

Rainwater Collection in Urban Environments



David Grigg, P.Eng., M.C.I.P.
UBC Campus and Community
Planning

Overview

- Problem Definition
- The UBC Context
- Integrated Stormwater Management
- Sustainability Street – the Prototype
- South Campus – Westbrook Place
- Conclusions

Problem Definition

- Approximately 90% CDN population in south
- Approximately 75% freshwater flows north
- Flight of population from rural farming to city. Water demand is greatest far from supply.
- Cost of fresh water supply infrastructure is unsustainable – both capital and operating cost
- Rainwater is a resource – not a nuisance or just a flood risk.

UBC – the Context



- UBC is a small city on a peninsula- surrounded by forest, river estuary and marine foreshore.

UBC wants to protect its own environment

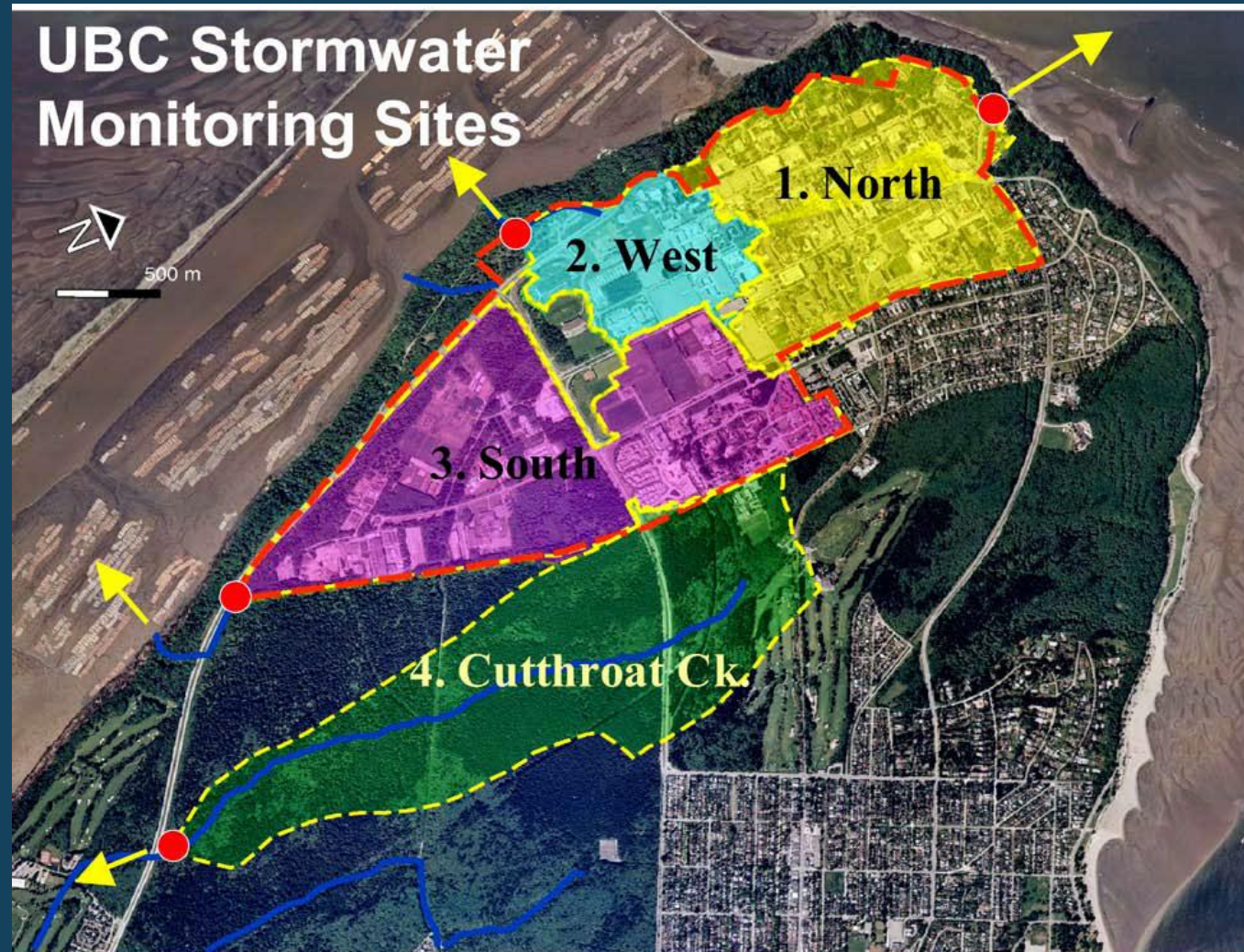
- Minimize storm contaminant loading
- Minimize flood and erosion risk to cliffs and creek
- Demonstrate leadership in rainwater management in an urban environment



UBC's Integrated Stormwater Management Plan (ISMP)

- The plan must have long term community support.
- The public, residents, faculty, students and staff must be consulted and involved.
- The problems must be well defined and the need well understood.
- At UBC we must minimize stormwater contaminants reaching recreational beaches and fish habitat.

UBC's Four Watersheds - currently buried and piped



The Challenge



reduce contamination

reduce peak storm loads



recycle and re-use water

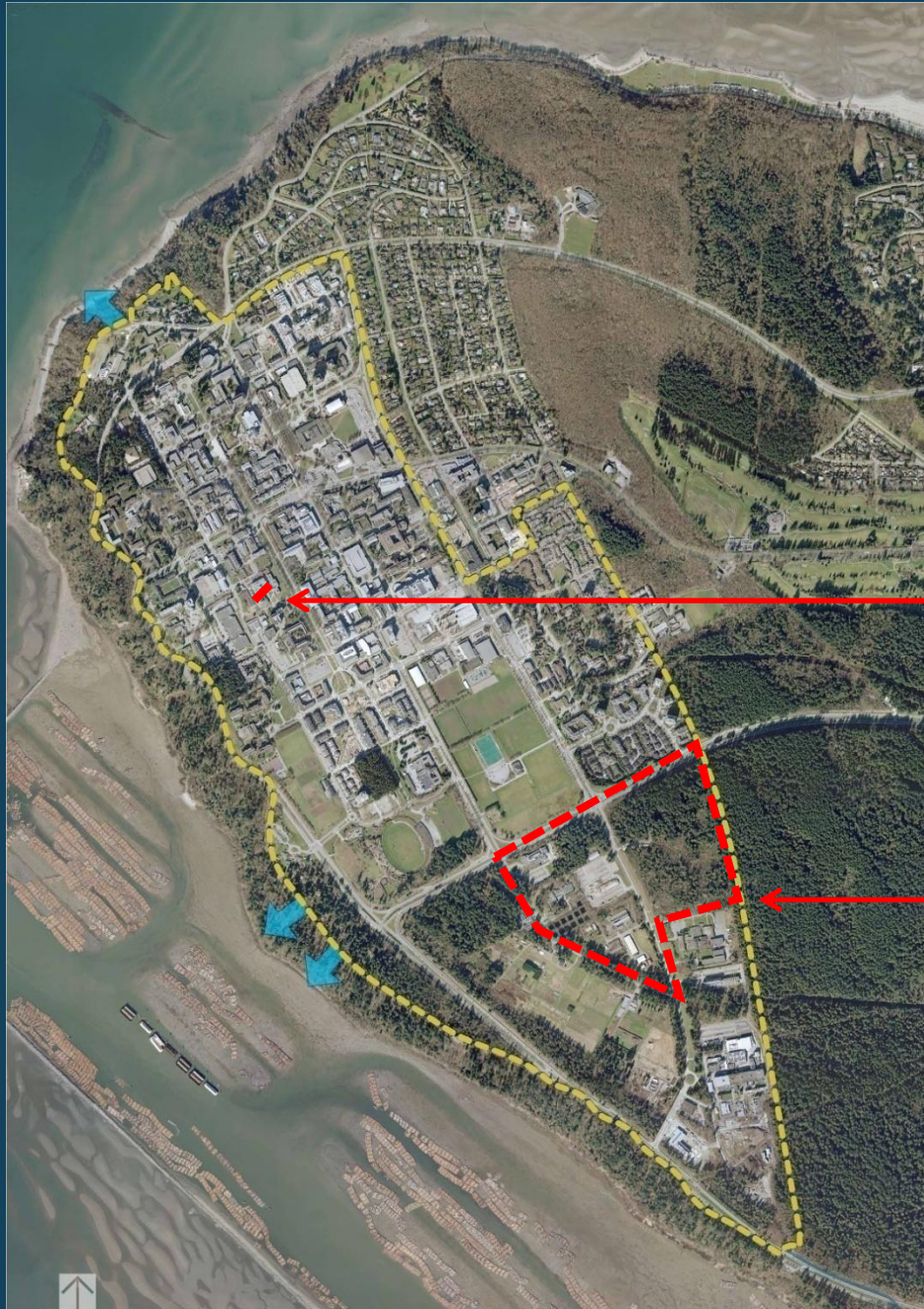
The Trials

A trial was carried out on a campus street

- *Sustainability Street*

This trial was extended to a developing urban area

- *Wesbrook Place*



From a campus street to a developing urban area.

Sustainability Street

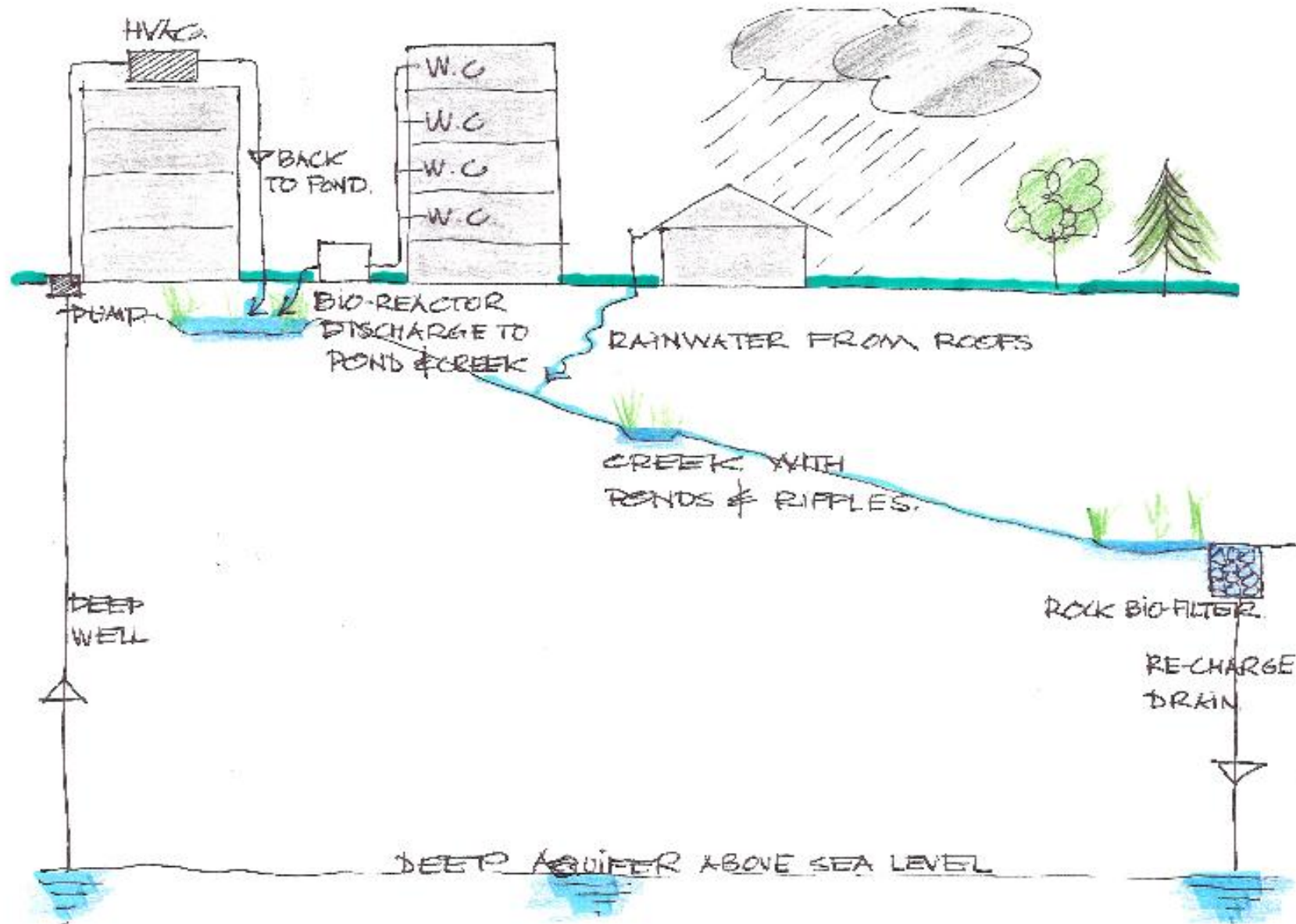
Wesbrook Place

Sustainability Street - Goals

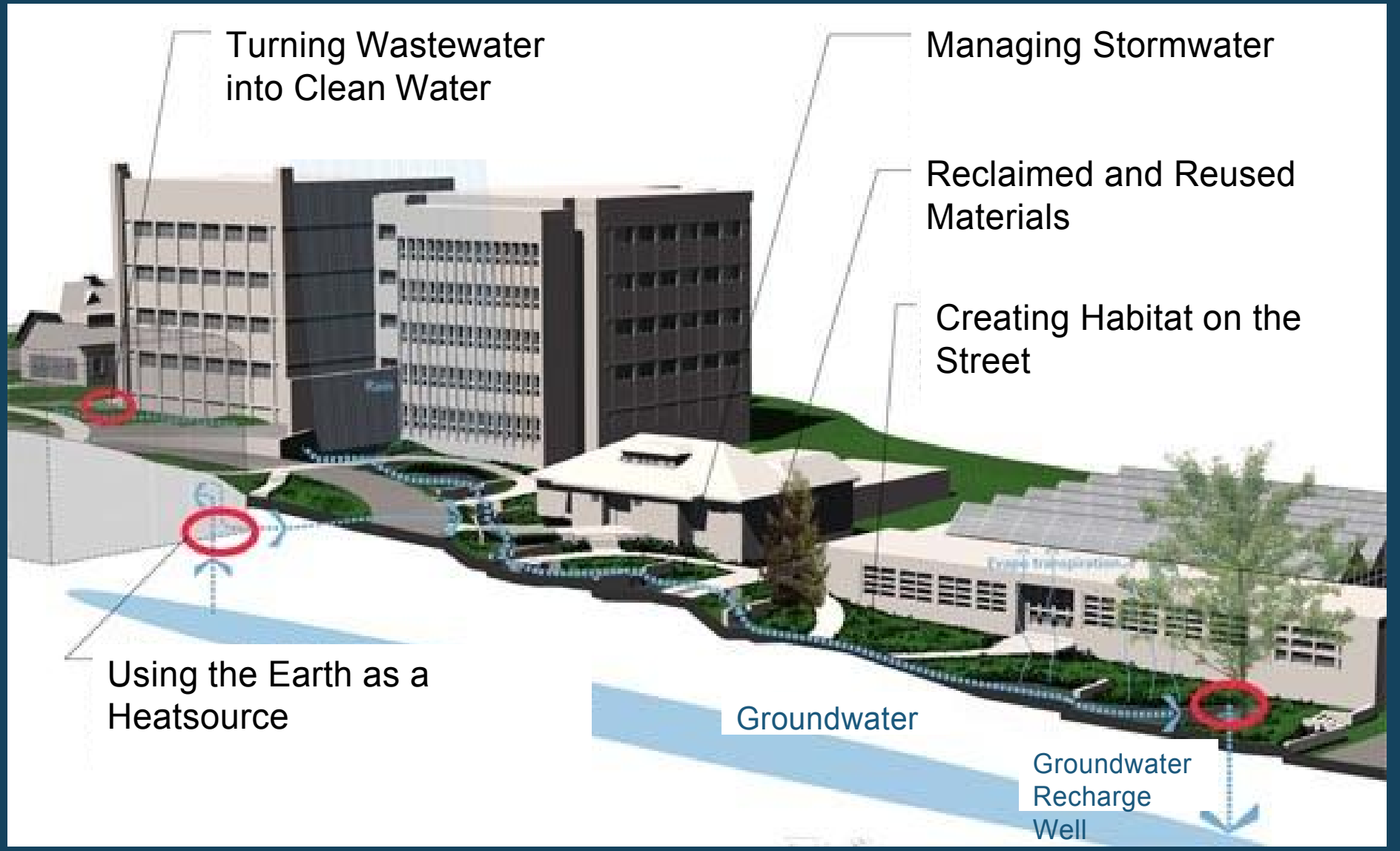
- Reconstruct the road for people
- Cleanse stormwater – reduce peak loads
- Treat building sanitary wastewater to potable water standards



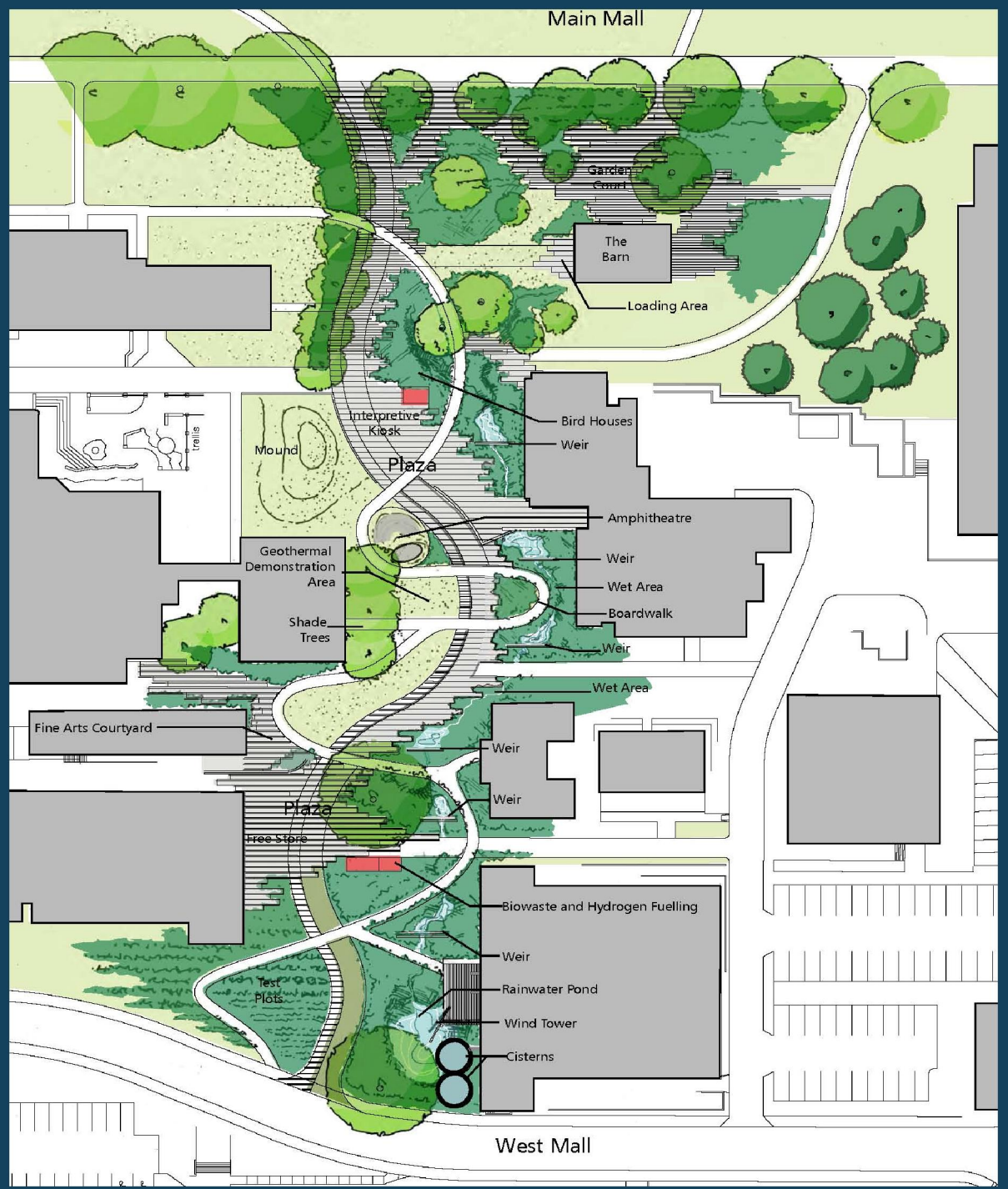
Sustainability Street - Schematic



Sustainability Street



Sustainability Street



Sustainability Street – Construction



Sustainability Street – sand filter



Sustainability Street



before



after

Sustainability Street



Sustainability Street



The University
is growing and
evolving



Wesbrook Place

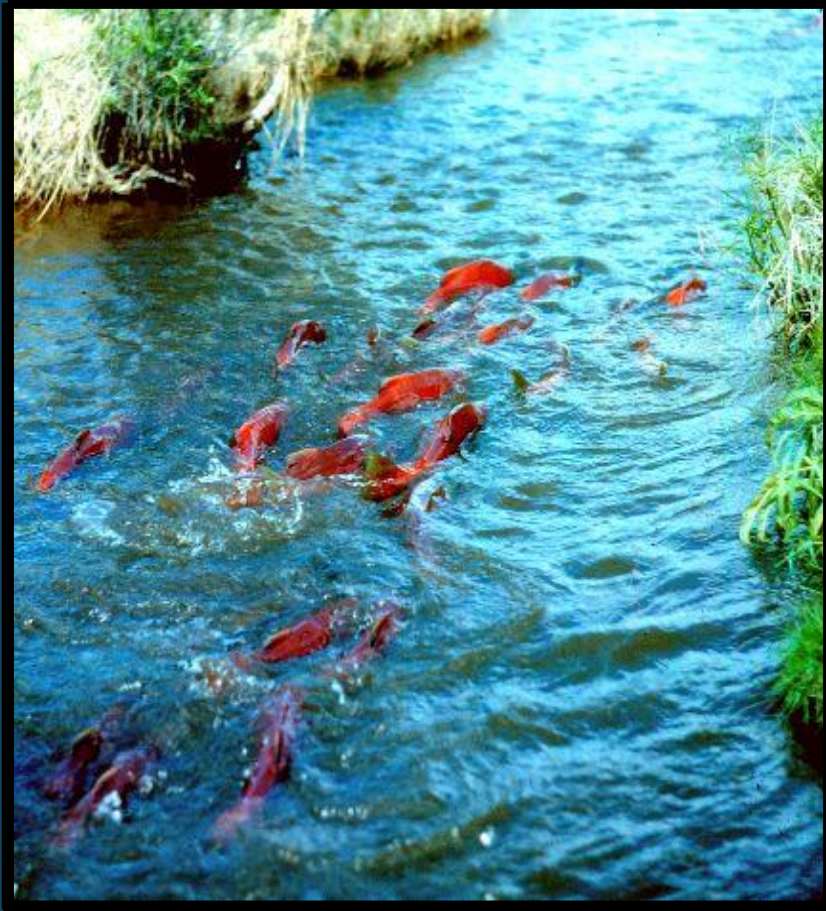


- UBC applied the principles implemented at Sustainability Street to Wesbrook Place.
- Wesbrook place was a forest two years ago.
- If UBC did not take steps to mitigate the tree clearing impacts, there would be environmental consequences.

Wesbrook Stormwater Management

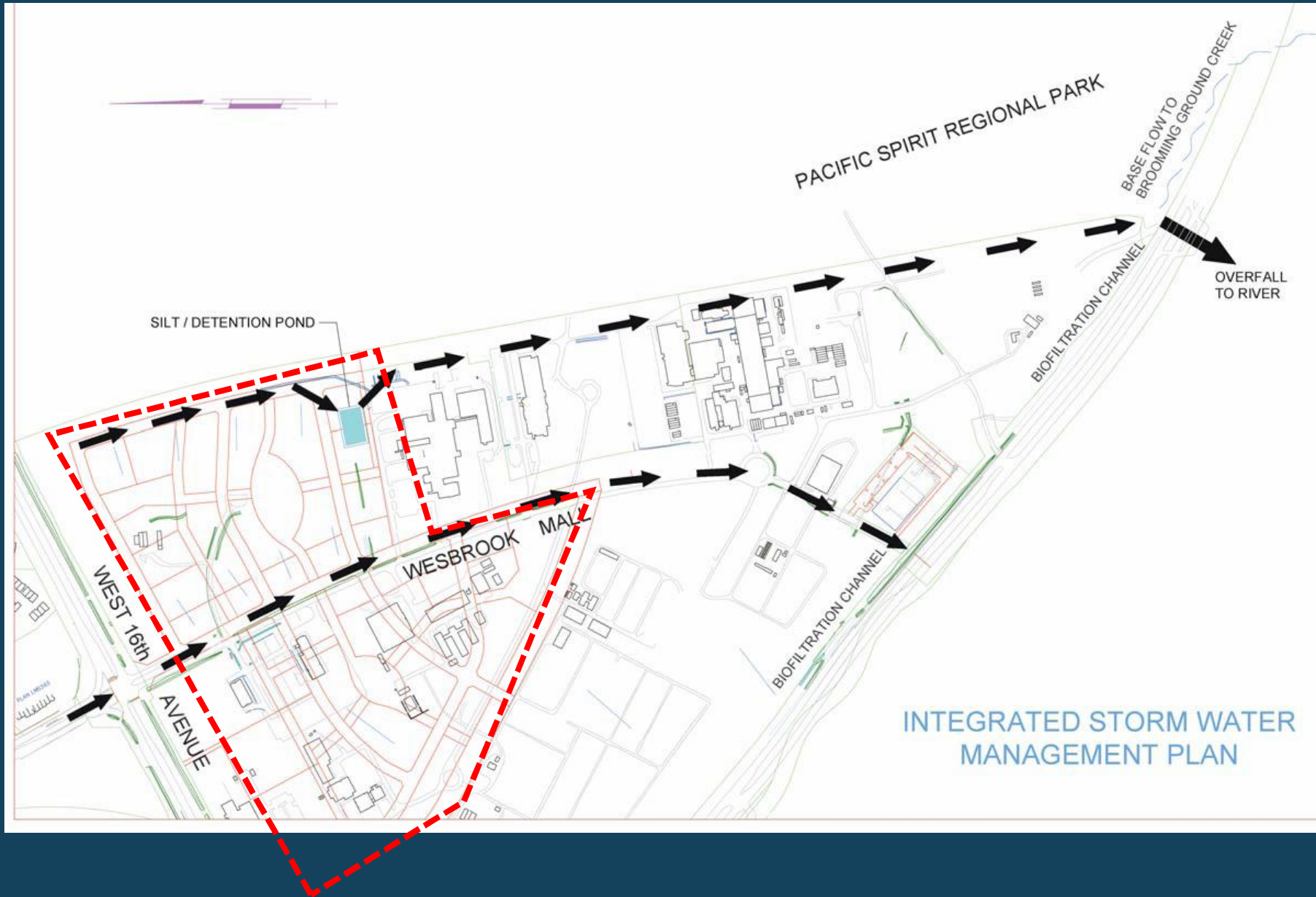
- *Goal:* Maintain stormwater flows to Booming Ground Creek at pre-development flows.
- *Techniques:* detention ponds; special attention to sediment source control during construction.
- *Long term:* outfall pipe to the Fraser River and a system of biofiltration channels (to replace the detention pond).

Re-introduce Stream Habitat



- Aesthetic Value
- Transports nutrients to sensitive downstream fish habitat.
- Promote Campus Sustainability
- Erosion Protection

Wesbrook Stormwater Management



Green Streets and Detention Ponds

- Ponds are designed for infiltration and peak runoff rate reduction.
- A stream can be restored to reduce stormwater load on the artificial stormwater system.

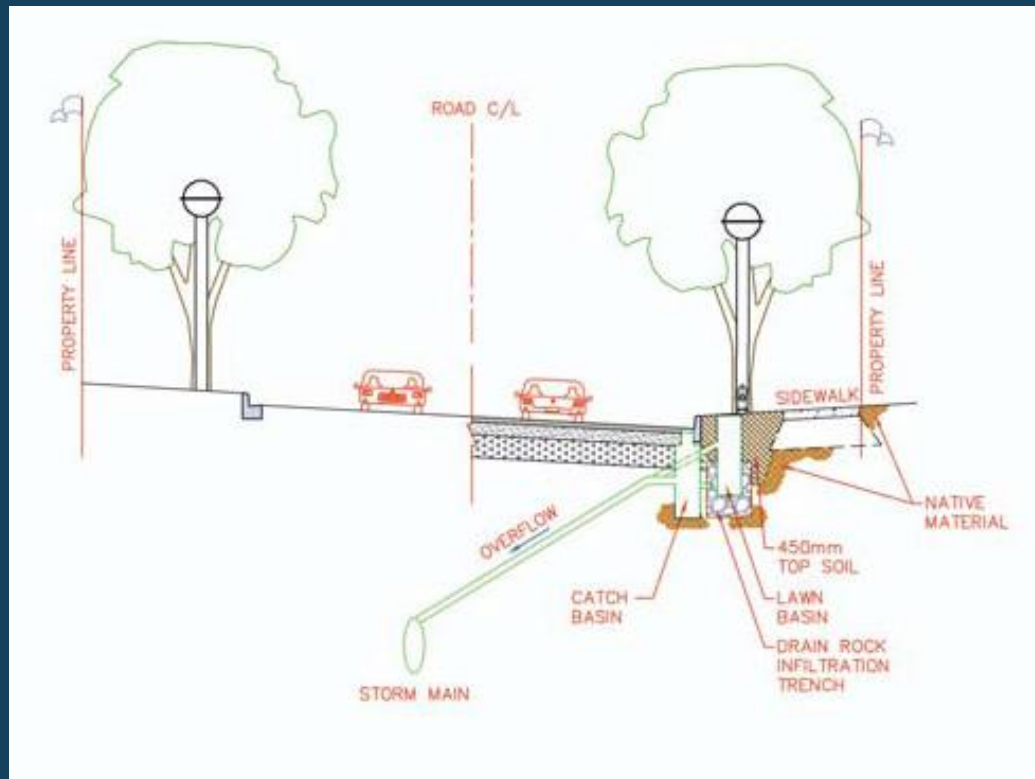
Ponds and streams add to the aesthetic value.



Wesbrook Place - Construction



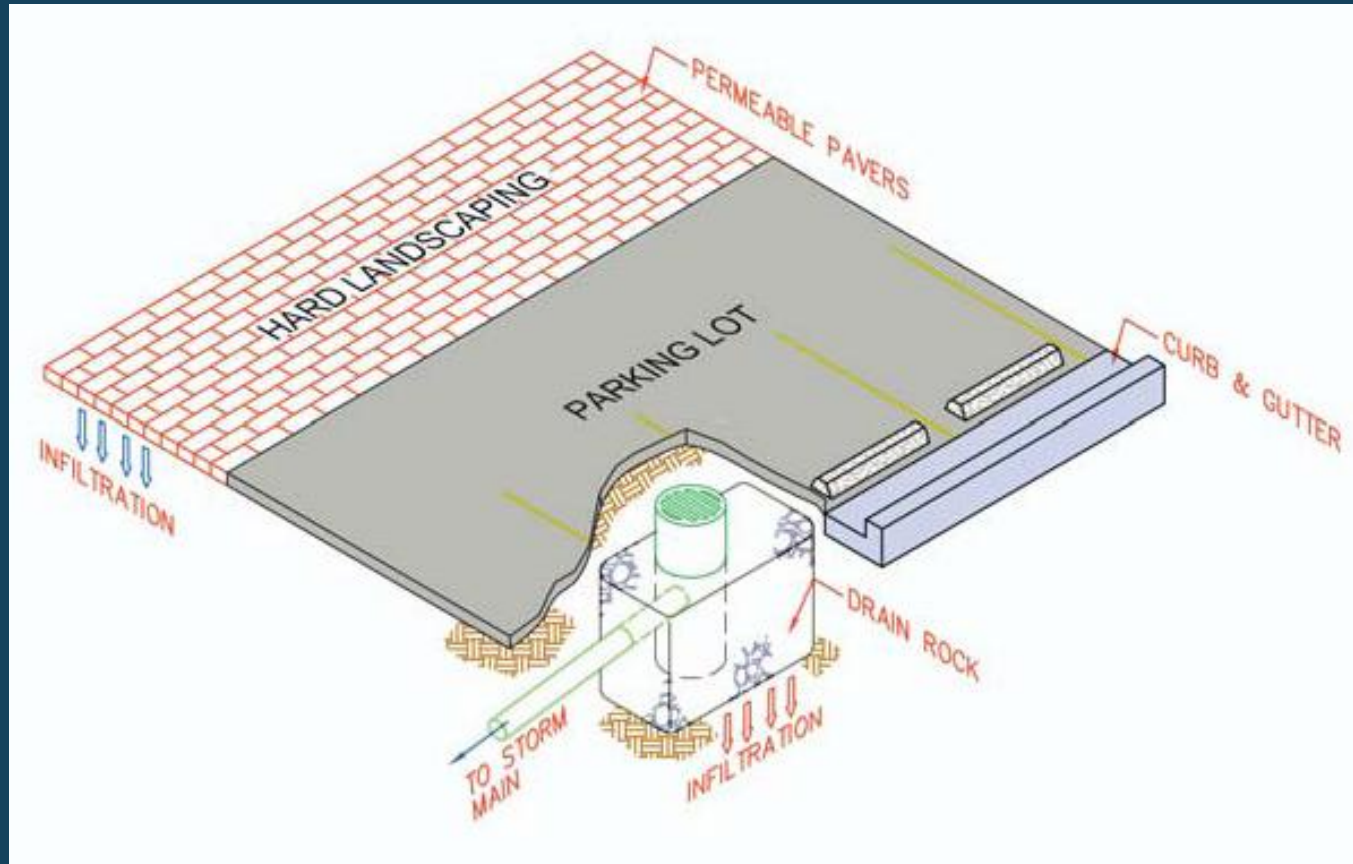
Wesbrook Stormwater Management



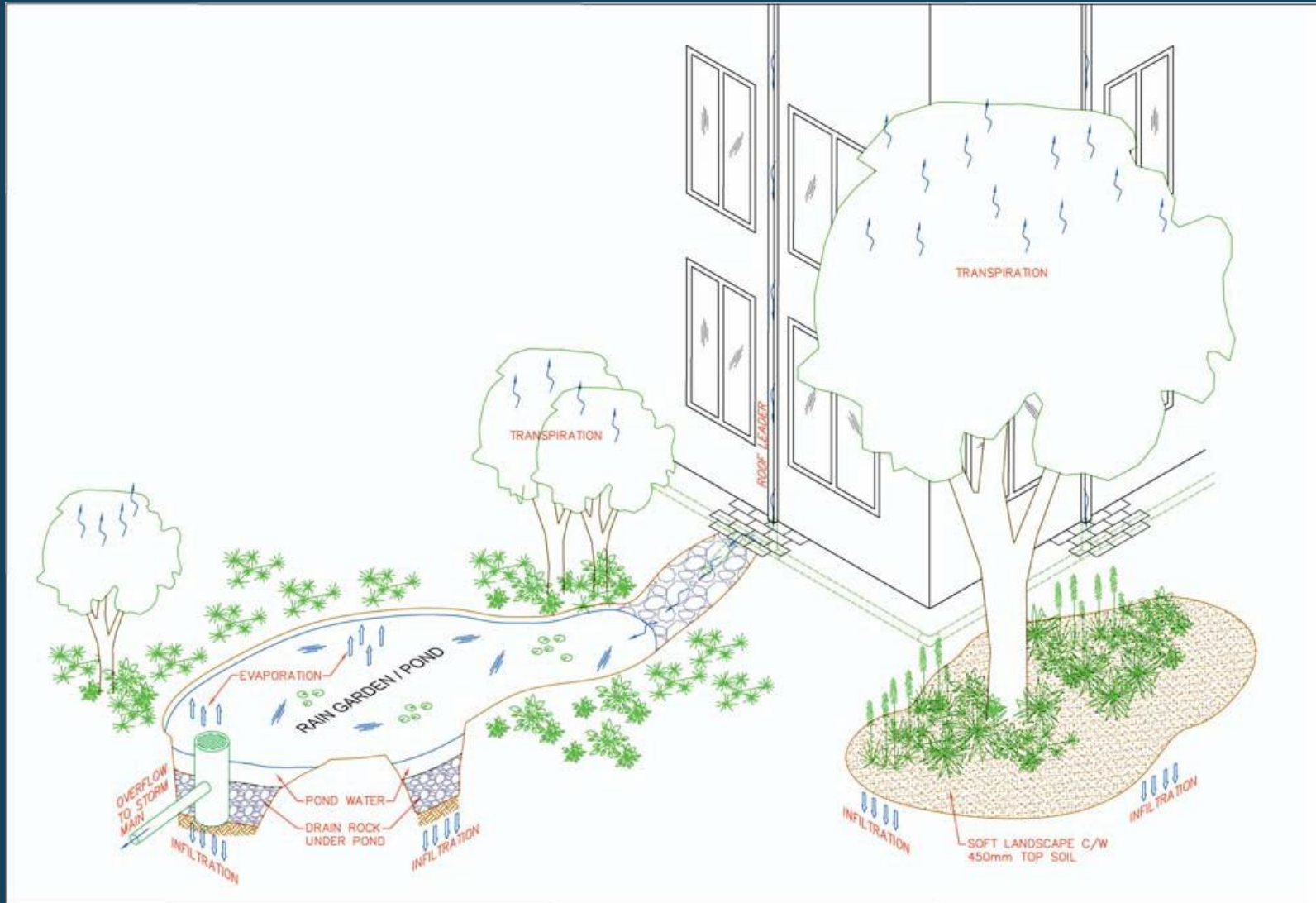
Roads will have a cross-slope to direct rainwater to one side of the road. Along this side, is a sub-surface infiltration trench .

Inlets convey rainfall from the road surface to the trench.

Hard Landscaping and Parking Lot



Rain Garden Pond



Stormwater Management: Site Level Techniques



Rain garden



Parking Lot Swale



Rain Barrel



Permeable
Pavers

Biofiltration Swales:



Storm sewers under roads will convey water to a detention pond (short term) or biofiltration channel (long term).

Old Stream at South Campus



Final Stream Location



Conclusions

- With climate change – more intense periods of rain and drought – rainwater management must also increase in intensity
- A multidisciplinary approach is vital – land use planners, engineers, landscape architects
- In terms of scarcity and value, water is the next oil crisis.

Questions?



David Grigg, P.Eng., M.C.I.P.
UBC Campus and Community Planning