

MUNICIPAL ASSISTANCE CENTER TECHNICAL PAPER #5

Managing Stormwater through Low Impact Development (LID) Techniques

MAY, 2008



INTRODUCTION

During the past several years, a new trend in stormwater management has been evolving and gaining momentum throughout the country. Low impact development (LID) stormwater management includes a set of practices and design approaches that maintain natural drainage patterns and retain more stormwater where it falls. LID practices help cleanse stormwater by filtering and releasing it slowly into receiving waterbodies, thereby improving water quality and reducing the risk of flash flooding.

Vermont municipalities can encourage LID to reduce the impacts of development on Lake Champlain and other lakes, rivers and streams. For new development, LID stormwater management methods mimic drainage and flow patterns that existed prior to development. LID can also be applied to urban retrofits and to redevelopment and revitalization projects to reduce runoff volumes, pollutant loads, and the overall impacts of existing development on receiving waters. This paper and the VLCT Municipal Assistance Center's model LID stormwater management bylaw offer guidance for municipal officials who want to adopt regulations that promote LID stormwater management practices at the local level.

CONVENTIONAL DEVELOPMENT VS. LID

Stormwater management over the past few decades has relied on highly engineered practices that channel stormwater quickly and efficiently away from the development site and into storm sewers, detention ponds or nearby waterbodies. This often involves clearing vegetation and disturbing and compacting valuable topsoil at a site prior to re-grading and paving. These development practices can reduce soil permeability, increase stormwater volume, increase frequency and magnitude of flood events, increase pollution in waterbodies (due to runoff and erosion), degrade stream channels and decrease groundwater recharge.

In contrast, the LID approach aims to retain the natural ability of the pre-development site to absorb water by capturing, detaining and infiltrating precipitation. These processes clean the water and promote groundwater recharge. LID as a stormwater strategy often uses a series of small-scale non-structural and structural practices linked together on the development site. For example, in lieu of a treatment pond or municipal storm sewer serving a new subdivision's runoff needs, the development site can integrate lot-level practices throughout, such as maintaining native vegetation, incorporating rain gardens, diverting water from downspouts into planting beds (and away from driveway surfaces) and eliminating curbs. This type of integrated approach costs less than conventional methods because the total volume of runoff to be managed is significantly minimized or even eliminated when stormwater is absorbed into the soil, and evaporated and transpired from plant surfaces. Less runoff volume equals less infrastructure and its related maintenance.

LID can also help communities that are looking for ways to reduce the occurrence of combined sewage overflows into surface waters. Combined sewer systems are designed to collect stormwater runoff, domestic sewage, and industrial wastewater in the same pipe. Most of the time, combined sewer systems transport all of their wastewater to a sewage

treatment plant, where it is treated and then discharged to a waterbody. During periods of heavy rainfall or snowmelt the wastewater volume in a combined sewer system can exceed the capacity of the sewer system or treatment plant. When this happens, the excess untreated wastewater is discharged directly into nearby rivers, streams and lakes.

Cities and towns that have not separated their combined sewers can effectively reduce sewer overflows by diverting stormwater away from the sewer system and directing it to areas where it can be absorbed into the ground, evaporated and transpired from plant surfaces, or re-used. This type of LID practice uses soil and vegetation to store and treat the stormwater, keeping it out of the sewer system so that it doesn't contribute to sewer overflows.

Identifying and measuring the full range of benefits and costs of LID as compared to conventional approaches can be challenging. In December, 2007, the U.S. Environmental Protection Agency Nonpoint Source Control Branch released a report concluding that LID practices can reduce project costs and improve overall environmental performance. In the majority of the 17 case studies summarized in the report, LID project costs were significantly lower due to reduced spending for site grading and preparation, stormwater infrastructure, site paving, and landscaping. This report is available on-line at <http://www.epa.gov/owow/nps/lid/costs07/>.

VLCT MODEL LID STORMWATER MANAGEMENT BYLAW

The VLCT model LID stormwater bylaw is one tool local officials have to help reduce the impacts of conventional development practices on water quality. It is important that prior to adopting any part of the VLCT model LID stormwater management bylaw, municipalities make sure that the LID standards are consistent with their general regulations and standards already in place. Many of the requirements in the model bylaw may already be covered elsewhere in a town's zoning and subdivision regulations, and related road, public works and stormwater management ordinances. For example, standards for natural area preservation, river corridor and vegetated buffer protection and limited development on steep slopes are all low impact development objectives that minimize land disturbance and limit stormwater runoff and erosion. The VLCT model bylaw offers municipalities a framework from which to extract and integrate the LID standards that best fit specific town needs into existing zoning and subdivision regulations.

Pre-development

The VLCT model LID stormwater bylaw includes general pre-development and construction site standards. These standards control all sources of soil erosion and sediment on the construction site and preserve existing site features that naturally aid in stormwater management. They also reflect the accepted management practices recommended by the State in its most recent editions of the *Low Risk Handbook for Erosion Prevention and Sediment Control* and *The Vermont Standards and Specifications for Erosion Prevention and Sediment Control*.

Post-construction

The model bylaw also includes post-construction review standards and guidelines that ensure LID stormwater management design approaches are utilized to the maximum extent practical. The standards express the development and design intentions of the model bylaw. The guidelines for each standard suggest how an applicant might comply with the standard. The guidelines help the applicant during the design process; the administrative officer or review board can also use them to determine compliance with the bylaw. The options for compliance with the standards are not limited to the guidelines listed in the model bylaw, allowing for flexibility and creativity. The four post-construction review standards are as follows:

1. **Vegetation and Landscaping.** Vegetative and landscaping controls that intercept the path of surface runoff shall be considered as a component of the comprehensive stormwater management plan.

2. **Steep Slopes.** Development on steep slopes equal to or in excess of 15% shall be sited and constructed (and slopes stabilized) to minimize risks to surface and ground waters and to protect neighboring properties from damage.
3. **Impervious Surfaces.** Stormwater shall be managed through land development strategies that emphasize the reduction of impervious surface areas such as streets, sidewalks, driveway and parking areas and roofs.
4. **Low Impact Integrated Management Practices (IMPs).** Stormwater shall be managed through the use of small-scale controls to capture, store and infiltrate it close to its source. Some of the more commonly used LID small-scale practices are described in the IMP post-construction review guidelines.

STATE VS. LOCAL STORMWATER MANAGEMENT CONTROL

The State of Vermont issues permits for stormwater runoff from both construction sites and impervious surfaces. Any project that disturbs more than one acre of land requires a construction permit and must include erosion and sediment control measures. Additionally, projects that will result in new impervious surfaces of one or more acres require an “operational” (or “post-construction”) permit. To obtain this permit, a project must demonstrate that it meets the State’s stormwater treatment standards relevant to water quality, channel protection, groundwater recharge and flood protection.

The potential effects of development involving less than one acre are not addressed under the State’s stormwater program. With residential and other small-scale development increasing nearly everywhere, the most important reason to adopt the VLCT LID stormwater management bylaw is to ensure that this incremental development occurs with minimal impact on water quality. Based on local conditions and policies, municipalities using the VLCT model LID stormwater bylaw determine the size of development that they intend to regulate. There are three different ways in which state and local stormwater regulations can interact:

State Approval Equals Local Approval. For projects requiring a state stormwater permit, municipalities may decide to accept that permit as evidence of compliance with their local stormwater bylaw by adding language such as: *For those projects that fall under the jurisdiction of the State stormwater requirements, the Town of _____ may accept a copy of the issued State Stormwater Operational permit and/or the State of Vermont General permit for construction site runoff as evidence of compliance with this bylaw.*

State Approval Equals Local Exemption. It’s important to note, however, that local review often precedes state review. There may also be some concern that adopting a state permit as proof that local criteria have been met might require a municipality to enforce the state’s permit conditions. Municipalities concerned with local acceptance of state permits can simply exempt projects requiring a state stormwater permit from local regulation.

State and Local Approval. With appropriate technical capacity and staff support, municipalities may decide to require that a development that is subject to a state stormwater permit must also meet the LID standards provided in the LID bylaw. The model bylaw states: *Applicants shall demonstrate why the use of LID approaches is not possible before proposing to use conventional structural stormwater management measures which channel stormwater away from the development site to storm sewer systems, detention ponds, and receiving bodies of water.* For example, a municipality could reject an application for a development with a state permitted stormwater collection system if the proposal did not include LID landscape design techniques that manage stormwater close to its source.

CONCLUSION

Low impact development can be used almost anywhere that soil and vegetation can be worked into the landscape. It can be customized to fit environmentally sensitive sites and open spaces as well as constrained urban areas. LID is most effective when a variety of storage and infiltration techniques are used on-site at the same time. For example, a single family home might incorporate permeable pavement for infiltration and a rain barrel or cistern to capture and re-use rainfall for watering plants or flushing toilets. Integrating LID stormwater management strategies into local land use regulations is a straightforward way for municipalities to develop economically while improving the water quality of lakes and streams, reducing the risk of flash flooding and conserving natural areas.

The VLCT model LID stormwater management bylaw is designed to offer municipalities a flexible, clear-cut framework that is simple to develop and administer. The stormwater management model language can easily be incorporated into an existing land use regulation and can be adapted to meet the unique conditions in your community. For assistance in reviewing existing regulatory language and manipulating the model to fit specific town needs, contact Milly Archer, Water Quality Coordinator, at the VLCT Municipal Assistance Center, 800/649-7915, or marcher@vlct.org. To access the on-line version of the VLCT model low impact development stormwater management bylaw, please visit the Resource Library at www.vlct.org.

ABOUT THE MAC TECHNICAL PAPERS

The Municipal Assistance Center began publishing its series of technical papers in 2007. Based on member inquiries, the MAC staff picks topics that need to be treated in more detail than a newsletter article, but less than a handbook. Papers previously issued are:

- #1, *Making It Stick: The Art of Writing Effective Zoning Decisions*, March 2007.
- #2, *Creating an Effective Riparian Buffer Ordinance*, April 2007.
- #3, *Creating a Development Review Board*, July 2007.
- #4, *On the Record Review*, February 2008.

PAPERS ON THE FOLLOWING TOPICS ARE COMING SOON:

- Roles and Responsibilities in Planning and Zoning
- The Intersection of Agricultural Practices and Zoning: Q & A