The Future of Stormwater Management: Bioswales and Environmentally Friendly Stormwater Control

Part 2 of 2

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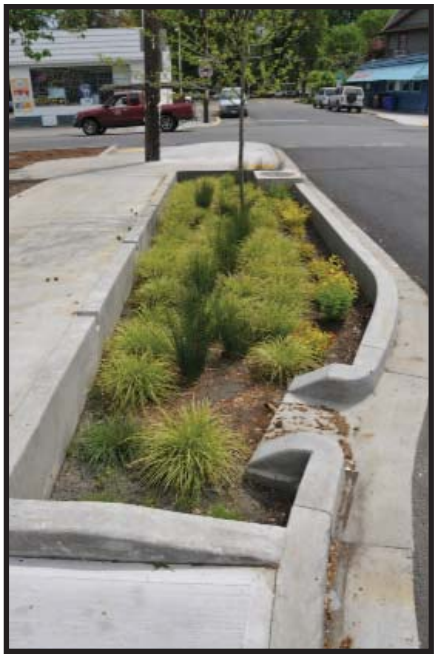
Part Two: Preparing the Public and Addressing Future Issues:

Part One of this two-part article addressed the engineering aspects of integrating environmentally friendly stormwater management principles and bioswales into municipal development. The environmental and engineering benefits of such systems are undeniably clear. However, there remain significant questions regarding the authority of municipalities and other units of government to require or construct the improvements and significant questions regarding the method of financing the same. For the majority of municipalities, the decision to utilize sustainable storm water management (SSM) programs will be a voluntary one. For some communities, such as those which use a combined sanitary sewer and storm sewer system (i.e., those which treat 100% of the storm water within their storm sewers through a waste water treatment plant, such as Portland, Oregon) and a few select municipalities that have significant surface contamination or runoff issues that they are dealing with through state or federal environmental protection agencies, the decision to switch to SSM programs will be of necessity.

At the present time, storm water is not among the pervasively regulated municipal utilities at the state or federal level. However, there is every indication that is likely to change in the next five to ten years, and that storm water will be subjected to the same regulatory review as are municipal potable water supplies and sanitary sewer / waste water treatment plants. In addition, even accepting the likelihood of state or federal regulation, municipalities can, as indicated above, address localized flooding conditions, improve the condition of the environment and reap the benefits of positive public relations which are inherent in the construction of SSM programs.

On the issue of authority, municipalities enjoy broad powers to design and construct public improvements including storm water drainage systems, public streets, sidewalks, and open spaces. Similarly, municipalities have authority to take action necessary to protect their sources of water both within and outside their corporate limits. In addition, the Municipal Code expressly recognizes that preliminary plats and plans for proposed subdivisions are required to show stormwater improvements and the method of stormwater management. (65 ILCS 5/11/12-8). Improvements of this sort not only manage storm water but can also be used to filter surface water runoff and recharge sources of groundwater. Thus, falling within the range of powers afforded to municipalities.

When the projects are accomplished as an aspect of a new development, they can be required by virtue of annexation or development agreements. (65 ILCS 5/11-15.1-2(b)). Storm water management systems of this nature could be incorporated into subdivision control ordinances to have general applicability to all developments, whether newly annexed or whether a redevelopment of an existing area. (65 ILCS 5/11-12-5). Where the projects are included within a private development, the property owner can be required to provide the space for the improvements (just as easements and right-of-way are customarily required). Where these projects are contemplated as a modification of an existing public roadway, flexible, innovative design standards should permit their location within the existing public right-of-way thereby minimizing the need for land acquisition (as shown in Part One of this article). The picture below shows one sample location for a bioswale located within a right of way (this sample from Portland, Oregon), where it requires no additional property acquisition and has a minimal impact upon traffic flow and parking. This particular bioswale is only a few months old, hence the immature plantings. The depth and configuration of the bioswale is thus clearly visible.



If for some reason, it proved necessary to acquire additional right-of-way, traditional acquisition methods (i.e., purchase or condemnation) should be available (although they may greatly increase the cost and complexity of a retrofit project).

In that last regard, non-home rule municipalities have the authority to condemn and to acquire by condemnation property for public purposes including for the construction of roads, right-of-way, drainage ditches, storm water

management facilities and related improvements. These broad, general grants of condemnation authority should prove adequate to permit condemnation for sustainable storm water management if required. Accepting that municipalities have the authority to acquire land for and to construct SSM facilities, the inevitable question of funding remains. Six general sources of funding immediately come to mind.

1. General Municipal Revenue (i.e., property taxes, sales taxes, etc.). Obviously, traditional revenue sources can be utilized for the funding of sustainable storm water management projects.

2. Grant Funding. At present, Illinois does not have any specific sources of grant funding specifically available for SSM projects. However, there may be some federal EPA grant programs available for assistance with the design and construction of the projects (e.g. US EPA Targeted Watershed Grants or Nonpoint Source Pollution Control Grants).

3. Impact Fees. When included with any new development, a municipality can require SSM projects to be constructed by a developer by including requirements within an annexation agreement. Conceivably, if a development project includes impermeable area that generates excess storm water, a developer could be required to pay additional impact fees to handle the storm water generated. Even assuming that a municipality is restricted to impact fees that relate to the impacts that are specifically and uniquely attributable to the development in question, it should not be difficult to show a causal link between development and the storm water it generates. Developers are already required to provide retention and detention to compensate for an impermeable area. Rather than discharging the storm water generated in the storm sewers, a municipality can require it to be included within a onsite or offsite SSM project.

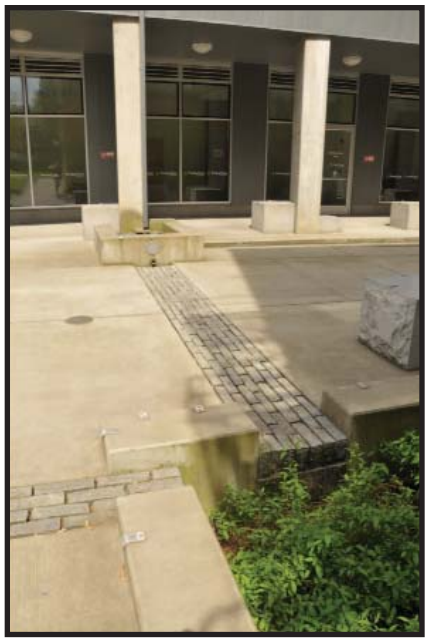
4. Fee In Lieu of Detention: Along with impact fees, many communities have ordinances in place permitting the payment of a fee in lieu of constructing detention area (where development is constructed in an area where additional detention is either unnecessary or infeasible to construct). These fees could be collected and used for construction of SSM facilities within the community.

5. Tax Increment Financing District. TIF districts are a powerful, flexible tool which can be used to fund SSM projects. TIF funding may be used for eligible project costs potentially including the construction of surface water conveyancing and detention areas. In particular, if storm water causes or contributes to the conditions giving rise to the blighted or conservation area qualification (e.g., the property is eligible for inclusion within a TIF as a blighted area due to the presence of recurring flooding or surface water conditions on the property), the use of TIF funding is even more appropriate. (See 65 ILCS 5/11-74.4-3(a)(3)(C)). Even without such pre-existing conditions, SSM projects are the sort of infrastructure necessary to permit property development and likely can be an TIF-reimbursable eligible project cost.

6. Special Service Areas/Special Assessment Areas. For purposes of this article, SSAs and SAAs are treated similarly (with the primary general difference being the method of forming the district and the fact that SAAs unlike SSAs can be established without landowner consent in the face of landowner objections). Both of these funding mechanisms can be used in conjunction with new development or with an SSM project in an existing improved area. Both also allow the local benefit received through the construction of an SSM project (e.g., addressing localized flooding) to be paid for through a localized tax extended only against those properties receiving the benefit. Also, unlike any of the other sources of funding mentioned above (other than traditional municipal taxes) SSAs and SAAs can be continually used indefinitely providing not only funding for initial construction of SSM projects but also funding of ongoing maintenance costs.

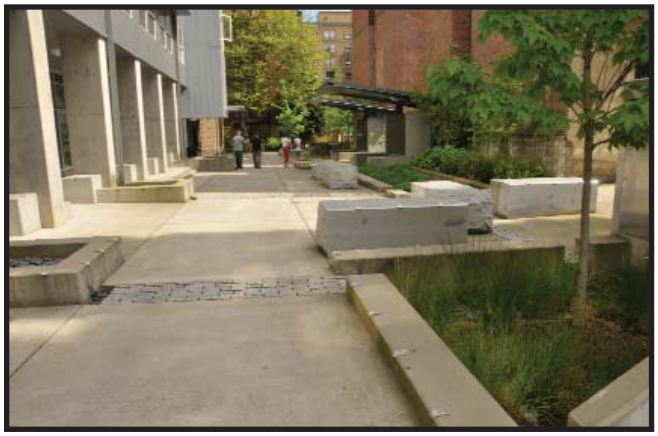
It also bears note that an SSM project included on a private development (e.g., utilized at a shopping center in lieu of or to augment traditional storm water detention) can have its maintenance funded by the property owner or property owner's association (as with traditional storm water management). If private groups maintain the SSM project, the municipality should strongly consider establishment of a "backup" or "dormant" SSA (i.e., an SSA which is established but which does not immediately have a tax levied) to guarantee future maintenance of the project area.

It may also be possible to coordinate the SSM project area maintenance with private landowners of adjacent properties. For example, in many residential areas, private owners maintain that portion of the right-of-way located between the street's edge and sidewalk. As this is a prime location for SSM projects and as they can include very aesthetically pleasing plantings and landscaping, municipalities should consider public private partnership to provide for irrigation where necessary in the establishment



of plans and maintenance of the SSM project area. Property owners may be interested in voluntarily maintaining the area (particularly if the municipality provides assistance with sedimentation removal and funding for plant replacement where necessary).

SSM projects also reward thinking outside the box. They may be easily integrated with courtyards and common space areas in a fashion that typical stormwater detention cannot be. For example, the pictures below depict a courtyard area in Portland, Oregon where SSM design is utilized to collect stormwater runoff from impermeable building area and redirect it into attractive courtyard planter boxes surrounded by a low seating wall for occupant use.



This first picture depicts the discharge from the building gutters, which permits stormwater to flow across an open patio area through bricks installed with channels allowing the stormwater to drain into the planter box shown at the bottom right of the picture. Both the building and the patio drain into these brick channels, which permit the flow of water while still allowing normal pedestrian and bike traffic to pass. As can be seen in the picture below, a series of terraced planter boxes, connected with the brick channels, are utilized in this design to create an attractive means of containing stormwater. Each successive planter box is installed at a slightly lower elevation than the preceding box, so that when one box fills, overflow drains to the second box, and so on. Eventually, if the storm flow exceeds what the planter boxes are able to handle, a storm sewer intake pipe is located in the furthest downstream planter box. (Terraced bioswales such as these can also successfully be used along streets, with initial flow entering the bioswale at the highest elevation, filling it, and then permitting overflow to proceed to successive bioswales. This not only provides additional storage, but on streets with significant pitch, the speed of stormwater flow can be greatly slowed. Additional design elements (such as asphalt or concrete 'mini-curbs' to redirect stormwater flows) may be required in such circumstances).

The above two pictures also show the use of bioswales in close proximity to buildings. When used in such close proximity, bioswales are typically designed with impermeable or less permeable bottoms. This limits the ability of the bioswales to recharge groundwater aquifers, but it also prevents bioswale induced building flooding (from immediate recharge into soils surrounding the building) and still permits the bioswales to provide filtration and desedimentation of stormwater, and additional peak-flow storage that reduces and slows the volume of discharge into conventional storm sewers. When designing and locating bioswales, care must be taken to either locate them an adequate distance from buildings that include basements, or to limit the permeability of the bioswale foundation.

If a municipality is considering the establishment of a SSM program, whether it be in a residential or commercial area, the municipality would be well advised to amend their municipal codes to provide regulations regarding the care and protection of the SSM project. Communities which have been on the cutting edge of SSM technology such as Portland, Oregon report that one of their ongoing problems is insuring that property owners adjacent to SSM projects understand the nature and characteristics of the SSM and the fact that the soil included within the SSM project area and the plantings included within the SSM project area have been specifically tailored to the unique drainage needs in that area.

When nearby property owners are unaware of this fact, they occasionally see an area where the surface of the ground is significantly below curb level (as would be required to create a water retention area in the SSM project and as illustrated in the pictures above), and decide to fill in that area with fresh dirt and to include plantings which they believe are more aesthetically pleasing. By doing so, they destroy the functionality of the SSM project and can create significant infiltration problems with downstream traditional storm water management if sedimentation from the newly added top soil is able to infiltrate into storm sewers.

Accordingly, a two-pronged effort to address this sort of problem should be utilized by municipalities. The first phase would be insuring that area property owners are informed when the project is installed of the nature and scope of the project and fashion in which is functions so that they understand the many benefits that the SSM project extends to them and are hopefully more reluctant to tamper with or interfere with its operation. Local property owners can then also be enlisted to assist in the day-to-day maintenance of the inlets (i.e., clearing leaves and other debris from the inlets) and to report to the municipality when more significant issues exist within the SSM project area. Phase two of the municipal approach should be to consider passing ordinances at the time of SSM project approval which address the long-term maintenance and care

of the SSM project areas and which delineate those responsibilities which municipality will undertake and also prohibit and penalize actions by property owners or other individuals who would tamper with or alter the SSM project area without municipal approval. Sample ordinance text is provided below:

Right of Way Improvement: Any public improvement installed within a public right of way, including but not limited to: Curbs, street signs, street lights, US Postal Public Collection Boxes, fire hydrants, valve boxes or other water system appurtenances, manholes, storm sewer inlets or grates, sidewalks, planter boxes (or the contents thereof), Stormwater Infiltration Areas (or the contents thereof), or related improvements.

Stormwater Infiltration Areas: Any areas within a public right of way which are generally surrounded by Curb or other similar barrier, with one or more grates or inlets permitting the flow of stormwater into the area, with a depressed basin intended to collect and permit infiltration and/or discharge of stormwater, or any area within a public right of way, depicted on an engineering plan approved by the Village Board as being a Stormwater Infiltration Area (whether or not such area is labeled as such).
Planter Boxes: Any areas within a public right of way which are maintained by the Village and improved the installation of bushes, flowers, or decorative flora other than turfgrass.

No person shall damage nor cause or permit to be damaged any Right of Way Improvement within the corporate limits of the [municipality]. Any person who shall violate this Section shall be responsible for the cost of repair or replacement of the Right of Way Improvements, in addition to any fines imposed based upon the violation of this Ordinance.

No person shall, without first obtaining the express, written permission of the [municipality], alter or remove or add to any plantings from a Planter Box or Stormwater Infiltration Area, remove or add fill or soil to any Planter Box or Stormwater Infiltration Area, spray or apply any chemical compound including but not limited to herbicides or fertilizers to any Planter Box or Stormwater Infiltration Area, or otherwise alter or interfere with the Village's management of any Planter Box or Stormwater Infiltration Area. In addition, no person shall obstruct any Stormwater Infiltration Area inlet or otherwise interfere with the passage of stormwater into or through such areas. Any person who shall violate this Section shall be responsible for the cost of repair or restoration of the Planter Box or Stormwater Infiltration Area, in addition to any fines imposed based upon the violation of this Ordinance.

Conclusion:

Sustainable Stormwater Management programs carry with them numerous benefits. They conserve land by converting otherwise unused right of way areas for detention purposes and thereby reducing the need for traditional detention basins. They aide the environment by filtering surface water runoff before it enters streams and channels, and by encouraging direct recharging of aquifers with filtered surface water. They are aesthetically pleasing and convert what are commonly flat, turfgrass areas into attractive planter boxes filled with hearty and colorful plants. And perhaps most importantly, they are a functional means of providing immediate, point source detention of peak flow stormwater which permits greater flexibility in designing downstream stormwater improvements.

As can be seen above, implementing a SSM program is something that nearly every community, old or new, can consider. Given the complexities of design and the differences between SSM programs and traditional stormwater detention, it is advisable to contact professionals familiar with these programs to assist in the initial implementation. ■

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