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Low Impact Development Research in Alberta

BACKGROUND, PARTNERS and PROPOSED ACTIVITIES

CONCEPT OF LOW IMPACT DEVELOPMENT

Stormwater management is a rapidly evolving field of expertise, which is moving in the direction of incorporating a variety of decentralized features upstream of ponds, wetlands and constructed wetlands. These features may occur on both private and public land, and often involve vegetative components. The range of features and practices of interest include green roofs, rainwater harvesting, turf alternatives, increased soil depths, downspout redirection, rain gardens, biofiltration (sometimes called bioretention), permeable pavements, and stormwater capture and reuse. These features and practices have been grouped together by stormwater practitioners and have come to be known--in North America--as "Low Impact Development" (LID), in reference to the ability of these features and practices to reduce the impact of urban land development on our precious water resources. The objective of LID is to reduce the volume of stormwater and to improve the quality of stormwater, thereby addressing the whole rainfall-runoff spectrum rather than just extreme rainfall events.

APPLICABILITY OF LID TO ALBERTA

Investigation into the viability and performance of LID has, so far, largely been undertaken in locations with warmer and wetter climates. In order to meet current and anticipated regulatory requirements, LID is expected to be widely implemented in Alberta. Of particular interest is the practice of biofiltration, which is the primary means of achieving stormwater treatment upstream of ponds and wetlands. Since biofiltration is a vegetative practice with numerous variables, the applicability of design and performance information from other jurisdictions is not generally viewed as transferrable to our climate and soil conditions and to our winter road maintenance regimes.

A GLOBAL CENTRE FOR COLD CLIMATE LID EXCELLENCE

Following preliminary consultation with colleagues in Minnesota, Quebec and Ontario and with the International Water Association/International Association on Hydraulic Engineering and Research (IWA/IAHR) Joint Committee on Urban Drainage (JCUD) Source Control for Stormwater Management Working Group (SOCOMA) and Urban Drainage in Cold Climate Working Group

(UDCC), consensus was easily achieved that Alberta, with its most challenging conditions, would be the logical place for the establishment of a *cold climate centre for LID excellence*.

OLDS COLLEGE

A review of the capabilities of educational and research facilities in Alberta revealed that Olds College was the most aligned with the breadth and depth of the requirements of a cold climate centre for LID excellence. Olds College offers the following qualities and capabilities:

- A candidate to receive post-secondary educational/institutional funding
- A province-wide mandate
- A partnering role with other institutions so that researchers at other facilities can be integrated
- An applied focus
- Analytical labs
- Greenhouses and growing facilities
- Land where testing to the point of failure can be accommodated
- An existing research facility in the complementary specialty of constructed wetlands
- A full-scale Class 1 Composting Facility
- Existing educational and training programs for the landscaping industry into which LID content can be readily incorporated
- Existing complementary certification programs and the opportunity to develop new LID certification programs
- A concentration of qualified staff and students to undertake projects

BIOFILTRATION RESEARCH URGENTLY NEEDED

Out of all the LID tools, the least understood for our climate is biofiltration. In Alberta, the difference between natural conditions and the regime of biofiltration is greater than in other jurisdictions, resulting in low confidence in recommendations from other jurisdictions. Local research is urgently required.

Two streams of investigation are proposed for biofiltration:

- One. An immediate field-scale evaluation of vegetation survivability as a function of soil media composition.
- Two. A systematic program of investigation moving through the stages of critical literature review, laboratory test column and box installations, vegetation tests, sensitivity analyses, pilot-scale mesocosm installations, and field-scale installations.

VEG v. MEDIA TRIAL

In the first half of 2012, approximately 400 ALIDP volunteer hours were invested to collaboratively design a field-scale trial of vegetation survivability as a function of soil media composition. In addition to determining suitable plants for use with a proposed Alberta media specification and an alternative media favoured by the landscape architecture community, a range of water quantity and

quality parameters under a variety of simulated rainfall events and contaminant loading scenarios would be measured and analyzed.

Early results of this trial would provide the quickest possible feedback on plant and media performance and provide a starter working palette and guidance for designers. In addition, it would be a low-risk project to begin the process of working together and to demonstrate the competence of the team.

SYSTEMATIC BIOFILTRATION RESEARCH

While the Veg v. Media trial is a good start, optimization requires much more. There are a number of amendments and design optimizations that are posited to assist in attaining water quality objectives, particularly for the case of nutrients. In addition to the range of amendments, various thicknesses, concentrations, layering possibilities and interactions need to be investigated. Feasibility with respect to what materials are locally available and the potential use of waste materials from other processes (e.g., water treatment residues) are also important considerations to be incorporated.

The overall objective of the research is to answer the following questions:

- What is the preferred soil media composition for different communities in Alberta?
- What is the preferred plant palette for Alberta?
- What is the maximum tributary area that can drain to a biofilter?
- What are the life-cycle operation and maintenance and costs for biofilters?

It is envisaged that Olds College will be the site for laboratory test column and box installations, vegetation tests, sensitivity analyses, and pilot-scale mesocosm installations. Once the field scale is reached, it is expected that multiple sites in Calgary, Olds, Edmonton and possibly elsewhere will be built.

OTHER LID RESEARCH

Biofilter research is the most pressing need at this time. There are several other types of investigation in the following areas that would fit within the scope of LID, including:

- Pervious pavers for cold climates
- Stormwater reuse
- Green roofs

While the development of proprietary products is not thought to form the bulk of the types of investigations that are necessary, this type of opportunity is foreseen in the area of pervious pavers, green roofs, and for media amendments and pre- and post-biofiltration treatment.

COLD CLIMATE ADVISORY PANEL

In addition to the expertise offered by ALIDP partners, an esteemed international panel of experts is being assembled to provide external review and support.

THE ALIDP

The Alberta Low Impact Development Partnership Society (ALIDP) is a non-profit society incorporated in Alberta since 2008. With more than 50 partners including municipalities, industry, academia and other non-profits, the partnership seeks to advance the implementation of LID across the province. The partnership hosts educational events, advocates for best practices and policies, supports the grassroots outreach activities of other agencies, and facilitates conversation and action across silos, disciplines and jurisdictions on matters of common interest, including research.

The ALIDP is seen as the logical agency to facilitate and coordinate the various partner agencies and to communicate the progress and outcomes of the activities to the urban drainage community. The ALIDP will work to draw the broader water audience in to the undertaking through its non-profit partners and through its own outreach efforts.

SUMMARY

Since the implementation of LID is expected to be widespread, optimization is seen to be critical. The proposed research will allow the development of credible and reliable design and implementation guidance. It will support the restoration of a high-performance urban landscape with respect to ecosystem services. It will provide much-needed guidance for policy development at the provincial and municipal level with respect to water quality objectives. Reduced water treatment costs, healthy ecosystems, and a reliable water supply will all be influenced by the implementation of these features.