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Addressing Stormwater in Ontario using Green Infrastructure: the New Ministry of the Environment and Climate Change Low Impact Development Stormwater Management Manual

TRIECA

**9:00am – 9:30am
March 21, 2018**

**EarthFx, Emmons & Olivier Resources,
J.F. Sabourin & Assoc.**

Presentation Overview

1. Overview and Introduction
2. Runoff Volume Control Targets (RVC_T)
3. RVC_T Control Hierarchy
4. Groundwater Protection
5. Climate Change

Current Status

- Second draft circulated to Stakeholder Review Group in December and fifth meeting in January
- Comments received incorporated into third draft

Going Forward

- Third draft to be reviewed by the MOECC
- Focused consultation with key stakeholders on the manual and implementation
- Finalize the guidance document and post on EBR for public consultation
- Timing of these next steps are still to be determined.

Stakeholder Review Group: Thank-you!

Ontario Ministry of the Environment and Climate Change (MOECC)	John Antoszek Don Cross Henry Jun Barb McMurray Sumithra Naguleswaran Juwairia Obaid Nathalie Osipenko Robin Skeates Sabrina Ternier Clara Tucker Robert Ulfig Magdi Widaatalla
Ontario Ministry of Municipal Affairs	Victor Doyle Charles O'Hara Barbara Adderley Corby Chapin
Ontario Ministry of Natural Resources and Forestry (MNR)	Mark Heaton
Ontario Ministry of Transportation (MTO)	Hani Farghaly
Environment Canada	Sandra Kok
University of Guelph	Andrea Bradford
Ryerson University	James Li
Conservation Ontario	Jo-Anne Rzadki
Credit Valley Conservation (CVC)	Christine Zimmer
Lake Simcoe Region Conservation Authority (LSRCA)	Mike Walters
Toronto and Region Conservation Authority (TRCA)	Sameer Dhalla
Association of Municipalities Ontario (AMO)	Craig Reid
Municipal Engineers Association (MEA)	Scott Mathers
Represented by the City of London	Shawna Chambers
Water Environment Association of Ontario (WEAO)	Dave Eadie Rob Muir
Institute for Catastrophic Loss Reduction (ICLR)	Dan Sandink
Green Infrastructure Ontario Coalition	Clifford Maynes Clara Blakelock
Landscape Ontario	Tony DiGiovanni Alex Zalewski Sean James
Building Industry and Land Development Association (BILD) and the Ontario Home Builders' Association (OHBA)	Steve Schaefer Sarah Kurtz Jennifer Young
Municipal Stormwater Management Discussion Group	John Nemeth
City of Calgary	Bert Van Duin
City of Kitchener	Nick Gollan
City of Ottawa	Darlene Conway
City of Toronto	Patrick Cheung
Region of Waterloo	Don Corbett





Runoff Volume Control Target (RVC_T)

Runoff Volume Control Target (RVC_T)

- The RVC_T is not an 'infiltration target'
.....it is a '**control target**'
- Key Principle: **Treatment Train** from 1991-2003
MOECC Manuals
 - Infiltration
 - Evapotranspiration
 - Re-use
 - Filtration
 - Detention
 - Mechanical Treatment (i.e. hydro-dynamic separation)

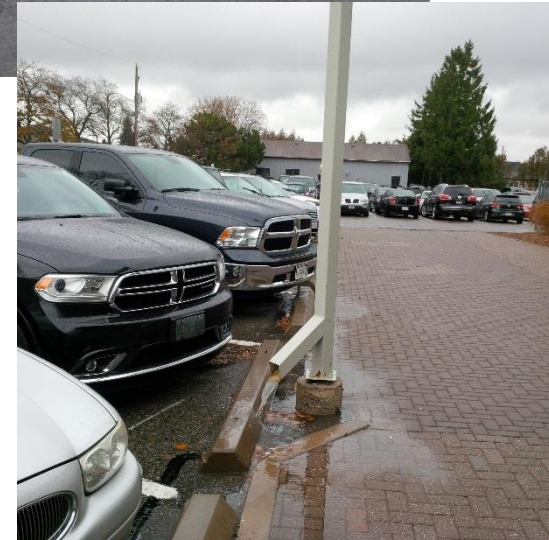
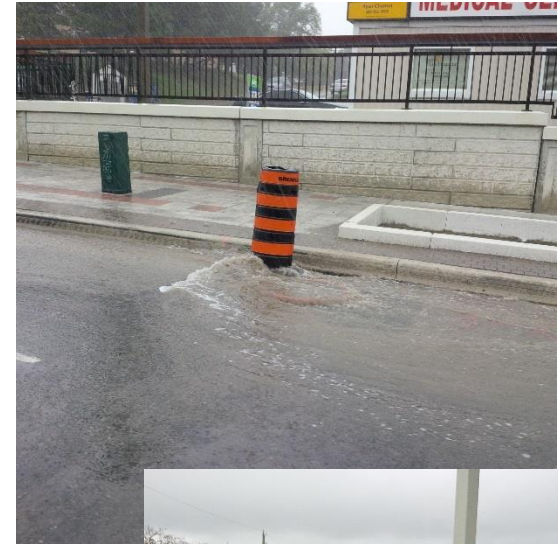


Source: Team-create.com

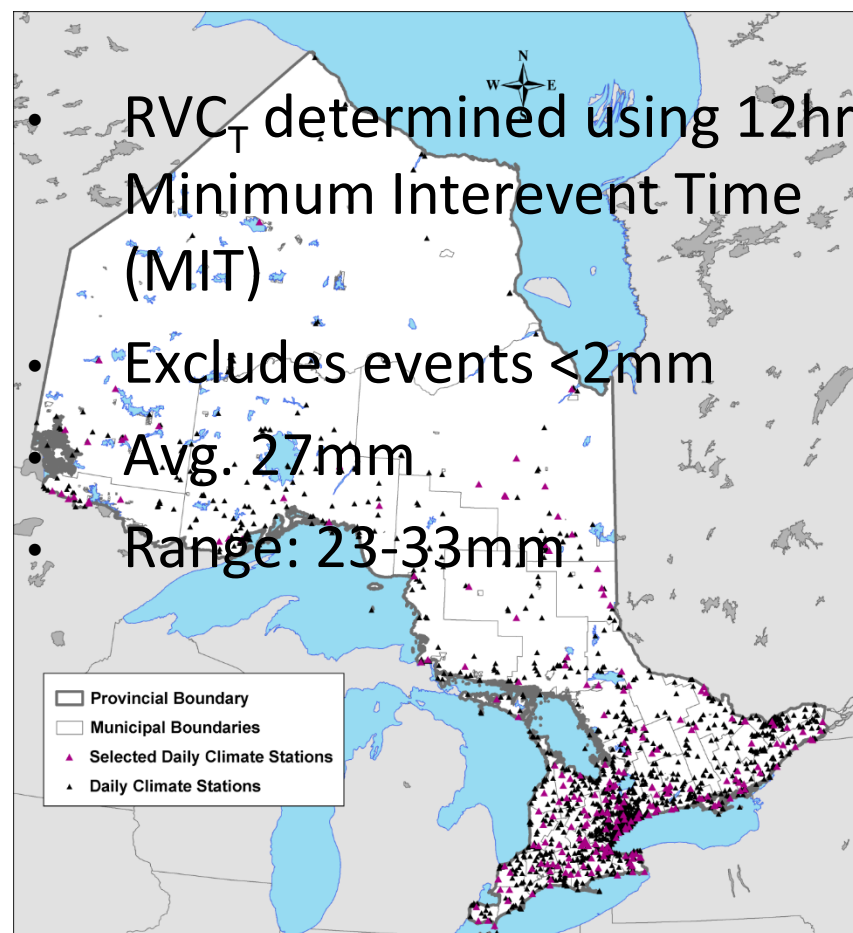
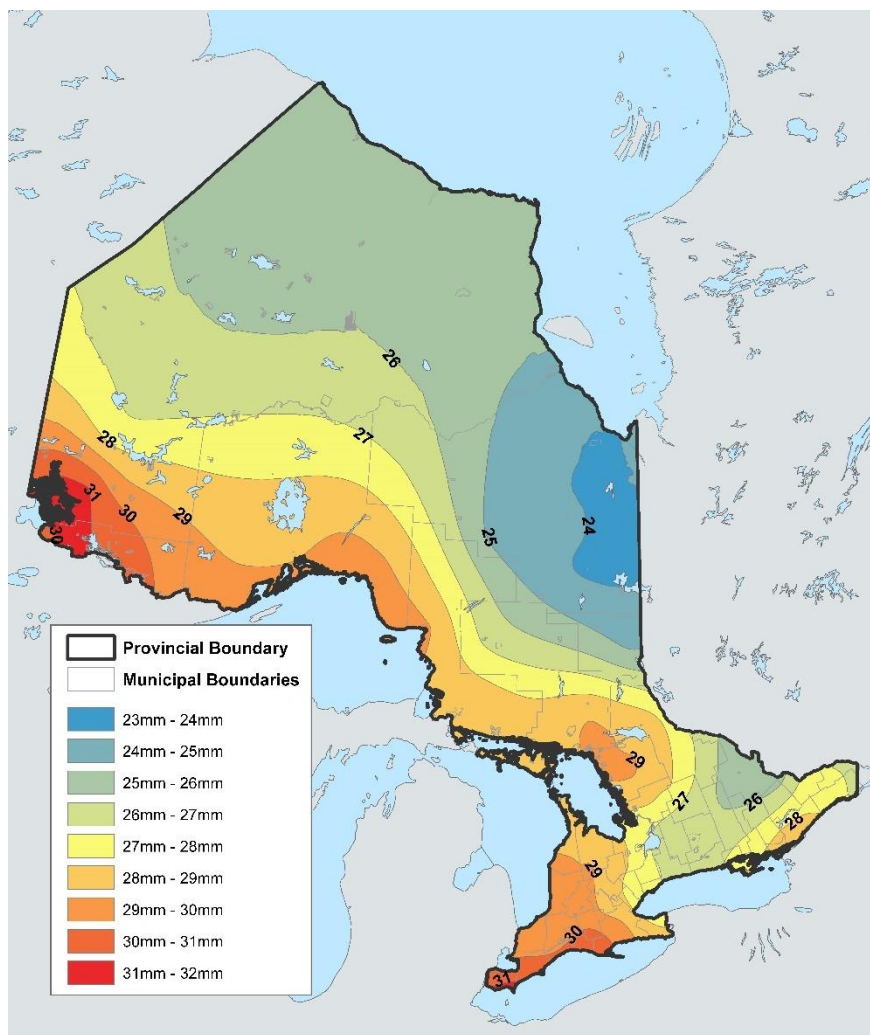
Runoff Volume Control Targets (RVC_T)

Key Principles:

- Maintenance of the pre-development water balance
- Return precipitation volume to the natural hydrologic pathways.
- Application of a consistently derived, **geographically specific volume control target** - the 90th percentile event



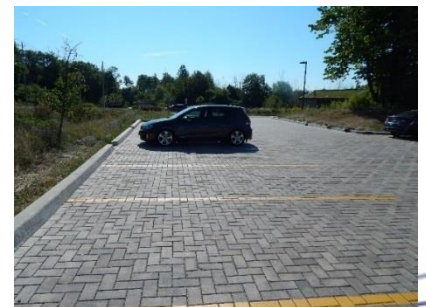
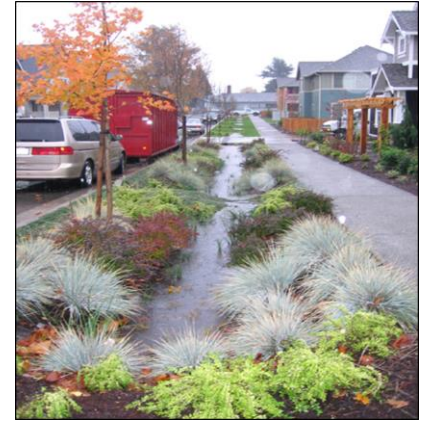
Rainfall Analysis & RVC_T



233 climate stations selected for the daily rainfall event analysis in Ontario.

Runoff Volume Control Target (RVC_T)

- Specific volume targets for New Development; Redevelopment, Reurbanization and Intensification; Linear Development; and Stormwater Retrofits
- Minimum volume targets, superseded by volume targets as developed through watershed, subwatershed, master drainage plans, Environmental Impact Statement (EIS) and/or other area specific studies.
- **Targets can be higher or lower than the RVC_T**



RVC_T Targets

- New Development; Redevelopment, Reurbanization and Intensification, Linear Development: **RVC_T = 90th Percentile**
- For Road Resurfacing & Minor roadway developments that may not significantly alter existing stormwater management the MOECC encourages **Maximum Extent Possible (MEP) or “best efforts” improvements**
- Stormwater Retrofits = **MEP**
 - Maintenance of rural cross-section = Retrofit



Linear Development Feasibility and Prioritization Studies

- Encourages the comprehensive and holistic assessment of SWM and LID for the ROW to improve cost effectiveness, environmental performance and overall benefit to the receiver and the community.
- Align planned or forecasted capital or maintenance works following a Class EA or Class EA type (Social, Environmental, Financial & Technical)
- Municipalities - assess their infrastructure and prioritize upgrades in a prudent and economically feasible manner.



RVC_T Flexibility

- Treatment Options for Sites with Restrictions (i.e. Constraints)
- Allow for reduced RVC_T: 75% of RVC_T or MEP where:
 - Physical constraints (High GW, Bedrock, Contam. soils etc.)
 - Risks to groundwater & drinking water
 - Risks to human health, private property and infrastructure (flooding, I/I)
 - Surface water dominant features (wetland etc.)

RVC_T Flexibility

RVC _T Control Hierarchy	Constraint Limits or Impacts Implementation						
	1			2		3	
Constraint	Infiltration	ET	Re-use	LID Filtration	Filtration	Hydro-dynamic Separation	Sedimentation
a) Shallow bedrock [†] and Karst	●	○	▣	▣	▣	▣	▣
b) High groundwater [†] or areas where increased infiltration will result in elevated groundwater levels which can be shown through an appropriate area specific study to impact critical utilities or property (i.e. susceptible to flooding)	●	○	▣	▣	▣	▣	▣
c) Swelling clays or unstable sub-soils	▣	○	○	○	○	○	▣
d) Contaminated soils (i.e. Brownfields)	●	○	○	○	○	○	▣
e) High Risk Site Activities including spill prone areas	●	○	○	○	○	○	○
○ - Constrain does not limit or impact; ● - Constraint limits or Impact; ▣ - Constraint may limit or impact							

RVC_T Control Hierarchy

Better Site Design (reduced land clearing, preserve natural systems etc) & **Pollution Prevention**



Approach 1 (Retention) – infiltration, evapotranspiration and or re-use. The volume does not become runoff.



Approach 2 (LID Volume Capture and Release) –utilize LID filtration. The controlled volume is filtered and released to the municipal sewer networks or surface waters at a reduced rate and volume (a portion may be infiltrated or evapotranspired).



Approach 3 (Other Volume Detention and Release) – Other technologies which utilize filtration, hydrodynamic separation and or sedimentation (to detain and treat runoff). The controlled volume is treated and released to the municipal sewer networks or surface waters at a reduced rate.



Groundwater Protection



- Groundwater Benefits and Risk from LID BMPs
- High Risk Site Activities
- Shallow and Deep Groundwater Systems
- Groundwater/ Surface Water Interaction & Water Quantity Risk
- Infiltration and Groundwater Quality
- Data Sources and Process for Determining Risks
- Infiltration Guidelines
- Designing for Minimal Impact on Groundwater Quality

Climate Change Fundamentals

Mitigation

- *measures or actions to avoid or reduce greenhouse gas emissions*
- *GOAL: The maximum reduction in GHG emissions*

Co-Benefit

*mitigation
and
adaptation*

*LID achieves
some level of
both*

Adaptation

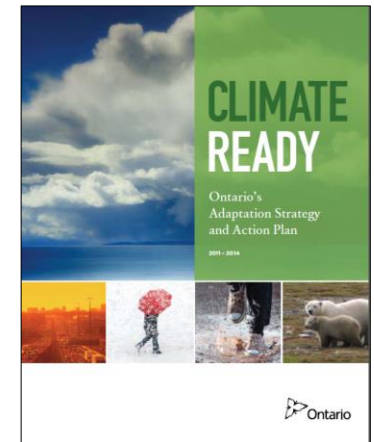
- *process of adjustment in the built and natural environments in response to actual or expected climate change and its effects*
- *GOAL: greatest possible reduction in vulnerability through adaptation and climate-resilient development*

Climate Change

- Duty of Care, Liability and Legal Responsibility
- Outlines Actions: Practitioners, Municipalities & CAs
- Assessing CC Impacts on Planning & Design
 - Need for Analysis, Watershed Scale and Site Scale Analysis
- Adaptation Protocols and Tools
 - PIEVC & BARC
 - Four (4) Step Process for SWM



Source: blogs.mcgill.ca



Source: Fau.eu

Climate Change

4 Step Process

1. Step 1 – Identify Climate Change Considerations
2. Step 2 - Evaluating Risks

STEP 2: Evaluating Risk caused by Climate Change Parameters

Climate Change Risk Evaluation Table

Climate Change Risk Evaluation Table

Technical Assessments:

- Hydrologic Modelling for a Future Climate
 - Global Circulation Models (GCMs) data sets
 - IDF – projections and tools
- Hydraulic Analysis for a Future Climate

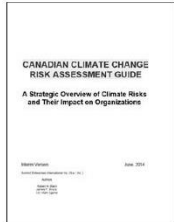
**Resource
Directory**

Very Low					
	Very Unlikely to Happen	Occurs Occasionally	Moderately Frequent	Occurs Often	Virtually Certain to Occur
FREQUENCY / PROBABILITY					

be undertaken.

Very Low	Impact Planning		Management			
	Very Unlikely to Happen	Occurs Occasionally	Moderately Frequent	Occurs Often	Virtually Certain to Occur	
FREQUENCY / PROBABILITY						do not require further consideration

Resource Directory

Climate Change Tool	PIEVC Engineering Protocol For Infrastructure Vulnerability Assessment and Adaptation to a Changing Climate Change https://pievc.ca/ https://pievc.ca/sites/default/files/pievc-protocol-principles-guidelines-june-2016-part_1-e.pdf	
Climate Change Guide and Tool	Changing Climate, Changing Communities: Guide and Workbook for Municipal Climate Adaptation http://www.iclecanada.org/images/iclecanada/pdfs/GuideWorkbookInfoAnnexes_WebsiteCombo.pdf Building Adaptive and Resilient Communities (BARC) On-line Tool: http://www.iclecanada.org/adaptationtool/introduction	
Climate Change	Stormwater Management in Ontario: Legal Issues in a Changing Climate (2014) http://www.creditvalley.ca/wp-content/uploads/2014/05/Stormwater-Management-in-Ontario_Legal-Issues-in-a-Changing-Climate_2014.04.29.pdf	
Climate Change Guide	Canadian Climate Change Risk Assessment Guide (2014) https://www.iclr.org/images/CC_Risk_Assessment_Guide_Interim2_Jun_8_14_.pdf	

- SWM Manuals
- GW Studies & Analysis Tools
- LID Guides (Design, Construction, Landscaping, Retrofits & Monitoring)
- Costing Tools
- Approvals Guides
- Climate Change Guides, Tools, Protocols, Modelling & Assessment Resources

QUESTIONS

John Antoszek, P.Eng
MOECC
John.Antoszek@ontario.ca

Chris Denich, M.Sc., P.Eng
Aquafor Beech Ltd
519-224-3744
denich.c@aquaforbeech.com



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