Attachment E– SWM Working Group Presentations

Former CFB Rockcliffe Redevelopment

LID Demonstration Project

Nov 7, 2014

Agenda

- **Introduction** – Darlene Conway, City of Ottawa
- **Overview of CFB Rockcliffe** – Don Schultz, CLC
- **Background to LID Demonstration** – Darlene Conway, City of Ottawa
- **LID Demonstration/ Pilot Project Former CFB Rockcliffe** - Chris Denich, Aquafor Beech
  - Purpose of the LID Pilot / Demonstration Project
  - Working Group Process and where we are now
  - Introduction to Low Impact Development (LID) - benefits and effectiveness
  - Location & Phasing - LID Pilot / Demonstration Project
  - Phase 1A – Site Characteristics
  - Suitability of LIDs for Phase 1A (selection process)
  - Proposed LIDs for Phase 1A and examples
  - Scaled Construction of Conventional SWM Infrastructure
  - Work Plan and Next Steps
- **Next SWM Working Group Meeting** – Darlene Conway, City of Ottawa

Introduction

- Darlene Conway, P. Eng.
  Senior Project Manager
  - City of Ottawa
  - Planning and Infrastructure

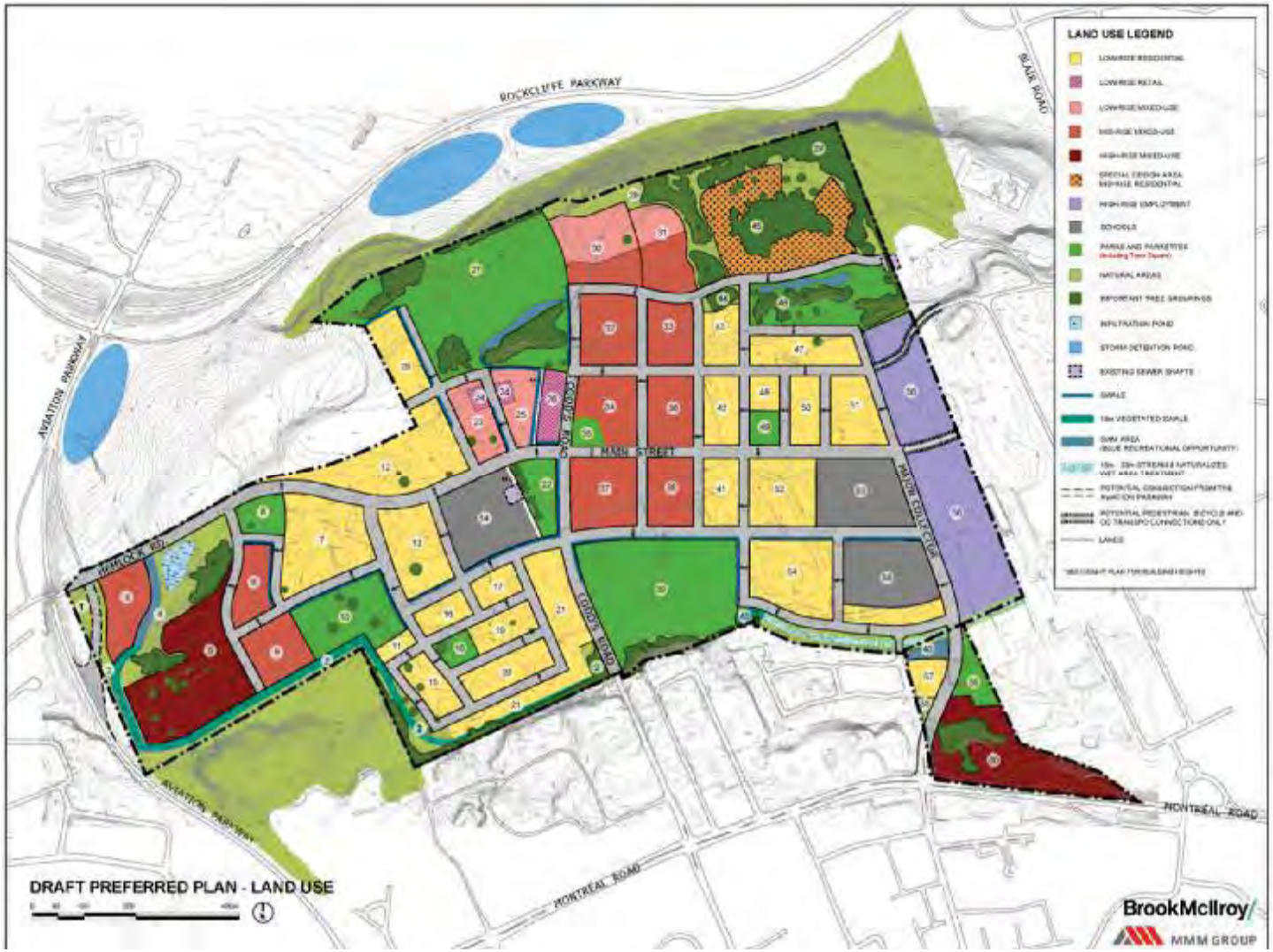
Overview of CFB Rockcliffe

- Don Schultz

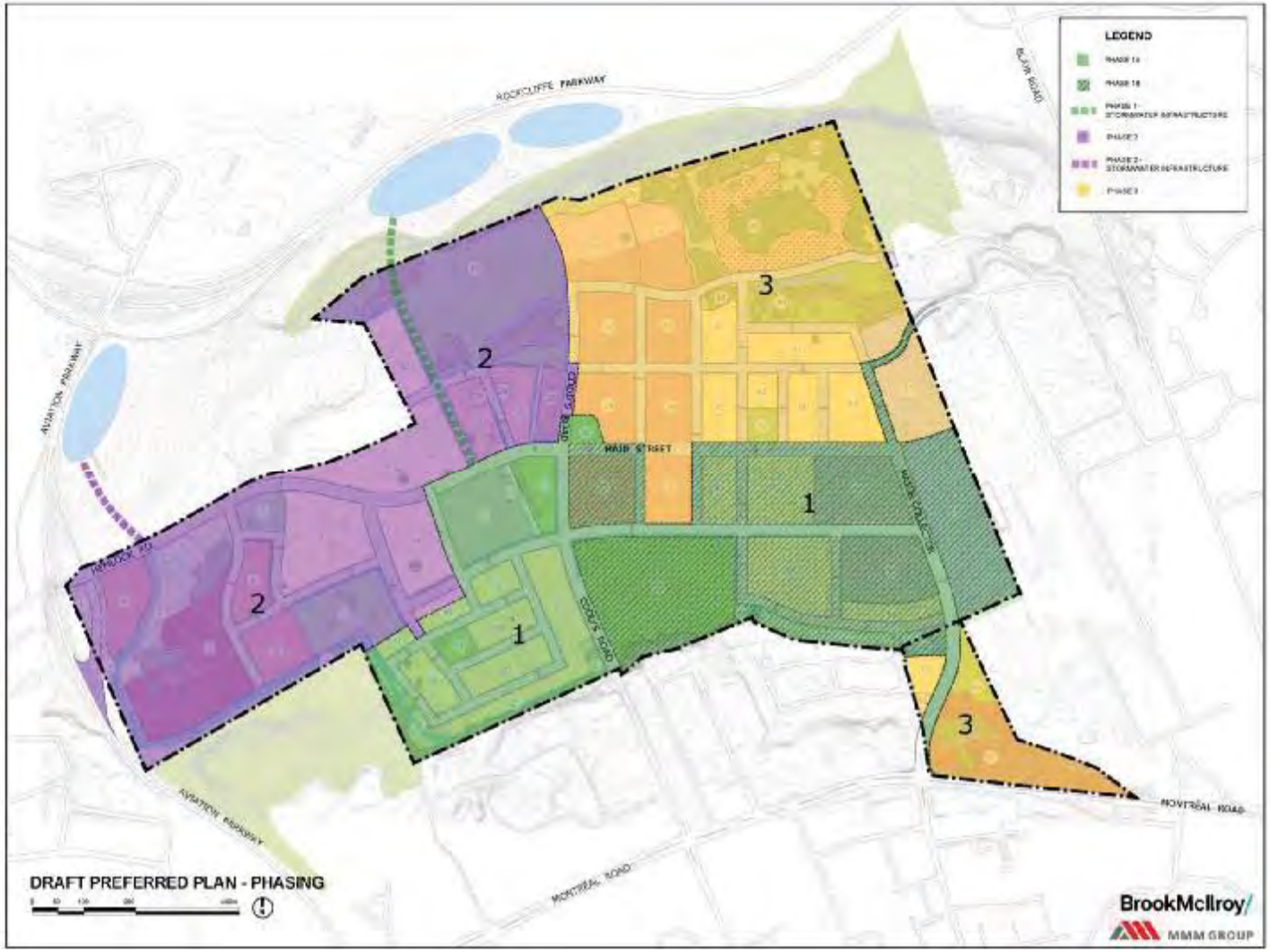
  Director, Real Estate,
  Rockcliffe Canada Lands
  Company

CANADA LANDS COMPANY
SOCIÉTÉ IMMOBILIÈRE DU CANADA

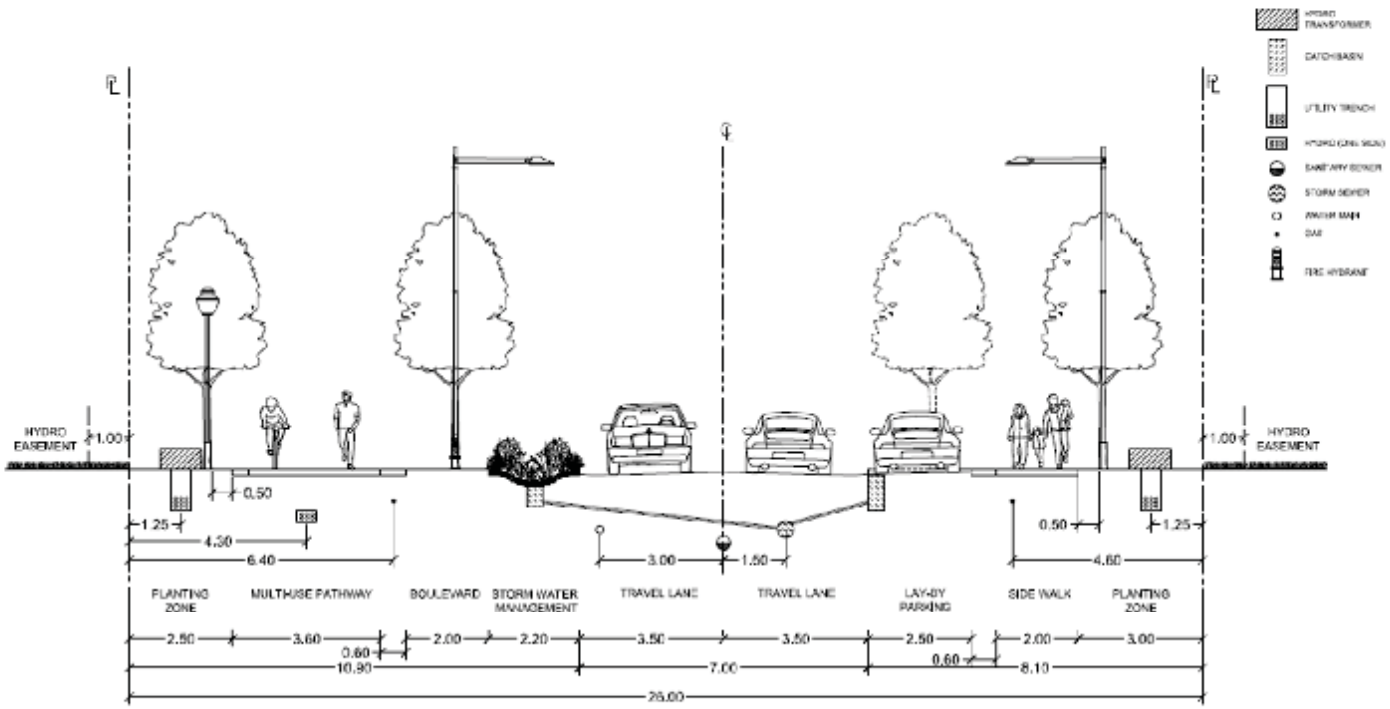
Overview of CFB Rockcliffe



Overview of CFB Rockcliffe



Overview of CFB Rockcliffe

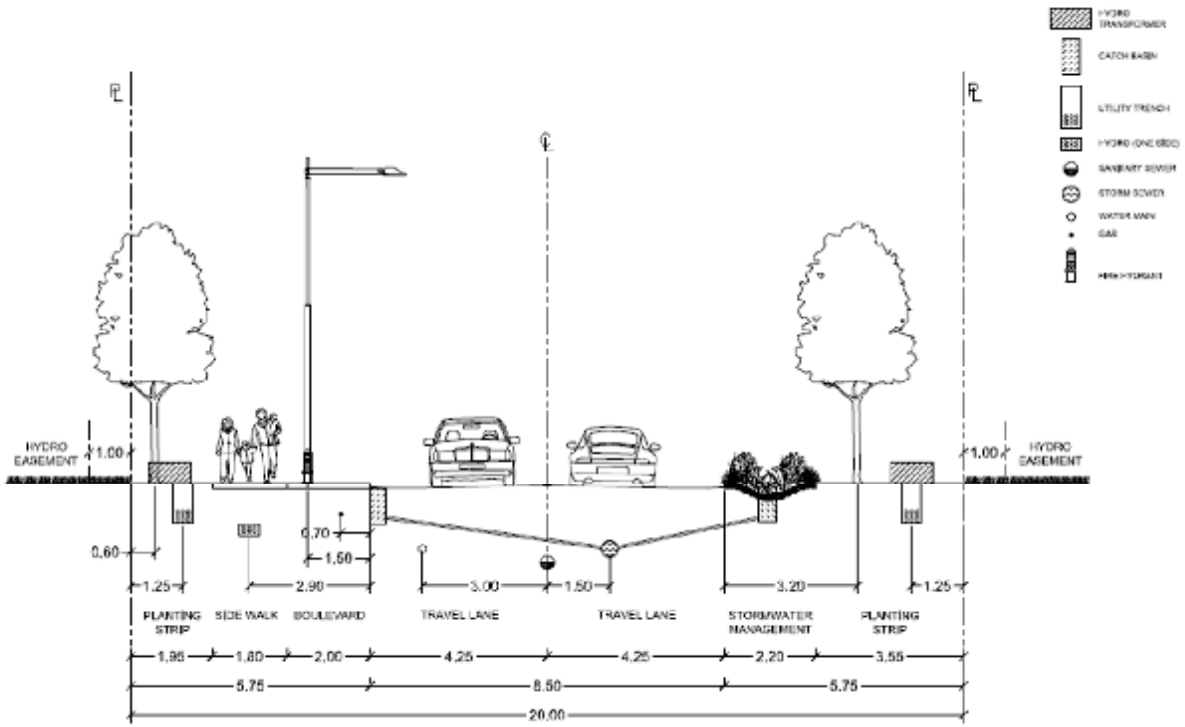


SECTION 1B - 26m ROW

NOTES
1. THE INSTALLATION OF PEDESTRIAN LIGHTING SHALL CONFORM TO THE DESIGNATED AREA IN FIGURE 5.7 AND THE RELEVANT CDP POLICY
2. WITH THE EXCEPTION OF BURIED UTILITIES AND FIRE HYDRANTS, THE MIRROR IMAGE OF THIS SECTION WILL APPLY WHEN SWALES AND MULTI-USE PATHWAYS ARE ON THE OTHER SIDE OF THE STREET. REFER TO LAND USE PLAN FOR SPECIFIC LOCATIONS.

0 1 2 5m

Overview of CFB Rockcliffe



3B - 20 M LOCAL ROAD WITH SWALE

NOTES:
1. WITH THE EXCEPTION OF BURIED UTILITIES AND FIRE HYDRANTS, THE MIRROR IMAGE OF THIS SECTION WILL APPLY WHEN SWALES AND MULTI-USE PATHWAYS ARE ON THE OTHER SIDE OF THE STREET. REFER TO LAND USE PLAN FOR SPECIFIC LOCATIONS.

0 1 2 5m

Background to LID Demonstration

- Darlene Conway, P. Eng.
  Senior Project Manager
  City of Ottawa
  Planning and Infrastructure

LID Demonstration/ Pilot Project Former CFB Rockcliffe

Chris Denich, M.Sc., P.Eng
Manager of SWM/ LID Specialist
Aquafor Beech Ltd

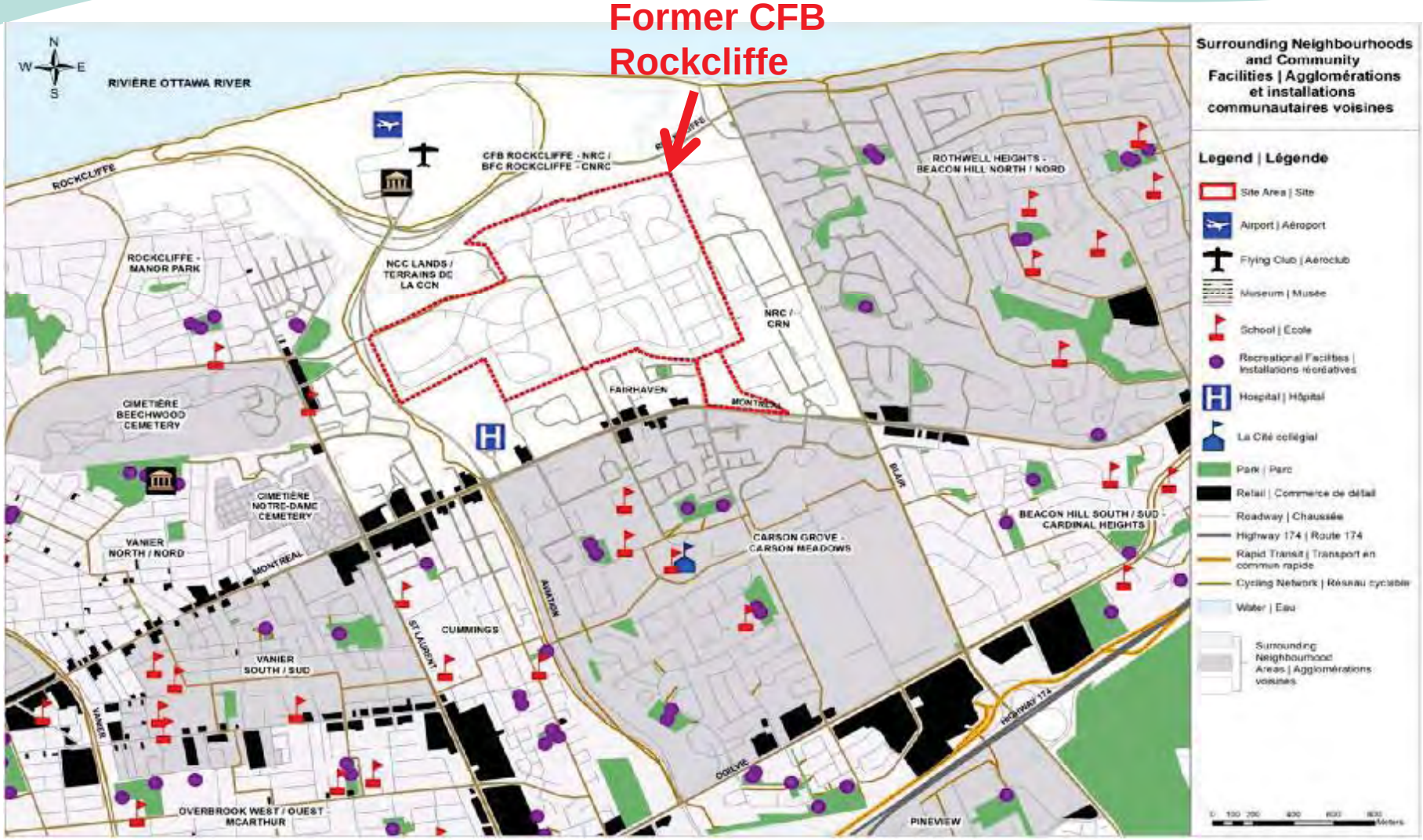
Aquafor Beech Ltd.

CMHC National Cold Climate LID Monitoring

Prime Authors of:

- MOE 2003 Manual
- LID Planning & Design Guide (CVC/ TRCA 2010)
- ASCE N. American Permeable Pavement Committee
- Currently developing 5 LID Retrofit guides for the MOE
- National LID Cold Climate Research
- Over 50 LID projects planned, designed and or constructed
  - Ontario's 1st Green Street – Lakeview
  - IMAX LID Parking Lot
  - Bioretention for Species at Risk
  - Peer review of LID Subdivisions across Canada

General Location Plan



Purpose of the LID Demonstration Project

- For the City to partner with CLC to develop the Rockcliffe lands using innovative SWM techniques collectively known as Low Impact Development (LID) to achieve:
  - Water balance (infiltration of rainwater)
  - Improved water quality
  - Reduced erosion potential
  - Reduction in flood risks
  - Improved environmental and habitat protection
    - (terrestrial and aquatic)

Purpose of the LID Demonstration Project

- Opportunity to understand and evaluate LID techniques
- A phased approach: Performance of each phase of LIDs will be evaluated through performance monitoring and the resulting SWM benefits quantified
- Pilot/ Demonstration Projects offer many benefits to the City….

Municipal Perspective

PLANNING

- Applying Development Policies and Standards
- Most don't specifically include LID
- Can have a disconnect with emerging policy

ENGINEERING

- Applying Municipal Engineering standards
- Lack of LID specifications and standards
- Building Capacity
- Potential to consider LID as "new" or "risky"

Municipal Perspective

PLANNING

- Applying Development Policies and Standards
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- Can have a disconnect with emerging policy

Pilot Projects

ENGINEERING

- Applying Municipal Engineering standards
- Lack of LID specifications and standards
- Building Capacity
- Potential to consider LID as "new" or "risky"

Municipal Perspective

- Pilot Projects:
  - Flexibility to consider new approaches not covered by municipal standards;
  - Does not set a precedent;
  - Municipality have greater control the process & schedule;
  - Lower risk environment;
  - Allow for capacity building;
  - Familiarization with materials, construction techniques, specifications, and contractor ability;
  - Indentify internal barriers and overcome (streamlined process);
  - Allows for inter-municipal consultation <u>ACROSS</u> departments; and
  - Results can be spread across municipal departments.

Pilot Project Examples

Retrofits

- Lakeview Green Street, Mississauga
- Beach Boulevard, Hamilton
- Green Glades, Mississauga
- IMAX Parking Lot Retrofit, Mississauga
- King Street, Kitchener
- Lakeside Park, Streetsville
- Hogg's Hollow, Toronto

New Developments

- Meadows in the Glen, Halton Hills
- Wychwood, Brampton, ON
- Airport Employment Growth District, Hamilton
- Numerous Commercial, Institutional & Industrial Examples

Pilot Project – Retrofits

- Lakeview Green Street, Mississauga
- Beach Boulevard, Hamilton
- Green Glades, Mississauga
- IMAX Parking Lot Retrofit, Mississauga

Lakeview (Municipal ROW)

- Bioswales & Permeable Pavement

Pilot Project – Retrofits

- Lakeview Green Street, Mississauga
- Beach Boulevard, Hamilton
- Green Glades, Mississauga
- IMAX Parking Lot Retrofit, Mississauga

Beach Blvd (Park Land)

Pilot Project – Retrofits

- Lakeview Green Street, Mississauga
- Beach Boulevard, Hamilton
- Green Glades, Mississauga
- IMAX Parking Lot Retrofit, Mississauga

Green Glades (Public Lands)

Pilot Project – Retrofits

- Lakeview Green Street, Mississauga
- Beach Boulevard, Hamilton
- Green Glades, Mississauga
- IMAX Parking Lot Retrofit, Mississauga

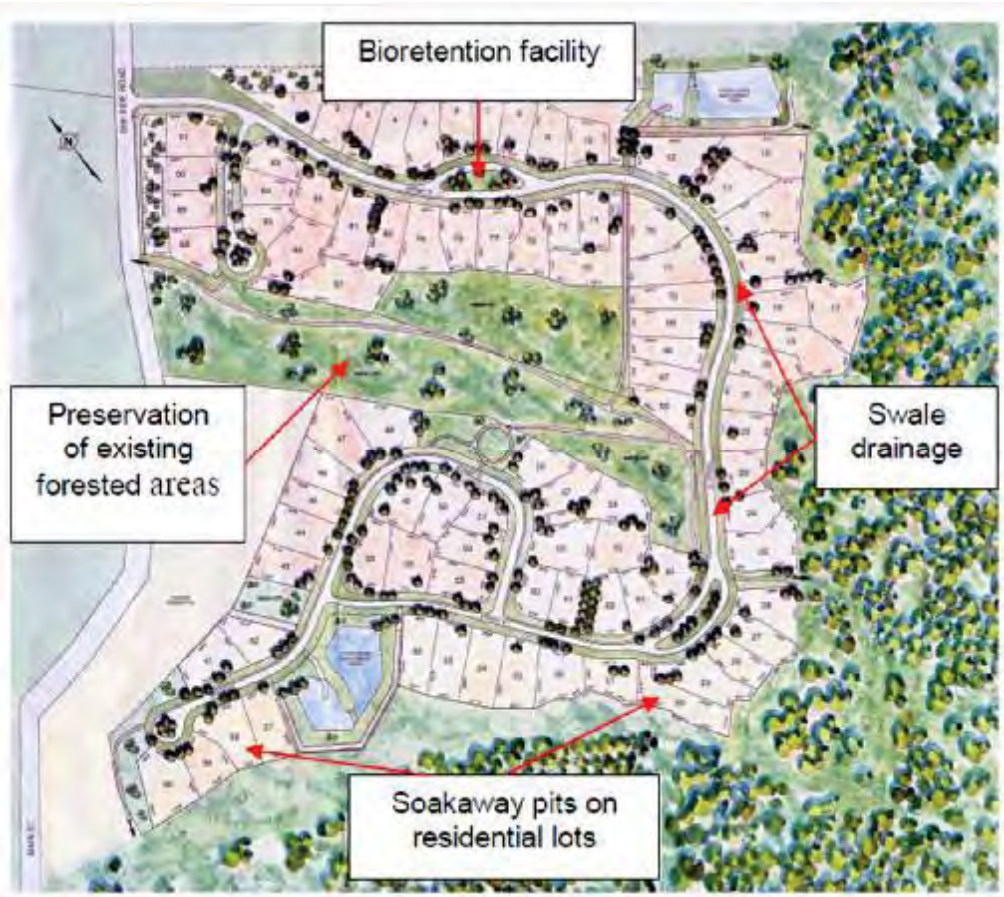
IMAX (Commercial/ Institutional)

- Innovative combinations using Bioswales, Sorptive units, Jellyfish, Permeable Pavements

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.

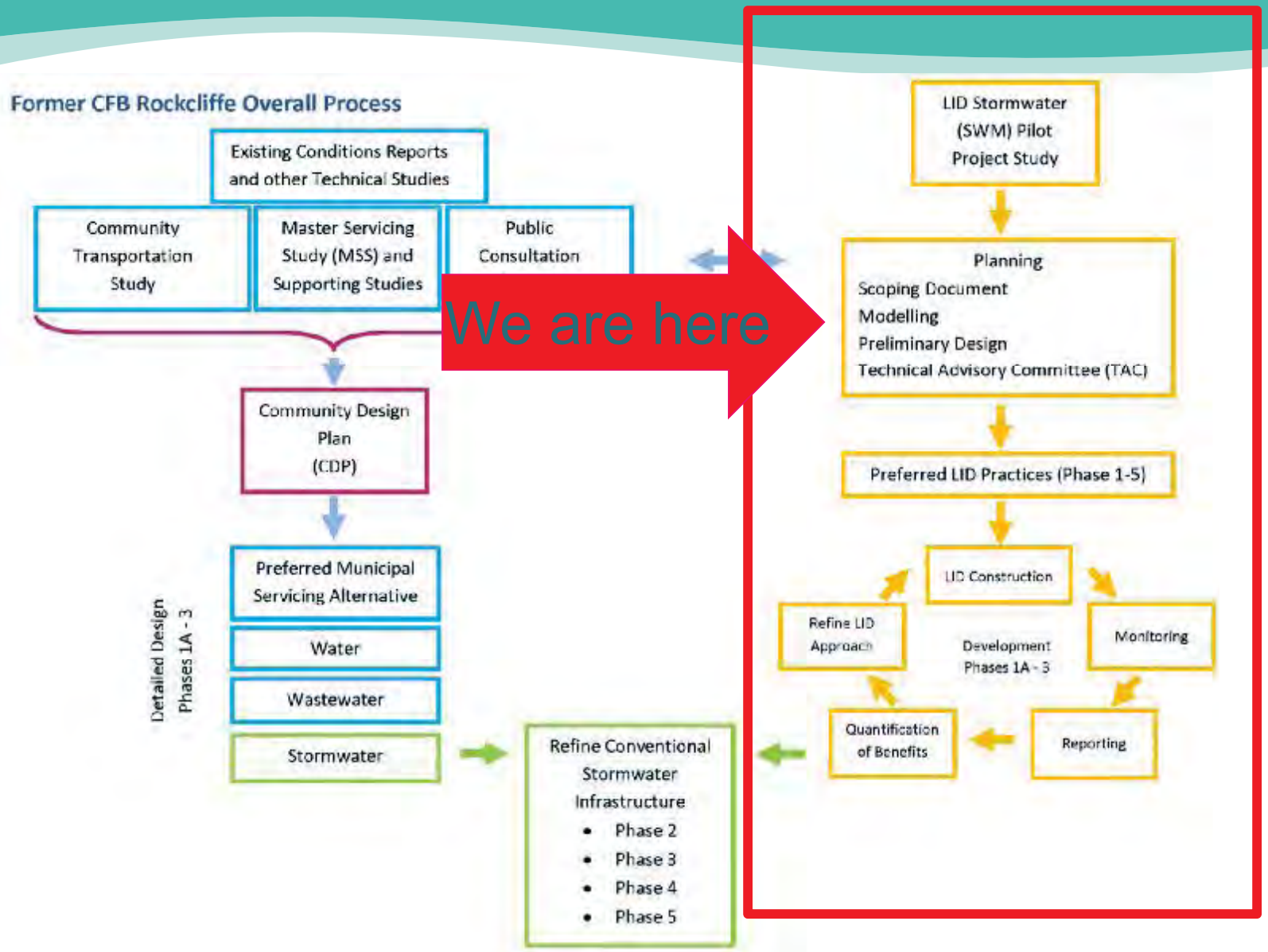
- It uses many LID practices for innovative stormwater management such as:
  - swale drainage,
  - bioretention cells,
  - soakaway pits,
  - rain gardens
  - permeable pavement driveways,
  - includes two SWM ponds



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.

Overall Process



Working Group Process

- A SWM Working Group has been formed, consisting of key members of the City of Ottawa, consultants engaged by the City of Ottawa, Canada Lands Company staff, and consultants engaged by Canada Lands Company.

Goal – Consultation process

- to provide a conduit into various City departments, whereby the LID Demonstration Project can be reviewed, discussed and comments provided in order to facilitate implementation

Working Group Process

Work Plan

3 Steps

- Step 1 – LID Demonstration Project Scoping
  - Consultation on Proposed LID Techniques, Selection Process and Proposed Phasing (Today)
- Step 2 – Modelling & Draft Preliminary Design
- Step 3 – Preliminary Designs Phase 1

Current work plan is up to the CDP and to inform the MSS

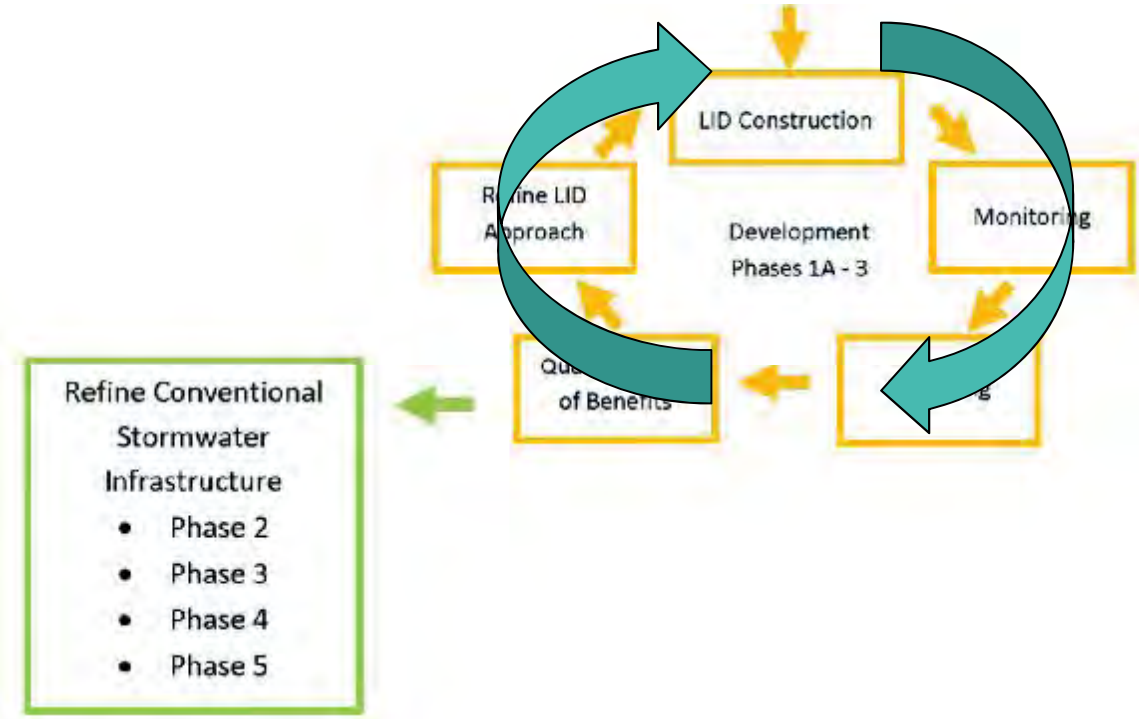
Additional steps beyond the CDP Approval – for Detailed design/ implementation

Working Group Process

- Consultation and comment at each step
- Key Tasks:
  - Selection of LIDs
  - Agreement on LID targets
  - Input on design details & O&M
  - Monitoring framework (parameters and reporting)
  - Assumption protocols
  - Continued input into the Adaptive Management Process

Working Group Process

Adaptive Management Process

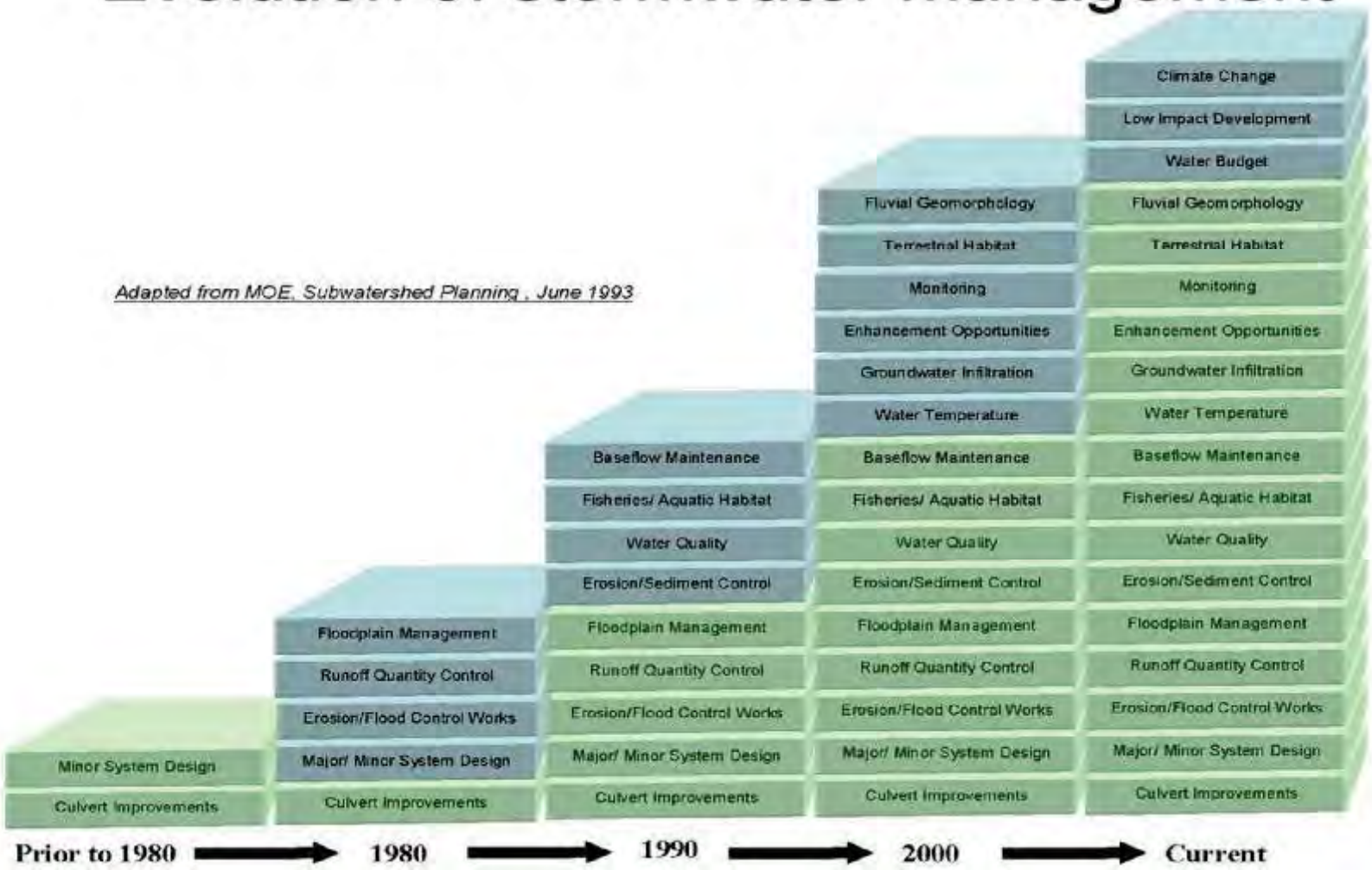


QUESTIONS ?

Break – 10min

Introduction to Low Impact Development (LID)

Evolution of stormwater management



What is next & where do we go from here?

STORMWATER

- Treatment Train - MOE 2003
  - Describes the combination of BMP controls applied in succession along the stormwater flow path, usually required in an overall stormwater management strategy to ensure that:
    - groundwater and baseflow characteristics are preserved;
    - water quality is protected;
    - the watercourse will not undergo undesirable geomorphic change;
    - no increase in flooding damage and potential;
    - an appropriate diversity of aquatic life and opportunities for human uses will be maintained.

Low Impact Development (LID)

- LID measures employ one or more of five processes to control runoff rates, volumes and/or improve water quality and erosion.
  1. Infiltration – water is infiltrated thereby recharging groundwater
  2. Filtration – water is filtered prior to discharge to improve water quality
  3. Evaporation/Transpiration – returned to the atmosphere
  4. Re-Use – used for beneficial secondary purposes
  5. Detention – to reduce peak flows and increase lag times

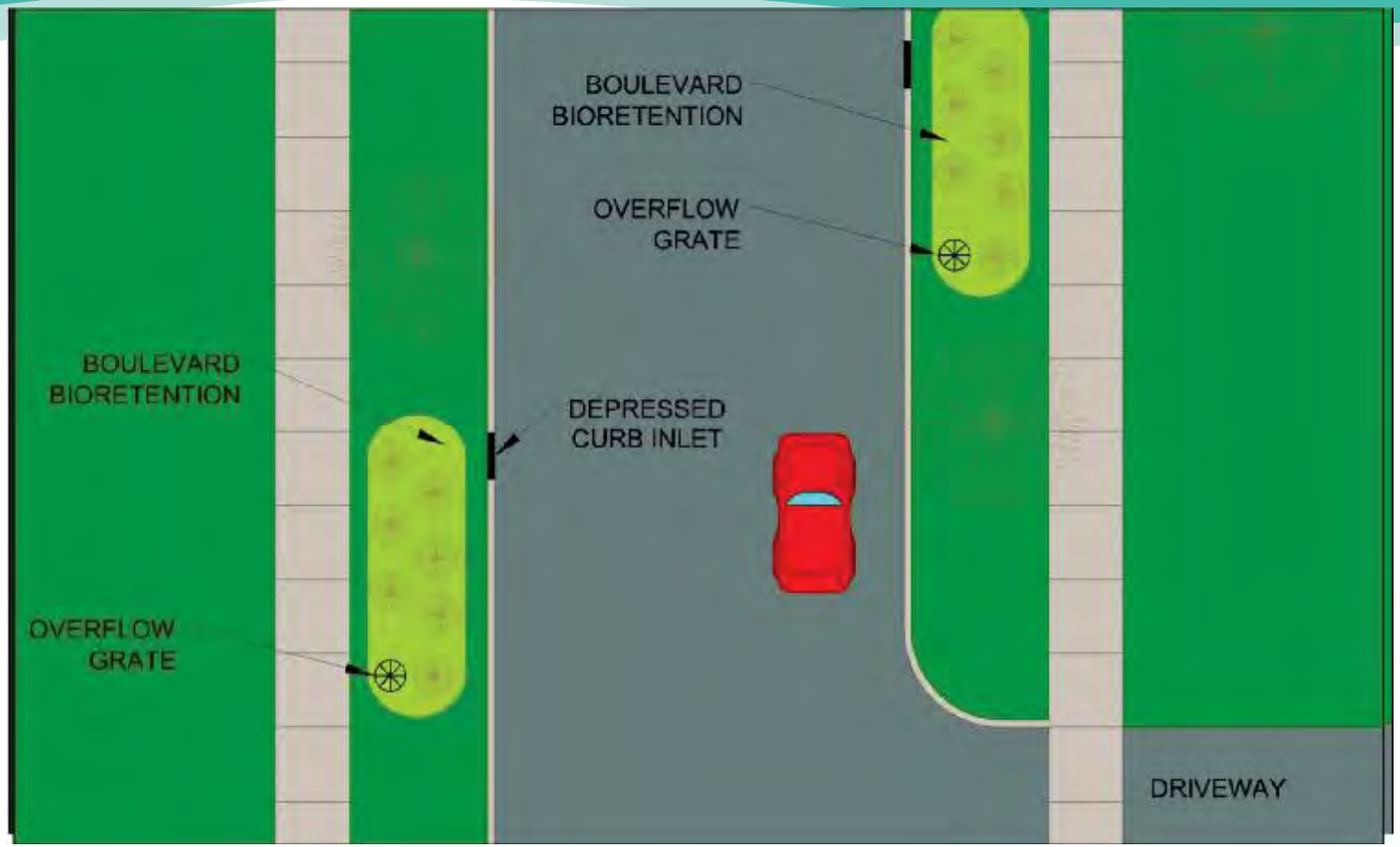
PRINCIPLES OF LID

- Rainwater is a resource
- Treat stormwater as close to the source area as possible
- Utilize and preserve existing natural systems
- Focus on runoff prevention
- Create multifunctional landscapes
- Educate and maintain

LOT-LEVEL CONTROLS

CONVEYANCE CONTROLS

CONVEYANCE CONTROLS



EOP Controls

addressing SWM
ties such as wet
of the

WHY IMPLEMENT LID

- Flooding
- Erosion

- Five 50yr storms, Three100 year storms, in the last 8 years in GTA
- Ottawa– Sept 9/04 (166mm) and July 24/09 (102mm)
- Insurance Bureau of Canada water damage is now the leading cause of property damage costing nearly $1.7

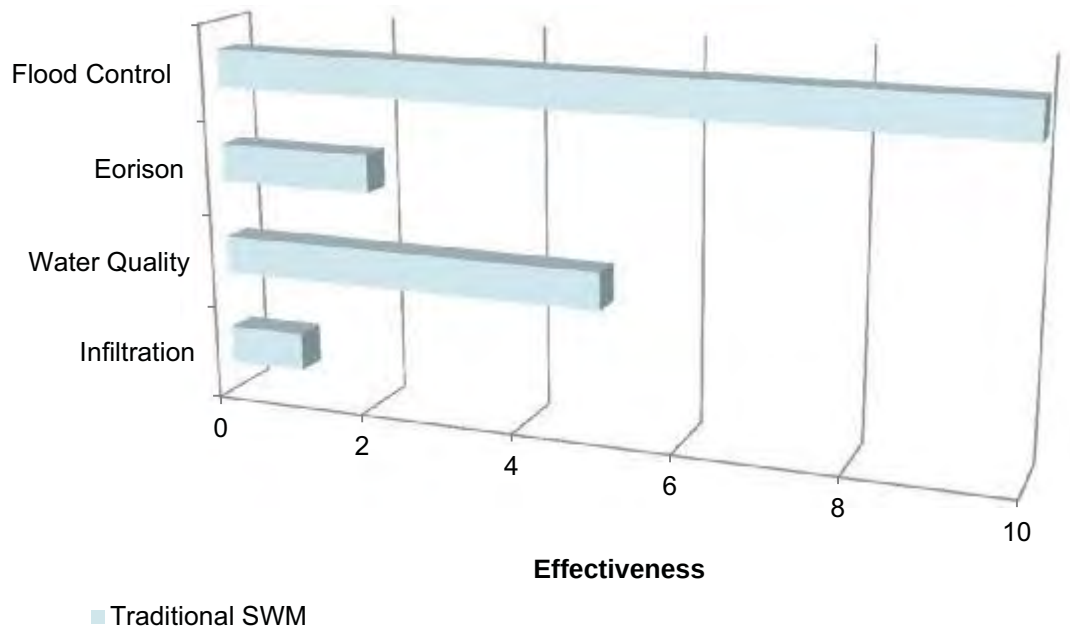
WHY IMPLEMENT LID

- Water Quality
- Water Balance
- Aquatics (baseflow and temperature)
- Recreation (swimming

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.

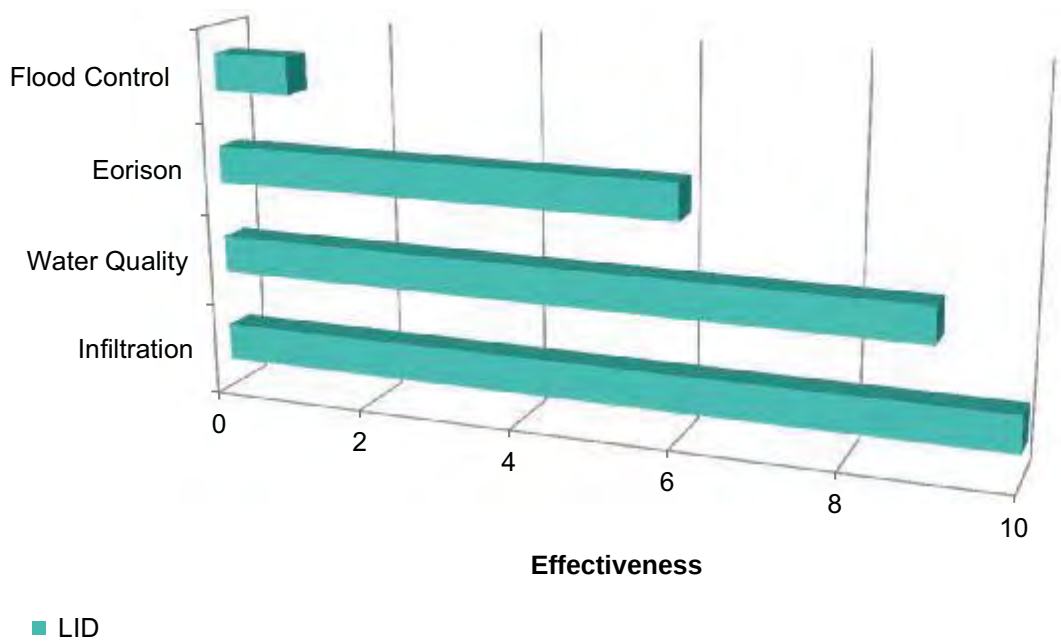
Traditional SWM Approach vs. Criteria



LID SWM Approach & Criteria

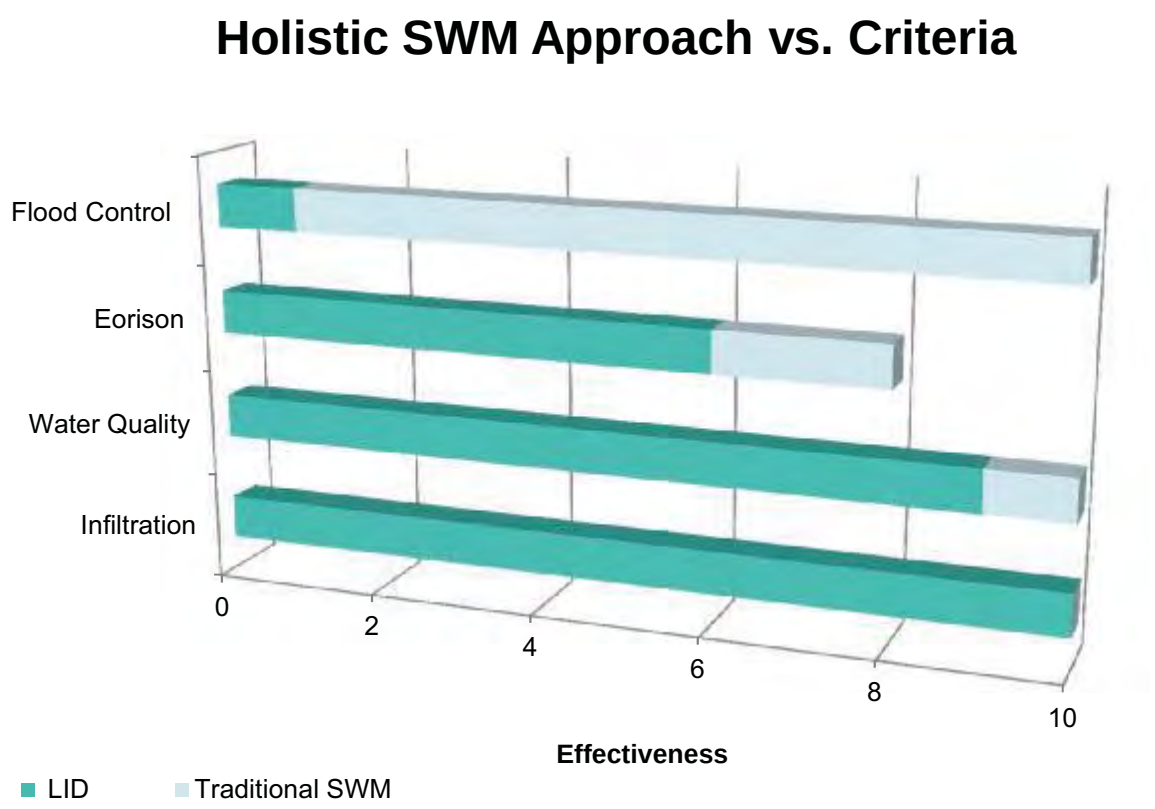
- LID techniques are highly capable of satisfying the majority of the 4 design criteria (water quality, erosion, and infiltration (water balance)

LID SWM Approach vs. Criteria



HOLISTIC APPROACH & CRITERIA

- When used together

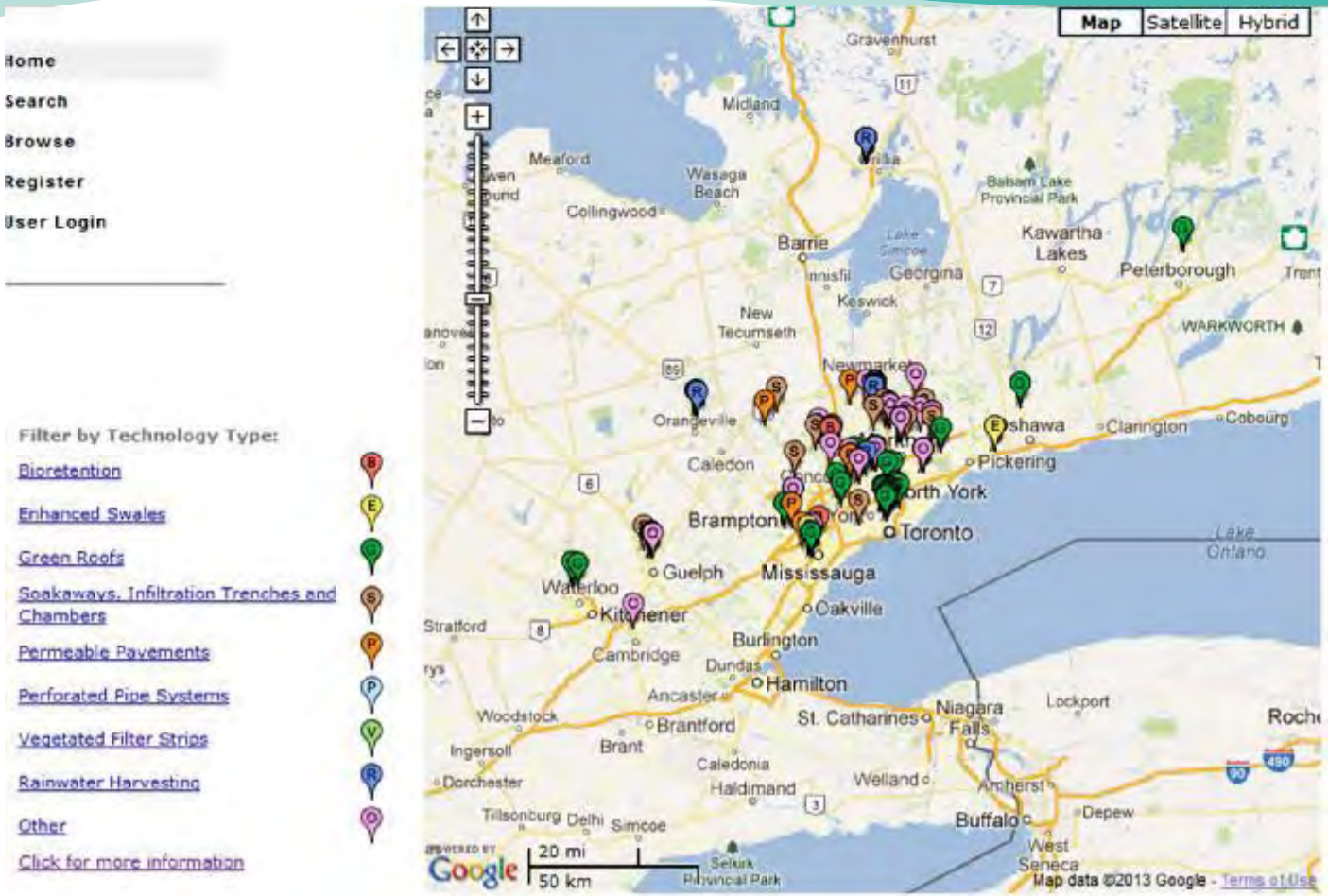


Current & Emerging Policies

- Wetland Protection
- Groundwater
- Source water protection

- Emerging
  - Temperature Mitigation
    - Species at risk
    - Sensitive fish species
  - Enhanced Water Quality
    - 25mg/L above baseline

WHERE ARE LIDS



http://www.iswm.ca/lid_map.php

LID in All Climates

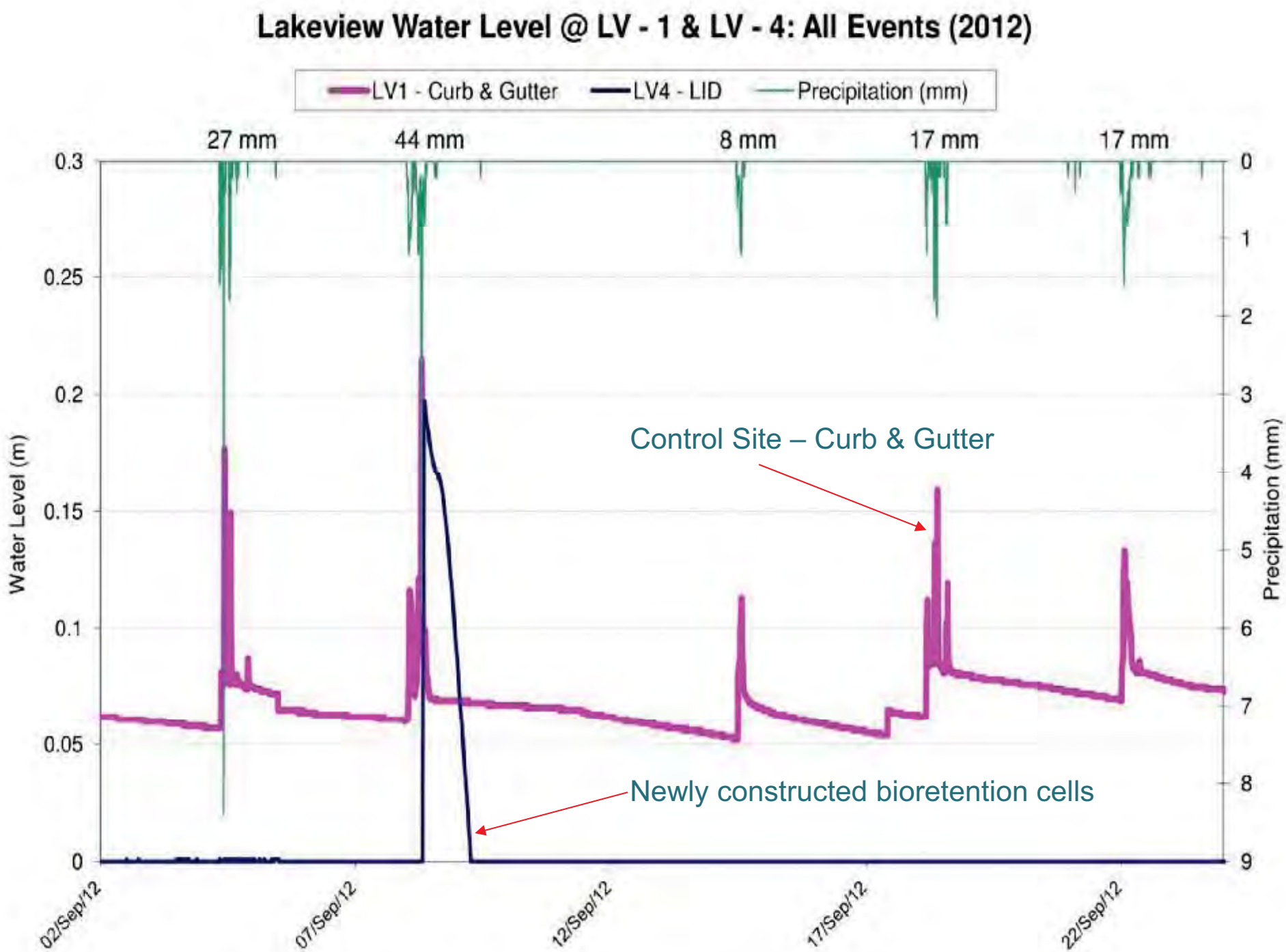
MOE and LID

- Revision to the MOE, 2003 guide is expected to begin in 2015 – will focus on LID
- MOE is issuing ECAs for LID in New Developments and Retrofits
- Aquafor has developing five (5) LID Manuals for the MOE:
  - How-To Guide: **Integrated SWM Master Plans**
  - Grey to Green: **Road Retrofits**: Optimizing Your Infrastructure Assets Thorough LID
  - Grey to Green: **Public Lands Retrofits**: Optimizing Parks, Public Buildings, Schools and Places of Worship Through LID
  - Grey to Green **Business & Multi-residential Retrofits**: Optimizing Your Bottom Line Through LID
  - Grey To Green: **Marketing LID Retrofits to Homeowners**

EFFECTIVENESS OF LID

- Lakeview District (Mississauga)
  - Residential ROW utilizing bioswales and permeable pavement

LAKEVIEW, MISSISSAUGA


Lakeview Water Level @ LV - 1 & LV - 4: All Events (2012)
LV1 - Curb & Gutter
LV4 - LID
Precipitation (mm)
27 mm
44 mm
8 mm
17 mm
17 mm
Water Level (m)
Precipitation (mm)
0.3
0.25
0.2
0.15
0.1
0.05
0
0
1
2
3
4
5
6
7
8
9
02/Sep/12
07/Sep/12
12/Sep/12
17/Sep/12
22/Sep/12
Control Site – Curb & Gutter
Newly constructed bioretention cells

LAKEVIEW, MISSISSAUGA

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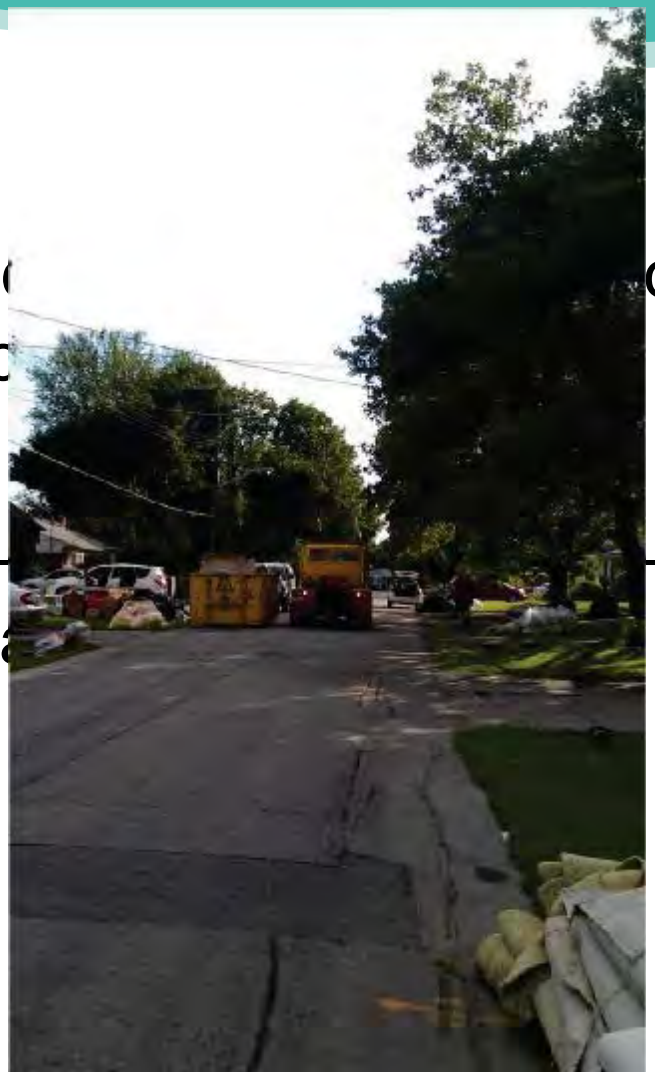
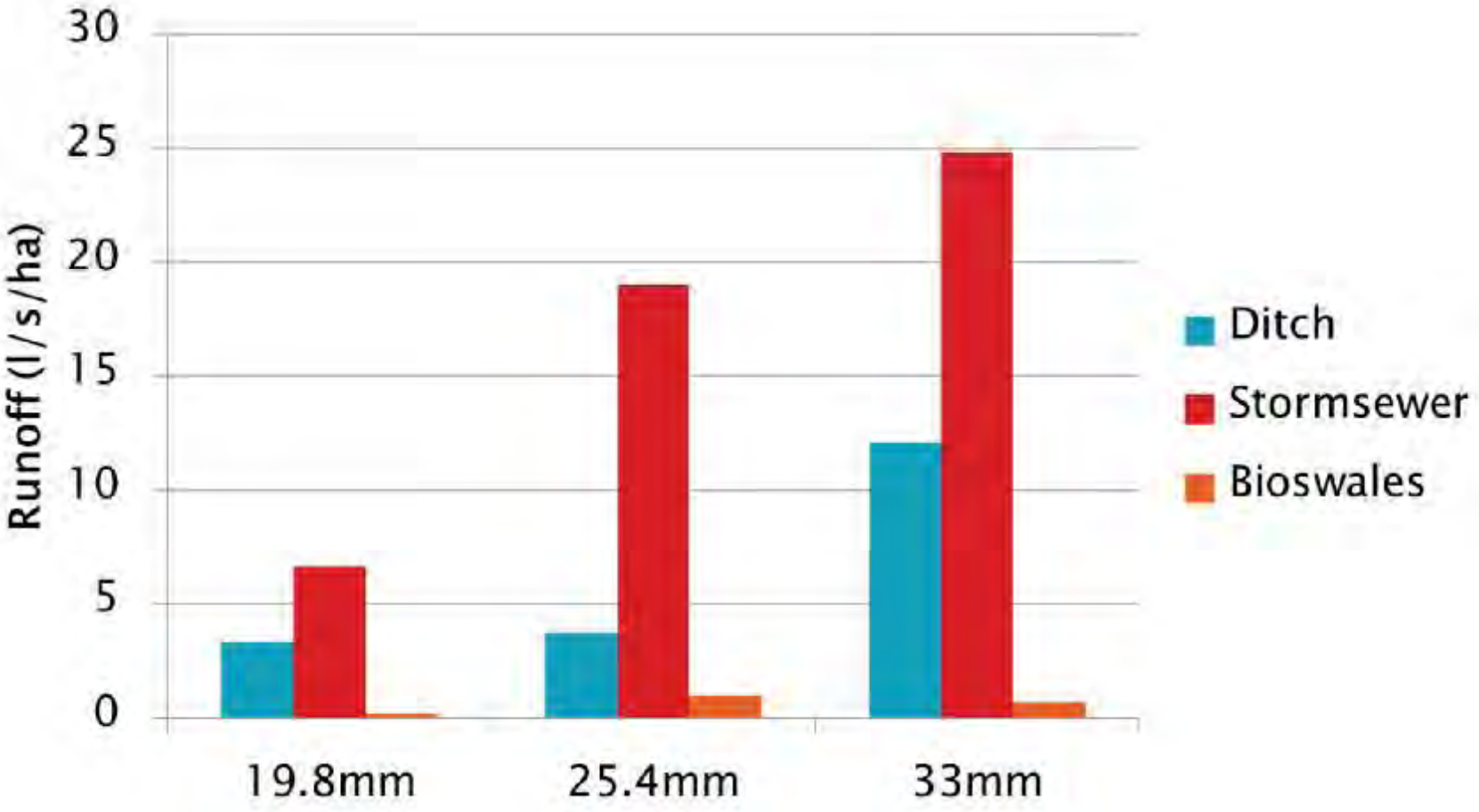
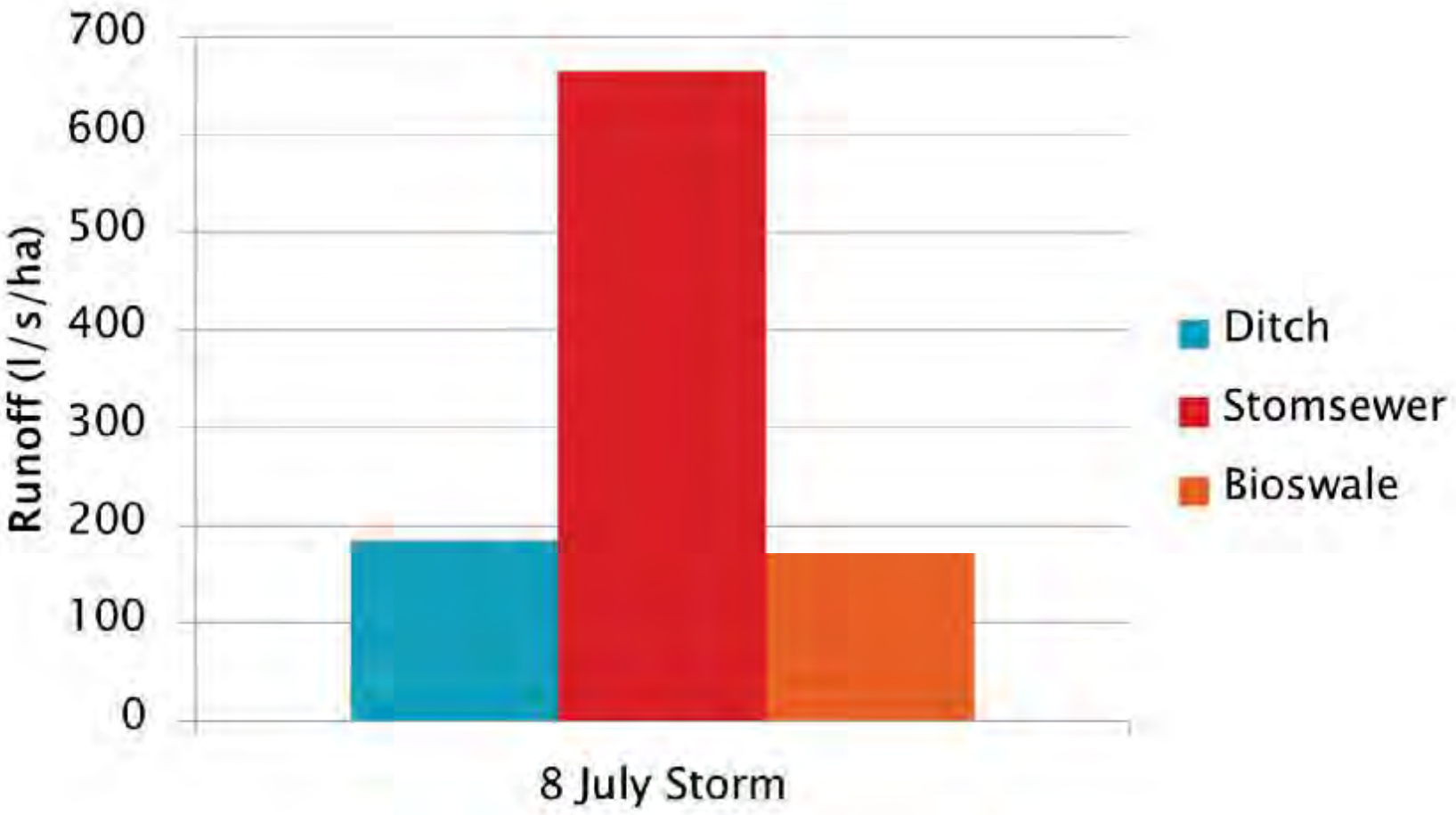


Event Response: 19-33mm



Event Response: 78mm



Removal (%)
LV1: Stormsewer, LV2: Ditch, 1st: Bioswale

Storm	10 April (10-hr storm 25.4 mm)			10 June (20 hr-storm, 33 mm)			8 July (2 hr-storm, 78 mm)			Influent (mg/l) (Residential Land use from Literature)
Road	LV2	LV1	1st	LV2	LV1	1st	LV2	LV1	1st	
Total Phosphorus	No removal	26.0	42.0	44.0	4.0	30.0	28.0	20.0	No removal	0.50
Total Suspended Solids	1.1	41.4	96.3	68.9	78.4	91.6	68.9	37.7	78.0	273
Copper (Cu)	No removal	No removal	No removal	6.7	6.7	No removal	13.3	No removal	No removal	0.015
Zinc (Zn)	No removal	No removal	86.0	42.0	35.0	84.0	45.0	No removal	74.0	0.10

King Street, Kitchener, ON

King Street, Kitchener, ON

- Water quality monitoring not possible;
- Flow monitoring is ongoing
  - Ultrasonic device and weir installed Nov, 2012

<u>Flow Monitoring</u>

Off-line condition (gates closed)

- November 18, 2012 to June 9, 2013

On-line condition – May 2013

- June 10, 2013 to November 12, 2013

Results normalized/mm rainfall

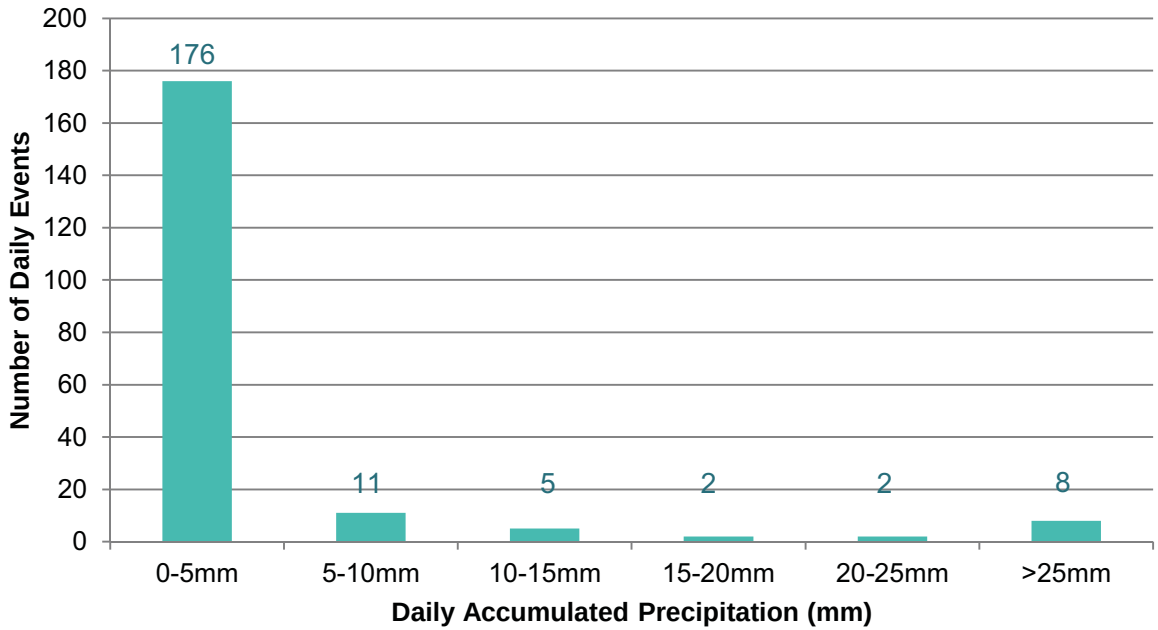
King Street, Kitchener, ON

Flow Conditions	Total Rainfall (mm)	Peak Outflow L/s/mm	Avg. L/s/mm
Offline	12.954	0.88	0.31
	9.398	0.03	
	5.08	0.04	
Online	17.53	0.03	0.03
	5.08	0.04	
	15.748	0.05	
	8.128	0.01	
	24.384	0.02	

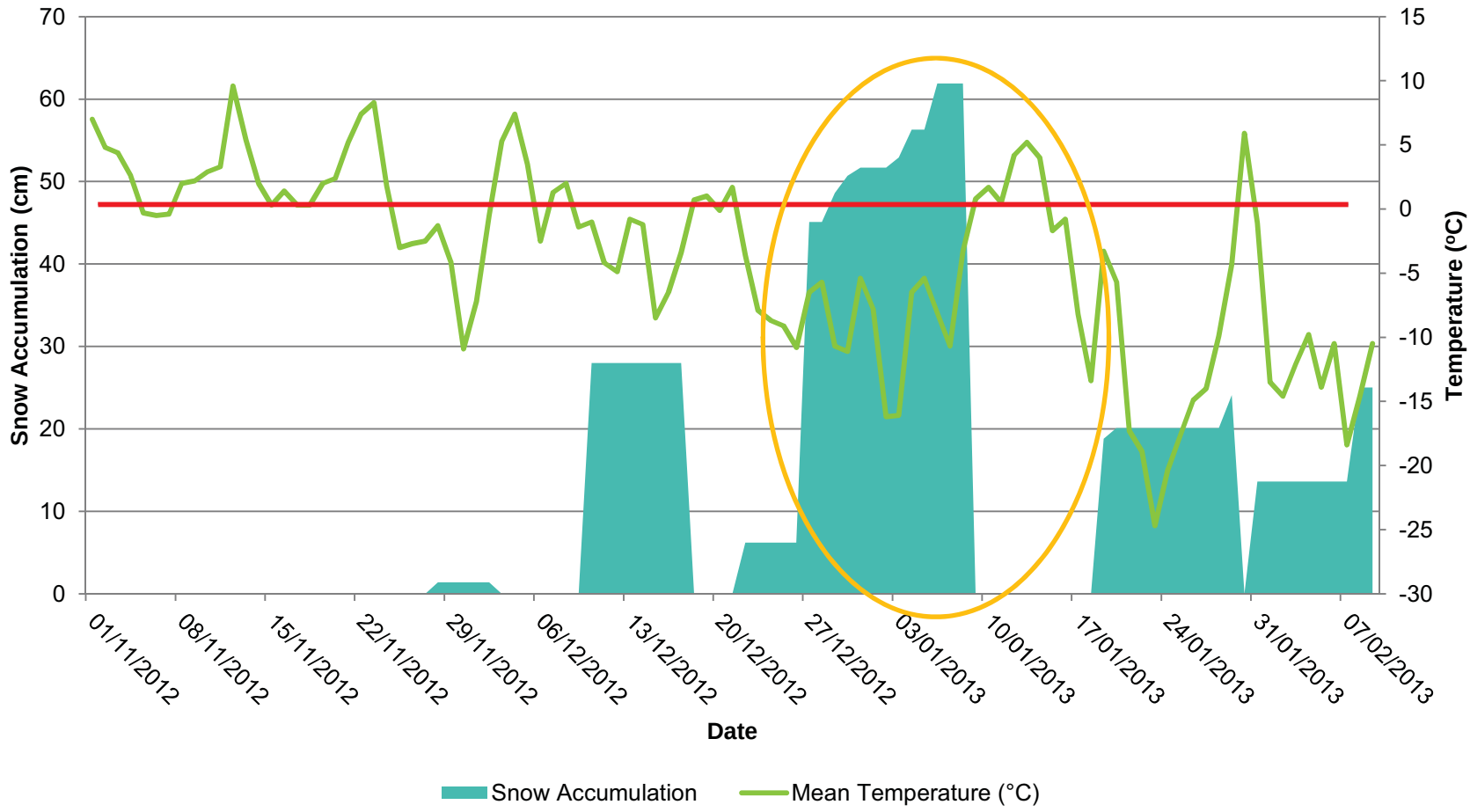
HABITATION JEANNE-MANCE, MONTREAL QC

Habitation Jeanne-Mance, Montreal QC

- Flow monitoring completed
  - Pressure transducer and weir installed July, 2012 – Feb 2013
  - 204 events – Maximum event 38.9mm
  - **No outflows for all 204 events**

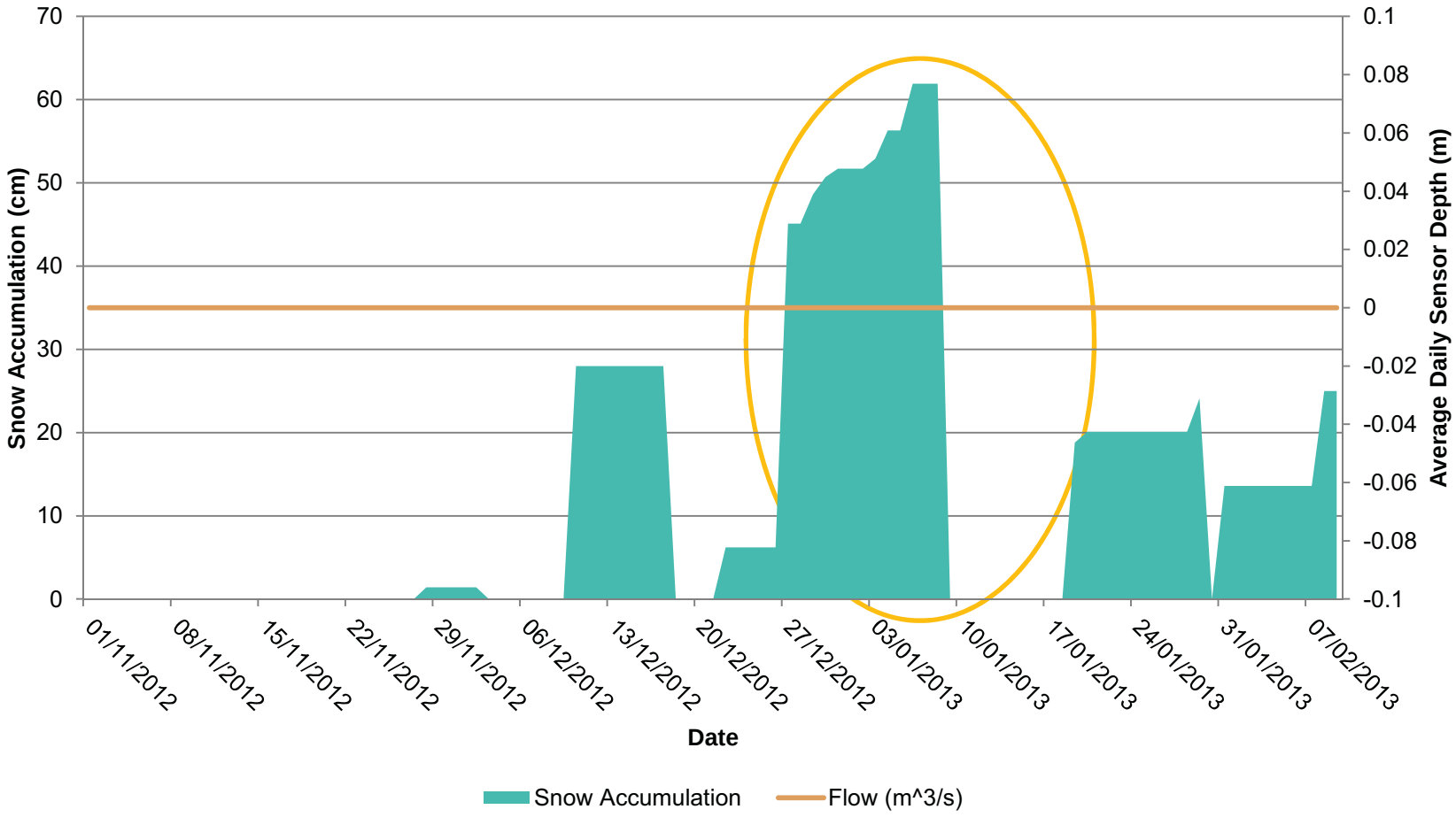


Habitation Jeanne-Mance, Montreal QC



CINÉMA

Habitation Jeanne-Mance, Montreal QC



WQ Example: Upper Middle Road

- Bioretention Unit
- New Development
- Oakville, Ontario
- Constructed in 2011
- Facility- 1,600m^2
- Accepts 4ha road drainage
- 25mm event

Designed to provide enhanced water quality for SAR habitat

Turbidity – 1 hour after event

14 Mile Creek - receiver (high turbidity)

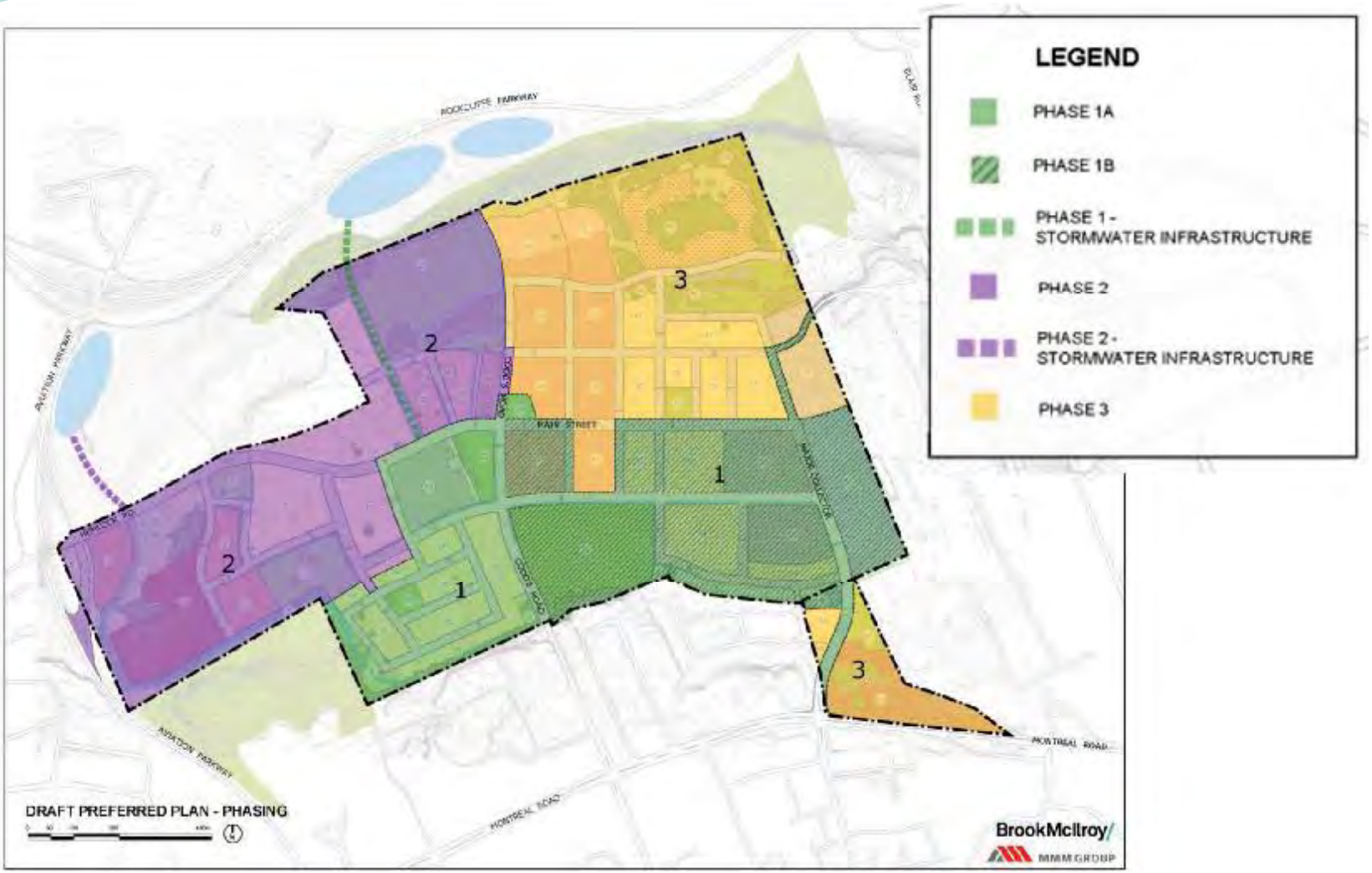
Bioretention outflow (low turbidity)

QUESTIONS ?

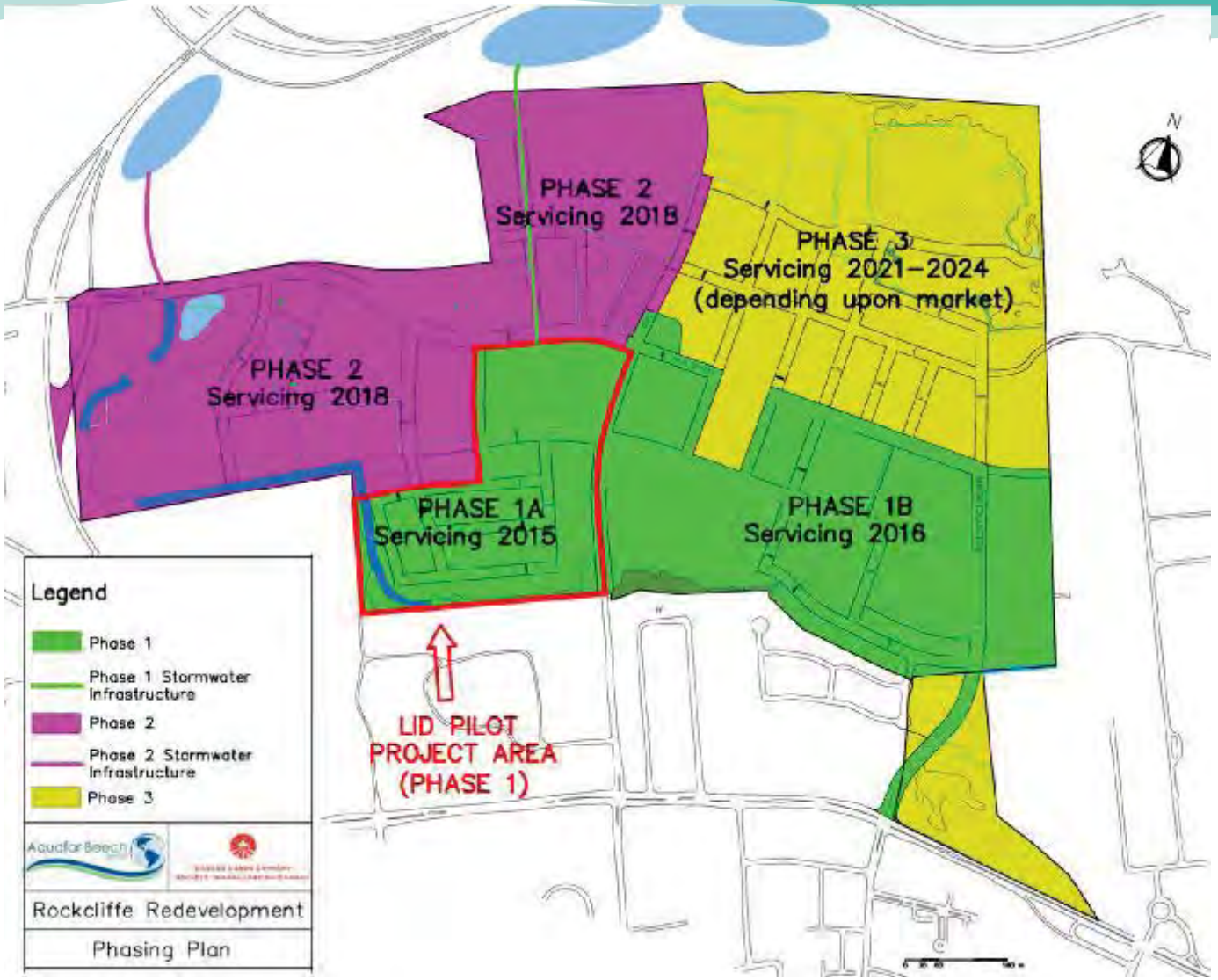
Break – 10min

LID Demonstration/ Pilot Project Former CFB Rockcliffe

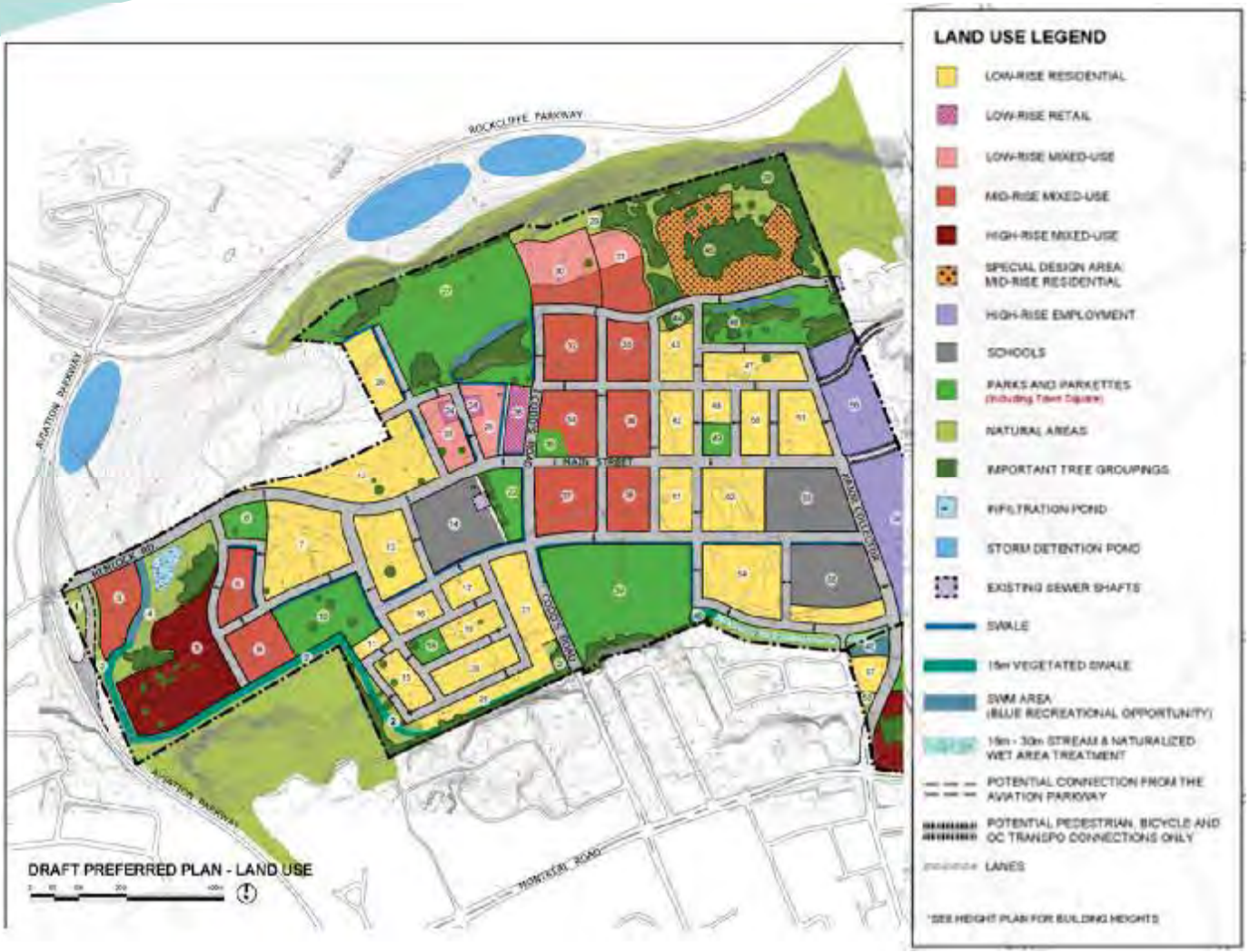
Location and Phasing



Location and Phasing



Characteristics



Characteristics:

- Demonstration Project = 11.6 ha
- 920 units of low-rise residential
- 6 local roads (20m ROW)
- 2 minor arterial (26m ROW)
- 2 park and 1 school block

Why was Phase 1 Chosen

- Phase 1A was chosen for the following rational:
  - Corresponds to the proposed development servicing plan
  - Contains primarily a single land-use
  - Represents a low risk in regards to types of LID facilities which can be implemented
  - Has redundant SWM servicing (pipes and ponds) per the MSS
  - Types of LID facilities which can be implemented have a low maintenance burden
  - Monitoring a single land-use is preferred as it increased resolution and accuracy and minimizes complexity.

Characteristics:

- Demonstration Project = 11.6 ha
- 920 units of low-rise residential
- 6 local roads (20m ROW)
- 2 minor arterial (26m ROW)
- 2 park and 1 school block

LID Selection Process

- Suitability of LID controls based on:
  - Predominant soil types
  - Primary land-uses
  - Available area (assumed lot coverage)

LID Selection Process

- General implementation considerations and suitability based on previous consultations with the development community, Ontario municipalities & past consultation with the City of Ottawa:
  - Implementation cost,
  - Types of expected infrastructure to accompany site development,
  - Anticipated site specific uses,
  - Anticipated source of runoff and
  - General City of Ottawa policy considerations.

LID Selection Process

		Phase 1A	
		Low & Medium Rise Residential	**Municipal ROW**
		50-60%*	**n/a**
Lot- Level Controls	Green Roofs	□	n/a
	Bioretention	□□	□□□
	Rainwater Harvesting	□	n/a
	Soakaways, Trenches & Chambers	□□□	n/a
	Downspout Disconnection	□□□	n/a
	Soil Amendments	□□□	n/a
	Permeable Pavements	□□	See Conveyance Controls
	Infiltration Basins	n/a	n/a
Conveyance Controls	Vegetated/ Grass Swales	n/a	□□
	Bioswales/Biofilters	n/a	□□□
	Perforated Pipes	n/a	□□
	Permeable Pavements	n/a	□□□
* **Assumed Lot Coverage** - indicates percentage of development with hard surface land cover □ □ □ = Highly Suitable, □ □ = Suitable, □ = Poor Suitability, n/a = Not Applicable			

Proposed LIDs: Residential Units

- Front Yard Soakaways
  - Subsurface
  - Storage & infiltration of roof runoff
  - Overflow to storm sewer system

Currie Barricks – Calgary, AB , Source: Aquafor Beech 2013

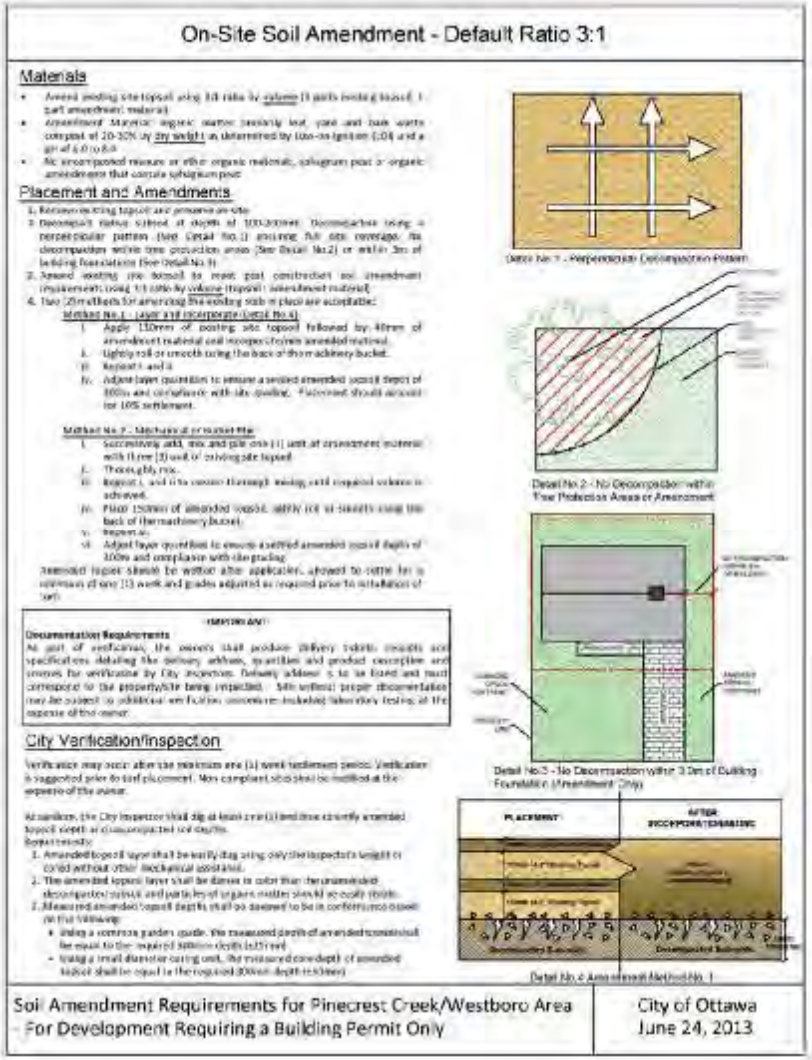
Proposed LIDs: Residential Units

- Soil Amendments
  - 300mm of amended topsoil over all turf and landscaped areas
  - 8-15% organics
  - pH 6-8
  - Organics = leaf, yard waste and food waste in accordance with OMOE & CCME guidelines

Proposed LIDs: Residential Units

SWM Guidelines for Pinecrest Creek/Westboro Area (JFSA, final draft June 2012) – **Development Requiring a Building Permit Only**

- Provision of a minimum depth of 0.30m (300mm) of amended topsoil over all landscaped areas in the post construction condition
- Direction of downspouts/ roof drainage to landscaped area to minimize runoff


On-Site Soil Amendment - Default Ratio 3:1

Materials

Placement and Amendments

City Verification/Inspection

Soil Amendment Requirements for Pinecrest Creek/Westboro Area - For Development Requiring a Building Permit Only

City of Ottawa
June 24, 2013

Soil Amendment Benefits

- Typical residential lot in Pinecrest Creek
  - 700m^2 with 50% lawn
  - @ 16L retained/m^2 of amended soils

  = 5,600 L retained

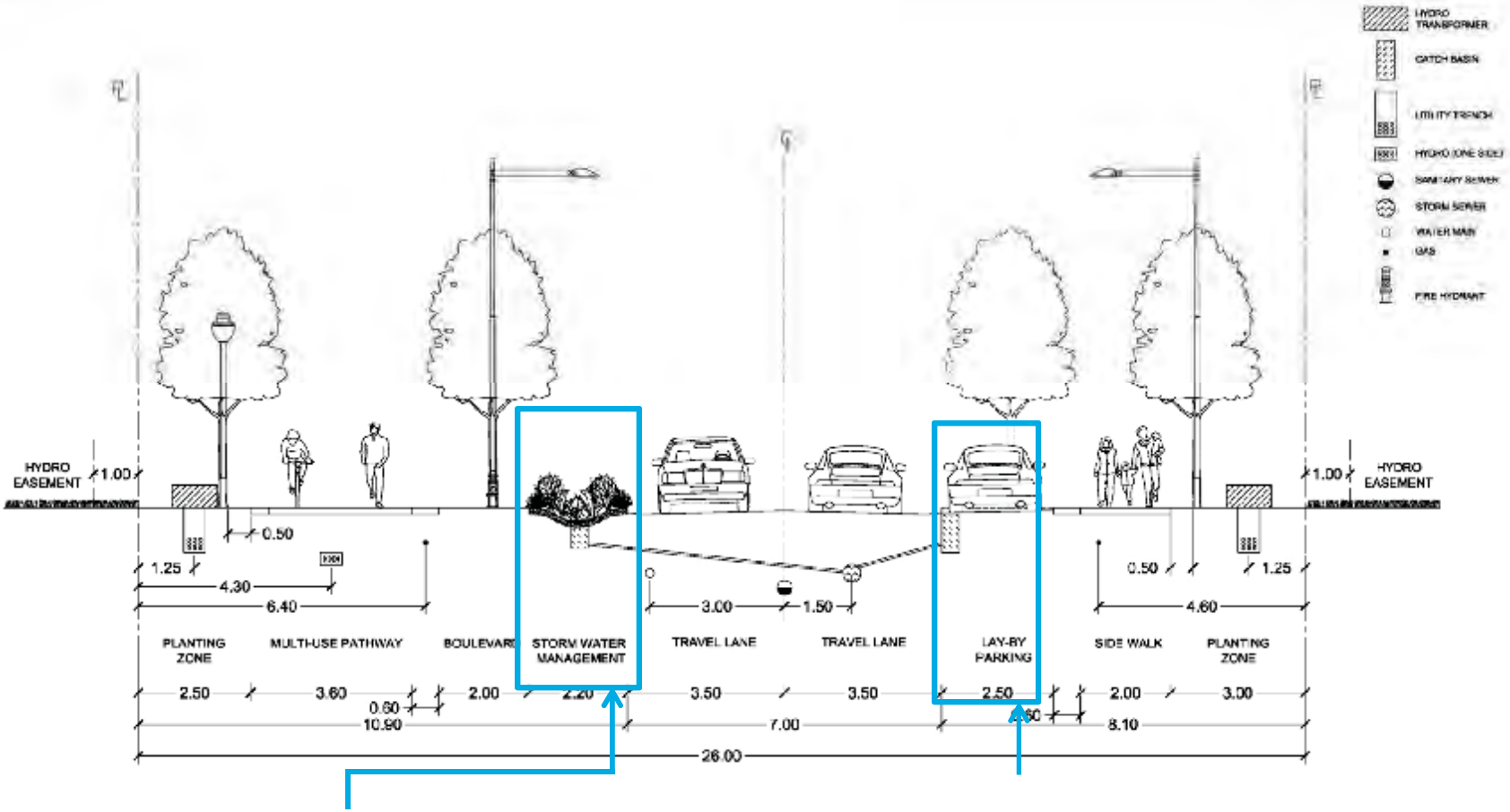
More than 22 bathtubs

Proposed LIDs: Residential Units

- Vegetated Swales (City easement)
  - Naturalized
  - Promotes infiltration of surface runoff from adjacent woodlot
  - Provides water quality enhancements
  - Prevents relatively clean water from entering storm sewer system

University of Minnesota, Source: Aquafor Beech 2014

Proposed LIDs: ROW

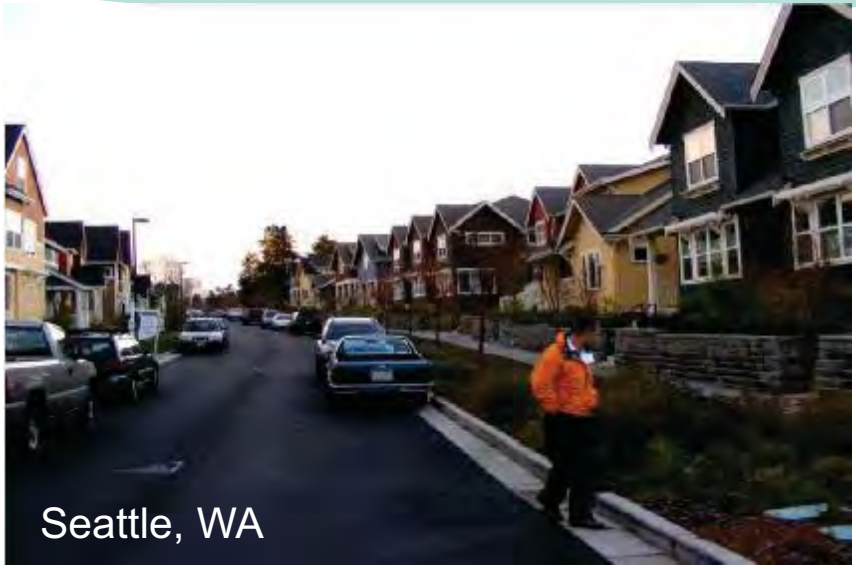


Bioswales

Permeable Pavement Lay-bys

Proposed LIDs: ROW

- Bioswales
  - Linear bioretention units
  - Planted or turf
  - Local - low use roads


Seattle, WA

Mississauga, ON

Cheltenham, ON

Proposed LIDs: ROW

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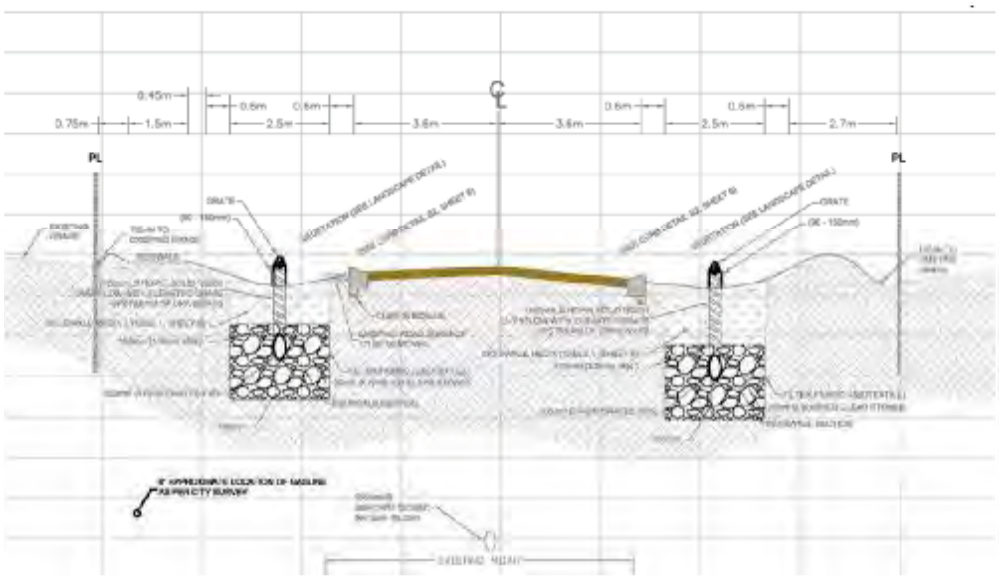

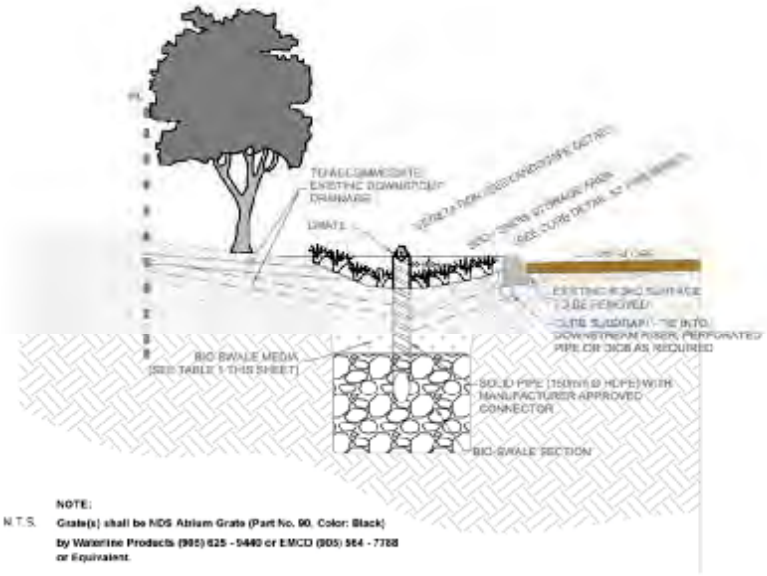

Proposed LIDs: ROW

- Permeable Pavement Parking Lay-bys
  - Concrete Paver units
  - Open graded aggregate base (no fines)
  - Long-history of implementation in Ontario
  - Provides water quality enhancements, run-off detention and infiltration benefits

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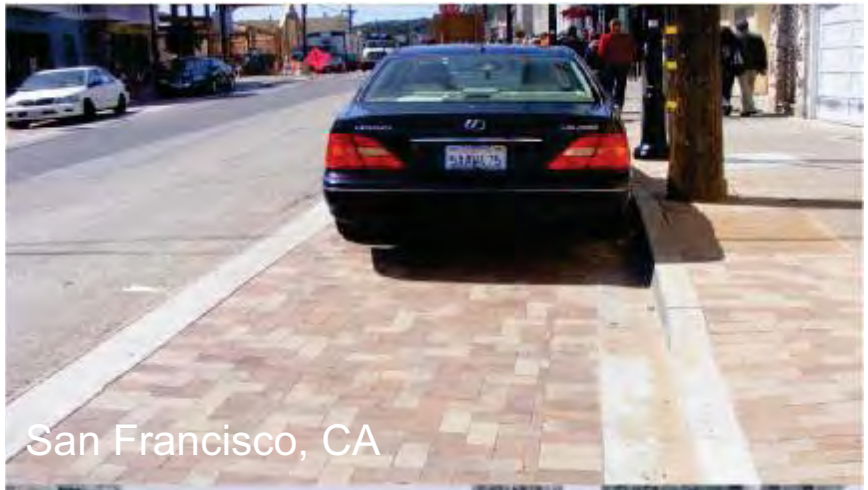

Scaled Construction of Conventional SWM Infrastructure

- Coincides with the phased approach of the LID Demonstration Project
- Performance monitoring will evaluate the effectiveness of LIDs
- Proposed that the construction of the East and West SWM Ponds be scaled to service the lands within the respective developments phases (1A- 3).

Scaled Construction of Conventional SWM Infrastructure

- Stormwater piping and pond infrastructure required to service Phase 1A will be constructed <u>in addition to the proposed LID controls as part of the LID Demonstration Project</u>

- The scaled construction will ensure that:
  - The benefits and associated credits for water quality, water quantity and erosion control can be realized during subsequent development and servicing phases
  - Infrastructure redundancy is limited to the greatest extent possible
  - End-of-pipe ponds function optimally for all phases of development. LID controls have been shown to reduce stormwater peak flows and volumes, which can:
    - Affect the ability of a pond to adequately flush the permeant pool creating algae blooms and degraded water quality.
    - Impact submergent and emergent vegetation communities
    - Create unacceptable mosquito breeding conditions

Work Plan and Next Steps

- **Step 1 – Development of Existing Conditions Report and LID Demonstration Project Scoping Document.** This meeting of the SWM Working Group and comments received will be utilized to finalize the Phase 1 Report.

Work Plan and Next Steps

- **Step 2 - Modelling and Interim Review of Draft Preliminary Design "Demonstration Plan"** and includes the following sub-tasks:
  - LID Demonstration Plan targets and criteria (water quality, erosion, flood control and infiltration)
    - Targets for LID Demonstration Plan lot-level controls in regards to the ultimate land-uses (i.e. residential vs. employment uses)
    - Targets LID Demonstration Plan for conveyance controls
    - Targets for LID Demonstration Plan end-of-pipe controls to be potentially implemented in future phases based on monitoring results.
  - Model selection and agreement on model parameters/inputs for the LID Demonstration Project
  - Modelling, results, analysis and reporting
  - Operations & Maintenance and Assumption Protocols
    - Potential LID operations and maintenance considerations, typical requirements and expected costs.
    - Recommended LID assumption protocols
  - Strategies for subsequent phases and demonstration plans
  - Implications for CDP

Work Plan and Next Steps

- **Step 2 - Modelling and Interim Review of Draft Preliminary Design "Demonstration Plan"**

- **Deliverables**
  1. **Infiltration Testing**
  2. **Water Balance Model**
     1. ***Assessment of the Hydrologic Regime***
     2. ***Assessment of Infiltration Deficit***
     3. **Stream Erosion Assessment (Now a separate process)**
  3. **Cost Benefit Analysis**
  4. **Hydraulic Model Development (Now a separate process)**
  5. **Operations & Maintenance and Assumption Protocols**
  6. **Strategies for Subsequent Phases and Demonstration Plans**

Work Plan and Next Steps

- **Step 3 - Preliminary Design for LID Demonstration Project Phase 1A** and includes the following sub-tasks:
  - Final Review of Preliminary Design
  - CDP Recommendations
  - Implementation recommendations including but not limited to:
  - Monitoring program recommendations based on project objectives and targets developed from Step 1
  - LID Demonstration Project reporting requirements
  - Adaptive Management Process (feedback process) whereby monitoring results are used to inform/refine future LID phases and used to refine modelling assumptions and SWM credits.

Work Plan and Next Steps

- **Step 3 - Preliminary Design for LID Demonstration Project Phase 1A** and includes the following sub-tasks:

- **Deliverables**
  1. **Development of Typical LID Details**
     a) Location of proposed LID,
     b) Types of LIDs,
     c) Targets and design criteria,
     d) Anticipated performance of LIDs determined through modelling using the previously developed EPA-SWMM model (Step 2).

Work Plan and Next Steps

- **Step 3 - Preliminary Design for LID Demonstration Project Phase 1A** and includes the following sub-tasks:

- **Deliverables**

  2. **LID Recommendations**

     a) By-law considerations
     b) Construction sequencing recommendations, protocols and ESC
     c) Reporting considerations for privately owned facilities
     d) O&M protocols (typical tasks, frequency and responsible party)
     e) Inspection recommendations
     f) Monitoring program recommendations
     g) LID demonstration project reporting requirements
     h) Adaptive Management Process (feedback process)
        a) Results are used to inform/refine future LID phases and used to refine modelling assumptions and SWM credits (scaled infrastructure)

Next SWM Working Group Meeting

- SWM Working Group #1
  - Comments in approx. 2 weeks
  - Finalized Phase 1 document
- SWM Working Group #2 (Phase 2)
  - Mid December 2014
  - Comments in approx. 2 weeks
  - Finalized Phase 2 document
- SWM Working Group #3 (Phase 3)
  - Late January 2015
  - Comments in approx. 2 weeks
  - Finalized Phase 3 document – integrate with CDP/ MSS

Questions

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519-224-3744

Former CFB Rockcliffe Redevelopment

LID Demonstration Project

Dec 16, 2014

Agenda

Session 1A: 8:30am to 10:30am

- **Introductions** – City
- **SWM Working Group No. 1 and Overall Process Recap** – City
- **Infiltration Testing Results**
- **LID Demonstration Plan (Water Balance Model)**
- **Lot Level and Conveyance Control Targets**
- **Overview - Stream Erosion Assessment and Hydraulic Model Development (East Creek)**

Session 1B: 10:45am to 12:00pm

Session 1A