



Apr 26th, 1:30 PM - 3:00 PM

Green rainwater infrastructure in the real world: City of Vancouver performance results

Sylvie Spraakman

Cassandra Humes

Follow this and additional works at: <https://cedar.wwu.edu/ssec>



Part of the [Fresh Water Studies Commons](#), [Marine Biology Commons](#), [Natural Resources and Conservation Commons](#), and the [Terrestrial and Aquatic Ecology Commons](#)

Spraakman, Sylvie and Humes, Cassandra, "Green rainwater infrastructure in the real world: City of Vancouver performance results" (2022). *Salish Sea Ecosystem Conference*. 77.
<https://cedar.wwu.edu/ssec/2022ssec/allsessions/77>

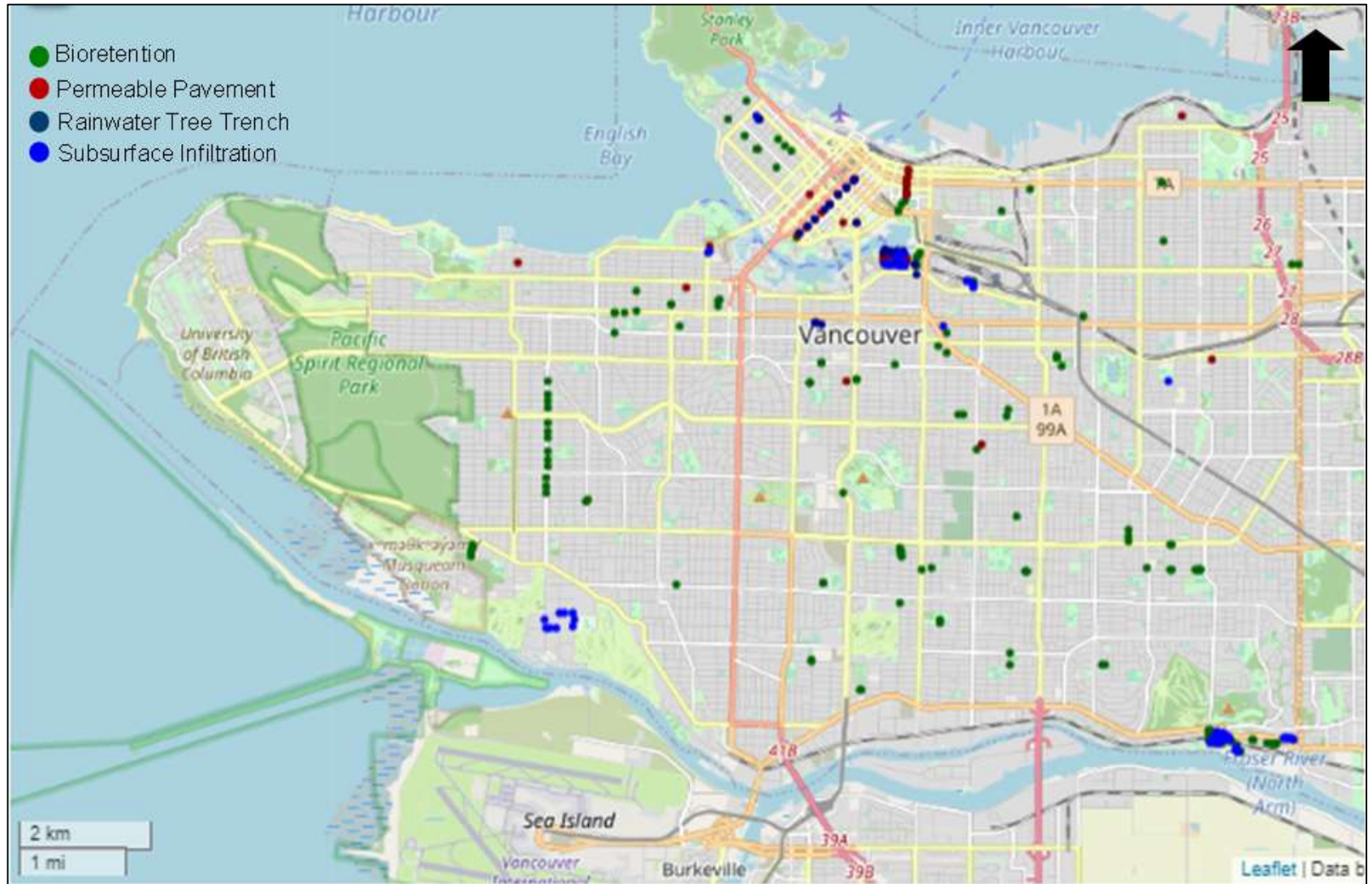
This Event is brought to you for free and open access by the Conferences and Events at Western CEDAR. It has been accepted for inclusion in Salish Sea Ecosystem Conference by an authorized administrator of Western CEDAR. For more information, please contact westerncedar@wwu.edu.



Green rainwater infrastructure in the real world: City of Vancouver performance results

Sylvie Spraakman, PhD, P. Eng., Cassandra Humes
April 26, 2022

Vancouver's Public Space GRI



309 GRI ASSETS IN VANCOUVER



163 bioretention



52 permeable pavement



26 rainwater tree trenches



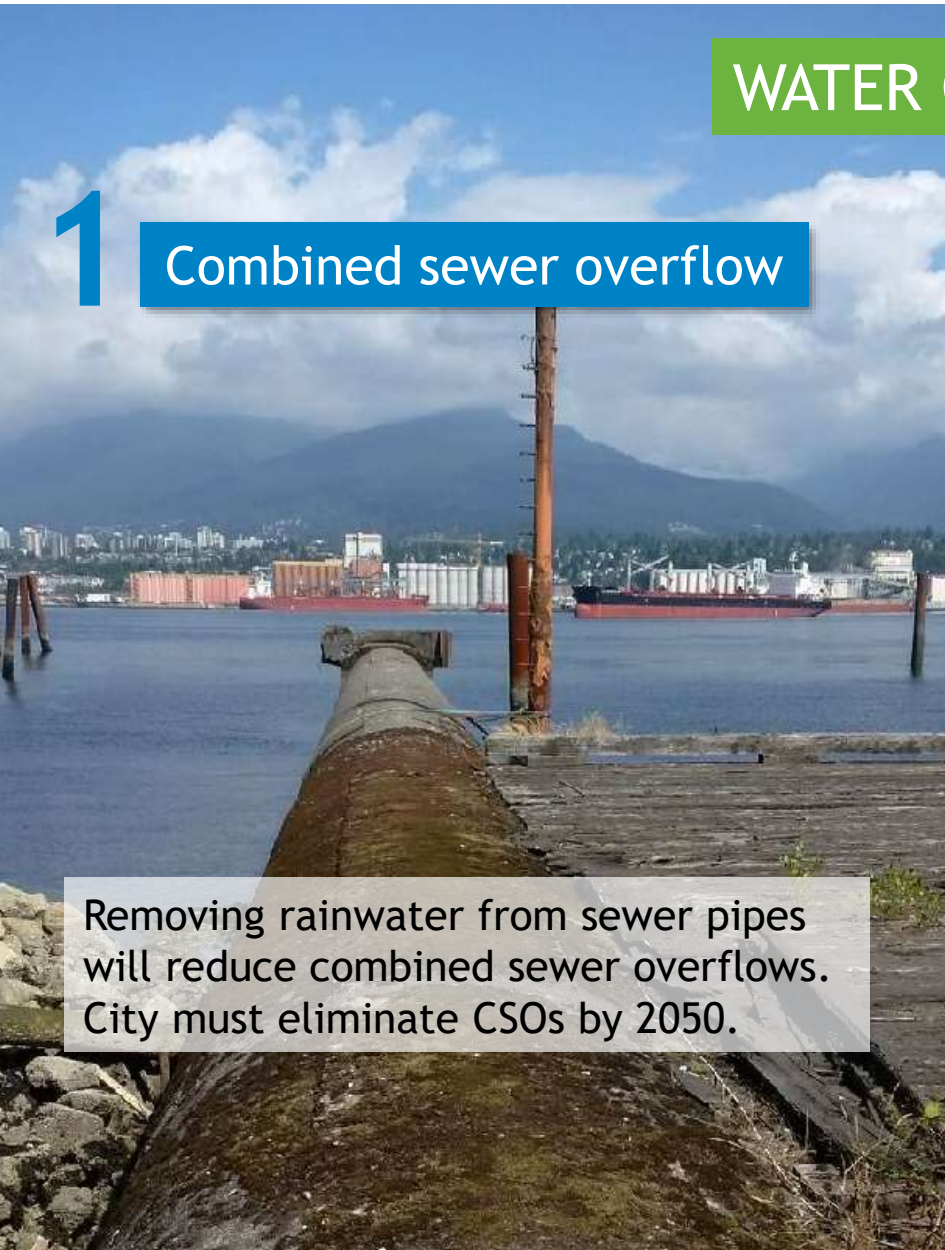
68 sub-surface infiltration

Why Implement GRI?

WATER QUALITY

1

Combined sewer overflow



Removing rainwater from sewer pipes will reduce combined sewer overflows. City must eliminate CSOs by 2050.

2

Urban stormwater pollution



Rainwater carries urban pollutants, such as gasoline, motor oil, heavy metals, sediments, litter, organics & fertilizer

GRI Objectives

Compliance Monitoring

Verifying that we are meeting provincially mandated implementation of stormwater management & Rain City Strategy Objectives

Performance Monitoring

Measuring how an asset is performing compared to design objectives and assumptions

Optimization Monitoring

Focuses on how an asset can be enhanced to improve performance, maintenance, and cost effectiveness

Monitoring Objectives

**Surface Ponding
<24 h**

**Subsurface
Storage
empty in
< 72 h**

**Design
infiltration
rates match
drawdown
rates**

**Retention/
filtration
target being
met**

**48mm in
24 h**

**90% of
annual
rainfall**

Monitoring Programs



Water Level Monitoring (23 active locations)

- HOBO loggers installed in monitoring wells on site
- Measures infiltration performance of asset over time



Water Quality Monitoring (1 location)

- Synthetic run-off test
 - TSS Load Reduction
 - Volume Reduction
 - Peak Flow Reduction

Monitoring Programs

Flow Monitoring (1 active location)

- Sensor and logger installed in the underdrain of asset
- Measures
 - Volume Reduction
 - Peak Flow Reduction
 - Lag Time (to sewer or combined sewer)

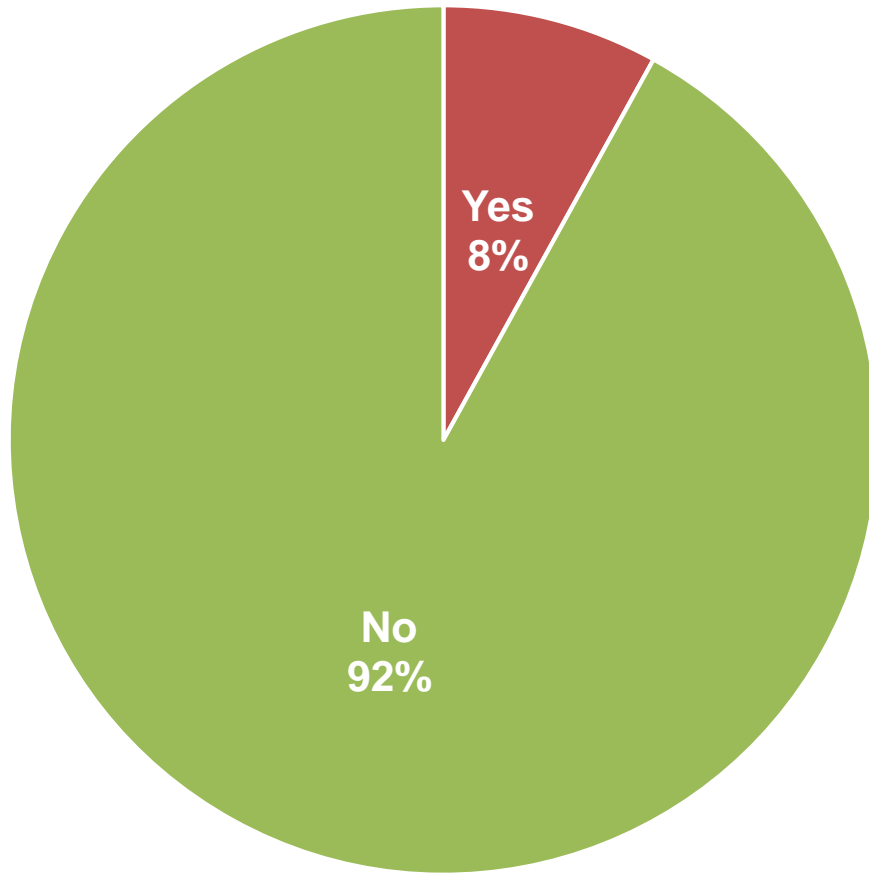
Visual Inspection Monitoring

- Sediment buildup
- Maintenance requirements
- Wet/dry weather inspections

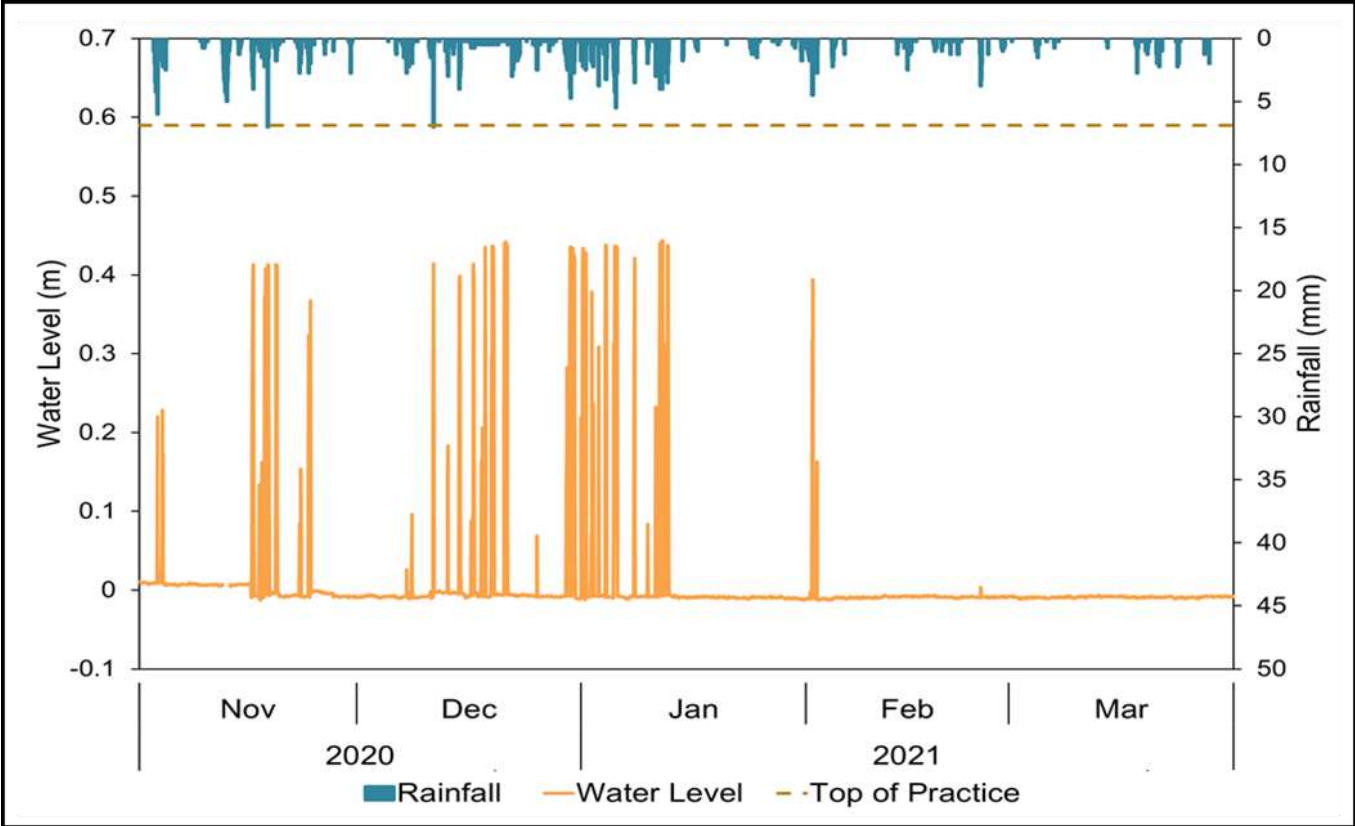


Surface Ponding

Standing Water 24hr after rainfall



63rd & Yukon - Bioswale



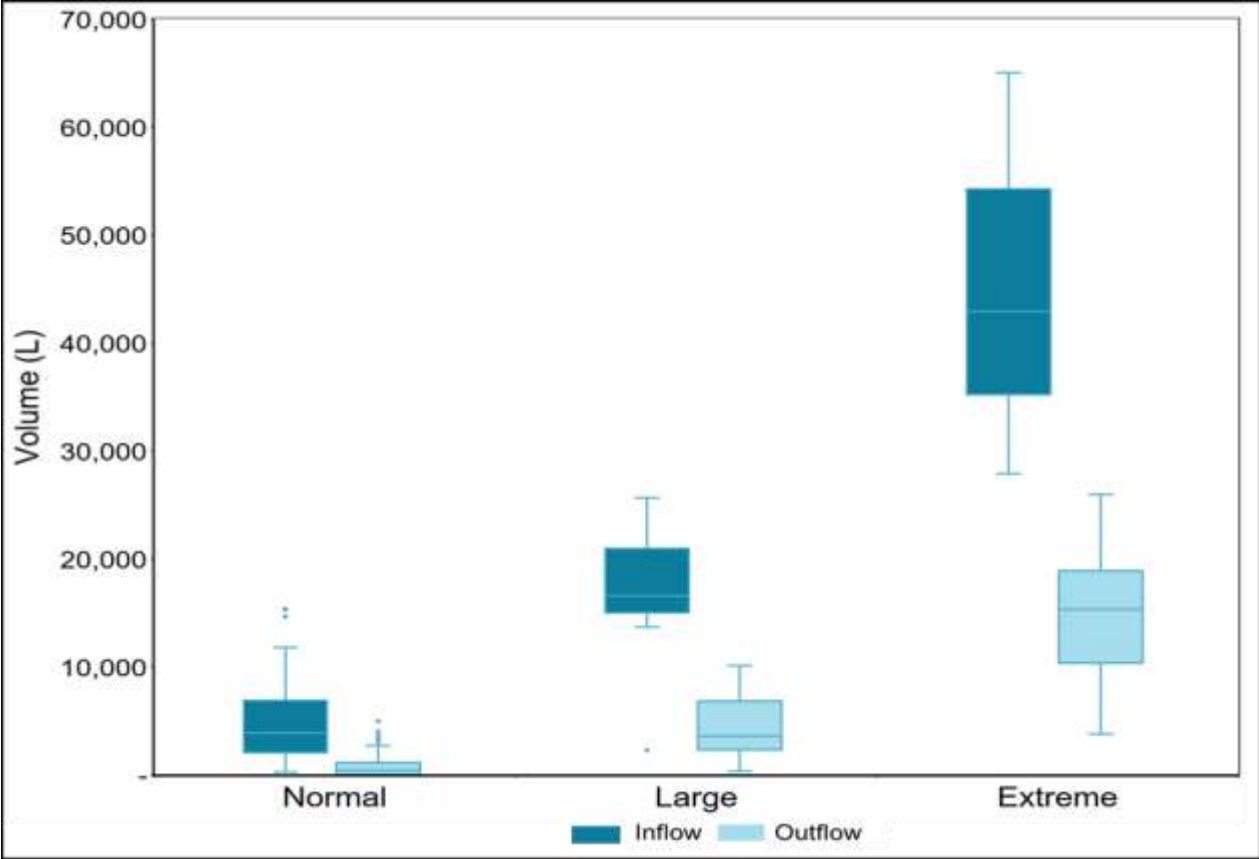
Storm Category	Normal (under 24 mm)	Large (between 24 and 48 mm)	Extreme (larger than 48 mm)	Total and average (weighted)
Drawdown Rate (mm/hr)	374	389	316	367
Design Infiltration Rate (mm/hr)			39	
% change	859%	897%	710%	841%

Summary Drawdown Rates

Site		Typology	Average Drawdown Time (h)	Average Drawdown Rate (mm/h)	Design Infiltration Rate (mm/h)	Difference between Drawdown Rate and Design Infiltration Rate (%)
Yukon & 63rd						
	North	Bioswale	1.6	367	39	841
Quebec & 1st						
	Location D	Bioswale	0.4	237	10	2270
Quebec & 2nd						
	North Well	Soil Cell RTT	27.4	8	10	-20
	Middle Well	Soil Cell RTT	28.5	9	10	-10
	South Well	Soil Cell RTT	22.9	10	10	0
Burrard & Cornwall						
	North Well	Infiltration Trench	7.4	61	5	1120
	South Well	Infiltration Trench	13.3	25	5	400
Average			14.5	102		

Quebec & 1st – Rainwater Tree Trench

Flow Monitoring



Storm Category	Normal (under 24 mm)	Large (between 24 and 48 mm)	Extreme (larger than 48 mm)	Total and average (weighted)
Average Retention (mm)	10	31	71	18
Volume Reduction	87%	75%	67%	84%
Peak Flow Reduction	79%	63%	61%	75%

Water Quality – Injection Test



66%

Peak Flow Reduction

77%

Volume Reduction

>99%

TSS Load Reduction

Conclusion

Surface ponding < 24 h



Subsurface storage empty in < 72h



Evaluate whether design infiltration rates are matching drawdown rates



Determine if retention/filtration target is being met



Interested in learning more?

City of Vancouver Green Infrastructure Monitoring Report

<https://vancouver.ca/home-property-development/green-infrastructure-documents-and-policies.aspx>

Image: Outfall at Clark Drive, Vancouver
Photo Credit: Bruce Todd

Rain City Strategy documents and policies

As part of our green rainwater infrastructure planning process, we have developed the [Rain City Strategy](#). The strategy reimagines and transforms how we manage rainwater with the goals of improving water quality, resilience, and livability through creating healthy urban ecosystems.

The strategy will implement sustainable rainwater management across the city with a goal of using rainwater as a resource rather than a waste product.

Green rainwater infrastructure has been proven to be a significant cost-saving investment.

Target

Capture and clean 90% of rainwater in the city

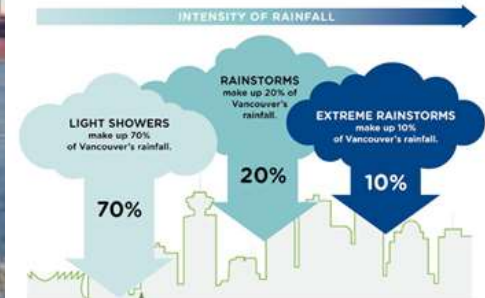
Performance standard

Capture and clean rainwater from a minimum of 48 mm per day.

Vancouver rainfall

The Rain City Strategy will bring us into compliance with Metro Vancouver and Ministry of Environment requirements, and will guide how we manage and use rainwater in Vancouver.

Our goal is to capture and treat 90% of the rainwater that falls in Vancouver using a combination of green rainwater infrastructure and conventional pipe systems.



[Find out what happens to the rainwater](#) (88 KB)

Documents

[Rain City Strategy](#) (21 MB)

Strategies

- [Rain City Strategy](#) (21 MB)
- [IRMP report card](#) (80 KB)
- [GRI Toolologies](#) (17 MB)
- [Watershed characterization](#) (16 MB)
- [Engagement summary](#) (6 MB)
- [Transformative directions and action plans](#) (805 KB)

Background documents

- [Open house information displays](#) (5.8 MB)
- [2018 engagement summary report](#) (5.5 MB)

Reports

- [Rainwater Management Plan and Green Infrastructure Strategy Council report](#) (10 MB)
- [Green Infrastructure Performance Monitoring report](#) (4.2 MB)



Sylvie Spraakman, PhD, P. Eng.
Senior Engineer
Sylvie.Spraakman@vancouver.ca

Cassandra Humes
Engineering Assistant
Cassandra.Humes@vancouver.ca