

GREENEST CITY SCHOLARS PROGRAM
UBC Sustainability Scholars Program, Summer 2018

Research project title

Application of Stormwater Tree Trenches in the City of Vancouver

Research supports the following policies -

- Greenest City Action Plan
 - Clean Water – reducing combined sewer overflows, treating stormwater runoff, supporting trees with rainwater
 - Access to Nature – supporting tree planting and tree health
 - Green Transportation – promoting solutions that allow environmental goals to be met without sacrificing bike and pedestrian uses; supporting pedestrian safety by reducing sidewalk buckling
- Healthy City Strategy
 - Environments to thrive in: Creating more comfortable spaces to walk in and reducing urban heat island by supporting mature tree canopy.
- Renewable City Action Plan
 - Enhance and accelerate the development of complete streets and green infrastructure (T.2)
- Urban Forest Strategy (Park Board 2017)
 - Update policies and standards to enable proactive design and alternative construction methods for retaining healthy trees (Action 1).
- Vancouver Citywide Integrate Rainwater Management Plan
 - Reduce rainwater runoff, clean rainwater, reduce urban heat island, and increase green space

Outline scope of project and why it is of value to City and describe how and when the scholar's work will be actionable

The Stormwater Tree Trench Study will benefit the city in multiple ways. Green infrastructure options are limited and more costly in dense urban development where buildings fill most of the lots and right-of-way space is taken up by more uses. As Vancouver densifies, this type of development with limited green space will be the most common type of development happening in Vancouver. Stormwater tree trenches are potentially an ideal solution that meets many objectives at once with a marginal cost increase over the conventional approach. The scholar's work will help our branch quantify the benefits of the practice, develop a city standard, and justify its continued use. Furthermore, about one kilometer of stormwater tree trenches will be installed in the new streets planned for the North East False Creek (NEFC) neighborhood. The lessons learned from the four stormwater tree trenches constructed in 2018 will help to ensure that the NEFC applications are improved upon and constructed smoothly.

Stormwater Tree Trenches can be constructed of either soil cells or structural soil. Soil cells are plastic crate like structures that are filled with loose planting soil, while structural soil is a mixture of large stones and planting soil. This practice allows useable paved space right up to the tree while allowing the tree to grow to full maturity, remain healthy, and live a long life. The reduction and treatment of stormwater runoff is another objective that these practices can achieve when runoff from streets and sidewalks is directed into the structural soil and soil cells.

Vancouver has used structural soil and soil cells for expanding soil volumes for tree roots over the past two decades, but they have not used this practice for capturing stormwater runoff. Vancouver will be constructing its first stormwater tree trenches at four locations in Spring 2018:

- Soil cells in a traffic island at Expo and Smithe St.;
- Structural soil under the bikeway on W 10th Ave between Willow and Laurel St.;
- Structural soil in Robson Plaza at Hornby and Robson St; and

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- Both soil cells and structural soil trenches under bike paths on Quebec St between Central and 1st Ave.



Graphic source: Philadelphia Water Department

To support the city in evaluating this new technology, the scholar will be completing the following tasks as part of their project scope:

- Undertake a literature review of studies that evaluated the performance of stormwater tree trenches.
- Gather information from other municipalities implementing this practice, but with a focus on cities within our climate region (Lower Mainland and western Washington), on design, construction, maintenance, and performance.
- Perform a cost benefit analysis on the full life cycle of a conventional street reconstruction and street reconstruction with a stormwater tree trench.
- Produce case studies on the four new Vancouver stormwater tree trenches including design details, construction documentation, and lessons learned.
- Analyze early water level monitoring data from monitoring wells installed at the new stormwater tree trench sites. (optional - depends on construction timing and rainfall)
- Provide comparison of structural soil and soil cell stormwater tree trenches that includes performance and cost. Does one always perform better? Or does each perform better in certain settings.

Deliverables

The Greenest City Scholar will deliver a final report containing a summary of their completed work. The report must be completed in Microsoft Word and should be no more than 20 pages with any additional content included as appendices. The report will be complemented by a final presentation to key stakeholders. The report should include:

- Summary of the current research on performance and the use of the practice in other municipalities.
- Case studies on the three stormwater tree trench project implemented by the City in 2018.
- Cost benefit analysis on the full life cycle of a conventional street reconstruction and street reconstruction with a stormwater tree trench.

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- Lessons learned from research and the case studies that can be applied to a future standard and the implementation of stormwater tree trenches in NEFC.
- Recommendation on the use of structural soil versus soil cells for stormwater tree trenches.

The final report will be submitted to the UBC Sustainability Scholars online project library.

Time Commitment

- This project will take **500 hours** to complete.
- This project should be completed between April 27 and Aug 10.
- The scholar is to complete hours between 8am and 5pm, Monday to Friday, approximately 30-35 hours per week.

Work location: Green Infrastructure Branch - 525 West 10th Avenue, (may change to 507 West Broadway by April 2018)

Skill set/background required/preferred

From Standardized List:

- Excellent research and writing skills.
- Demonstrated interest in green infrastructure or urban stormwater management
- Strong technical writing skills
- Familiarity with research methodologies
- Strong analytical skills
- Ability to work independently
- Demonstrated time management skills
- Deadline oriented
- Project management and organizational skills
- Strong technical and drafting skills
- Familiarity with quantitative research methodologies and implementation

Addition Skills Required/Preferred:

- Understanding of hydrology, hydraulic, water quality, and geotechnical principles.
- Experience in literature reviews, life-cycle cost analysis, cost estimating, reading construction drawings, construction and monitoring would be an asset.
- Proficiency in Microsoft Word and Excel is required.
- Experience with AutoCAD and graphics software would be helpful, but not required.
- Particularly suitable for a student in the Civil Engineering Program, but recruitment should be open to other departments.

Additional Project Needs

- The scholar may accompany Branch staff to the construction site. Any necessary personal protection equipment will be provided by the Branch. The scholar should bring their own pair of steel toed boots, but a loaner pair could be provided if needed.
- The Branch will provide the water level monitoring equipment and any other data collection equipment needed.

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