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Public Education and Outreach on Storm Water Impacts

Low-Impact Development

Description

Using low-impact development (LID) approaches for new development can help to achieve storm water pollution reduction goals. Through LID approaches, storm water runoff can be controlled while development objectives are achieved.

An important component of a municipal LID program is public outreach. The first step in achieving LID is to encourage developers to adopt such approaches. This is followed by the development and implementation of a program to ensure that design standards are met and that homeowners are adequately informed of their responsibilities. The latter should be the responsibility of the developer and homebuilder. This outreach takes the form of the developer's communicating maintenance instructions and pollution prevention measures to the property owners. The public outreach program informs property owners of their responsibilities to the environment. When successfully implemented, LID education and awareness programs accomplish the following:



Directing runoff from impervious surfaces, such as parking lots, onto vegetated areas using curb cuts can achieve pollutant removal and reduce runoff quantity through infiltration

- Establish a marketing tool that allows developers to attract environmentally conscious buyers
- Create more landscaped areas, enhancing the aesthetics of developed areas
- Educate property owners on effective pollution prevention measures
- Promote the proper maintenance of best management practices
- Inform commercial property owners of potential cost savings from using LID approaches

Applicability

Outreach for Residential Properties. LID public outreach programs accomplish the above goals by providing residential property owners with essential information to maintain a property in an environmentally friendly manner. For example, one of the critical aspects of these programs is teaching property owners to maintain previously installed pollution prevention and best management practices properly. The developer or local public agency should communicate to current or potential property owners the benefits of LID, as well as their individual maintenance responsibilities as property owners. For example, property owners should understand that effective management of an LID property includes maintaining vegetative buffers, removing trash and debris from outflow points, using fertilizers properly, sweeping paved areas, practicing water conservation, and using mowing practices that promote runoff infiltration.

Outreach for Commercial Properties. Municipalities should consider three objectives when developing an outreach program for commercial properties. First, they should educate developers and provide incentives to incorporate LID practices into their designs. Second, they should educate existing commercial property owners and provide incentives to retrofit their properties with LID practices,

Source: US Environmental Protection Agency, March 2003



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especially for areas adjacent to sensitive waterbodies. Finally, municipalities should provide guidance and other assistance to property owners who have already incorporated LID practices into their landscapes.

Implementation

Development of public outreach programs for LID properties should be tailored to a specific site and audience. The first step in developing a public outreach program is to identify the objectives of the program. For example, is the goal of the program to educate potential property owners about the maintenance requirements of best management practices, or simply to inform commercial property owners of the potential cost savings of LID? These goals should be considered when selecting outreach materials for distribution.

The next step in the development of an outreach program is to identify the target audience. For residential, commercial, or industrial LID properties, the developer might need to communicate with diverse audiences, including potential buyers, new property owners, builders, construction site managers, homeowner associations, and current property owners. The message to each respective audience differs slightly. For example, developers often promote the environmental benefits of LID to potential buyers by emphasizing measures such as reforestation or landscaping practices conducted at a site. Potential buyers must also be informed of their responsibility to maintain measures that have already been implemented. When dealing with builders and site construction managers, the developer must inform all parties of appropriate phasing and construction practices necessary to properly implement management practices. Developers must also provide new property owners with a set of conditions to be met with the acquisition of the land. After the property is transferred to a new owner, the developer should assign someone to train the new property owners and monitor maintenance activities.

When the goals and the specific audiences are identified, the development and transfer of information to the property owner can be achieved in several phases.

Program Planning. In the program planning phase, the developer meets with county or state review agencies to determine which best management practices are applicable and to identify the maintenance requirements of a specific property. The developer should obtain and understand documentation of the construction and maintenance requirements of the best management practices and then pass this information on to the property owner. The product of the program planning phase is a set of informational materials that provide the property owner with general information on LID as well as specific property maintenance information.

Buyer Awareness. In the buyer awareness phase, the developer must make the potential property owner aware of the benefits and the responsibilities of owning a LID property. The developer should inform the potential buyer of the aesthetic and financial value of the management practices that have been implemented on the property. In addition, it should be emphasized that the responsibility of maintaining best management practices on the property falls on the potential property owner. In this phase, the potential owner should be provided with maintenance materials that outline the basic requirements for the best management practices (BMPs) located on the property.

Settlement Documents. The sale of LID sites typically involves legal information and instruments to ensure that the property will be properly maintained. These legal approaches may include easements, covenants, homeowners' association requirements, or other instruments. The maintenance requirements for these documents can be developed from brochures, fact sheets, and sample documents from the county. The requirements and wording often must be approved by a review agency. When these documents have been compiled, the developer must allow the buyer to evaluate and then accept the terms associated with acquisition of the land.

Inspection. During the construction phase, county inspectors should be on-site to ensure that BMPs and proper construction practices are followed. To avoid construction problems, the developer should

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communicate with the builder and site construction manager to make them aware of appropriate phasing and construction practices.

Maintenance. The maintenance of the BMPs is ultimately the responsibility of the new property owner. After the initial property transfer, however, the developer should assign someone to ensure that the maintenance procedures and operations are being followed consistently.

Throughout this process, the potential property owners and buyers should be provided with materials that allow them to understand the importance and the maintenance of LID properties. Brochures, manuals, and fact sheets on BMPs, pollution prevention, proper construction measures, car and lawn care, water conservation, and property management should be distributed during each phase of the process. Such outreach information is usually available from county or state environmental agencies.

Other Programs. In 1999, the city of Chicago began its Urban Heat Island Reduction Initiative, aimed at reducing urban air temperature and pollution and beautifying the downtown area. As a secondary benefit, the practices used in this program also benefit storm water runoff. The city is using light-colored rooftops, creating rooftop gardens, planting trees in areas without existing trees, and replacing asphalt with porous pavement (USEPA, 2000). More examples of successful implementation of LID practices can be found at the Low Impact Development Center's web site at www.lowimpactdevelopment.org.

Effectiveness

Because LID is a relatively new concept, its effectiveness with respect to water quality improvement and water quantity reduction is largely untested. Many of the practices associated with LID, such as bioretention swales, dry wells, filter and buffer strips, and infiltration trenches, have been evaluated with respect to pollutant removal and hydrologic control, as shown in Tables 1 and 2.

Table 1. Reported pollutant removal efficiencies of LID practices (Prince George's County, Maryland, 2000).

Practice	TSS ^a	Total P ^a	Total N ^a	Zinc	Lead	BOD ^a	Bacteria
Bioretention Swales	-	81	43	99	99	-	-
Dry Wells	80-100	40-60	40-60	80-100	80-100	60-80	60-80
Infiltration Trenches	80-100	40-60	40-60	80-100	80-100	60-80	60-80
Filter and Buffer Strips	20-100	0-60	0-60	20-100	20-100	0-80	-
Vegetated Swales	30-65	10-25	0-15	20-50	20-50	-	Neg.
Infiltration Swales	90	65	50	80-90	80-90	-	-
Wet Swales	80	20	40	40-70	40-70	-	-
Rain Barrels	NA	NA	NA	NA	NA	NA	NA
Cisterns	NA	NA	NA	NA	NA	NA	NA

^aTSS=total suspended solids; Total P=total phosphorus; Total N=total nitrogen; BOD=biological oxygen demand

Table 2. Hydrologic functions of LID practices (Prince George's County, Maryland, 2000).

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Hydrologic Functions ^a	Bioretention Swales	Dry Wells	Filter and Buffer Strips	Grass Swales	Rain Barrels	Cisterns	Infiltration Trenches
Interception	H	N	H	M	N	N	N
Depression Storage	H	N	H	H	N	N	M
Infiltration	H	H	M	M	N	N	H
Groundwater Recharge	H	H	M	M	N	N	H
Runoff Volume	H	H	M	M	L	M	H
Peak Discharge	M	L	L	M	M	M	M
Runoff Frequency	H	M	M	M	M	M	M
Water Quality	H	H	H	H	L	L	H
Base Flow	M	H	H	M	M	N	L
Stream Quality	H	H	H	M	N	L	H

^aH=high; M=medium; L=low; N=none

Benefits

The benefits of LID are many. First, it addresses hydrologic changes caused by development at the site level, which reduces the downstream impact of increased imperviousness. Second, LID practices, when used in combination with each other and with traditional treatment practices such as regional retention ponds, reduce pollutant loading to receiving water bodies, as shown in Table 1. Third, many LID practices involve natural landscaping including the planting of trees, shrubs, and flower gardens--these elements enhance the aesthetics of the site and reduce mowing requirements. If the plants are wisely chosen from local species and locally grown stocks, watering and fertilizer requirements can be reduced because the plants are adapted to local climate conditions. Finally, careful regrading and well-sited depressional storage areas can improve overall site drainage, help prevent pooling and creation of mosquito-breeding habitat, and reduce both onsite and downstream flooding.

Limitations

LID can be applied at many different scales, from a simple bioretention swale at the low point of a home site to large-scale subdivision planning with narrow streets, conservative layouts, and multiple, integrated management practices. This flexibility allows watershed managers to be able to use LID at most new development sites. Some LID applications can be limited by existing development codes that dictate minimum street and sidewalk widths, pavement types, setbacks, and other design details. An excellent resource that deals with the issue of changing restrictive development rules is called *Better Site Design: A Handbook for Changing Development Rules in Your Community* (CWP, 1998).

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Costs

The costs for the municipality to encourage homebuilders and developers to implement LID are dependent on how municipalities want to market LID. LID approaches could be added to the locality's comprehensive plan or design standards. The updating of these documents would have some costs associated with them. Information brochures, flyers, and posters could be displayed in the local planning office and in other areas of government buildings. To promote LID to developers, information seminars and meetings could be held, which involve costs associated with paying employees to conduct such sessions.

The costs associated with LID applications vary with the scope of the application. In some cases, costs for designing depressional storage and other LID elements can be incorporated in the general design costs. Additionally, depressional storage areas can be incorporated into the overall grading plan, yielding a neutral cost for these additional elements. Bioretention swales and other structural management practices cost more to install than their turf or pavement alternatives but cost-savings can be found over many years with reduced maintenance requirements relative to turf and pavement, as well as reduced costs of retaining and treating storm water.

References

- CWP. 1998. *Better Site Design: A Handbook for Changing Development Rules in Your Community*. Center for Watershed Protection, Ellicott City, MD.
- Low Impact Development Center. 2000. *Low Impact Development*. [www.lowimpactdevelopment.org]. Last updated September 5, 2000. Accessed April 9, 2001.
- The Nature Conservancy. No date. *The Darby Book: A Guide for Residents of the Darby Creek Watershed*. The Nature Conservancy, Ohio Chapter.
- Prince George's County, Maryland, Department of Environmental Resources. 2000. *Low-Impact Development Design Strategies, An Integrated Design Approach*. Department of Environmental Resources and Planning Division, Prince George's County, MD.
- U.S. Environmental Protection Agency. 2000. Chicago Beats the Heat with Green Techniques. *Nonpoint Source News-Notes* 60 (March).

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