CASE STUDY



Low Impact Development Series



Bioretention

Groups involved:

- **Urban Design within City Planning**
- **Toronto Water**
- **Transportation Services**
- Parks, Forestry and Recreation
- Parks, Capital and **Operations and** Maintenance
- **Engineering and** Construction Services

Budget: \$350,000 Actual: \$320,000

Construction: July 2014 to September 2015

Image courtesy of City of Toronto

Opened in the fall of 2015, the Fairford Parkette is an official Toronto Green Streets pilot project completed as a partnership between City Planning and Toronto Water. The site was first identified as a priority location for improving traffic flow and pedestrian safety in 2014, and the City took the opportunity to retrofit it as a green infrastructure demonstration site. For the project, the right turn lane from Fairford Avenue eastbound to Coxwell Avenue was eliminated and the space was used to build a landscaped bioretention area and public seating.

Incorporating green infrastructure when performing upgrades or replacing existing infrastructure is one method the City of Toronto is using to help improve its resiliency to storm events while enhancing neighbourhood aesthetics. This is also in line with recommendations from the City's Basement Flooding Protection Program, which investigated the causes of basement flooding and recommended strategies for building capacity and resilience in the City's stormwater sewer network.

While the construction of green infrastructure in public right-of-ways can raise some challenges (e.g. space constraints, working around existing infrastructure), the features can create functional stormwater management areas that also serve as attractive and practical public spaces. By locating eye-catching Green Streets pilot projects in public spaces and designing the sites such that passersby can see how stormwater moves through the system, these demonstration sites can also help to enhance public comprehension and support of green infrastructure.

Toronto's Green Streets Technical Guidelines *provide advice on the integration of green infrastructure within typical street elements* (image courtesy of City of Toronto).



STUDY SITE

The Fairford Parkette is located on the south west corner of Fairford Avenue and Coxwell Avenue in an area of mixed residential and small business. Initiated in 2012, the project was spurred by a community request for pedestrian improvements to the area. The re-designed intersection includes a parkette in place of a turning lane, a trench drain system for bioretention planters, bicycle parking spaces and two small limestone seating areas for up to 22 people.



Figure 1. Study site location

Project Objectives

- Enhance the pedestrian environment and improve the aesthetics of the area
- Incorporate lessons learned from the Keele Street Pilot project and from other cities
- Document the design and construction of the bioretention areas that receive stormwater from the roadway
- Develop evaluation criteria such as quantity of runoff reduction, vegetation health and degree of public awareness
- Identify internal coordination issues

PLANNING AND REGULATIONS

On July 8th, 2013 a large intense storm passed over Toronto that caused damage to public and private property and infrastructure. Thousands were without power and nearly 5,000 basements were reported to be flooded. Following this event the City of Toronto's Basement Flooding Protection Program was expanded, and based on environmental assessment studies, recommended solutions to reduce basement and surface flooding risks.

For small storms, recommendations included increasing green infrastructure solutions, such as bioretention, within public right-of-ways. These small decentralized low impact development (LID) practices can be shoehorned into existing built-up areas to help reduce stormwater runoff volumes and contaminant loads to receiving water systems. There are a few challenges with implementing these smaller types of green infrastructure in public right-of-ways, such as space constraints, risk of interfering with existing infrastructure and trees during construction, and adherence to park bylaws. While these challenges can prevent the implementation of green infrastructure in certain parts of the city, there remain many areas well suited to these types of practices. In 2013, Urban Design within the City Planning Division suggested that the site be used to demonstrate Wet Weather Flow Management Policy principles and implement the Toronto Green Standard in the right-of-way. Many departments worked collaboratively to fund and implement the project; Toronto Water provided funding towards the stormwater aspects of the work as the site met the criteria for a Green Streets pilot to test LID practices, Transportation Services funded the road works and were supportive of incorporating bioretention in the new road realignment design, Parks, Forestry and Recreation were very supportive of the project and green infrastructure initiatives in general, Parks, Capital and Operations and Maintenance staff advised on the design, and Engineering and Construction Services managed the delivery of the project.

Because of the multidisciplinary nature of the project – requiring expertise from landscape architects and water resources engineers – some additional time was required to see the project through to fruition. By collaborating well and working together, City staff were able to work through gaps in information, process and skill sets to make the project a reality and satisfy all the parties involved.

DESIGN

The Fairford Parkette Green Streets Pilot consists of a bioretention area that treats and infiltrates stormwater runoff from the adjacent roads. In addition to improving stormwater management, the retrofit also improves aesthetics and the functionality of the area as a public space.

For specific design information on individual LID practices please refer to the Toronto Green Streets Technical Guidelines (City of Toronto, 2017 in progress) and the LID Stormwater Management Planning and Design Guide (TRCA and CVC, 2010).



Figure 2. Overview of parkette with detail (image courtesy of City of Toronto)

Bioretention

The Fairford Parkette bioretention system receives road runoff through trench drains that allow the public to see the water moving through the system. The system offers the benefits of improving runoff quality, delaying peak flows and reducing the total volume of runoff discharged into the storm sewer system. As stormwater moves through the system it is used to irrigate the planting bed, eliminating the need to use potable water to keep the plants alive. Stormwater runoff entering the system is filtered by the soil (bioretention media), and when it reaches its storage capacity, excess runoff is directed to the conventional storm sewer. The design involved replacing approximately 300 m² of asphalt with high-albedo (cooler) concrete paving and permeable green space.



Figure 3. Cross section view of the bioretention (image courtesy of City of Toronto)

Native plantings

Prior to the retrofit, street trees or other plantings were noticeably absent, and now native plants are highly visible to everyone in the area. The bioretention area was landscaped using native tree species, such as Kentucky coffeetree, honey locust, autumn blaze maple, and tulip tree. Native grasses and flowers complete the planting plan and provide stunning colours during the blooming season.

Enhanced Community Experience

The design of the Parkette improves community experience and safety by allowing better traffic flow, encouraging the use of alternative modes of transportation, and providing ample seating for those looking to enjoy some time outside. The preexisting traffic concerns were alleviated by realigning the road and installing additional pedestrian lighting.



Figure 4. Specially designed grate at bioretention inlets allows the public to see the water move into the system (image courtesy of University of Toronto)

CONSTRUCTION AND COMMISSIONING

Construction of the Fairford Parkette pilot was part of 2014's Civic Improvement Projects, tendered through Toronto's Engineering and Construction Services. The larger project included not only the Fairford Parkette section, but various other improvements along Fairford Avenue. Unfortunately, the initial construction was plagued with delays and poor quality of work from the original contractor. Issues also arose in procuring some of the special order items, such as the trench drain and stone seat wall, as well as finding soil suppliers that could meet the soil specifications required for the bioretention media. In June 2015 a new contractor was retained to recommence construction, and the Fairford Parkette was completed in October 2015. The maintenance of the system by this second contractor – provided for a two year warranty period following completion of construction – was ultimately unsatisfactory, garnering complaints from the community. The local Councillor intervened to address this issue, and it was determined that going forward the site would be maintained by Transportation Services.



Figure 5. Construction (image courtesy of City of Toronto)

OPERATION AND MAINTENANCE

Proper maintenance of LID practices is crucial for optimizing performance, cost effectiveness, and aesthetics, especially during the initial establishment of vegetation. In some cases it is necessary to follow-up with the contractor to ensure that the activities specified within the maintenance agreement are taking place. For specific information on operation and maintenance of individual LID practices, please refer to the LID Stormwater Management Practice Inspection and Maintenance Guide (TRCA, 2016).

Ongoing maintenance of the Fairford Parkette, including the stormwater inlets and trench drain, is part of the ongoing work Toronto Water is doing to support Green Infrastructure. The trench drain system requires regular maintenance to remove leaves, litter and debris clogging the inlet. Toronto Operations staff responsible for catch-basin clean-out will be requested to use the catchbasin vacuum truck to do this work. The trees are maintained by Urban Forestry while the planting beds are maintained by Transportation Services. The Fairford Parkette is maintained under the "Orphan Spaces" program, with work carried out by the department of Parks, Forestry and Recreation and funded by Transportation Services. To date the planting beds remain in good condition and the system functions as intended, draining even heavy rain events within 24 hours.

ACHIEVEMENTS

Stormwater management benefits. Incorporation of LID principles results in more sustainable stormwater management.

Functional design. Dual functioning of a park space and stormwater management.

Innovative project. The Fairford Parkette is an official "Green Streets" pilot project.

Multifunctionality. Creation of a usable and attractive community space, including native plants and habitat for pollinators, which also improves stormwater management.

Green Infrastructure. Diversion of stormwater from the sewer system into areas where it can be infiltrated, reused or evapotranspired.

LESSONS LEARNED

- There is a need for staff training on essential knowledge related to LID practices and their inspection in order to prevent misunderstandings between City departments
- Using skilled and informed contractors is important, and carefully worded tender specifications can be helpful so that the general contractor only hires skilled subcontractors that are experienced in landscape architectural work with LID practices
- There is a need for greater public consultation and engagement prior to finalizing design, in order to improve the eco-literacy messaging about the project and promote community stewardship
- It is necessary to allot additional time when the design includes non-standard items, and also for the time required for materials testing and site plan approvals.
- Coordination and approval issues can pose challenges during delivery of a new kind of project in the right-of-way with multiple stakeholders
- Practitioner concerns regarding the use of non-standard details, items, and processes during the construction of green infrastructure, like bioretention areas, can be a barrier to its implementation
- Specifications for bioretention media need to be simplified, as the industry does not appear willing to invest time to prepare these mixes in small quantities
- The responsibility for maintenance of bioretention areas can be difficult to establish early on, and as such the development of a maintenance program during project planning could help to eliminate uncertainties about which parties are responsible for which tasks

REFERENCES

Credit Valley Conservation and Toronto and Region Conservation (CVC & TRCA). (2010). Low Impact Development Stormwater Management Planning and Design Guide (Version 1.0). Toronto, Ontario.

Toronto and Region Conservation (TRCA). (2016). Low Impact Development Stormwater Management Practice Inspection and Maintenance Guide. Toronto, Ontario.

City of Toronto. (2017 in progress). Toronto Green Streets Technical Guidelines. Toronto, Ontario.



Figure 6. Final parkette (image courtesy of City of Toronto)

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