Low Impact Development (LID) Course Details

Introduction to Low Impact Development (LID)

Low Impact Development (LID) is an innovative stormwater management approach that treats, infiltrates, filters, and retains runoff at the source. LID practices are proven approaches that have been implemented with great success for decades. This approach is quickly gaining traction here in Ontario and across Canada as practitioners come to understand the benefits and need for building water resilient communities.

This course will demonstrate how LID differs from traditional stormwater practices, and why it is becoming a necessary part of our infrastructure. Over the course of the day, participants will learn the fundamentals of LID and review common trends in LID performance. Instructors will also explain how to overcome common barriers to implementing LID including winter performance, site constraints, soils, bedrock, groundwater, and utilities. Participants will have a chance to discuss real world examples of LID projects through a series of case studies on a variety of land use types, including residential, linear, and industrial/commercial. These case studies will provide real-world examples where "constraints" have been mitigated through creative planning and design. Instructors will share valuable lessons learned on design, documentation, construction, erosion and sediment control, inspection and maintenance. Finally, course instructors will also review some of the decision support tools available to help implement LID projects, including the WIKI Design Guide, the LID Treatment Train Tool, and the LID Lifecycle Costing Tool.

Principles of Successful LID Construction

Construction of LID practices involves techniques and specifications that differ from traditional stormwater management construction practices. Failing to follow proper LID construction processes can result in barren bioretention landscapes, clogged infiltration practices, uneven permeable pavements, and ultimately costly post-construction repairs. This LID construction training is applicable to anyone involved in the design, construction, and inspection of LID, whether it is in a large subdivision development or a small parking lot retrofit. Instructors will take participants through each step of the LID construction process highlighting potential errors, lessons learned from various Ontario projects and explain proper techniques.

LID Inspection, Maintenance and Operation

Municipalities face significant challenges in tracking, inspecting and maintaining their own conventional stormwater infrastructure while ensuring practices on private property are also adequately maintained. Integrating green stormwater infrastructure like low impact development (LID) into municipal asset management programs presents additional challenges, but ways to overcome them do exist. Participants will learn about essential steps in program design, inspection and testing protocols, and the specific maintenance needs for bioretention and other LID practice types.

LID Design: Bioretention

Green infrastructure, including low impact development (LID) practices, is becoming an increasingly common approach to stormwater management control. Bioretention is one type of LID measure that is designed to treat runoff from paved areas by using the natural properties of soil and vegetation to remove contaminants. Water management practitioners need to be familiar with the 'ins and outs' of bioretention design including sizing and siting, inlet and outlet design, material specification, construction planning, as well as the associated lifecycle inspection and maintenance requirements that should be considered during the design process

Applying the Treating Train Tool in LID Design Analysis

Modelling is an essential component of the LID planning and design process, as it allows for estimation of the performance of different controls and facilitates sizing calculations and optimization of designs. This course will provide an overview and comparison of different models that can be used to simulate the application of LID measures, including discussion of their advantages and disadvantages and project specific considerations. The use of the Low Impact Development Treatment Train Tool (LID TTT), developed by STEP, will be demonstrated during the course to allow participants to better understand the modelling process.

The purpose of the tool is to analyze annual and event-based runoff volumes and pollutant load removal by the use of best management practices LID techniques. It provides preliminary water budget analysis (i.e. surface ET, surface runoff, infiltration to soil) and pollutant load removal estimates for pre- and post-development scenarios. The tool is built upon the open source EPA SWMM5 model providing a user-friendly interface for novice modelers and cross-compatibility with SWMM5 for further model development. Instructors will deliver a detailed walk through of the LID TTT's capabilities, case study examples, and a Q & A and experimentation period to ensure that participants will have ample opportunity for hands-on learning.

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Life-Cycle Costing for LID Applications

As the application of LID practices expands, the need to accurately estimate the costs of LID construction and budget for necessary operations and maintenance activities has become increasingly important. However, costing of LID best management practices can be a time-consuming and costly process. This course will provide participants with the latest information and tools that can be applied towards costing LID practices. Instructors will discuss how capital costs are calculated for different LID types and designs, how maintenance requirements and associated costs can be forecasted, and the tools that can be used to facilitate these calculations and assess life cycle costs of LID practices. Instructors will present costing examples using the STEP LID Life Cycle Costing Tool (LID LCCT) for calculations. The tool facilitates assessment and comparison of life cycle costs of bioretention areas, enhanced grass swales, vegetated filter strips, green roofs, rainwater harvesting systems, infiltration chambers, infiltration trenches, wet ponds and dry ponds. Participants will practice using the tool with built-in model designs and learn to make adjustments for alternative designs, as well as back-end changes to assumptions built into the calculations.

Introduction to Erosion and Sediment Control & Best Practices for LID Implementation

Erosion and sediment control (ESC) can be a challenge even on an easy site, but protecting LID practices, which are designed to infiltrate and/or filter stormwater upwards of 30 years, requires even more thoughtful and rigorous ESC planning. The secret to success starts with an effective design that is communicated through a plan set and specifications that clearly define what will be required during construction and throughout the life of the LID practice. Once construction starts, communication and adaptability are the keys to meeting the unique needs of that development during mass grading, street and utility installation, building construction, final excavation and construction of the practice.

This course will focus on understanding the fundamental principles of ESC and how they should be applied in the protection of LID measures during construction. Topics will include: (i) ESC fundamentals, (ii) impacts of construction activities, (iii) erosion and sediment control best management practices, (iv) pumping and dewatering best practices (v) winter preparedness, (vi) inspections and monitoring, (vii) installation of ESC for LIDs, and (viii) legislative context. Instructors will provide ESC plan examples for LID sites and lead participants through exercises that will focus on recognizing problems and solutions on real life construction projects and reviewing an ESC plan for an LID site.

LID Performance Monitoring Verification

Stormwater permits and approvals often stipulate that owners /operators demonstrate facility performance through monitoring. Monitoring of LID and other stormwater features helps to ensure that they have been both properly designed and constructed, and that they function as intended. Failing to properly monitor LID practices can result in assuming ownership of stormwater practices stormwater practices that are ineffective, unattractive, unsafe and ultimately fail to meet water quality and quantity criteria. In this course, instructors will describe best practices for successful monitoring of LID stormwater management practices. Instructors will provide participants with comprehensive content on types of sampling equipment, calibration approaches and estimates of monitoring program costs. Tips, tricks, potential errors and proper monitoring techniques will be reviewed, and advanced approaches for analyzing performance verification data will be covered.

Emerging Topics in Stormwater Management

The science of stormwater management continues to evolve. With it, so do technologies and design approaches. This course will provide a synopsis of emerging topics such as one water design, application of smart technologies to low impact development and emerging practices to design, construct, operate/maintain and share associated costs for communal stormwater systems.

Introduction to Municipal Stormwater Financing/Charges

Stormwater user fees can provide dedicated, sustainable and increased funding for traditionally underfunded stormwater services and infrastructure. As a result, municipalities in Ontario and Canada are increasingly recognizing the benefits of adopting a user fee approach to fulfill their stormwater management needs and are increasingly adopting stormwater charges or user fees as their main source of funding. This course will provide an overview of the rationale for implementing stormwater user fees and will guide participants through assessing and undertaking the options, steps and considerations required to develop a municipal stormwater user fee program.

Topics will include: (i) developing guiding principles to ensure defensibility stormwater fees, (ii) assessing resources needed develop and administer a fee system, (iii) user fee options and considerations for different communities and property types, (iv) assessing and considering public dynamics, (v) consultation and outreach with public, businesses, elected officials, municipal staff and other audiences, (vi) developing user fee policies and by-laws, (vii) operational and administrative considerations and (viii) developing credit or incentive programs for stormwater BMPs on private property. Participants will have a chance to discuss real world examples of stormwater user fees through a series of case studies from diverse municipalities. Instructors will share lessons learned from various jurisdictions that have implemented stormwater user fee systems and participants will be able to adapt their learnings to exercises specific their own municipality's needs.