NRDC

Low Impact Development Offers Some Solutions for Groundwater Issues

In recent years, the availability and quality of water in areas throughout the country have become more driving factors in how business gets done, particularly the business of building. From droughts to flooding, from quantity of water to quality of water—awareness and scrutiny of water management practices is at an all-time high, and will continue. Since water quality plays a key role in all elements of the ecology, organizations from community groups, to regional watershed authorities, to state and federal agencies have become involved in this issue. Low Impact Development, a practice pioneered by the Department of Environmental Resources for Prince George's County, Md., is one form of stormwater management that may satisfy many of these stakeholders, while at the same time resulting in potential cost savings for builders, developers, and consumers.

In terms of the bottom line, water quality protection through regulation can impact consumer interests by affecting new home affordability. According to some estimates, stormwater, erosion control, and sedimentation regulations together can account for up to six percent of land development costs, and can add significantly to the total cost of building a home. As new requirements have attempted to address water quality, erosion, flow volume, and other problems created by common conveyance methods, the cost and complexity of these engineered systems have increased.

Cost benefits to builders and developers utilizing Low Impact Development (LID) strategies can be significant. According to the Center for Watershed Protection, traditional curbs, gutters, storm drain inlets, piping, and detention basins can cost two to three times more than engineered grass swales and other LID techniques to handle roadway runoff. Other strategies, as described below, can have similar cost-saving impact. LID techniques can offer builders and developers a more cost effective way to address stormwater management through management practices and site design modifications.

Problem Solving By Design

Pollution from stormwater runoff can be a major concern, especially in urban areas. Rainwater washing across streets and sidewalks can pick up spilled oil, detergents, solvents, de-icing salt, pesticides, fertilizer, and bacteria from pet waste. Traditional stormwater drains do not typically channel water to treatment facilities, but carry runoff directly into streams, rivers, and lakes. Most surface pollutants are collected during the first one-half inch of rainfall in any storm event. If carried untreated into streams and waterways, these materials become non-point source pollutants, which can increase algae content, reduce aquatic life, and require additional treatment to make the water potable for downstream water systems.

LID strategies allow natural infiltration to occur as close as possible to the original area of rainfall, as opposed to traditional conveyance systems. By engineering terrain, vegetation, and soil features to perform this function, costly conveyance systems can be avoided, and the landscape can retain more of its natural hydrological function. Strategies fall under the two broad categories of Practices and Site Design.

Basic LID Practices for handling runoff are implemented to reduce the volume of runoff and decentralize water

flows. This is usually best accomplished by creating a series of smaller retention or detention areas that allow localized filtration rather than carrying runoff to a remote collection area. Some common structural and non-structural methods include:

- **Bio-Retention Cells**, also called "rain gardens," consist of grass buffers, sand beds, a ponding area for excess runoff storage, organic layers, planting soil, and vegetation. They provide a storage area away from buildings and roadways, where stormwater collects and filters into the soil. They are usually landscaped with native plants and grasses, selected according to their moisture requirements and ability to tolerate pollutants.

- **Grass Swales** provide an alternative to curb and gutter systems by using grasses or other vegetation to reduce runoff velocity and allow filtration, while high volume flows are channeled away safely. In areas where salts are commonly used for winter de-icing, careful attention must be paid to selecting plant species which are salt tolerant.

- **Filter Strips** can be incorporated within parking lots or other areas to collect flow from large impervious surfaces. They may direct water into vegetated detention areas or sand filters that capture pollutants and gradually discharge water over a period of time.

- **Disconnected Impervious Areas** direct water flows from structures, driveways, or street sections, into separate localized detention cells rather than combining them in drainpipes with other runoff. Disconnecting the flow limits the velocity and overall amount of conveyed water that must be handled by end-of-pipe facilities.

In terms of Site Design, decreasing impervious surfaces can be a simple strategy to avoid problems from stormwater runoff and water table depletion, by reducing surfaces that prevent natural filtration. Some methods include:

- **Reducing Roadway Surfaces** can retain more permeable land area. Pavement needs can be reduced significantly by using longer, undulating roads that create more available lot frontage. Shared driveways, "flag" lots with reduced street frontage, landscaped detention islands within cul-de-sacs, or alternate designs for turn-around areas are other options.

- **Permeable Pavement Surfaces**, which allow water to flow through and replenish soil areas below, can be constructed from materials, including traditional asphalt and concrete, gravel, or pavers. In many cases, they can reduce or eliminate the need for traditional stormwater structures.

- **Planning Site Layout and Grading to Natural Land Contours** can minimize grading costs and retain a greater percentage of the land's natural hydrology. Contours which function as filtration basins can be retained or enhanced and incorporated into the landscaping design.

- **Natural Resource Preservation and Xeriscaping** can be used to minimize the need for irrigation systems and enhance property values. Preserving existing wooded areas, mature trees, and natural terrain can give new developments a premium "mature landscape" and provide residents with additional recreational amenities. Both of these features can improve marketability. Xeriscaping refers to landscaping with plants native to area climate and soil conditions. These plants thrive naturally, requiring less maintenance and irrigation than most hybrid or imported varieties.

Not all sites can effectively utilize LID techniques. Soil permeability, slope, and water table characteristics may limit the potential for local infiltration. In urban areas, and areas with existing high contaminant levels, use of LID filtration techniques may be precluded.

Codes may also pose a barrier. Many existing local codes and regulations for zoning, parking, and streets were developed prior to the emergence of water management concerns, and may be at odds with LID practices. Established practices can be difficult to modify, although cost factors may help drive change.

If Low Impact Development is a possibility for your site, keep in mind that it requires more precise engineering for soil characteristics, filtration rates, water tables, native vegetation, and other site features, so participation of environmental consultants and planners is critical from the beginning for residential development. For more information, visit the Land Use category on the ToolBase Services website.

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