TRIECA Conference 2012

March 27, 2012

TORONTO AND REGION CONSERVATION AUTHORITY

THE GREAT LAKES CHAPTER OF THE INTERNATIONAL EROSION CONTROL ASSOCIATION

Mark Schollen, Principal
Schollen & Company Inc.

Sustainable Stormwater Management / L.I.D. Design

Essentials

–Multi-disciplinary team
- Engineers
- Architects
- Landscape architects
- Ecologists

–Integrated design process

–Multi-objective based approach

–Commitment to innovation

Honda Canada Campus, Markham

Objectives:

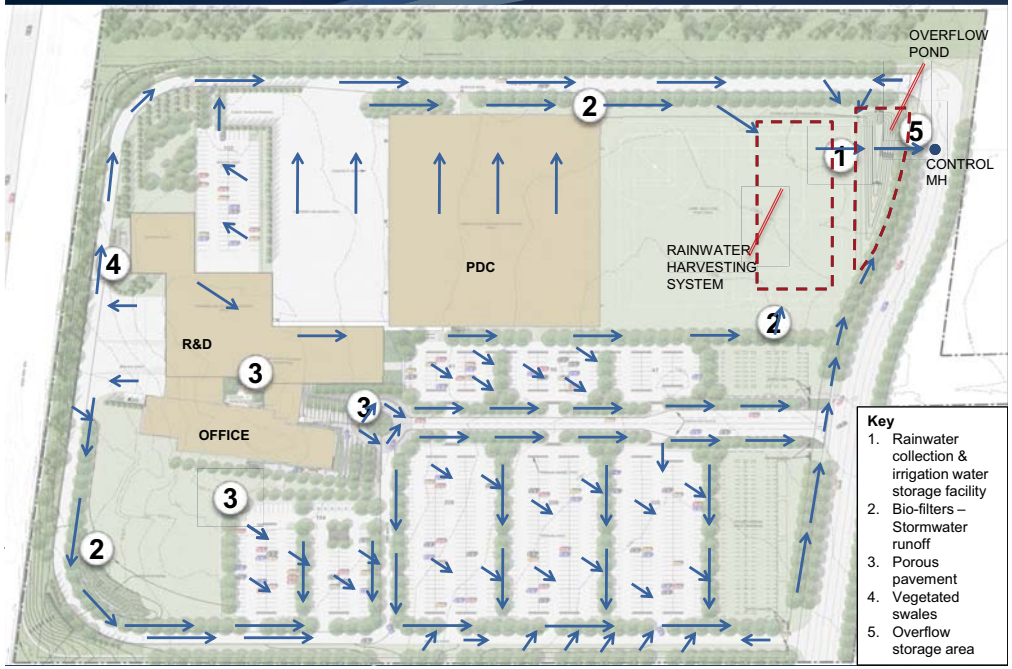
- –Minimize reliance on end-of-pipe SWM
- –Optimize efficiency
- –Utilize the landscape as a functional system
- –Address practical considerations
- –Reflect Honda's corporate mission
- –Achieve LEED Certification

ZAS / HOK Architects
Sabourin Kimble & Associates
Schollen & Company Inc.

Honda Canada Campus, Markham
Site Plan

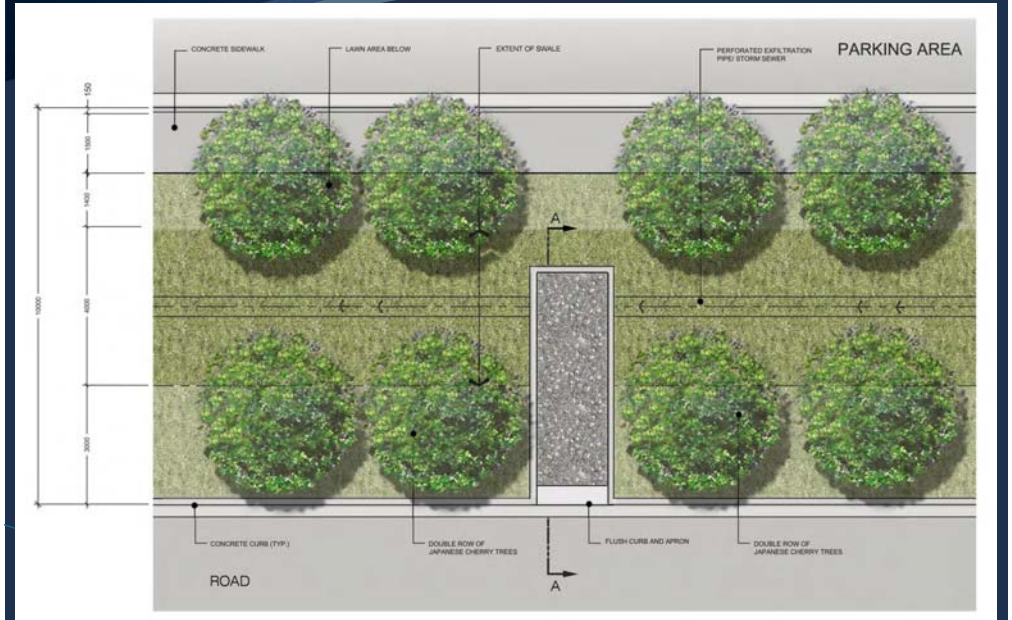
Site Area = approx.27 ha
Building Area = 27,127m²

Honda Canada Campus, Markham
Stormwater Management Plan

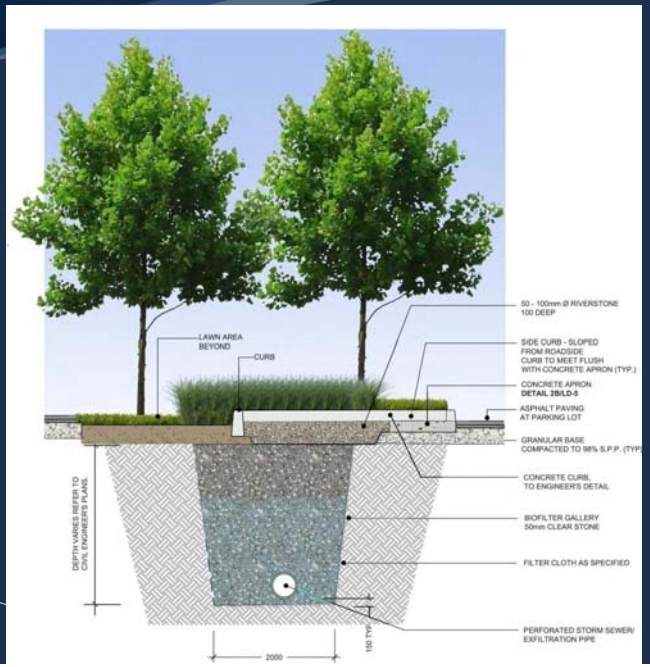


Honda Canada Campus, Markham
Water Conservation Plan

Honda Canada Campus, Markham
Biofilter Plan



Honda Canada Campus, Markham
Biofilter Section



Honda Canada Campus, Markham
Selected Site Photos

Rainwater Harvesting Tank

Natural Drainage

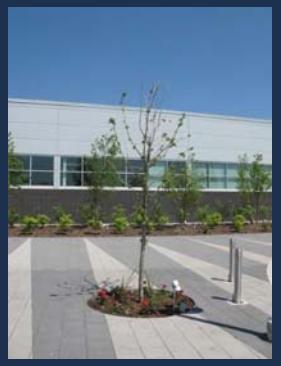
Permeable Pavement in Parking Lot

Permeable Pavement in Forecourt Roundabout

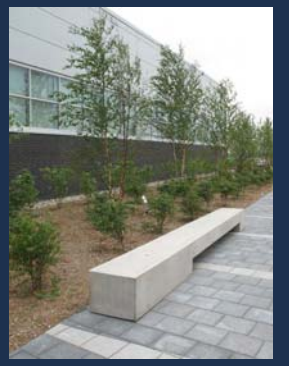
Honda Canada Campus, Markham
Selected Site Photos

Granular Fitness Path and Drainage Swale

Biofilter

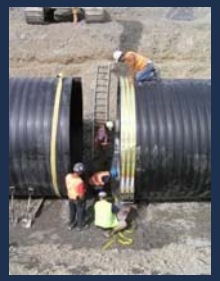


Paving and plants in courtyard



Landscaped Outdoor Eating Areas

Honda Canada Campus, Markham



Challenges / Lessons Learned:

–Contractor education is key

–Integration of utilities and infrastructure is critical

–Maintenance / management program is essential

–System must be protected during construction

Bill Crothers Secondary School, Markham

Objectives:

–Achieve pre to post development water balance

–Address off-site catchment area contribution

–Provide water for irrigation

–Utilize a treatment-train approach

–Enhance the Rouge River corridor

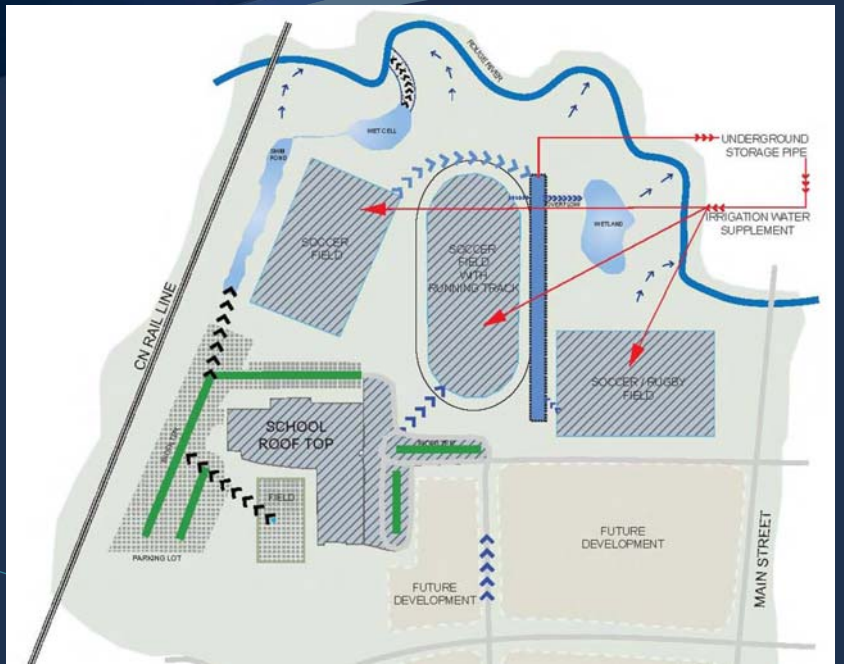
–Achieve recreational/educational program requirements

ZAS / HOK Architects
Schaefers Associates
Schollen & Company Inc.

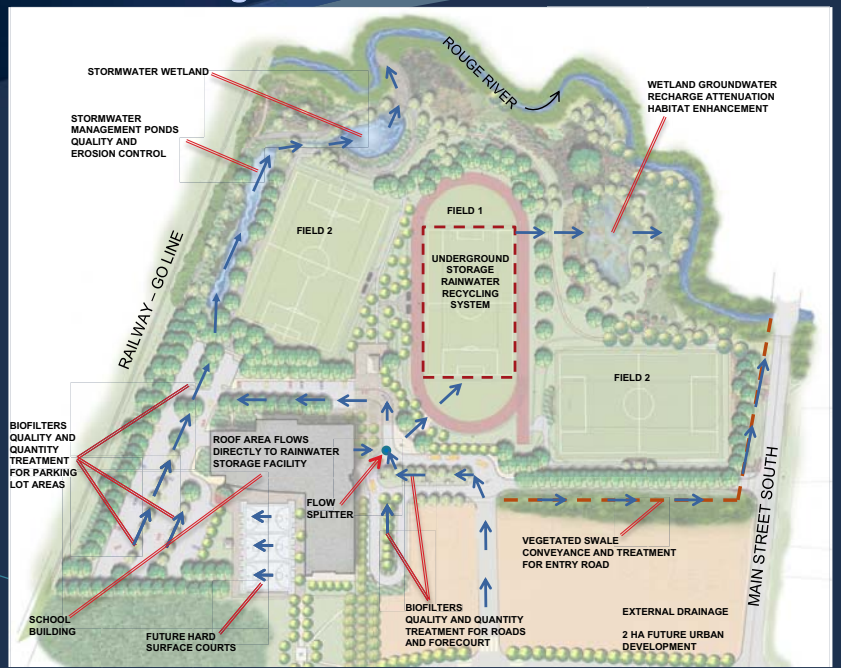
Bill Crothers Secondary School, Markham
Concept Plan

Site Area = approx.12.25 ha

Bill Crothers Secondary School, Markham
Stormwater Management Strategy



Bill Crothers Secondary School, Markham
Stormwater Management Plan



Bill Crothers Secondary School, Markham
Selected Site Photos

Storage Pipe Construction

Biofilter

Parking Lot with Biofilter

Artificial Turf Sports Field and Running Track with Rainwater Harvesting System Beneath

Bill Crothers Secondary School, Markham

Challenges / Lessons Learned:

–Contractor education is key

–Protection of installations during construction is essential

–Maintenance – inadequate maintenance can impact function

–Municipal standards stifle innovation

Mississauga Valley Community Centre Parking Lot Retrofit and LID Study, Mississauga

Objectives:

–Provide effective SWM to mitigate downstream flooding and erosion

–Address on-site drainage problems

–Enhance overall sustainability

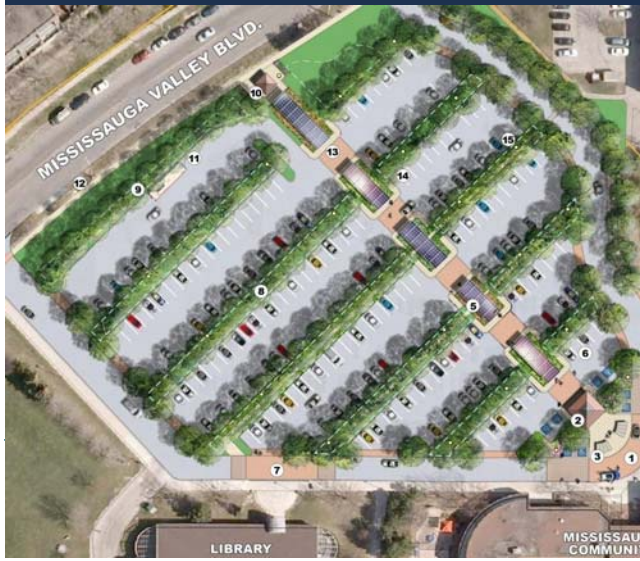
- Pedestrian realm
- Urban tree canopy
- Access to transit
- Energy generation

Credit Valley Conservation
City of Mississauga
The Municipal Infrastructure Group
Schollen & Company Inc.

Mississauga Valley Community Centre, Parking Lot Retrofit and LID Study, Mississauga

Concept Plan

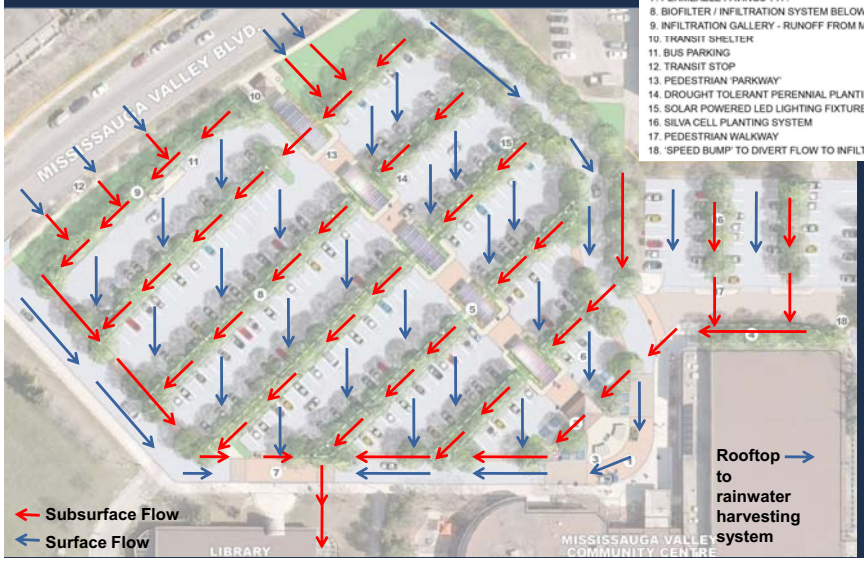
Full Sustainability Option



1. ENTRY COURT
2. SHELTER
3. SHELTERED BICYCLE PARKING
4. INFILTRATION GALLERY
5. PHOTOVOLTAIC ARCADE PEDESTRIAN WALKWAY BENEATH
6. DELINEATED CAR-POOL PARKING AREA
7. PERMEABLE PAVINGS TYP.
8. BIOFILTER / INFILTRATION SYSTEM BELOW ISLAND, TYP.
9. INFILTRATION GALLERY - RUNOFF FROM MISSISSAUGA VALLEY BLVD.
10. TRANSIT SHELTER
11. BUS PARKING
12. TRANSIT STOP
13. PEDESTRIAN 'PARKWAY'
14. DROUGHT TOLERANT PERENNIAL PLANTING
15. SOLAR POWERED LED LIGHTING FIXTURE
16. SILVA CELL PLANTING SYSTEM
17. PEDESTRIAN WALKWAY
18. 'SPEED BUMP' TO DIVERT FLOW TO INFILTRATION GALLERY

Mississauga Valley Community Centre, Parking Lot Retrofit and LID Study, Mississauga

Stormwater Management Plan



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17. PEDESTRIAN WALKWAY
18. 'SPEED BUMP' TO DIVERT FLOW TO INFILTRATION GALLERY

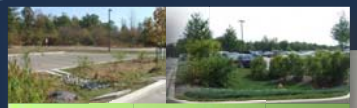
Mississauga Valley Community Centre, Parking Lot Retrofit and LID Study, Mississauga

Treatment Approach – Sustainable Parking Lot Design

Total redesign of the main parking area to increase green space and promote pedestrian traffic

Use of LID measures across the entire site

Provides water balance and water quality and quantity control



BIO-RETENTION FEATURES

SOLAR ENERGY

PERMEABLE PAVEMENT

Mississauga Valley Community Centre, Parking Lot Retrofit and LID Study, Mississauga

Challenges / Lessons Learned:

–Funding

–Sequencing of construction to maintain parking capacity

–Future maintenance

–Snow management

Edwards Gardens / TBG Sustainable Parking Lot, Toronto

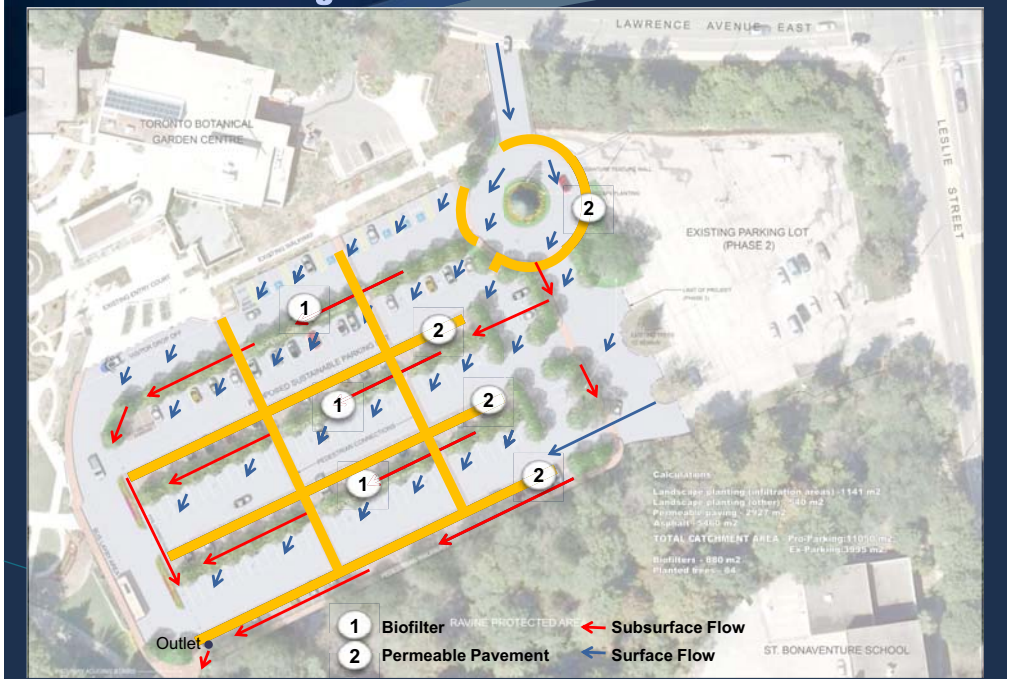
Objectives:

- Restore an existing degraded parking lot
- Integrate SWM – quality and quantity
- Enhance tree canopy
- Improve circulation and utility
- Position as complementary to TBG programs

City of Toronto
Toronto Botanical Garden
RV Anderson Associates
Schollen & Company Inc.

Edwards Gardens / TBG Sustainable Parking Lot, Toronto
Concept Plan

Edwards Gardens / TBG Sustainable Parking Lot, Toronto
Stormwater Management Plan



Edwards Gardens / TBG Sustainable Parking Lot, Toronto

Challenges / Lessons Learned:

–Budget

- Basic resurfacing $800,000
- Sustainable parking lot $1.8 million

–Timing – relative to TBG programs

–Need to maintain parking capacity

–Retrofit project issues

Dundas Street Commercial Site, Mississauga

Objectives:

- Improve infiltration potential
- Enhance base flow contribution to Etobicoke Creek
- Improve extent of natural system along stream corridor
- Manifest LID technologies as amenities in the landscape
- Expedite the approval process

Fieldgate Commercial / Smart Centres
Counterpoint Engineering
Schollen & Company Inc.
Terraplan Landscape Architects

Dundas Street Commercial Site, Mississauga
Concept Plan

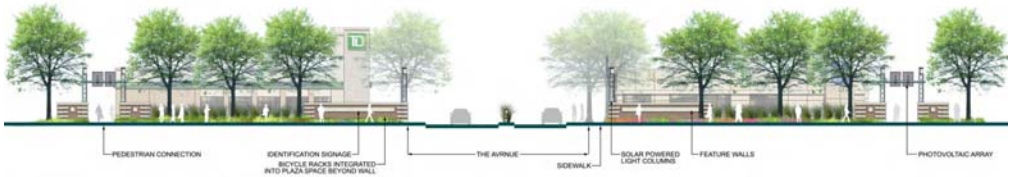
Dundas Street Commercial Site, Mississauga
Stormwater Management Plan

Dundas Street Commercial Site, Mississauga
The Avenue – Integrated SWM / Streetscape Design

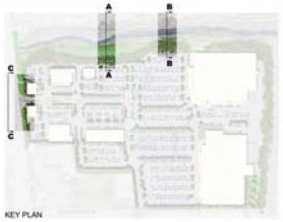
Dundas Street Commercial Site, Mississauga
Storm Fountain Feature – Concept

1. BIOFILTER
2. INTERPRETIVE PAVILION
3. PERMEABLE PAVING
4. RAINWATER FOUNTAIN
5. SOLAR ARCADE - PHOTOVOLTAIC PANELS
6. LIGHT COLUMNS
7. FEATURE WALL
8. GRATE / WET WELL / PUMP FOR FOUNTAIN
9. PHOTOVOLTAIC ROOF PANELS
10. INTERPRETIVE SIGNAGE
11. PEDESTRIAN CONNECTION
12. DECORATIVE PAVEMENT

Dundas Street Commercial Site, Mississauga
Sections



ELEVATION C-C' - DUNDAS STREET EAST FRONTAGE LANDSCAPE TREATMENT



Dundas Street Commercial Site, Mississauga

Challenges / Lessons Learned:

–Reclamation of Brownfields site

- Soil contamination
- Dumped debris

–Extent of impervious cover – parking and building area

–Practical commercial requirements:

- Circulation
- Servicing / loading
- Visibility of retail tenants

Markham Uptown, Markham

Objectives:

–Optimize on-site SWM / source controls

–Achieve sustainability vision set out by Developer and Town

–Integrate SWM with architecture and landscape

–Achieve a transition from urban to natural

Times Group Corporation
Schollen & Company Inc.
Kirkor Architects
SCS Consulting Group Ltd.

Markham Uptown, Markham
Concept Plan

Part of Markham's new "Downtown"

Site Area = approx.35.76 ha
Total 18 Towers / 4400 residential units

Markham Uptown, Markham
Stormwater Management Plan

SWM is integrated within each development block:

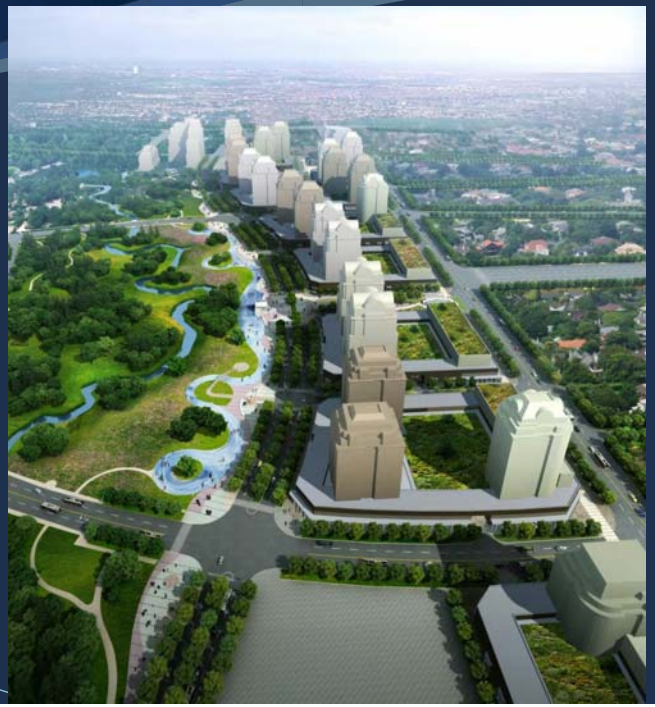
1. Green roof
2. Rainwater harvesting
3. Stormwater planters

SWM to be integrated into streetscape:

- Permeable pavement
- Stormwater fountains
- Infiltration galleries

Runoff from roads to be directed to infiltration galleries (A) and ponds

Markham Uptown, Markham
Perspective



Markham Uptown, Markham
Perspective – Linear Park

Markham Uptown, Markham

Challenges / Lessons Learned:

–Requirement for structured parking

–Need to address Town's concern regarding privately owned infrastructure

–Integration of SWM / infiltration galleries within parkland

–Operations and maintenance

Thunder Bay Regional Hospital, Thunder Bay

Objectives:

–Protect coldwater fish habitat in McIntyre River

–Maintain pre-development tributary catchment areas and discharge points

–Provide water quality improvement

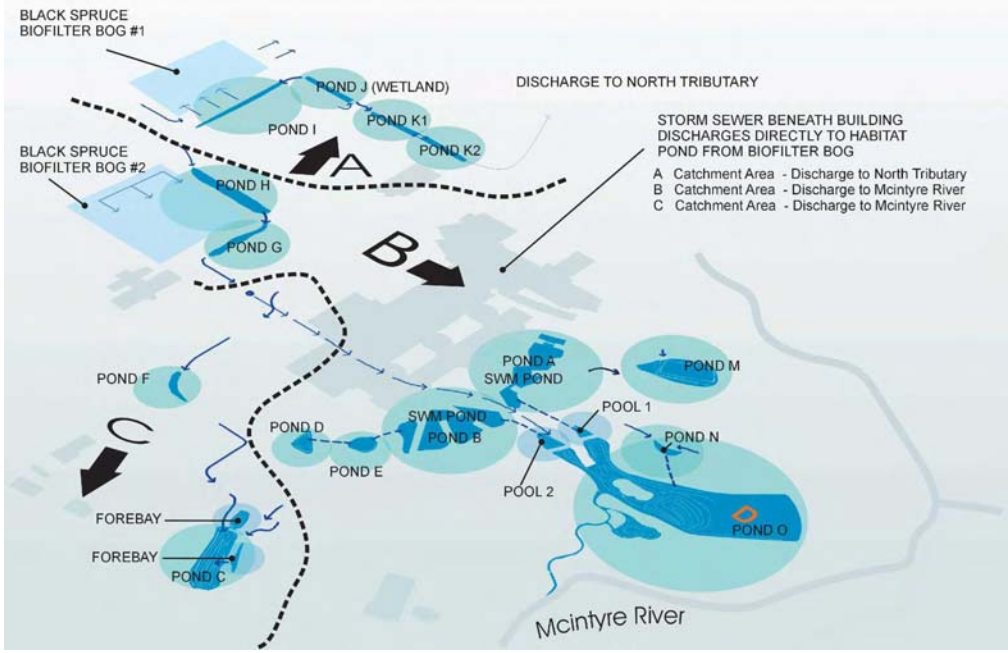
–Enhance aquatic habitat

–Create a therapeutic landscape

KSGM Architects and Engineer
Salter Pilon Architects
Engineering Northwest
Wardrop Engineering
Schollen & Company Inc.

Thunder Bay Regional Hospital, Thunder Bay
Integrated Stormwater Management Habitat Enhancement and Landscape Concept Plan

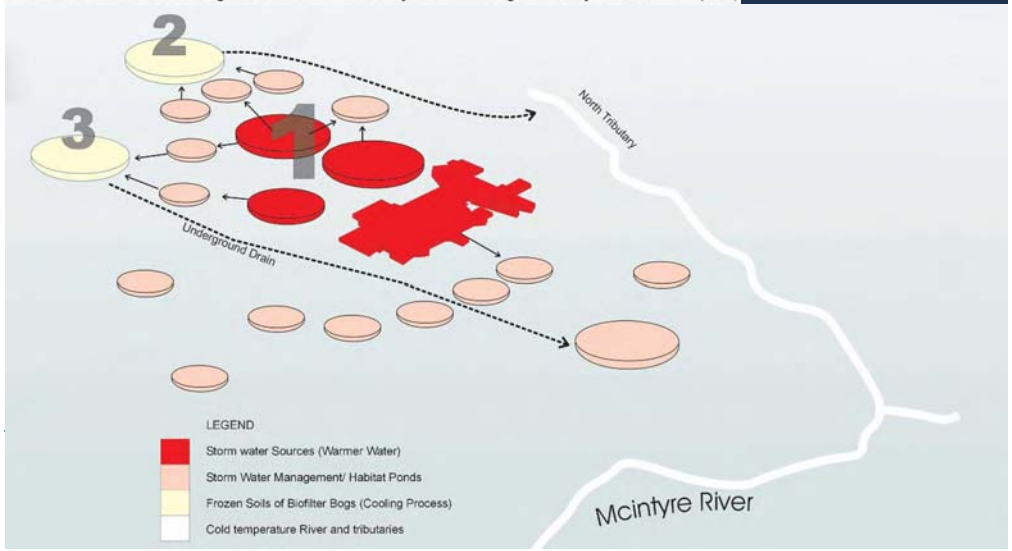
Thunder Bay Regional Hospital, Thunder Bay
Stormwater Management System



Thunder Bay Regional Hospital, Thunder Bay
Stormwater Management System Components

Water Temperature Mitigation

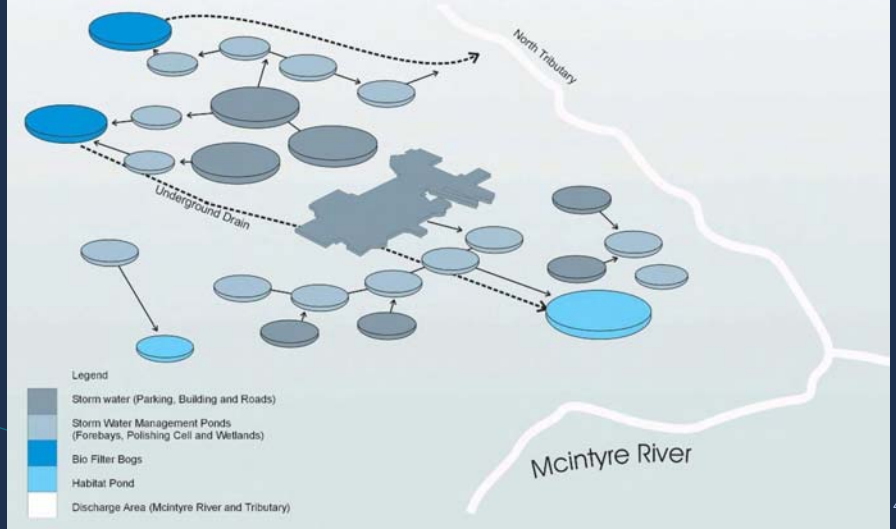
1. Stormwater from SWM Ponds and Parking Area diverted to Biofilter Bogs
2. The underlying peat soils of the Bogs remain frozen through July cooling the stored water. The cooled water is discharged to the river system
3. In the case of biofilter bog #2, the Storm Sewer System discharges directly to the habitat pond



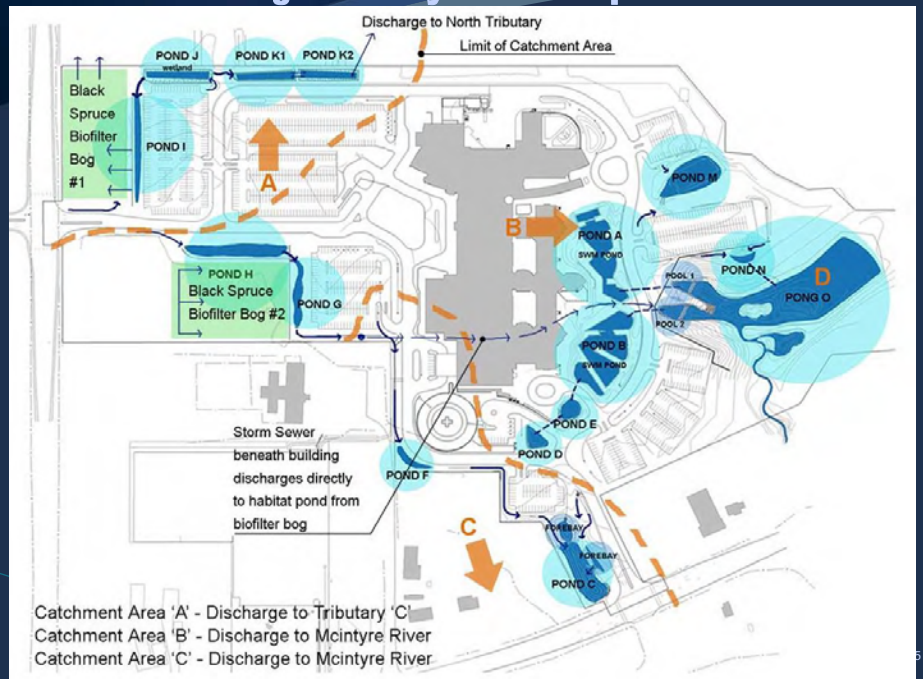
Thunder Bay Regional Hospital, Thunder Bay
Stormwater Management System Components

Water Quality Enhancement

- Stormwater runoff from site is allowed to infiltrate, while runoff from parking areas and other paved surfaces is directed into SWM Ponds
- The series of Forebays, SWM Ponds and Polishing Cells allows for the Filtration of the Storm Water
- The enhanced water is discharged into the into the Mcintyre River and its Tributary

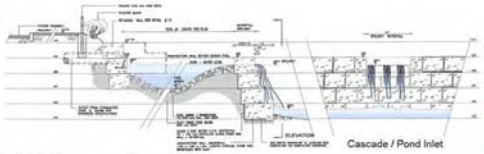


Thunder Bay Regional Hospital, Thunder Bay
Stormwater Management System Components



Thunder Bay Regional Hospital, Thunder Bay
Model Study

Thunder Bay Regional Hospital, Thunder Bay
Habitat / Spawning Pond



Habitat Restoration and Management

The landscape plan was developed with the objecive of enhancing fish habitat within the McIntyre River system. To achieve this objective, the following components were designed.

- A large pond was designed to provide nursery habitat. The pond receives cold, clean water from the bog biofilter system and incorporate shoals, an extended littoral zone and shelter structures.
- A spawning pond with artificial redds which are fed from a bottom draw outlet i the main pond.
- A new tributary channel with gravel substrate, upwelling areas and pools to support spawning and rearing.
- Extensive native plantings to provide habitat for birds and wildlife as well as insects as a food supply for the fish community.
- Utilization of a range of fruit bearing species to provide an overwintering food source for wildlife.
- Incorporation of ephemeral pools to support herptile life cycle requirements.

Habitat / Spawning Pond

Thunder Bay Regional Hospital, Thunder Bay
Stormwater Ponds

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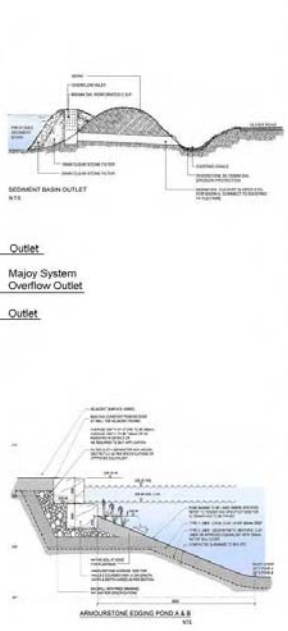
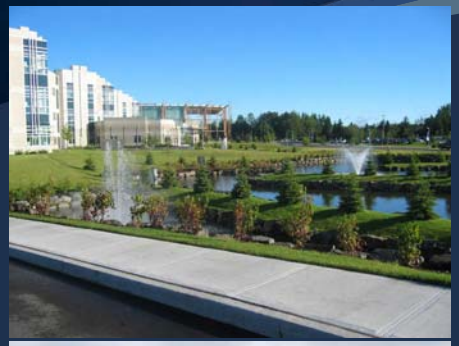
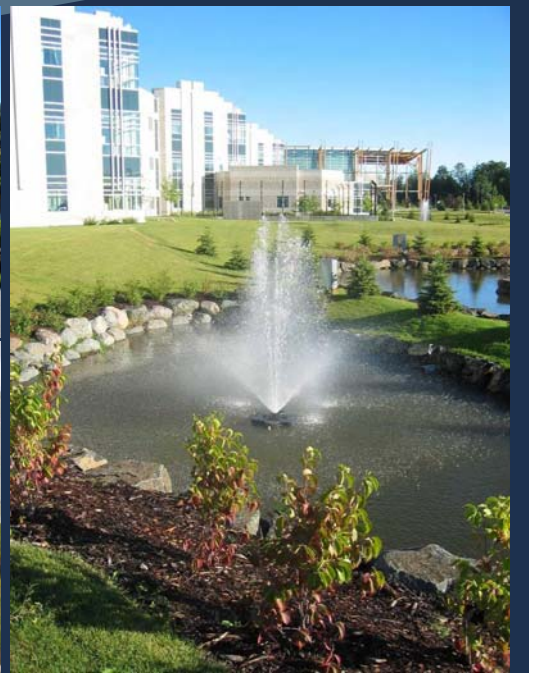


SWM Ponds A & B

Thunder Bay Regional Hospital, Thunder Bay
Selected Site Photos





Thunder Bay Regional Hospital, Thunder Bay

Challenges / Lessons Learned:

–Winter operation

–Contractor education is key

–Operation and maintenance (4 season)

–Need to accommodate future expansion

Wuxi Chang Guang Xi National Park, Wuxi, China

Objectives:

–Improve water quality

–Resolve flooding issues

–Create an ecologically sustainable river corridor

–Integrate amenities for recreation, interpretation and education

–Restore aquatic habitat

Wuxi Chang Guang Xi National Park, Wuxi, China
Project Background

- **Project Size:**
  - 10km of River (main branch)
- **Project Area:**
  - 200-300m corridor along tributaries and main branch
- **Project Component:**
  - Stormwater quality improvement facilities
  - Educational/ecological park
  - Wetlands
  - Trail system
  - Outdoor classrooms
  - Monitoring Station

Wuxi Chang Guang Xi National Park, Wuxi, China
Project Background

'Boat Villages' – 'live on' boat communities with no sewage disposal infrastructure

Flow regime – River and lake system is controlled by 11 gates to manipulate their pollutes

Land use – heavy industry adjacent the river corridor poses specific challenges

Hardening of shorelines and dredging to facilitate boat access to industrial sites

Wuxi Chang Guang Xi National Park, Wuxi, China
Project Background

River system is used for drinking, washing and waste disposal

Numerous canals and tributaries are a source of pollution

Some tributaries have evolved into wetland, water quality benefits are evident

Dumping along the river corridor

Wuxi Chang Guang Xi National Park, Wuxi, China
Project Background

Grey water discharges from adjacent residences

Industrial dumping along the river corridor

Resident boaters inhabit the river system. Frequent boat traffic results in resuspension of sediment

Several tributaries are not navigated. Water quality benefits are evident

Wuxi Chang Guang Xi National Park, Wuxi, China
Project Background

Water quality in some tributaries is good

Barge loading operations result in dumping

Outfalls located along the river corridor – sources of effluent not well documented

Residents abut water's edge

Wuxi Chang Guang Xi National Park, Wuxi, China
Proposed Land Use

The proposed land uses defined in the model were based on the Wu Xi Design Institute proposed land use design plan.

Wuxi Chang Guang Xi National Park, Wuxi, China

The selection of representative storm was based on the maximum daily rainfall depth between year 1952 and the year 1999

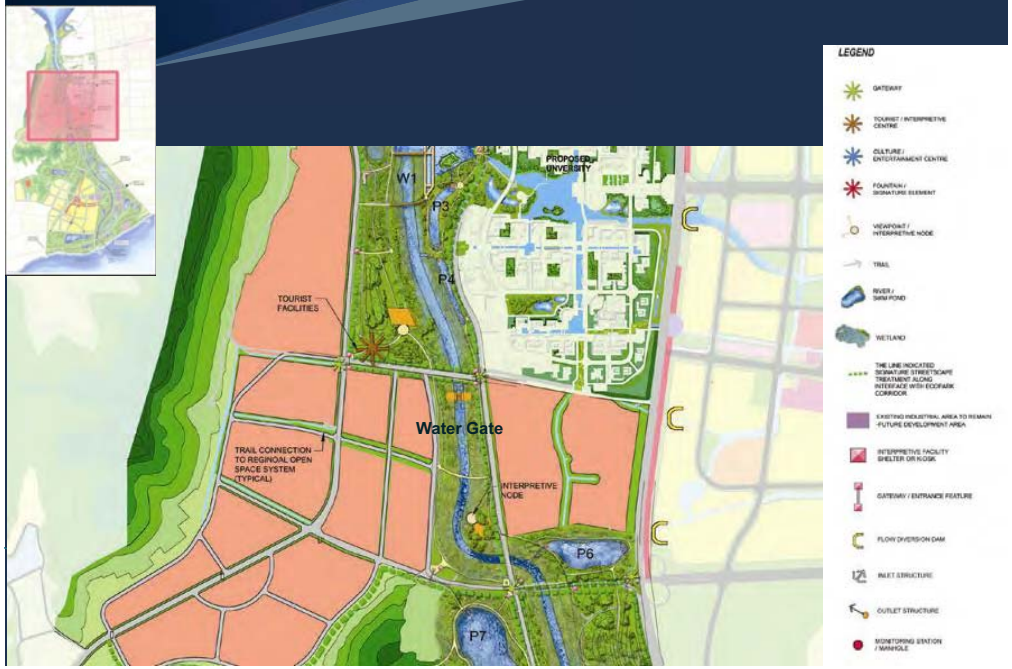
Top Ten Maximum Daily Rainfall Events from Year 1952-1999

Ranking	Date of Rainfall	Maximum daily rainfall depth for the year (mm)
1	8/31/1990	221.2
2	7/1/1991	162.6
3	9/5/1962	161.5
4	7/12/1970	148
5	7/1/1957	143.4
6	9/3/1988	138.3
7	10/4/1961	120.8
8	9/15/1989	102.5
9	9/14/1977	101.2

Wuxi Chang Guang Xi National Park, Wuxi, China
Master Plan

Wuxi Chang Guang Xi National Park, Wuxi, China
Master Plan – Area A

Wuxi Chang Guang Xi National Park, Wuxi, China
Master Plan – Area B



Wuxi Chang Guang Xi National Park, Wuxi, China
Master Plan – Area C

Wuxi Chang Guang Xi National Park, Wuxi, China
Master Plan – Area D

Wuxi Chang Guang Xi National Park, Wuxi, China
Lihu New City SWM Schematic Plans – Scenario 1 & 2

Wuxi Chang Guang Xi National Park, Wuxi, China
Lihu Southbank Park SWM Plan

Wuxi Chang Guang Xi National Park, Wuxi, China
Master Plan Elements

Ponds / Wetland Design Criteria

- Designed to achieve Type 2 water quality
- Design capacity – 300 m²/ ha to achieve quality targets
- Facilities are designed for water quality only – no flood / erosion control
- Ponds sized to treat 60 mm rainfall event
- River system maximum water level is 4.7m to mitigate flood risk

Wuxi Chang Guang Xi National Park, Wuxi, China
Master Plan Elements

Wetland / River System Design Criteria

- System designed to incorporate existing control gate
- On-line wetland area – 80 ha
- Base flow – 400,000 m³ over 7 days
- Pump system – minimum 1 m³/sec. Higher volumes are possible contingent on cost limitation for pump system
- System is designed to integrate with existing development

Wuxi Chang Guang Xi National Park, Wuxi, China
300M Demonstration Area

Wuxi Chang Guang Xi National Park, Wuxi, China
300M Demonstration Area

- Filter Beds


- Wetlands

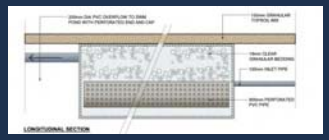

Wuxi Chang Guang Xi National Park, Wuxi, China
300M Demonstration Area

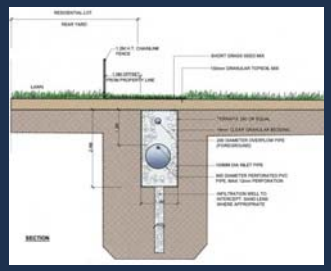
- Wet Ponds


- Riverine Wetlands


Wuxi Chang Guang Xi National Park, Wuxi, China
300M Demonstration Area

- Infiltration Galleries





- Vegetated Filters

Wuxi Chang Guang Xi National Park, Wuxi, China
300M Demonstration Area

Wuxi Chang Guang Xi National Park, Wuxi, China
300M Demonstration Area

Wuxi Chang Guang Xi National Park, Wuxi, China
300M Demonstration Area

Wuxi Chang Guang Xi National Park, Wuxi, China
300M Demonstration Area




SUMMARY

Key issues:

–Site conditions

–Integration with municipal standards

–Contractor education

–Maintenance and operation

–Need for monitoring


SUMMARY

Essentials:

–Integrated design process

–Multi-disciplinary team

–Iterative / inclusive methodology

–Creativity / innovation

–Perseverance

TRIECA Conference 2012

March 27, 2012

TORONTO AND REGION CONSERVATION AUTHORITY

THE GREAT LAKES CHAPTER OF THE INTERNATIONAL EROSION CONTROL ASSOCIATION

Mark Schollen, Principal
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