LID Performance

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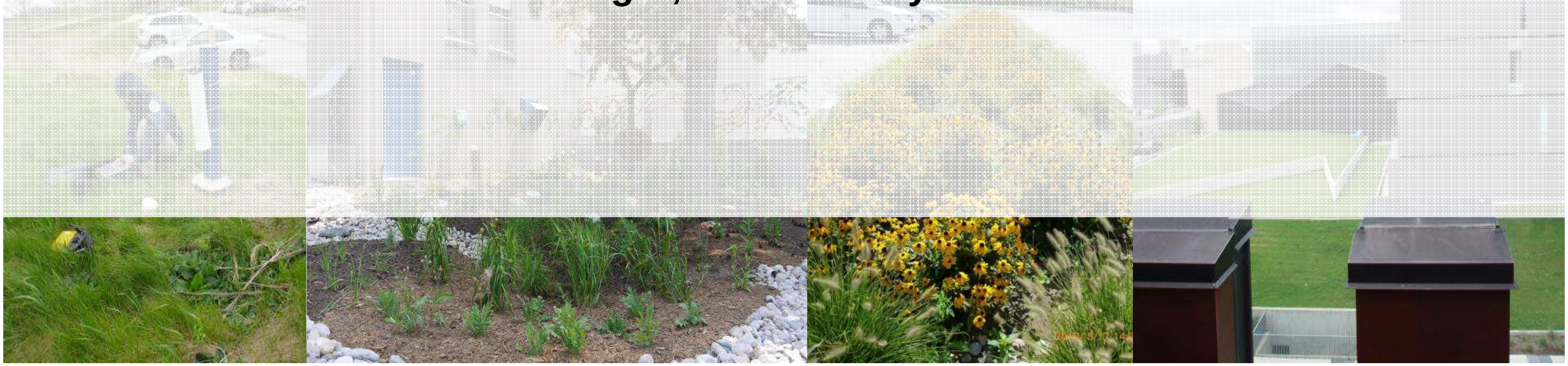
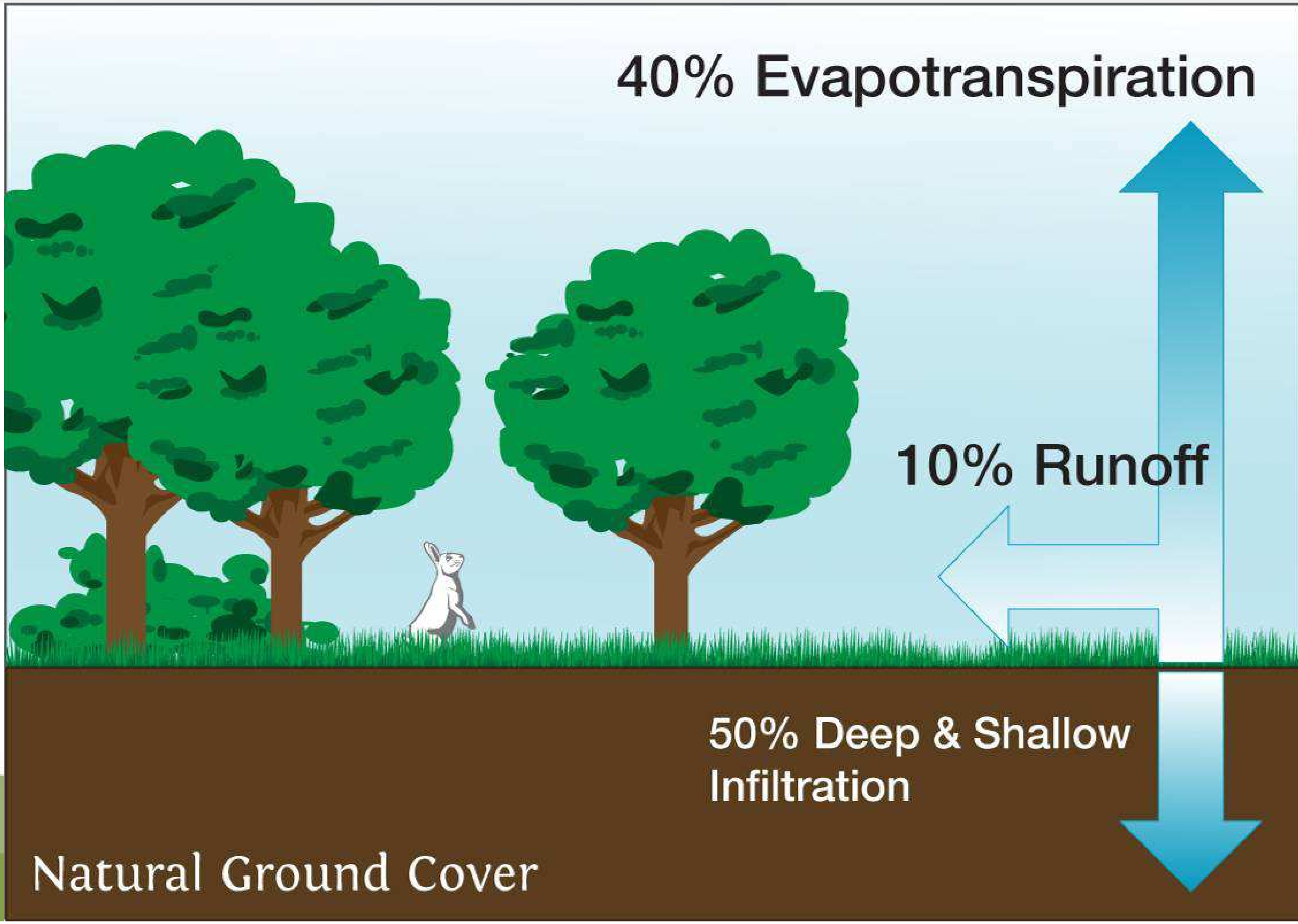
Senior Manager, Credit Valley Conservation



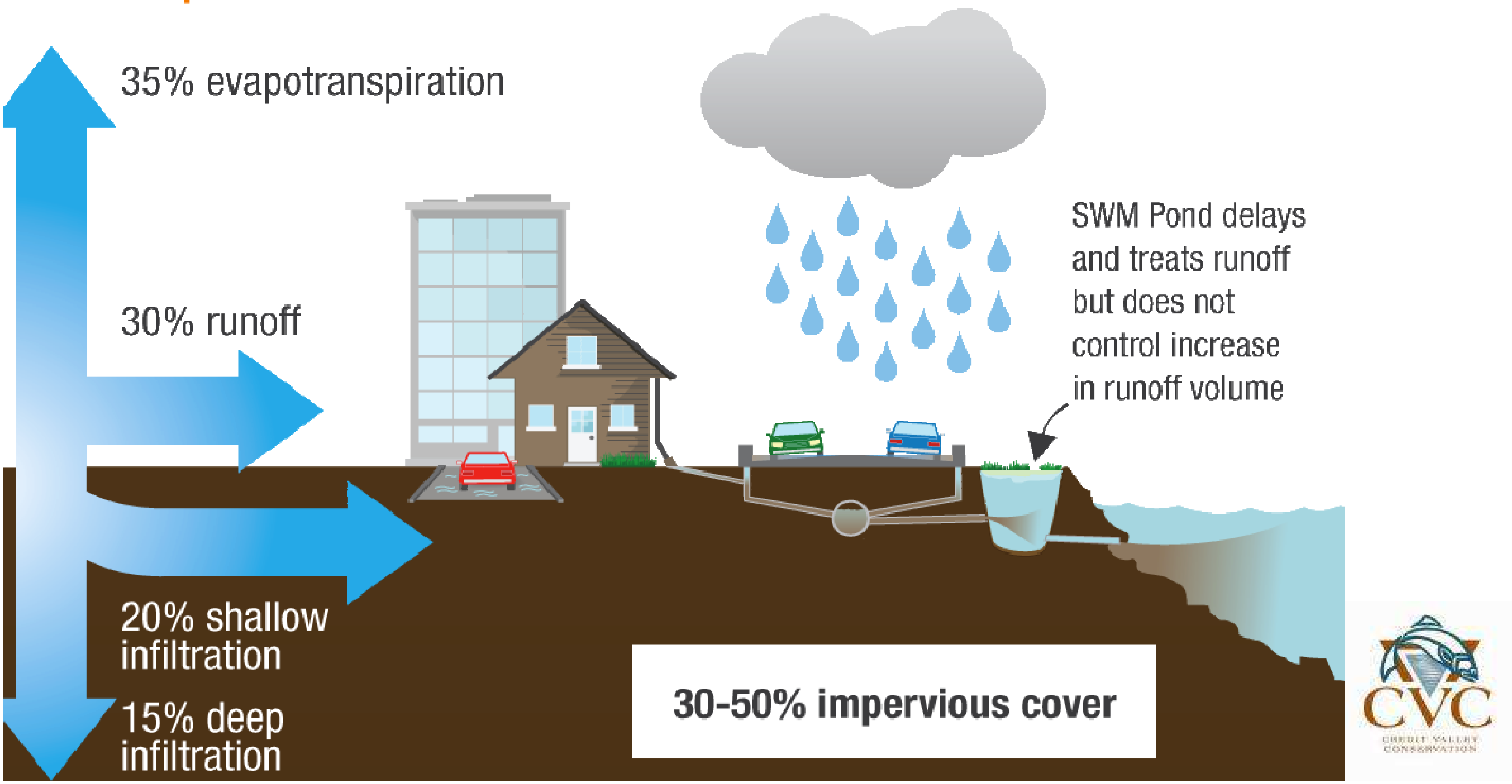
Pre-Development



Conventional End of Pipe

Urban Hydrology

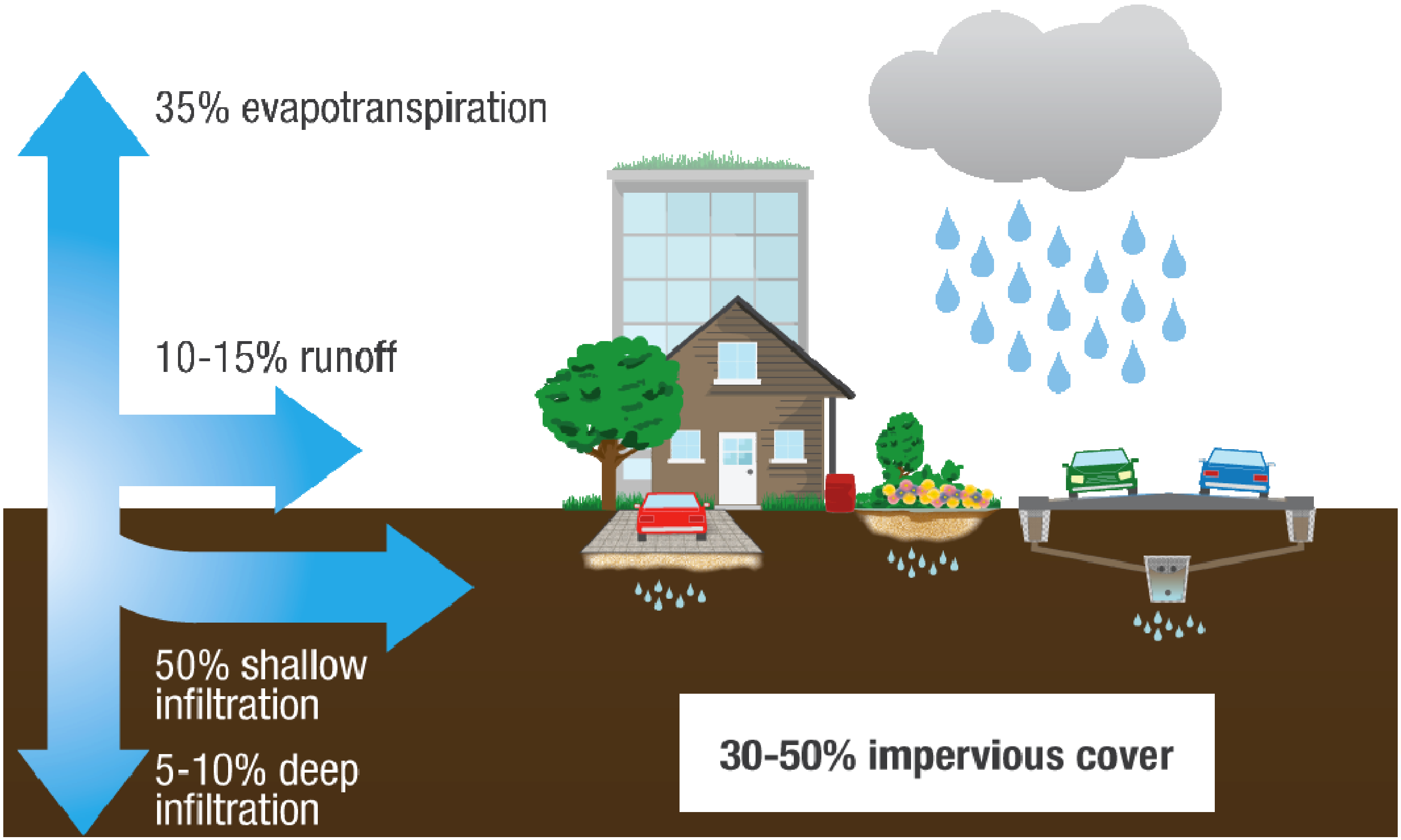
Typical development: Stormwater management using End of Pipe SWM Pond



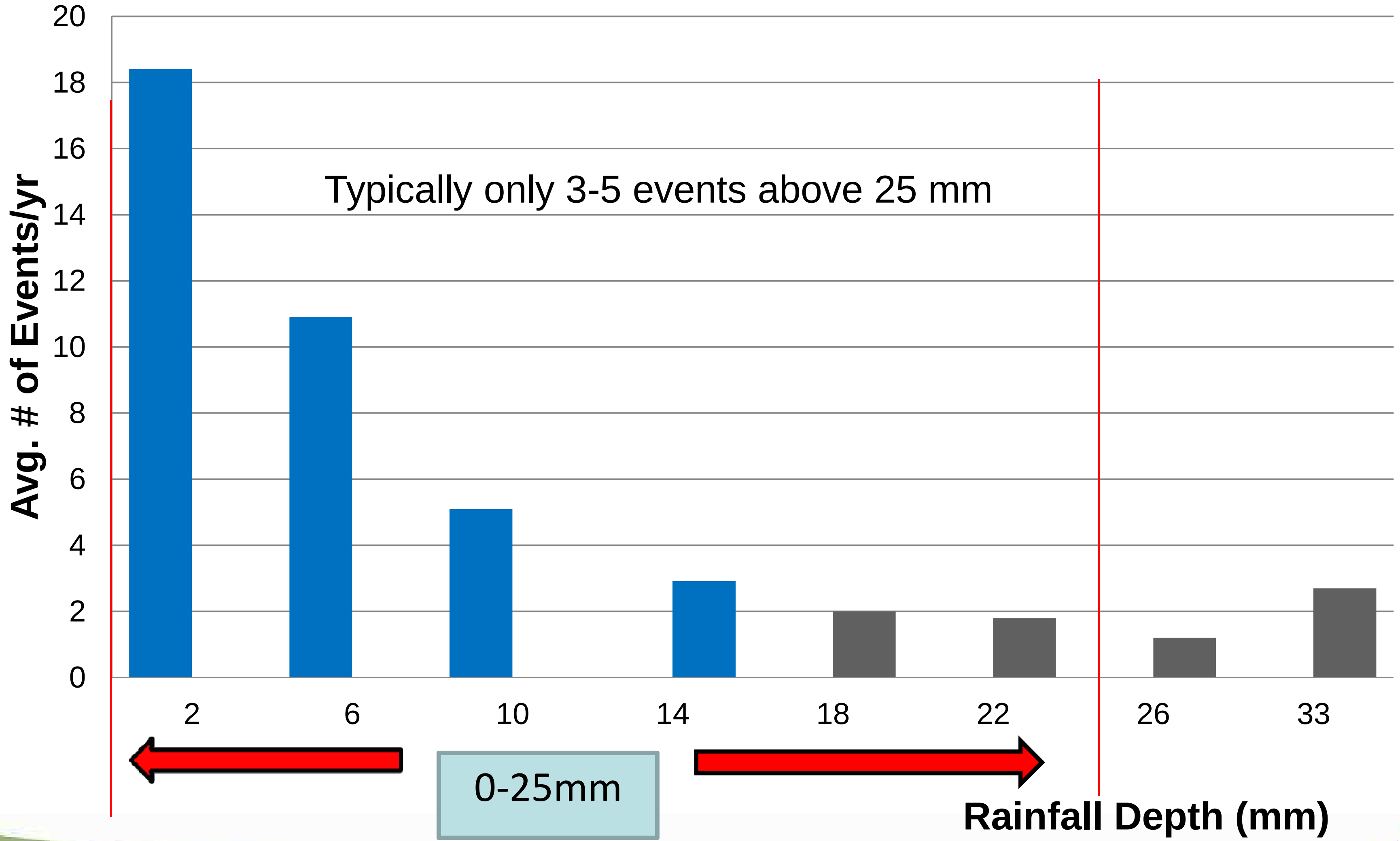
Integrated SWM Controls

Urban Hydrology

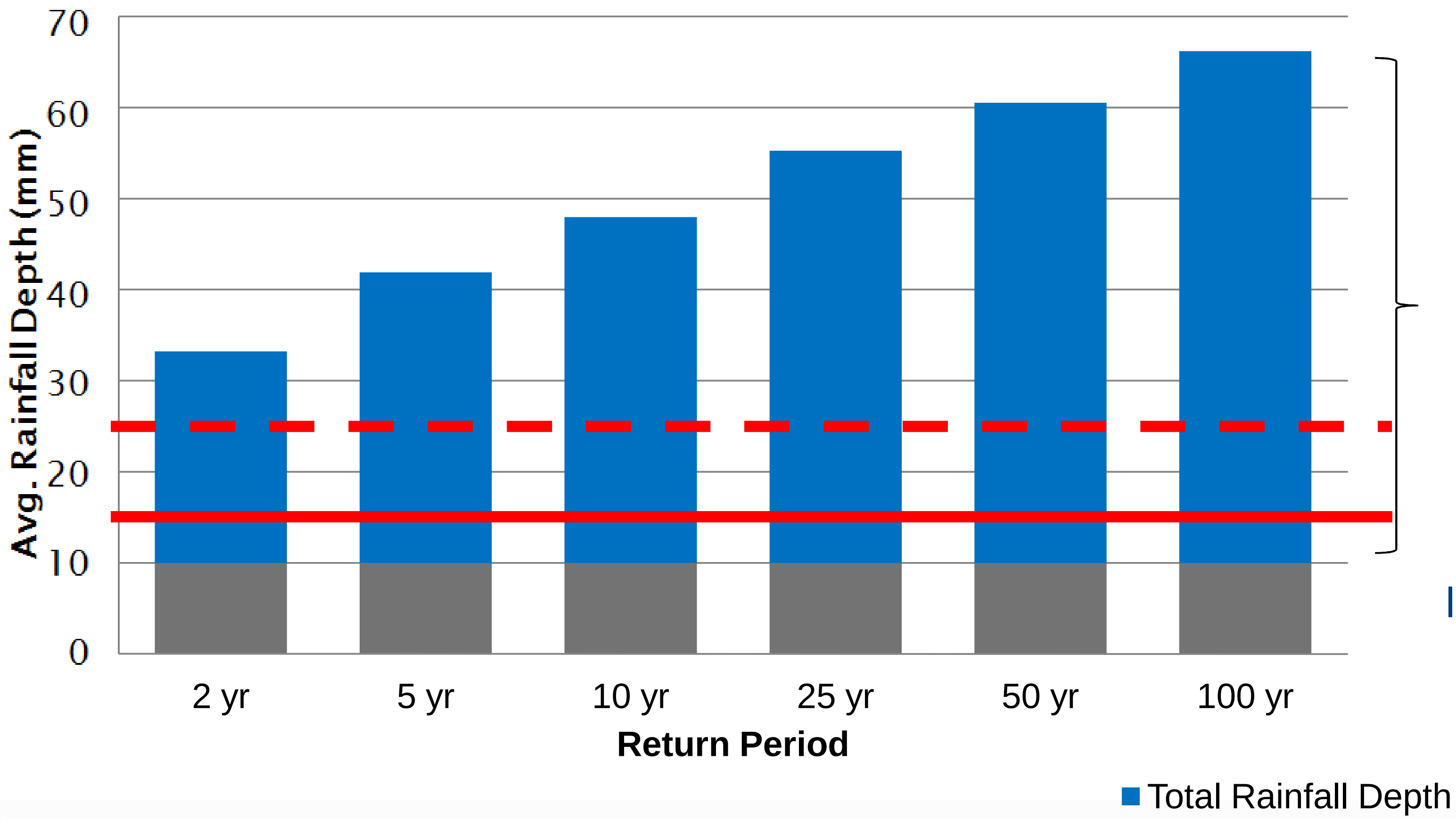
Development with Low Impact Development



TYPICAL ANNUAL RAINFALL FREQUENCY DISTRIBUTION FOR



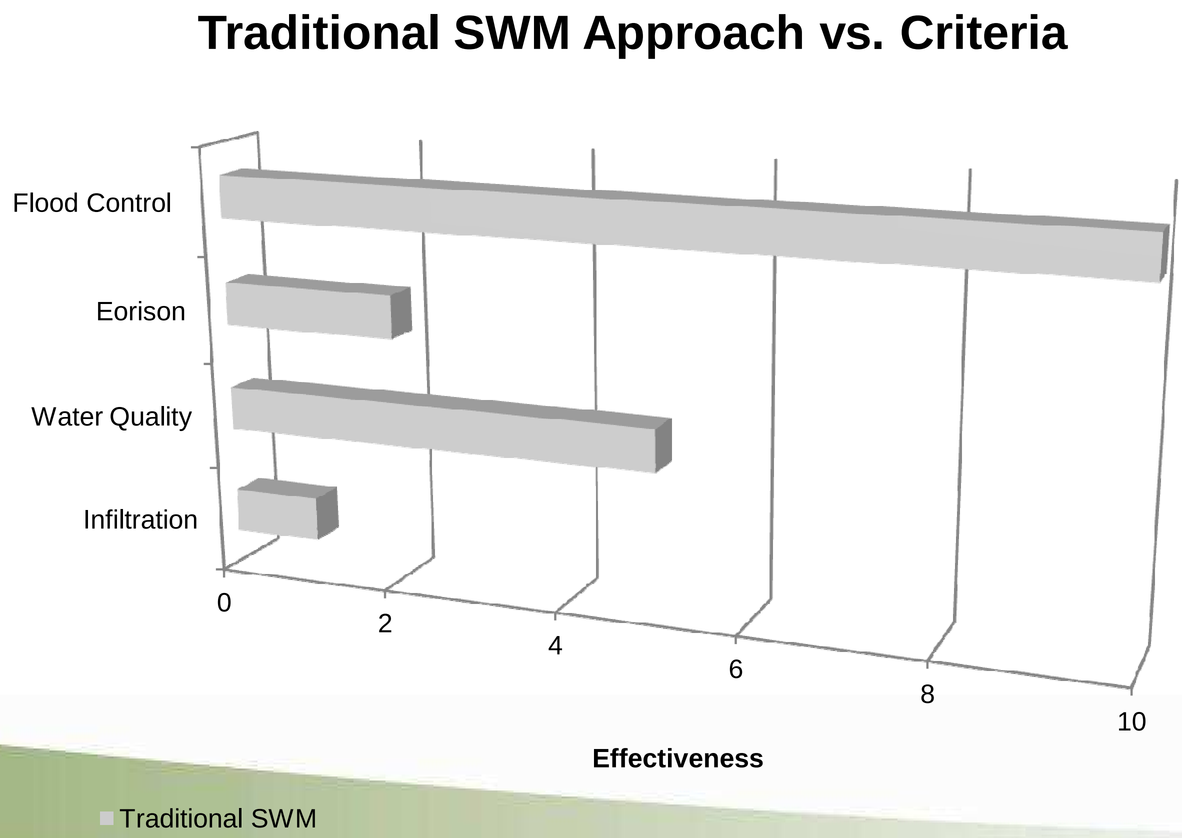
AVERAGE RAINFALL DEPTHS &



Previously thought to have little effect in mitigating flows from large events

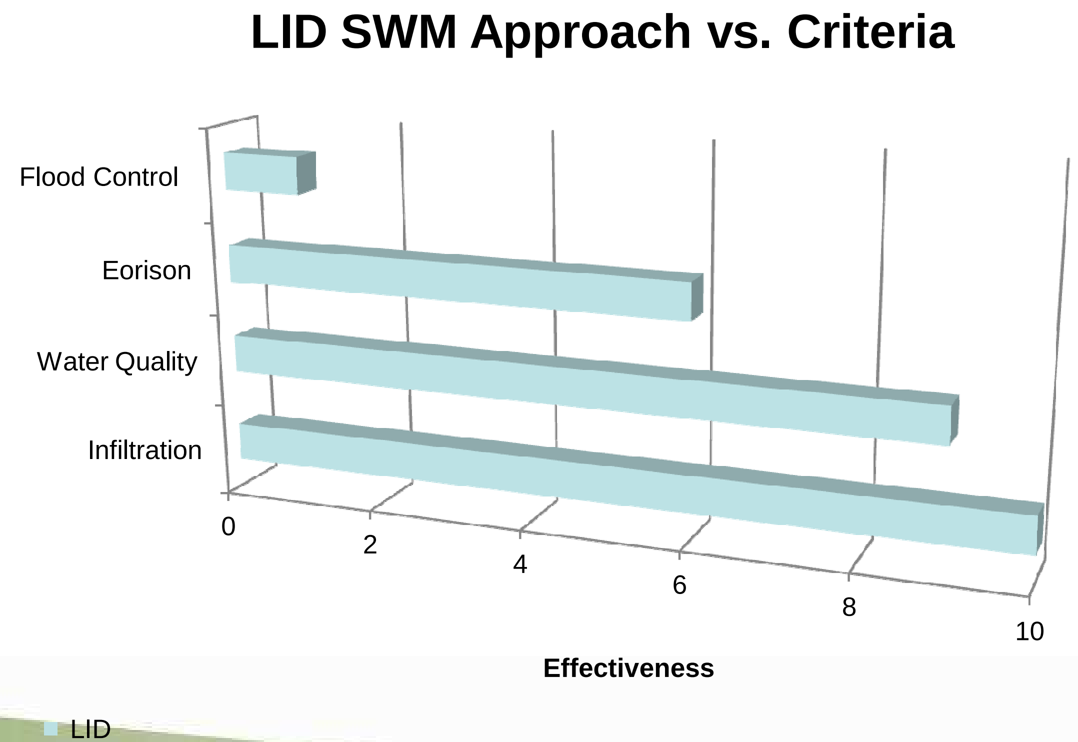
TRADITIONAL SWM APPROACH & CRITERIA

- Traditional SWM techniques perform poorly in relation to Infiltration and Erosion criteria, moderately well in relation to Water Quality, but perform exceptionally well in the context of Flood Control criteria.



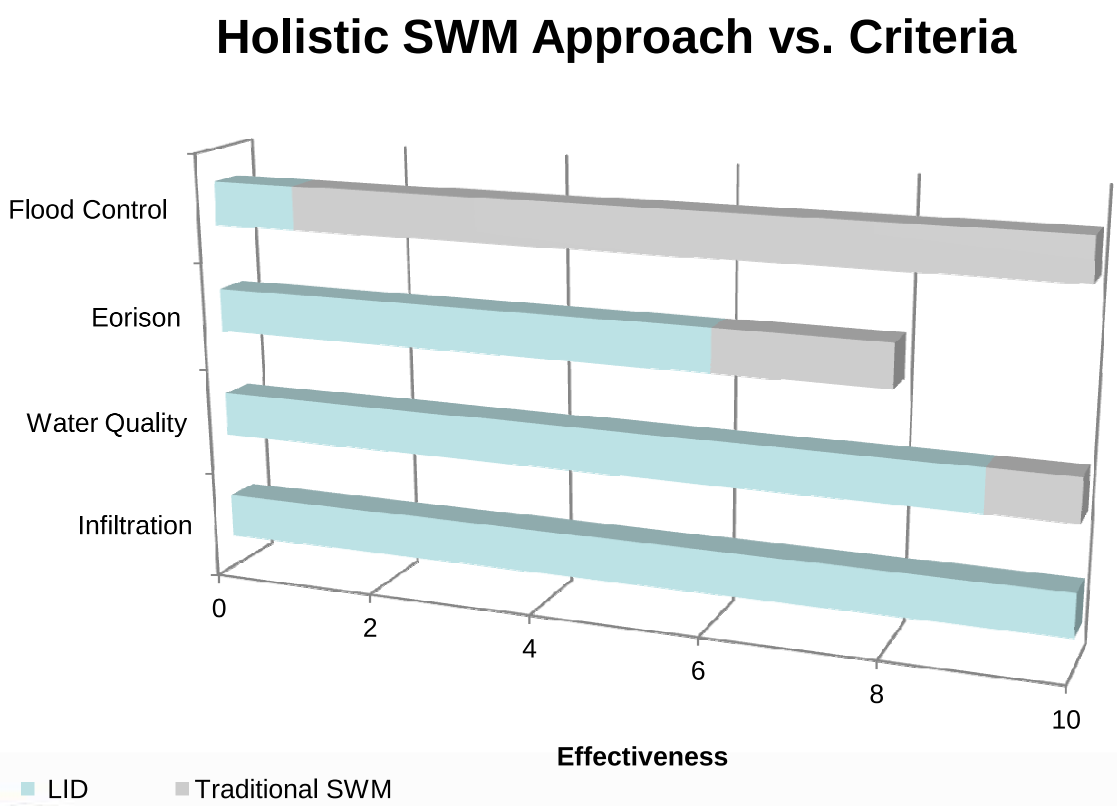
LID SWM APPROACH & CRITERIA

- LID techniques are highly capable of satisfying the majority of the 4 design criteria (water quality, erosion, infiltration and (water balance)



HOLISTIC APPROACH & CRITERIA

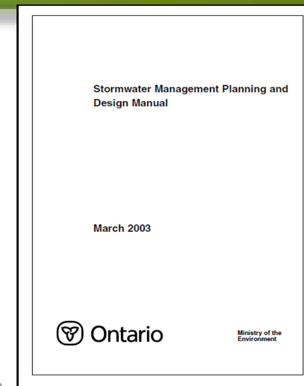
- When used together



ONTARIO POLICIES

Lake Simcoe Protection Plan

Species at Risk Legislation


Stormwater Management Planning and Design Manual

March 2003

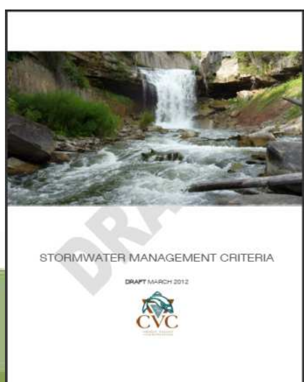
Ontario

Ministry of the Environment

SWS, EIS, MDP, Wetland Policies

Infiltration targets, water balance criteria, pre-development hydrology

Climate Change Mitigation Strategies


STORMWATER MANAGEMENT CRITERIA

DRAFT MARCH 2012

CVC

Local Requirements i.e. City of Toronto

Source Water Protection

Top Five Stakeholder Priorities

Long term maintenance needs and impact on performance;

Lifecycle costs (asset management);

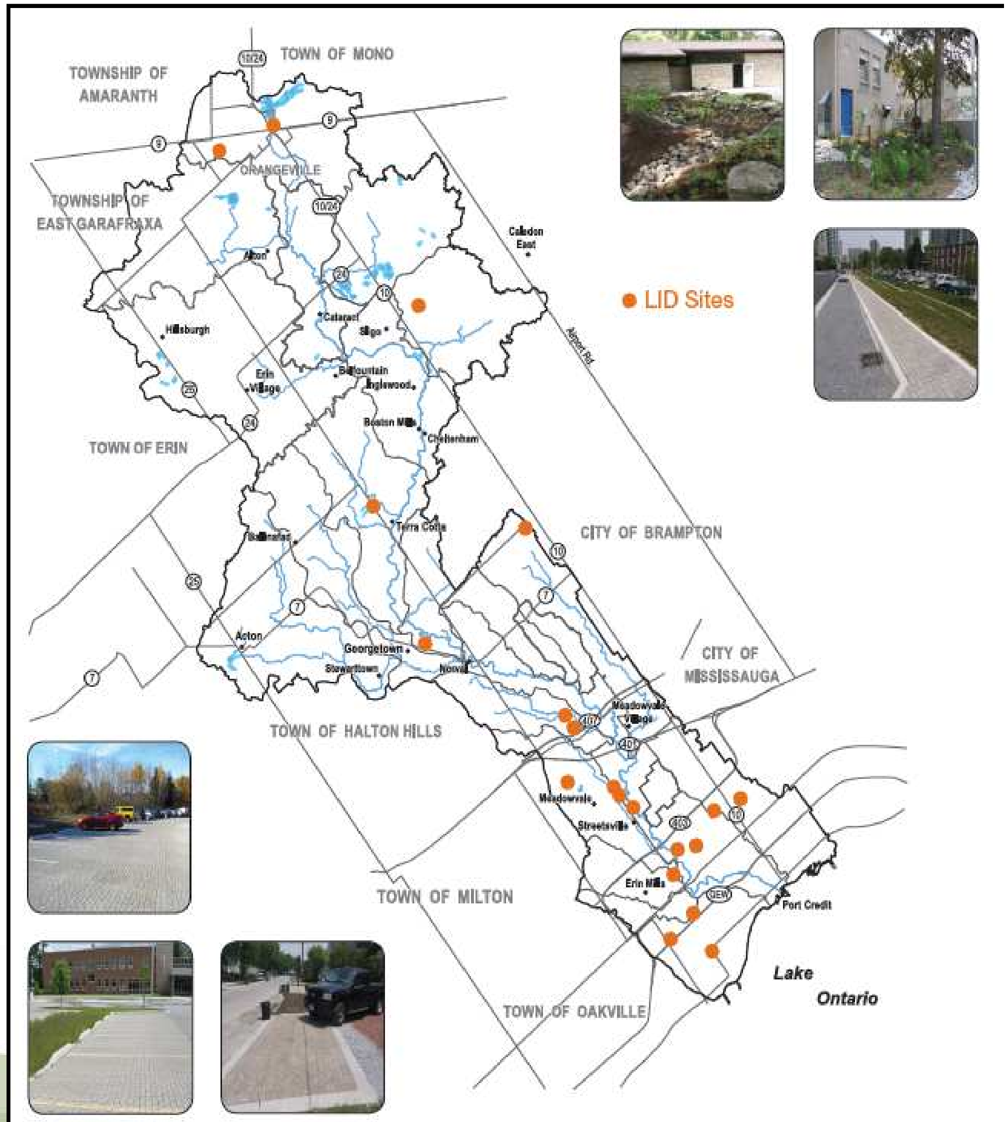
Water quality and quantity performance of LID design in low infiltration soils;

How multiple LID treats and manages stormwater;

Performance of flood control, erosion control, water quality and natural heritage protection.

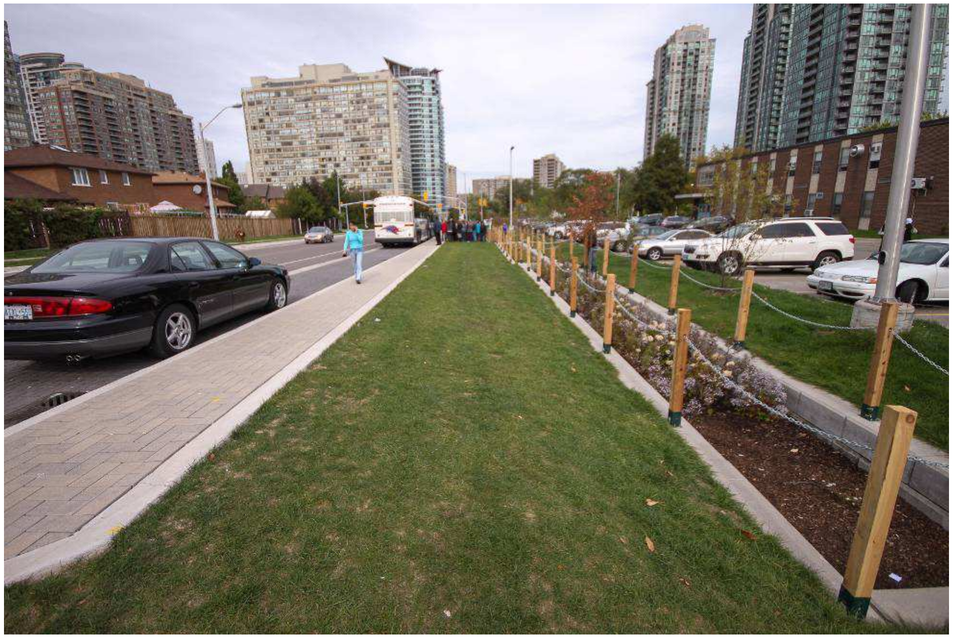
CVC's Infrastructure Performance & Risk Assessment Program

- 30 constructed 25 planned LID sites
- 12 LID retrofit monitoring sites:
  - All sites have water level monitoring
  - 3 comprehensive flow and water quality monitoring
- 2 New Development sites- starting 2014
- 1 Regional Road (water conservation/SWM)- 2015



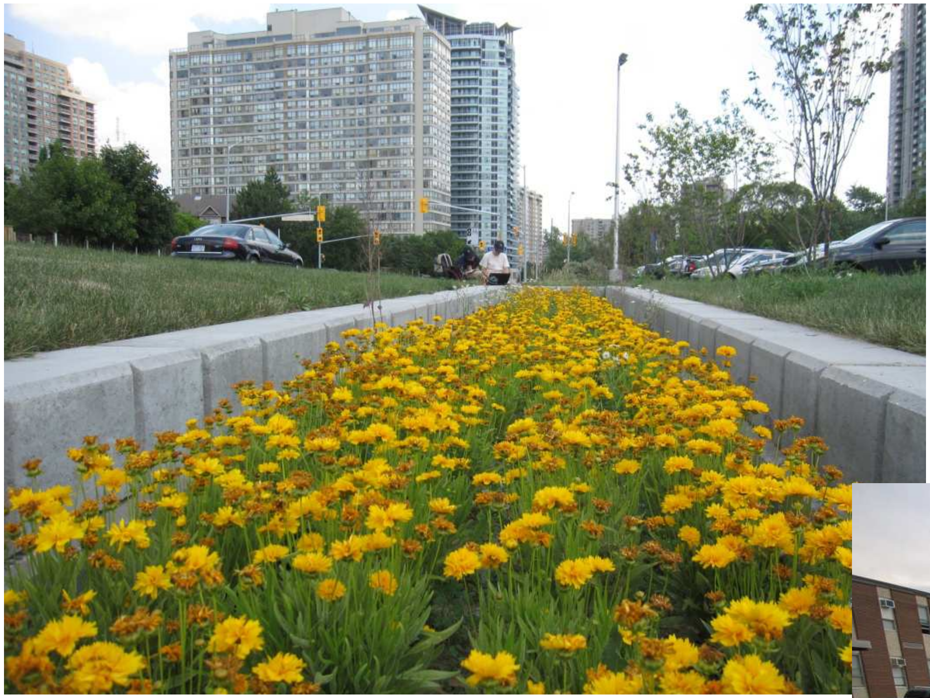
Elm Drive- Road Reconstruction

BEFORE



AFTER

Elm Drive

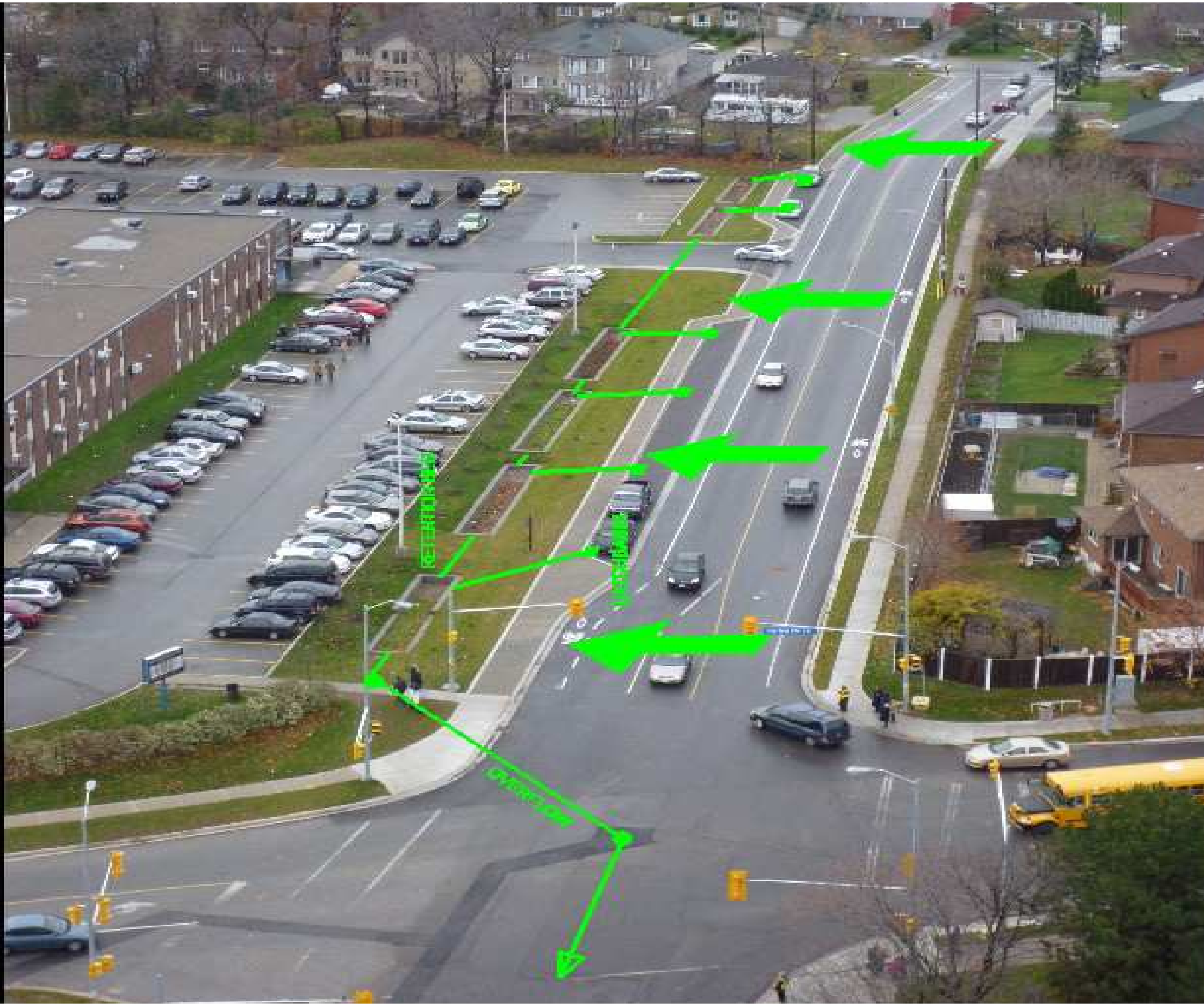


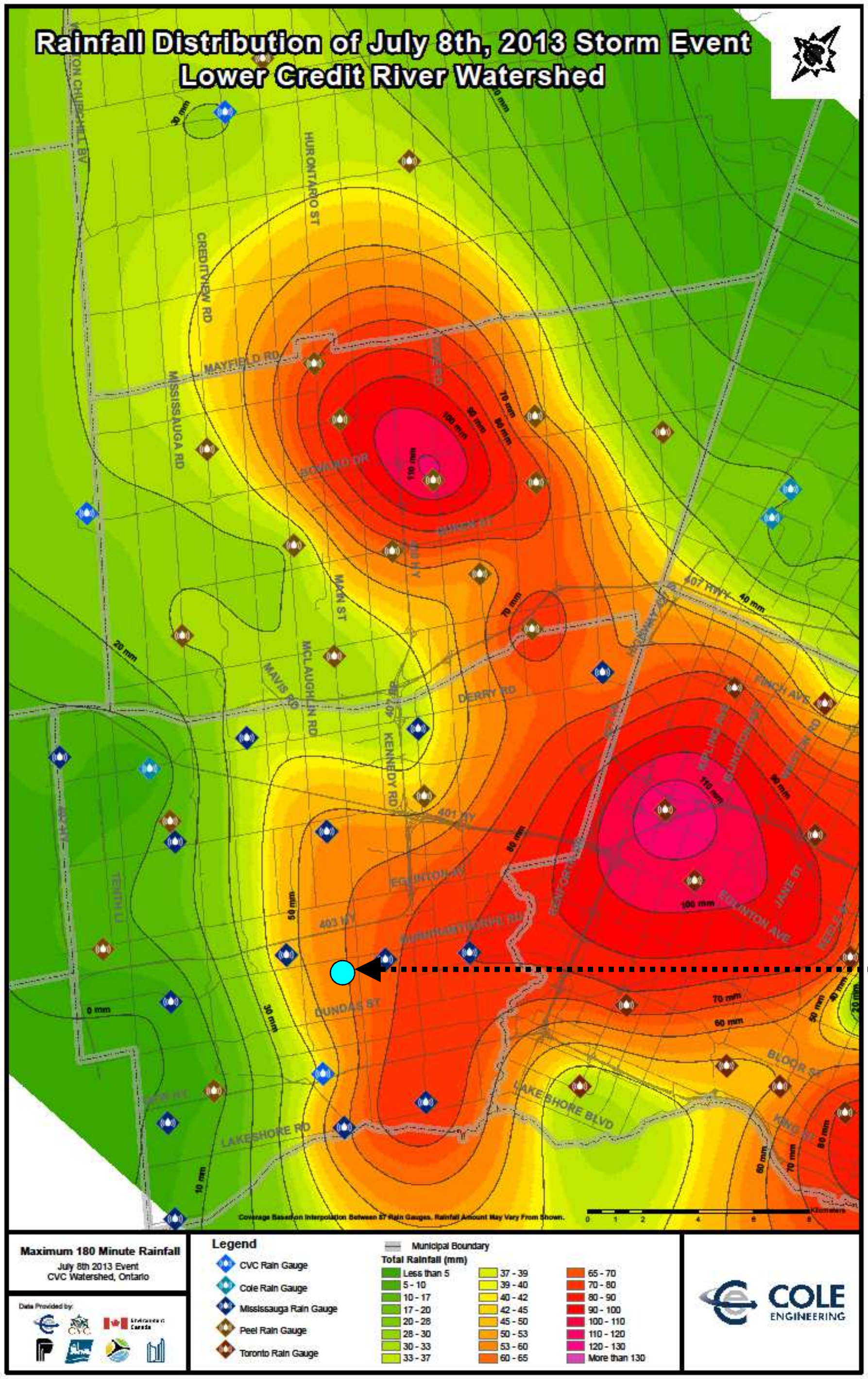
- Construction completed May 2011
- Hydrological monitoring began August 2011
- Water quality monitoring began June 2012

Designed to Provide:

- Enhanced water quality control
- Erosion control to the extent possible

CREDIT VALLEY CONSERVATION





July 8th 2013 Thunder Storm

Greater than 100 Year Event

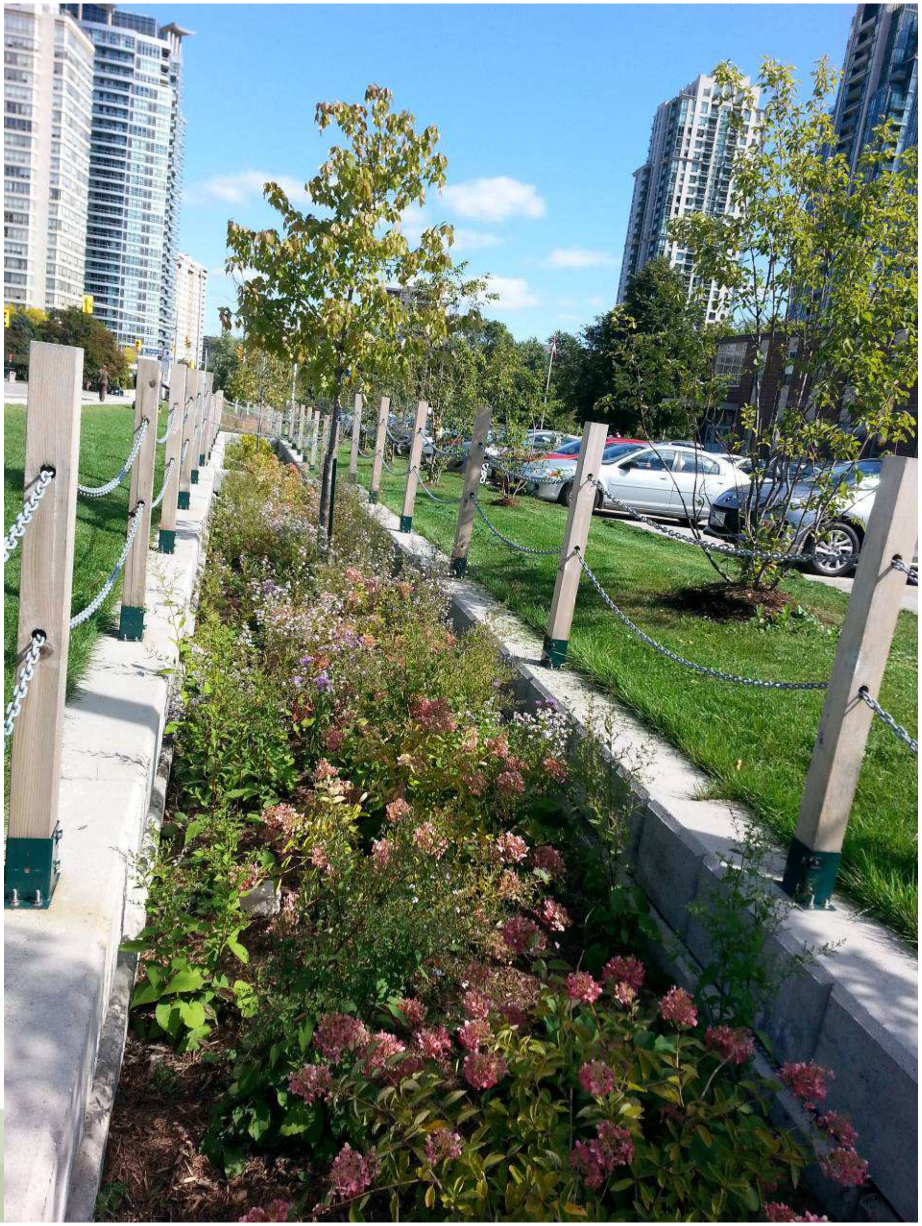
Elm Drive LID Site

LID Performance

- Pre-construction ~100% of rainfall would enter municipal stormsewers
- Post Construction- 30% less volume entering sewers and creek

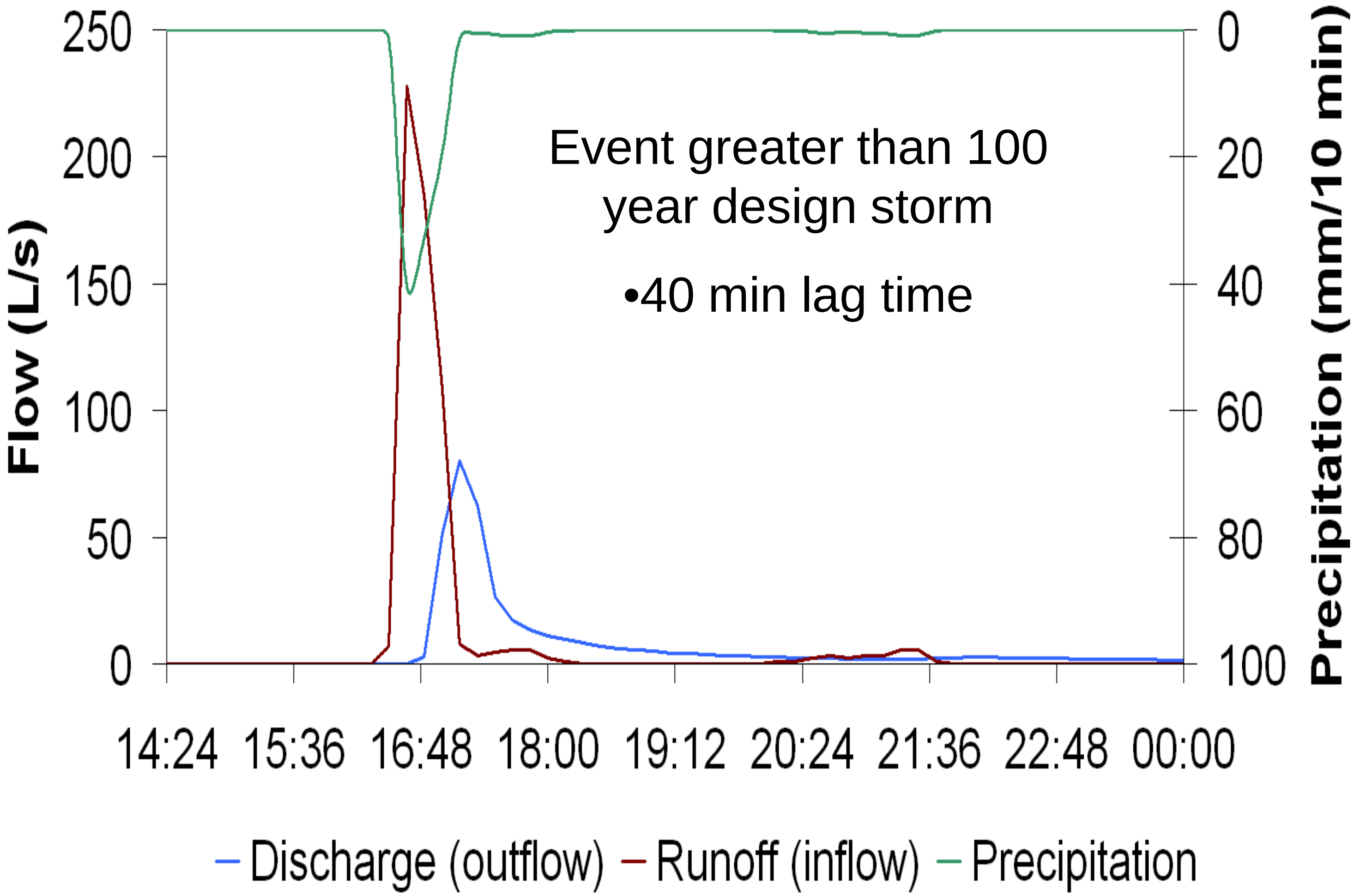
LID Performance

- LID reduced up to 60% of the peak runoff;
- Delayed the timing of the peak by 40 minutes



July 8th 2013 Thunder Storms

104 mm over 5 ½ hrs – 240 mm/hr peak intensity for 10 min interval



For 90% of all rainfall events

- No flow entering Cooksville
- No pollutants
- Recreating nature in the heart of the City

Water Quality

Design Goal for Elm	Enhanced Treatment 80% SS Removal Annual AVG
CVC Stormwater Management Criteria	Enhanced Treatment 80% SS Removal Annual AVG
Observed Performance	99% TSS Removal Concentration for TSS is below stream objectives **Performance exceeding all criteria**

CVC
CREDIT VALLEY CONSERVATION

Flood Control

Design Goal for Elm	None However, design estimations were as follows: 2 Yr – 37% Reduction 5 Yr – 27% 100 Yr – 13% Compared to pre-retrofit conditions (uncontrolled)
CVC Stormwater Management Criteria	Post to Pre control of peak flows for the 2-100 year design storms to the appropriate Watershed Flood Control Criteria.
Observed Performance	2 year event 70-100% Reduction to pre-retrofit conditions 60% peak flow reduction, 30% volume reduction, 40 min lag **Performance excellent**

Erosion Control

Design Goal for Elm	To the extent possible
CVC Stormwater Management Criteria	As a minimum, on site detention of 5 mm. For sites w. a SWM Pond, detain the 25 mm event for 48 hrs
Observed Performance	Volume of the 25 mm event is absorbed reduced by 100% going well beyond criteria. **Performance exceeding all criteria**

CVC
CREDIT VALLEY CONSERVATION

Water Balance

Design Goal for Elm	None
CVC Stormwater Management Criteria	Minimum of 3 mm of groundwater recharge per event. (Low Volume Groundwater Recharge Area)
Observed Performance	All runoff is exfiltrated for events under 25 mm. Up to 13 mm is recharged for events of this size. For larger events where discharge was observed: 11-16 mm of recharge provided **Performance exceeding all criteria**

CVC
CREDIT VALLEY CONSERVATION

Lakeview Road Retrofit

Preconstruction Monitoring Began in 2010;

Post-construction monitoring began in Fall 2012;

Resident input on aesthetic vision for streetscape helped increase uptake of street side gardens (23 of 26 are gardens, 3 grassed)

Lakeview

Preliminary data showing similar results to Elm Drive

CONSERVATION

Broad Transferability of Data and Knowledge

- Participation of leading national/international SWM researchers and practitioners in the area of LID monitoring to ensure quality control of data analysis;

- Monitoring results consistent and in some cases outperforming International BMP database (BMPDB) and National (USA) Stormwater Quality Database (NSQD), and STEP (Ontario);

- Water level data supports LID functioning during winter thaw events

New Residential Development

Evaluate SW pond performance in light of LID upstream given only 3-5 events (annually) produce runoff entering pond

CVC
CREDIT VALLEY CONSERVATION

New Residential Development

CVC
CREDIT VALLEY CONSERVATION

Top stakeholder priorities

1. Water quality and quantity performance of LID design in low infiltration soils;	*Objectives 1, 2 & 3 will begin to be addressed in a report that will be released in March 2014*
2. How multiple LID treats and manage stormwater;	
3. Performance of flood control, erosion control, water quality and natural heritage protection;	
4. Long term maintenance needs and impact on performance;	*Objective 4 & 5 – Require longer term monitoring (min 5 years) to answer these objectives*
5. Lifecycle costs to support asset management.	

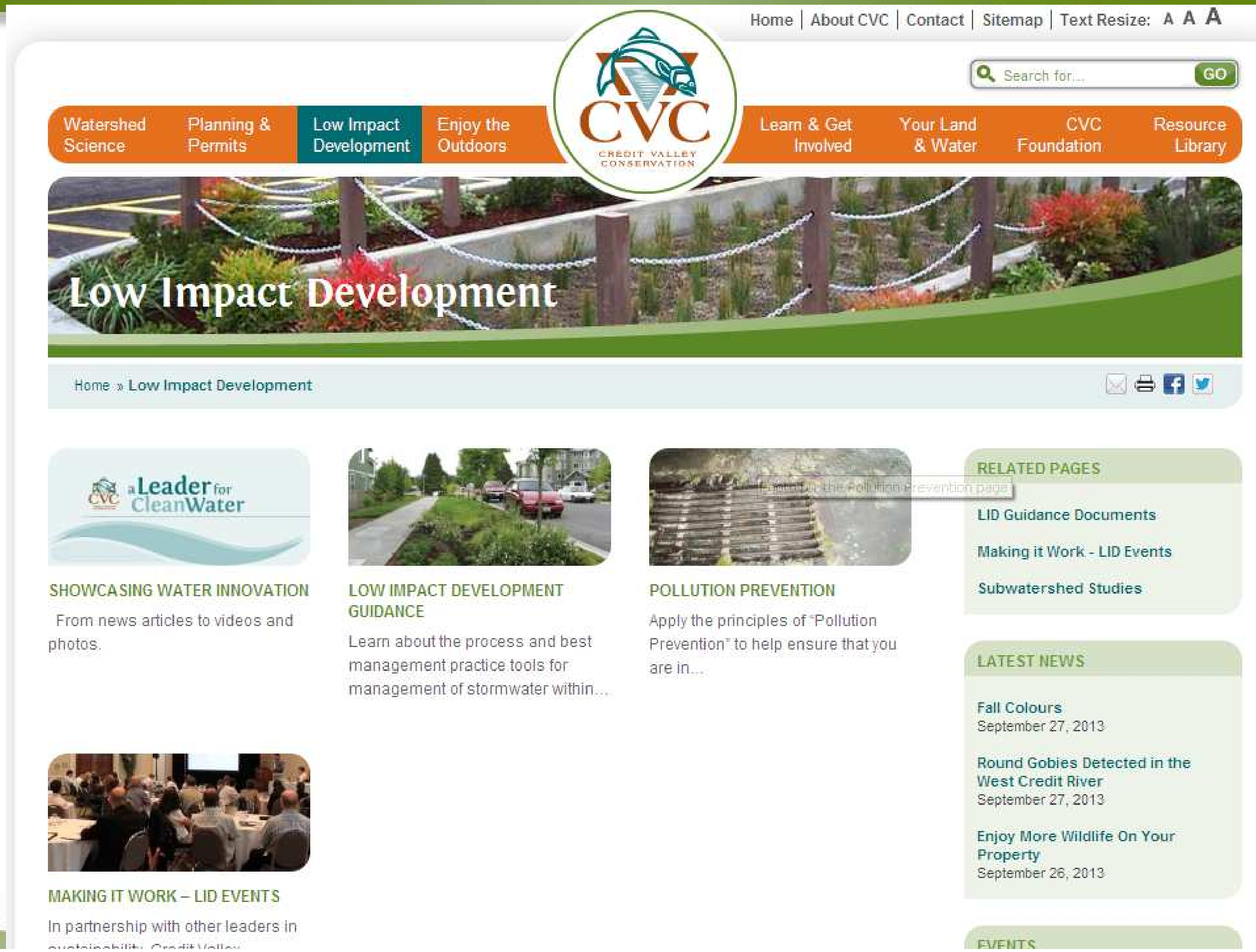
Smart Silt

- CVC in partnership with Provincial and Federal Ministries developed erosion and sediment control effectiveness monitoring and rapid response protocol for high risk construction projects.

- Piloted in the City of Brampton and is meant to be implemented by the developer/landowner and self-regulatory;

- CVC's real time in-stream water quality gauges;

More Information



http://www.creditvalleyca.ca/low-impact-development/