with the goal of gleaning innovative practices that can be recreated at other universities. While it is too early to determine which stormwater plans have succeeded over time, a survey given to ten universities reveals a common framework necessary for any plan. It also seems that a comprehensive plan should attempt to mimic natural hydrological conditions by integrating plans to protect ecologically-sensitive areas with future development plans.



METHODS

This study reviewed current literature on stormwater management plans and effective combinations of best management practices, and conducted interviews with facilities staff from the University of Pennsylvania and other institutions. A thirteen question survey was developed and given to each university. Ten universities responded. Universities were contacted for three main reasons:

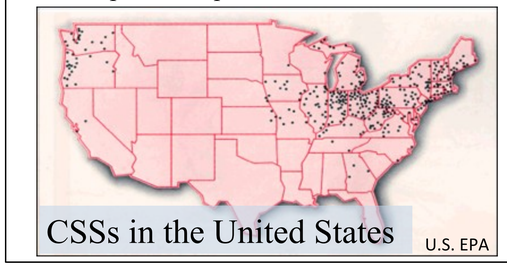
1) Ivy League universities
2) Philadelphia area universities
3) Universities that have innovative stormwater practices

Trends in University Stormwater Management

Campuses on Combined Sewer Systems (CSS)	5 have at least some sewage and runoff going into a CSS
Campuses with Combined Sewer Overflows (CSOs)	4 Reported issues with CSOs
Most common low-hanging fruit on campuses	5 universities mentioned disconnecting roof leaders onto pervious surfaces
Prioritization of stormwater management	4 cited stormwater control as being as important as other environmental issues
Drivers in developing stormwater plan	8 mentioned regulatory compliance; also campus sustainability goals
Major barriers to stormwater projects	8 mentioned high capital costs; 3 mentioned lack of guidance from regulators; 2 mentioned a lack of space
Common Stormwater Plan Components	Mapping and inventory of campus infrastructure and physical conditions; Best Management Practice lists; Education
Most innovative stormwater plan elements	Divide campus into ecological-sensitivity zones; mimic natural hydrology

BACKGROUND

The rate of new land development was more than twice the rate of population growth in the United States between 1982 and 1997 (Kloss, 2006). With development came more impervious surfaces, which do not allow water to be absorbed into the ground. In many communities stormwater runoff is channeled into a Combined Sewer System (CSS), which also carries raw sewage. CSSs can become overwhelmed with the volume of stormwater runoff during wet weather and cannot transport all the runoff to the wastewater treatment plant. Volume that cannot be handled by the CSS is released into local streams and rivers through outfalls in an event known as a Combined Sewer Overflow (CSO) (PWD, 2009)). Under the Clean Water Act Philadelphia is required to reduce CSO volumes by 85% (Moya, 2001).




Alliance for the Great Lakes

Issues related to CSOs:

1. Contamination of the fish population
2. Health risks to people
3. Beach closings and prevention of other recreational activities
4. Diminished property values along the riverfront
5. Stream bank erosion from high peak flows (Kloss, 2006)

Green City, Clean Waters – Philadelphia's Plan (PWS, 2009)

- Spends $2 billion over 20 years to "green" a third of impervious area
- Primarily utilizes green infrastructure to reduce CSOs
- Requires new development or major renovations to manage stormwater
- Phases in a stormwater fee based on impervious cover over 4 years:

Monthly fee = (GA rate x GA of property) + (IA rate x IA of property).
The Gross Area rate is $0.526/500 square feet and the Impervious Area rate is $4.145/500 square feet. (PWD, 2010)

CONCLUSION

There are complications in comparing the stormwater management practices of different universities. Campuses can be urban or rural and can have different regulatory and economic incentives. Despite these differences, universities are in a position to educate their students about the environmental issues surrounding stormwater management and to take a leadership role in addressing these issues.

Most stormwater plans are too new to evaluate their effectiveness, but universities can still share innovative ideas and Best Management Practices to develop cost-effective plans that protect waterways and are compatible with the other social and development requirements and goals on campus.

Works Cited: Alliance for the Great Lakes. *Combined sewer overflows.* http://www.greatlakes.org/Page.aspx?pid=454. FRES, University of Pennsylvania. http://www.pennconnects.upenn.edu/find_a_project/by_map/find_a_project_by_map.php. Kloss, C., & Calarusse, C. (2006). *Rooftops to rivers: Green strategies for controlling stormwater and combined sewer overflows.* Olga Moya, A. F. (2001). *Federal environmental law: The user's guide* (2nd ed.). St. Paul, Minnesota: West Group. Philadelphia Water Department. (2009). *Green city, clean waters: The City of Philadelphia's program for combined sewer overflow control - A long term control plan update - Summary report.* Philadelphia: Philadelphia Water Department. Philadelphia Water Department. (2010). *PWD's water, sewer and stormwater bill July 2010.* U.S. Environmental Protection Agency. (2008). *Combined sewer overflow demographics.* http://cfpub.epa.gov/npdes/cso/demo.cfm?program_id=5.