



# LID Performance and Risk Assessment Program

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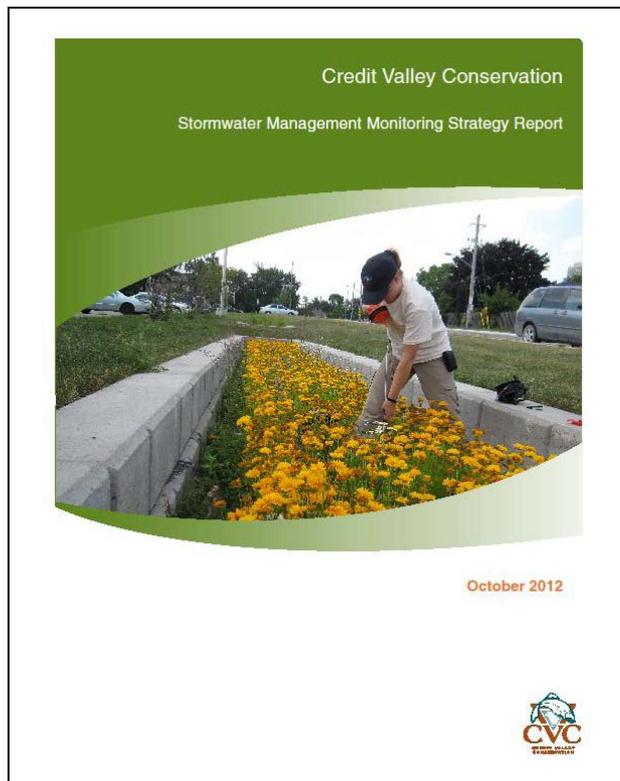
Manager, Water Quality Protection

Credit Valley Conservation Authority

## Outline

- CVC Stormwater Monitoring Strategy
- Monitoring Objectives
- Overview of LID Performance Monitoring Sites
- Maintenance Inspection Monitoring
- LID Performance Assessment Guidance Document

# Stormwater Management Monitoring Strategy



- Highlight the importance of SWM monitoring in the design, construction, assumption, operation and maintenance of stormwater infrastructure to ensure long-term performance;
- Provide an overview of how CVC's stormwater monitoring program fits within our watershed stakeholders priorities (Region of Peel and member municipalities, Ministry of Environment, Ministry of Natural Resources, Development Community);
- **Defined 17 objectives for CVC's overall SWM monitoring program.**

## LID Performance Assessment Advisory Committee Meeting



- December 13, 2012, CVC held a meeting to collect input from various stakeholders:
  - including municipal decision makers,
  - provincial and federal environmental agencies,
  - engineering and planning professionals,
  - conservation authorities,
  - academia,
  - and watershed advocate groups.

Surveys were distributed to the meeting participants to collect feedback regarding the CVC monitoring program objectives, as well as the reports and publications that CVC will publish as a result of the monitoring effort.

## Top Five Stakeholder Priorities

- **Long term maintenance needs and impact of maintenance on performance;**
- **Lifecycle costs;**
- **Water quality and quantity performance of LID design in low infiltration soils;**
- **How multiple LID function in a treatment train**
- **Performance of flood control, erosion control, water quality and natural heritage protection.**



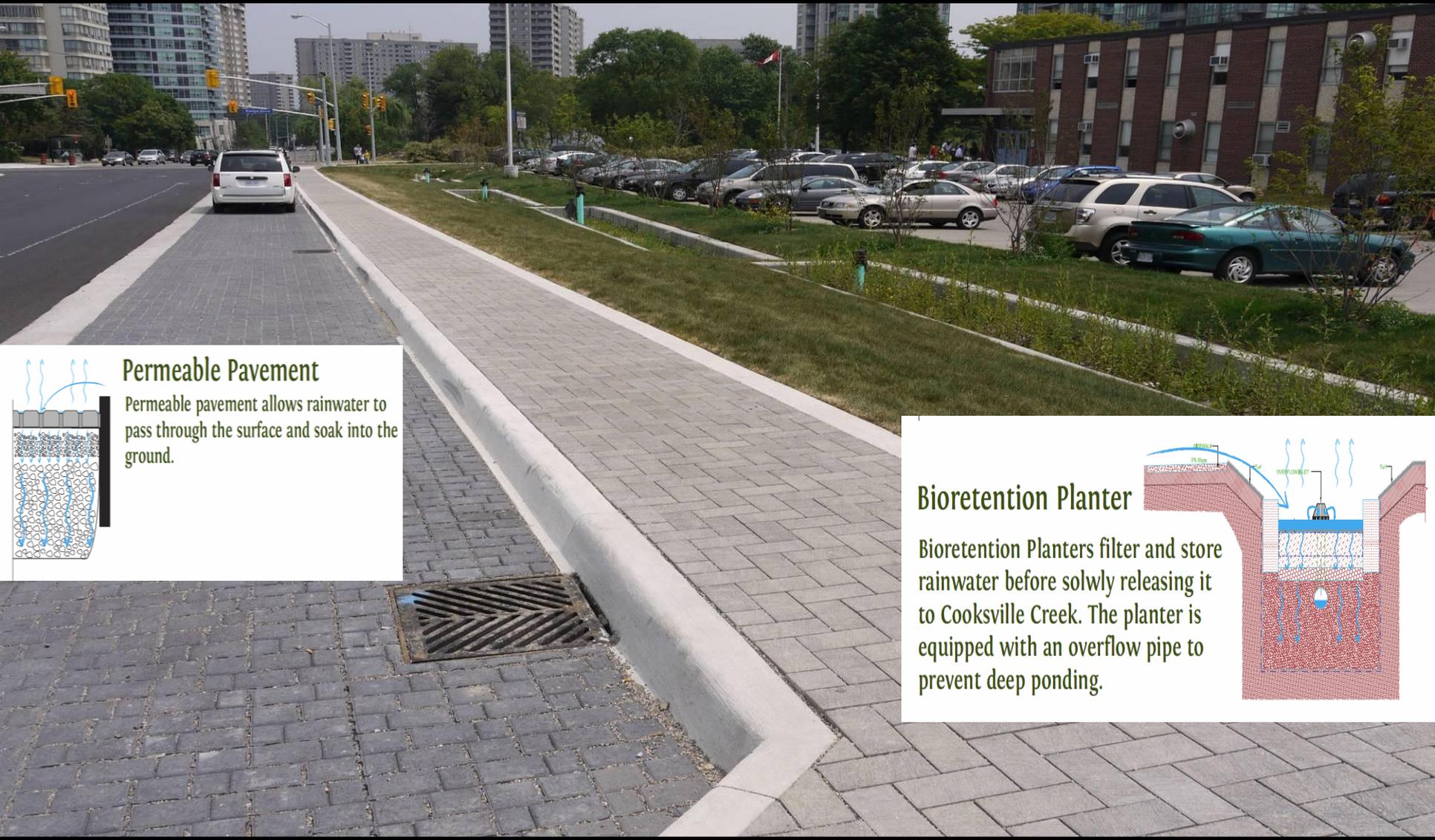
## ***Showcasing Water Innovation – Performance Assessment Demonstration Sites***

- Elm Drive – Road Right of Way
- Lakeview – Residential Right of Way
- IMAX – industrial-commercial lands / technology performance
- Bioretention cells in public lands – to develop construction assumption protocols

# Elm Drive - Road Right of Ways

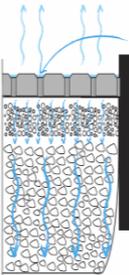


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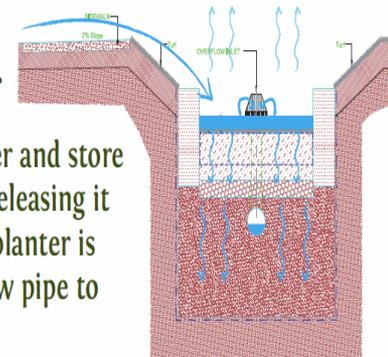
## Permeable Pavement

Permeable pavement allows rainwater to pass through the surface and soak into the ground.



## Bioretention Planter

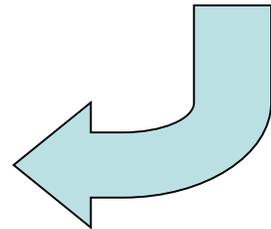
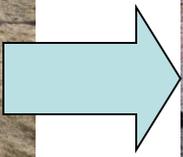
Bioretention Planters filter and store rainwater before slowly releasing it to Cooksville Creek. The planter is equipped with an overflow pipe to prevent deep ponding.





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# Elm Drive Before & After





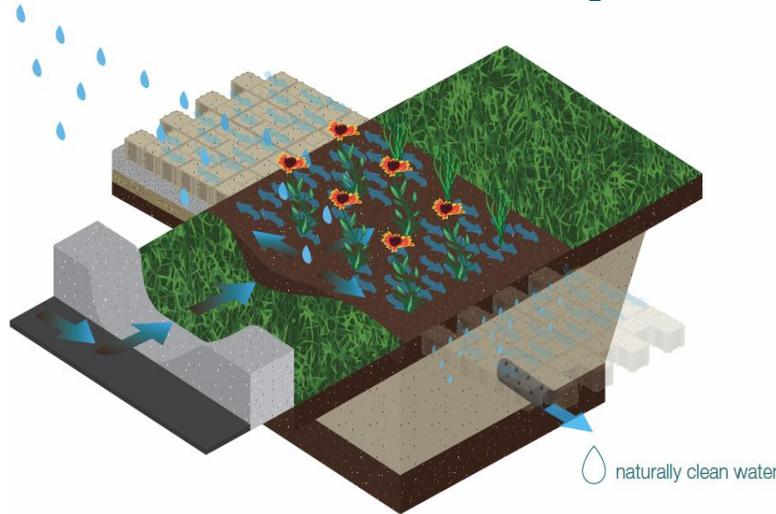
# Lakeview – Green Street Project - Mississauga

## Key Facts

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





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# Lakeview Residential ROW



Before Construction



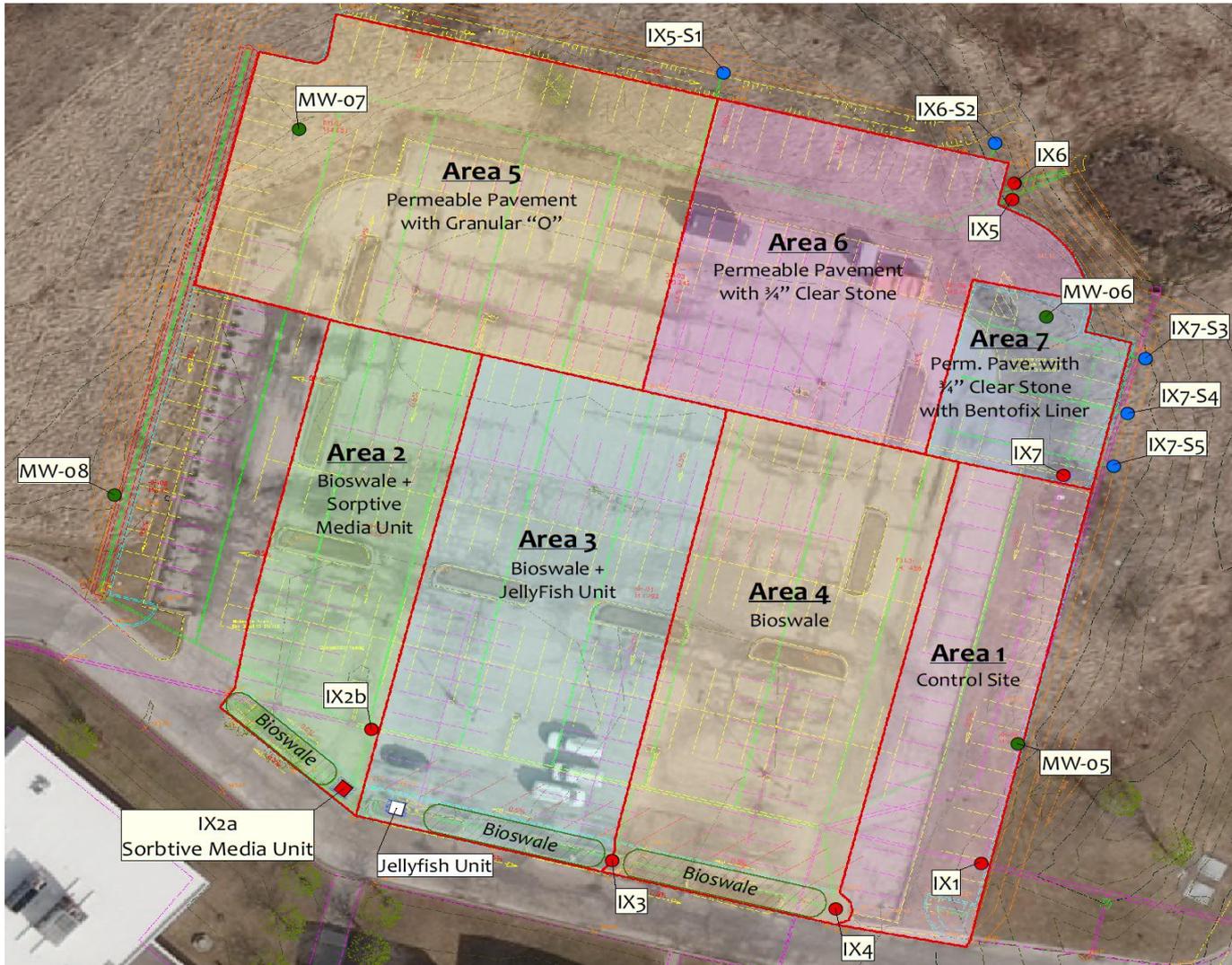
Summer 2013



During Construction Spring 2012



# IMAX Monitoring Plan



- Surface water monitoring
- Groundwater monitoring well
- Groundwater stilling well



- Area 1 – Asphalt to catchbasin
- Area 2 – Asphalt to Bioswale + SorbtiveMedia Unit
- Area 3 – Asphalt to Jellyfish Filter + Bioswale
- Area 4 – Asphalt to Bioswale
- Area 5 – Permeable Pavement with Granular “O”
- Area 6 – Permeable Pavement with  $\frac{3}{4}$ ” clearstone
- Area 7 - Permeable Pavement with  $\frac{3}{4}$ ” clearstone + Impermeable Liner



## Monitoring to evaluate

- Collective performance of permeable pavement, Imbrium, bioretention
- Ability of a liner to protect groundwater from Chloride for source protection
- Any changes in slips/falls on permeable pavement
- Long term performance



Terra Cotta June 26, 2012



Credit Valley Conservation

O'Connor Park June 27, 2012



Lakeside Park June 21, 2012

# Public Lands



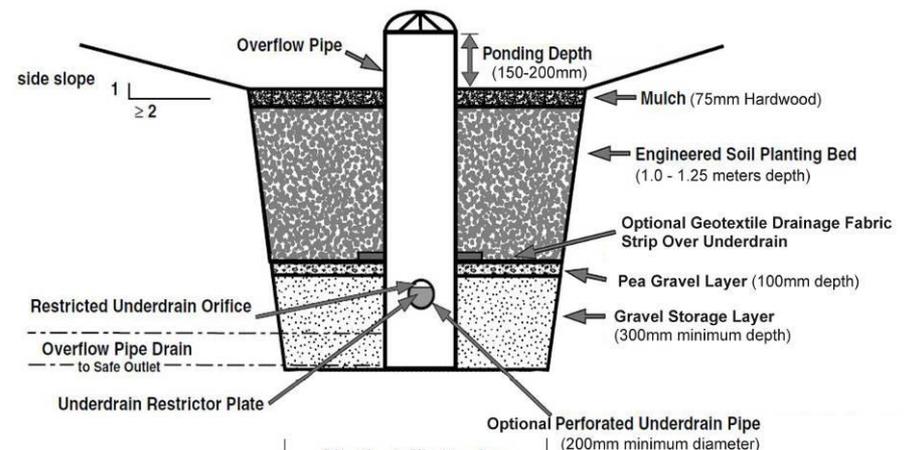
Green Glade June 21, 2012

# Public Lands

Based on a study by the Centre for Watershed Protection, 50% of LID practices are not functioning as intended due to improper construction and maintenance.

To address this issue CVC created the LID Construction Guide and LID Landscape Guides, and developed monitoring to assess:

- What criteria should be used to assume bioretention facilities?
- Are current bioretention design standards optimal?



# New Sites in 2014

## Wychwood (Brampton)

- Ontario's first large all-LID residential development
- 5.6 ha greenfield residential development consisting of 70 large single family detached lots
- both lot and site level controls:
  - permeable paver driveways,
  - reduced impervious area,
  - bioretention swale,
  - infiltration trench
  - landscaped rain gardens.

The site was designed to fully meet the stormwater criteria without the use of a stormwater pond



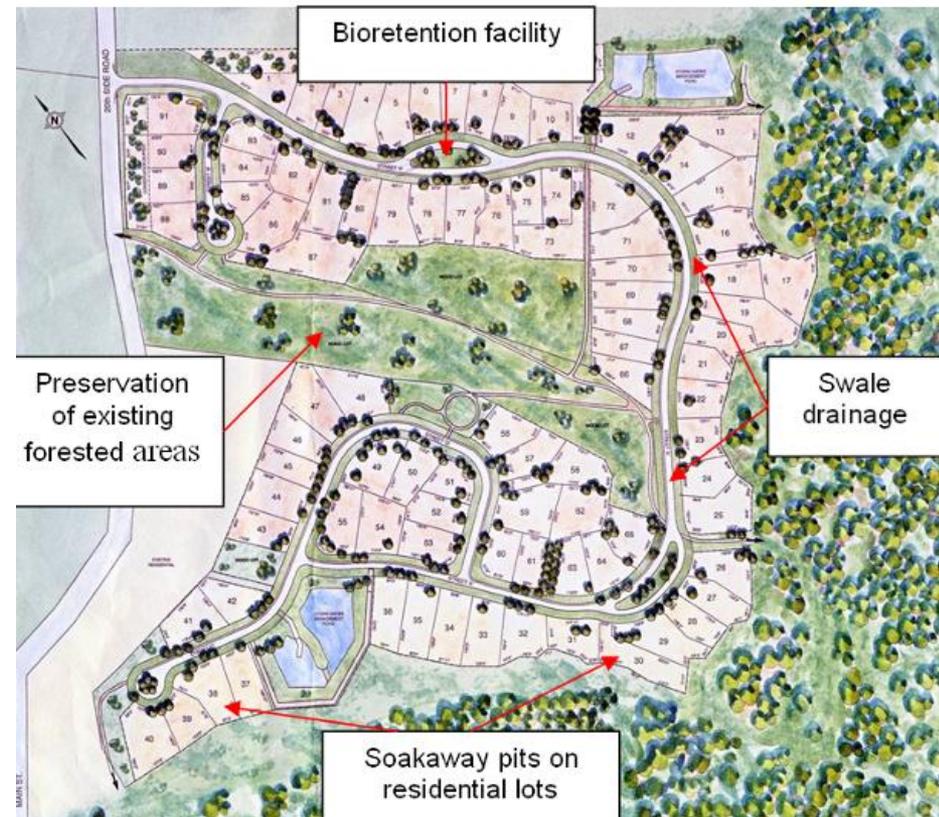


## Meadows in the Glen (Halton Hills)

“*First of its Kind*” demonstration project contains stormwater treatment approaches that are “*above and beyond*” the standard practices for stormwater management in residential subdivisions in Ontario.

It uses many LID practices for innovative stormwater management such as:

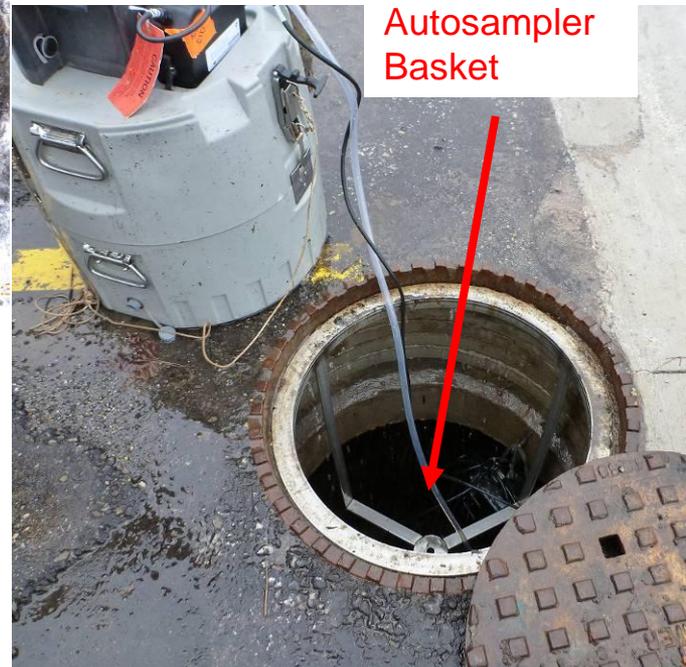
- swale drainage,
- bioretention cells,
- soakaway pits,
- rain gardens
- permeable pavement driveways,
- includes two SWM ponds





# CVC Head Office

24 Bottle  
Sampling Kit





# Maintenance Inspection Monitoring

**Common issues and types of damage are associated with LID features such as erosion, inlet blockage, sediment accumulation, water ponding, and vegetation death.**

**Since we are aware of these issues they are carefully tracked at each site inspection and documented.**

- Maintenance issues can be tracked over time to see if they are design or site related
- Maintenance schedules will provide insight as to when issues are addressed, how frequently, and if they are resolved
- Routine maintenance will be more cost efficient in the long-term if small issues are addressed more frequently than leaving them to develop into larger problems



# LID Inspection Checklist



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## LID Inspection Checklist

Site: Elm Drive

Inspector: \_\_\_\_\_

Date: \_\_\_\_\_

### Site Characteristics:

Elm Drive Bioretention Cells	
Drainage Area	Road, parking lay-by and sidewalk
Soil Media	Engineered bioretention mix
Pretreatment	Permeable pavement and grass swale
Hydraulic Configuration	Online
Inlet Type	Inlet pipes from parking lay-by and permeable pavement sidewalk

Contributing Drainage Area:		Category:	Notes:
% of Trash/Debris Present	0% --- 5% --- 10% --- 15% --- 20% +		
% of Sediment Accumulation	0% --- 5% --- 10% --- 15% --- 20% +		
<b>Inlets:</b>			
% of Trash/Debris Present	0% --- 5% --- 10% --- 15% --- 20% +		
% of Sediment Accumulation	0% --- 5% --- 10% --- 15% --- 20% +		
% of Erosion	0% --- 5% --- 10% --- 15% --- 20% +		
Structural damage?	Yes or No		
Is inlet clear and able to accept incoming flow?	Yes or No		
<b>Facility:</b>			
% of Trash/Debris Present	0% --- 5% --- 10% --- 15% --- 20% +		
Evidence of Ponding	Yes or No		
% of Area Ponding	0% --- 5% --- 10% --- 15% --- 20% +		
Approximate Depth of Ponding	_____		

% of Bare/Exposed Soil	0% --- 5% --- 10% --- 15% --- 20% +		
% of Sediment Accumulation	0% --- 5% --- 10% --- 15% --- 20% +		
% of Erosion	0% --- 5% --- 10% --- 15% --- 20% +		
<b>Permeable Pavement:</b>			
% of Trash/Debris Present	0% --- 5% --- 10% --- 15% --- 20% +		
% of Sediment Accumulation	0% --- 5% --- 10% --- 15% --- 20% +		
Structural damage?	Yes or No		
Area of broken/cracked/heaving pavers or curbs?	0% --- 5% --- 10% --- 15% --- 20% +		
Evidence of Clogging	Yes or No		
<b>Outlet:</b>			
% of Trash/Debris Present	0% --- 5% --- 10% --- 15% --- 20% +		
% of Erosion	0% --- 5% --- 10% --- 15% --- 20% +		
% of Sediment Accumulation	0% --- 5% --- 10% --- 15% --- 20% +		
Structural damage?	Yes or No		
Is outlet clear and able to accept overflow?	Yes or No		
<b>Non-LID Feature:</b>			
Sign on Site	Yes or No		
Damage to Sign	Yes or No		
<b>Vegetation (changes seasonally):</b>			
% Vegetation Cover	0% --- 5% --- 10% --- 15% --- 20% +		
% Dead Vegetation	0% --- 5% --- 10% --- 15% --- 20% +		
% of <u>Invasives/Weeds</u>	0% --- 5% --- 10% --- 15% --- 20% +		



# LID Maintenance

Information about the structure of the LID feature is collected during the completion of the LID Site Inspection Checklist. This is to ensure:

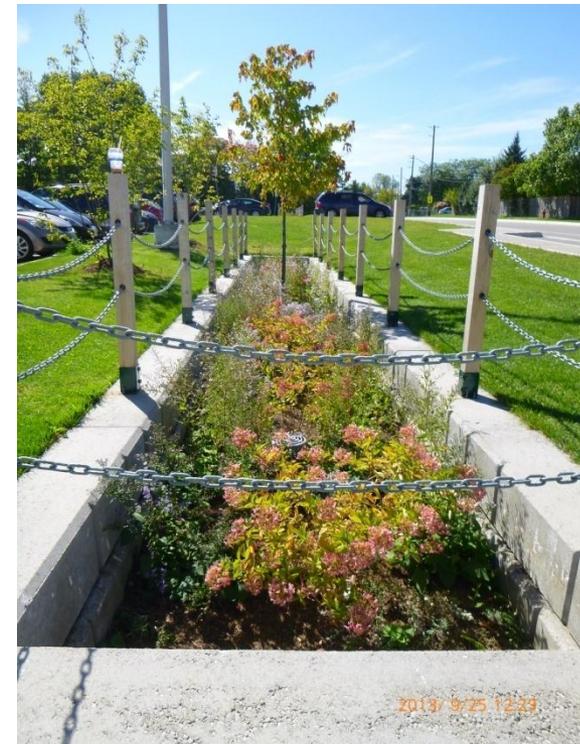
- Proper functionality of the feature
- Inlets are clear and able to accept incoming flow
- Garbage and debris aren't interfering with performance
- Plants look both visually pleasing and are helping the feature to absorb water and pollutants
- If any maintenance is require it is recorded and photographed to allow staff to prepare accordingly to address the issue





# Maintenance Inspection Monitoring

**Aesthetics are just as important as structural issues as the public wants to see an attractive feature. This is why it is important to both inspect structural features to ensure functionality as well as visual feature to ensure an attractive site is well maintained.**



# Importance of qualitative observations:

(inspections, notes, photos)



# CVC LID Performance and Risk Assessment Guide

- In 2014 CVC will be producing a Performance and Risk Assessment Guide
- Give information on specific protocols and methodologies for LID monitoring including:
  - Site Design & monitoring plans
  - Monitoring Equipment
  - Monitoring Data Management
  - Data Analysis
  - Lessons Learned