wash. rinse. repeat.

shalea oretzky

symbiotic urbanism masterplan : hastings corridor individual design

sustainable urbanism : the hastings corridor

ubc urban studio : fall 2008

wash. rinse. repeat

water management system

This project illuminates opportunities for green infrastructure to create symbiotic relationships within urban and natural systems. Wash. Rinse. Repeat proposes a visible, inexpensive water system, which cleanses storm water and treated grey water and returns unpolluted water to the natural system, while supplying irrigation to agricultural programs.

Rationale: The current sewage system in the City of Burnaby is a combined sewage and stormwater pipe system. On dry days, sewage is piped to Annacis Island Wastewater Treatment Plant in Delta. On days with higher levels of rainfall, the system becomes overloaded and sewage is discharged into Burrard Inlet. Burnaby has committed to retrofit the current system over the next several decades to create separate sewage and stormwater systems.

Wash. Rinse. Repeat showcases methods in which new developments and community retrofits might be re-imagined with greener, smaller, localized infrastructure to meet neighborhood sewage needs. This system is explored in the new proposed development replacing the current Shell Oil Tank Farm on the eastern edge of the Hastings Corridor Study Site.

Wastewater Treatment Facilities in the GVRD

Goal:

Demonstrate a closed loop system within an urban industrial context, recognizing the ability to use water as an organizing element for both natural and social landscapes.

Objectives:

1. Design participatory and didactic green infrastructure.
2. Showcase the versatility and capabilities of water
3. Allow and encourage transformation over time.
4. Recognize the importance of the journey.
5. Amplify the intensity of the experience.
6. Create availability for human activities that foster a love of place.

participatory

didactic

versatility

transformation

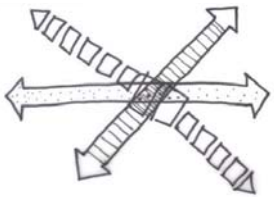
journey

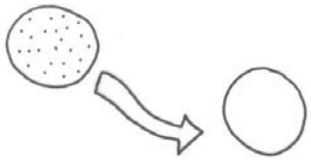
experience

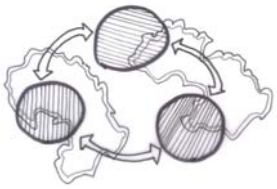
love

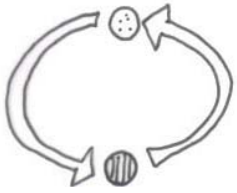
Process:

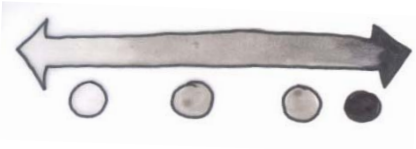
Diagram out form for these ideas, then establish design principles and begin to spatialize them within the context of the site.







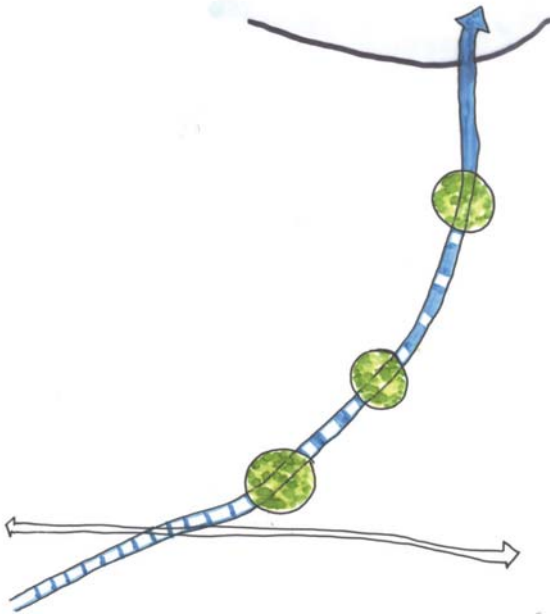


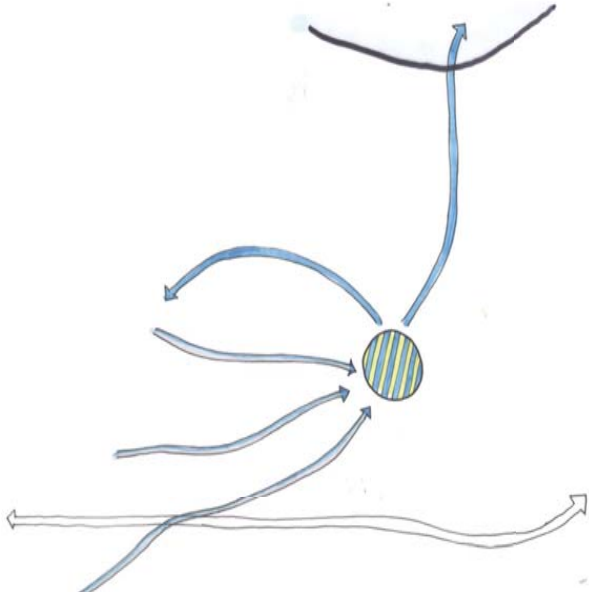


design principles

Highlight the capability of natural filtering systems

Making systems and treatment visible and interactive through all stages of the process allows for an understanding of natural process and a desire for closed loop systems.



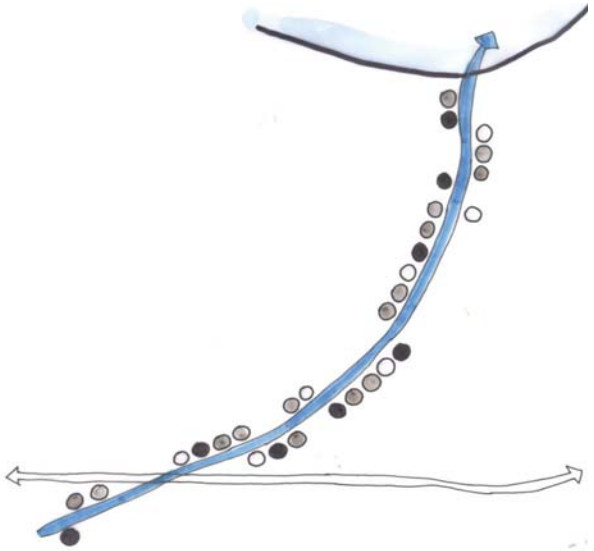


Create a biological wastewater treatment system

A system whichfilters industrial and residential wastewater, street run off - then reconnects the system. A closed loop system allows for water treatment and re-use, while minimizing energy expenditure and abstaining from building in to the current combined sewer. The biological system will create symbiotic relationships between urban and natural contexts, enhancing each realm.

Learning opportunities should cater to multiple user groups

Landscapes should be an opportunity for eve ryone to learn and connect with the land. These experiences will be represented in a gradient between subtle and obvious forms. It should be recognized that people can learn through a variety of different types experiences.



Utilize areas where different systems and infrastructure intersect to create points of interest and excitement.

When multiple systems overlap, opportunities for special site features and adaptations occur. These incidences exhibit uniqueness and create a distinct character of that place.

Design recreational and social spaces that physically interact with green infrastructure

This site can be an incredible amenity for the community, layering sustainable systems and human activities, producing experiences that facilitate a relationship between the two systems.

Arcata Wastewater Treatment Plant, Marsh, and Wildlife Sactuary, Arcata, CA

Originally the city of Arcata, CA disposed of it's waste water directly into Arcata Bay. After disease out break from oysters raised near the bay the city began to look for new alternatives. Between 1949 -1975 sewage treatment became more complex involving oxidation pools, chlorination and then de-chlorination processes. The closing of the existing plant came simultaneously with the 1975 Clean Water Act. It was decided that the water that left the new facility must actually be cleaner than water currently in the bay and be used to enhance the environmental character of the area rather than damage it further. With community support a partnership began between Humbolt University Environmental Engineering and the Wastewater treatment Plant to explore the use of wetlands in natural water treatment process.

The project was successful and expanded to restore areas of the coastline that been left in a brown-field state by large industry. Allan Marsh over 30 years has been transformed and studied as been cleansed and enhanced to the point that it has attracted so many species of wild life that it is now a bird sanctuary.

Treatment and Wetlands Water Cleansing Process:

Primary Treatment- primary clarifier removes suspended solids from grey and black water.

↓

Oxidation Ponds- Algae growing in ponds add oxygen to water stimulating microorganisms (which remove up to 50% of biochemical oxygen demand [BOD]). As well as creating another chance for further solids settlement.

↓

Enhancement Marshes- remove excess nutrients from the water such as nitrogen and phosphorus, which can cause undesired excessive growth of certain organisms within the bay (it acts as a shot of fertilizer).

↓

Chain Treatment Wetlands- Works to degrade organic materials in the water (from the previous ponds) and roots from marsh plants further reduce BOD.

Photo: *left*: Alllan Marsh, *right:* Arcata WastewaterTreatment Plant

Dockside Green, Victoria BC

Dockside Green is anew development in Victoria, BC that is focused on the principles of smart growth, new urbanism, and sustainable development. It was design to meet LEED platinum standards with attention specifically on closed loop systems. The area is a good comparison with Shell Tank Farm in Burnaby, as an old industrial site converted into a mixed use, light industrial, and job supplying community (Dockside green is approximately 1/4th the size of the Burnaby site). The water system is planned to collect, treat, and reuse as much water as possible within the development itself. Dockside Green uses an in house sewage system (A GE Water & Process Technologies Z-MOD* packaged wastewater treatment plant, incorporating ZeeWeed* membrane bioreactor technology) to treat 100% of it's water which is then recycled for re-use in toilet water, irrigation, and water features throughout the community.

Blackand Grey Water Treatment Process

Bioreactor Tank- Sewage flows to the tank where bacteria consume and digest biodegradable waste.

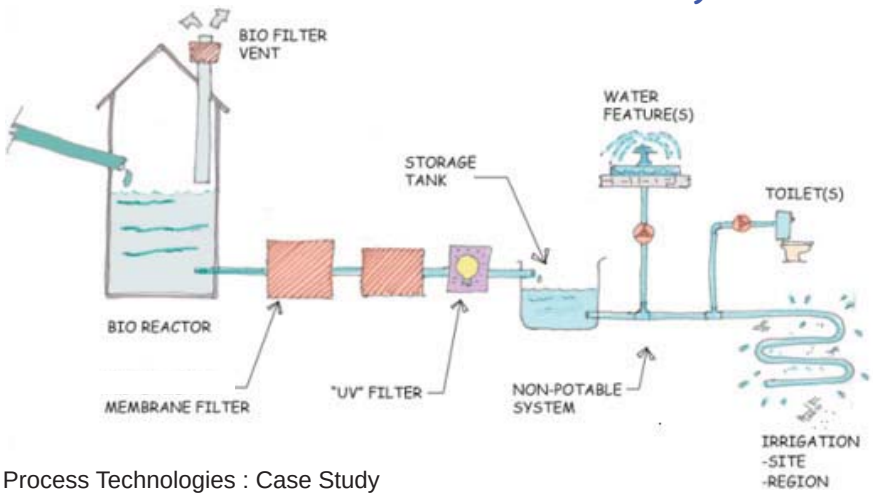
→

Membrane Chamber- the ZeeWeed membrane filters suspended solids and viruses from the water.

→

Ultra Violet Filter- disinfects and sanitizes the water, finishing the cleansing process. Water is then moved to a storage tank to be reused, for non-potable needs.

Dockside Creek Wastewater Treatment and Reuse System Flow Diagram



GE Water and Process Technologies : Case Study

Portland, Oregon

Portland, Oregon has become a major North American leader over the last decade in design for urban stormwater management and viewing water as a resource rather than a waste. They have recognized that the high speeds in which stormwater runs off urban surfaces has caused serious stream damage, and have tried to abate the problem by designing street runoff collection systems which more closely resemble natures process than a sewer system. Portland has worked mostly in publicly owned land such as street right of ways and school and university properties to demonstrate the success of these endeavors and to change peoples opinions and aesthetics. These approaches include: rainwater gardens (to slow the flow of runoff), curb cuts in streets, stormwater planters in parking lots. Rainwater gardens are mostly a series of cascading compartments regulated by weirs that can be adjusted based on need after construction. Compartments can contain plants, which filter debris, remove toxins, or large rocks that act as spreaders to move water more evenly through the garden. Plants are mainly rushes and sedges, planted tightly together to prevent weeding and keep maintenance costs down.

Photo: Portland State University street garden, Glencoe Elementary School, Portland State University Courtyard,

design precedents

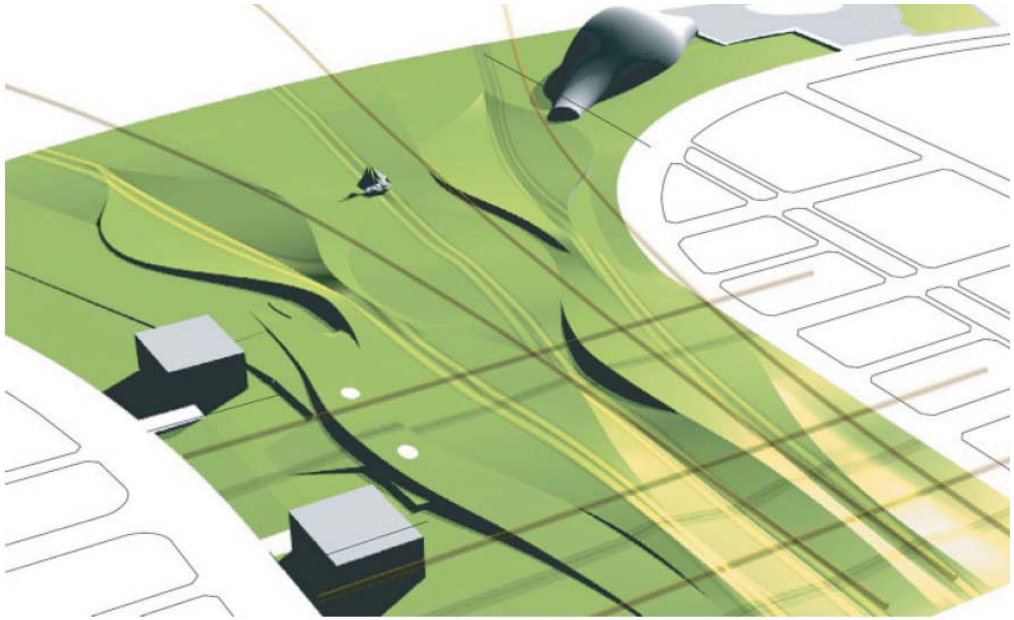
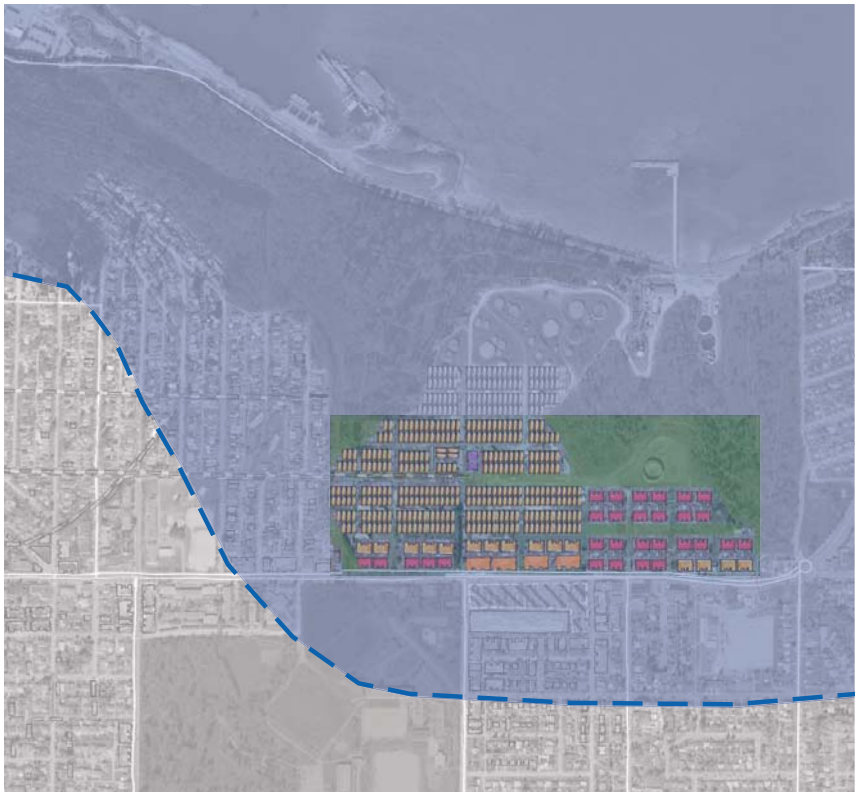


Photo: [clockwise from top left] Singapore Bay - Kathryn Gustafson, Living Water Garden Chendu, China - Betsy Damon, Connecticut Water Treatment Facility - Michael Van Valkenburgh Associates Inc., Columbia Blvd. Water Treatment Plant - Murase Associates.



Water

The project works within the existing watershed, utilizing natural topography and street grading to move water to and through a channel and wetland without excessive use of pumps and pipes.

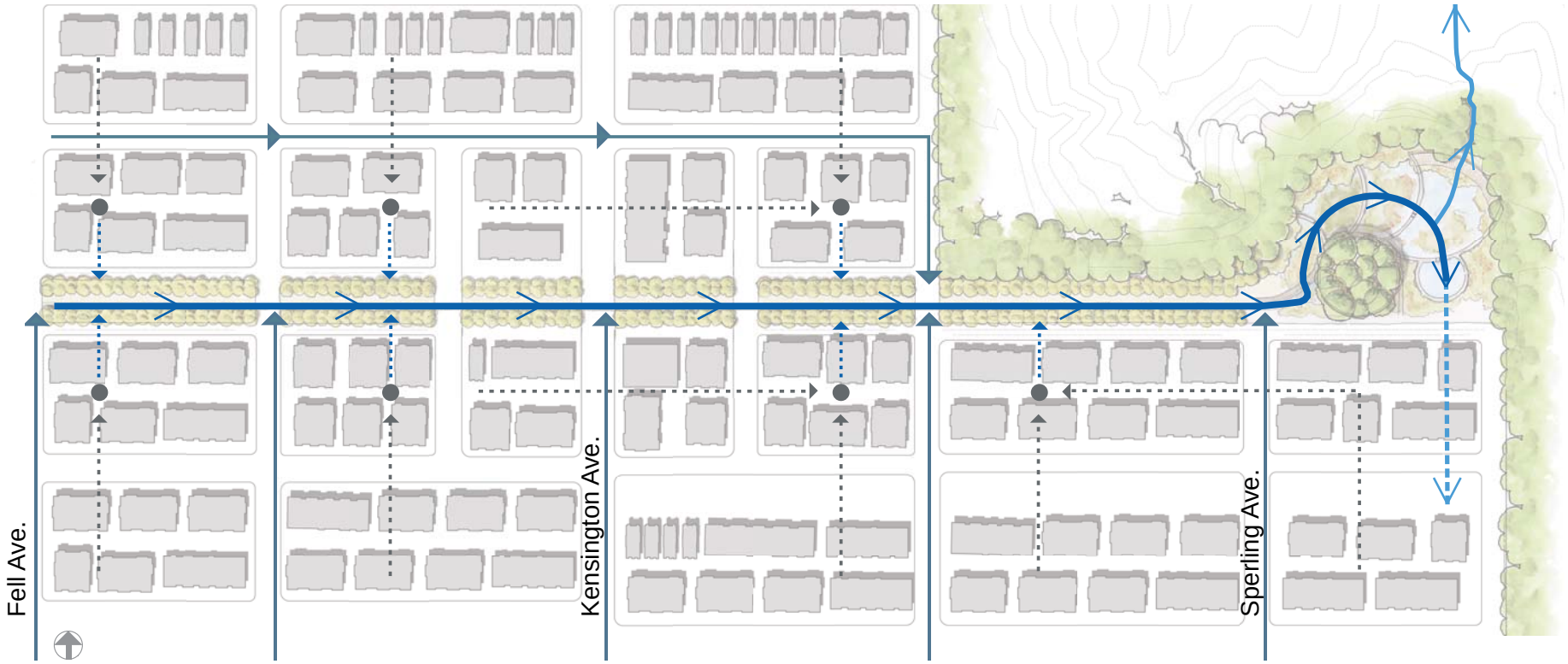
Green Networks

Larger green networks have been disrupted by the current development pattern and industrial uses. The greenway reconnects the larger system with a green corridor within the new community.

①Black and grey water are collected the local level. ②A GE Water & Process Technologies Z-MOD packaged wastewater treatment plant (separates solids and cleanses) treats black and grey water and pumps it through a series of pipe fountains in the water channel.③Stormwater from Hasting St. (between Fell Ave. and Sperling Ave.) and the new community is directed toward the water channel through street grading.

④ The water channel is a collection point for water and is planted with sedges that begin the filtering process. ⑤ Water moves through the treatment wetland and is cleansed through a series of cascading pools planted with species that remove toxins. ⑥ Water is directed back to the existing stream having been filtered and with a regulated speed as to closer mimic the natural system. ⑦Stream exits to Burrard Inlet. ⑧ Water is piped to neighboring agricultural lands for irrigation.

water management system diagram



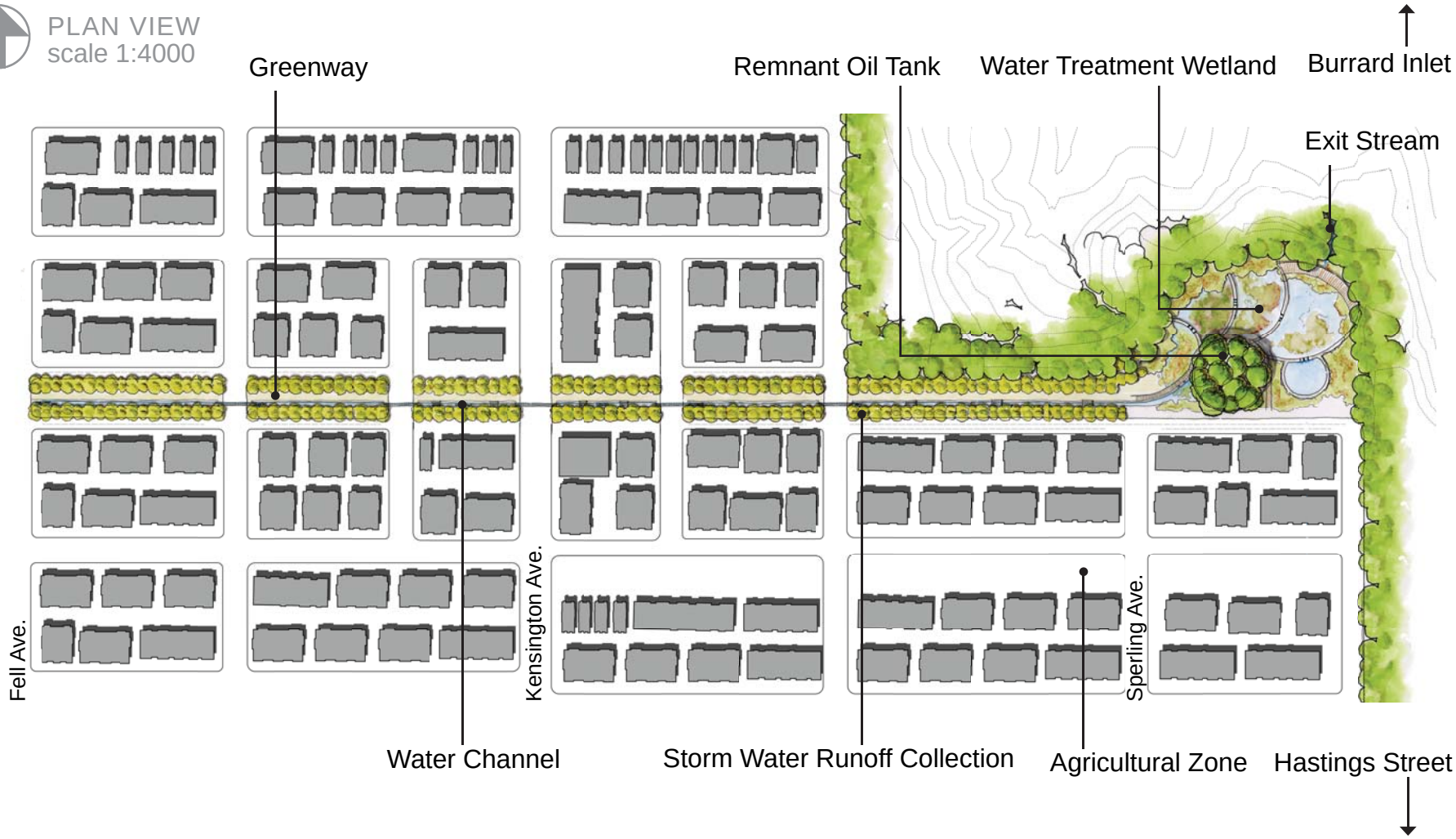
LEGEND

- Sewage Filtration Station
- Black and Grey Water
- Treated Grey Water
- Storm Water Runoff
- Water Cleansing Channel and Wetland
- Cleansed Water
- Visible Water
- Piped Water

This diagram spatializes the water management system program. Water is addressed as a full system in this design, focusing on inputs, treatment, interaction (above and below street level), and output.

concept plan

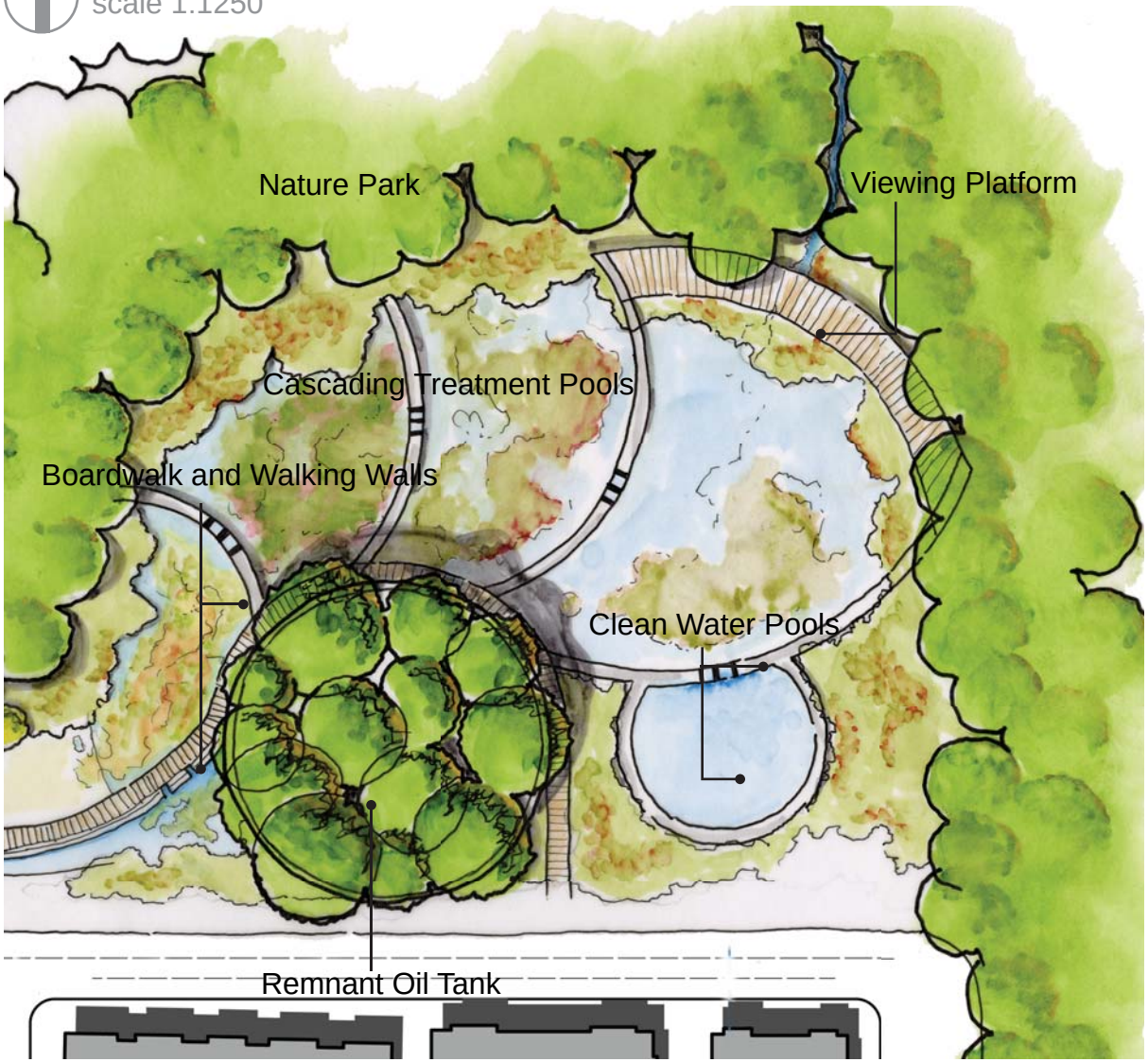
PLAN VIEW
scale 1:4000



The design focuses on the intersections between urban and natural systems, recognizing that these spaces are often dynamic and placemaking. The large greenway acts as a multipurpose open space corridor, which can be programmed for festivals, markets, weddings, impromptu sports and recreation, outdoor movies etc… for the new dense community and industry that surrounds this area. The space is activated by the water channel as a feature, with the planted remnant oil tank and Burnaby Mountain as focal points for the greenway.

treatment wetland plan

WETLAND PLAN
scale 1:1250



The wetland is a community amenity through recreational spaces and interactive learning, as well as a gateway to the nature park. It centers around a large remnant oil tank (remaining from the current tank farm) planted with a sampling from the adjacent forest. A rounded staircase leads up the tank, showcasing vistas of Burrard inlet and the Northshore Mountains, Burnaby Mountain, and the City of Burnaby. A ground level boardwalk leads users through the space and access to walking walls that separate the cascading pools and allow interaction within the site. A viewing deck features a view of the entire wetland and water returning to the stream capitalizing on views through the clearing in the forest cover.

wetland palette


Cornus sericea


Iris psuedocoris


Carex obnupta


Carex aquatilis


Alisima plantago aquatica


Spirea douglasii


Juncus patens

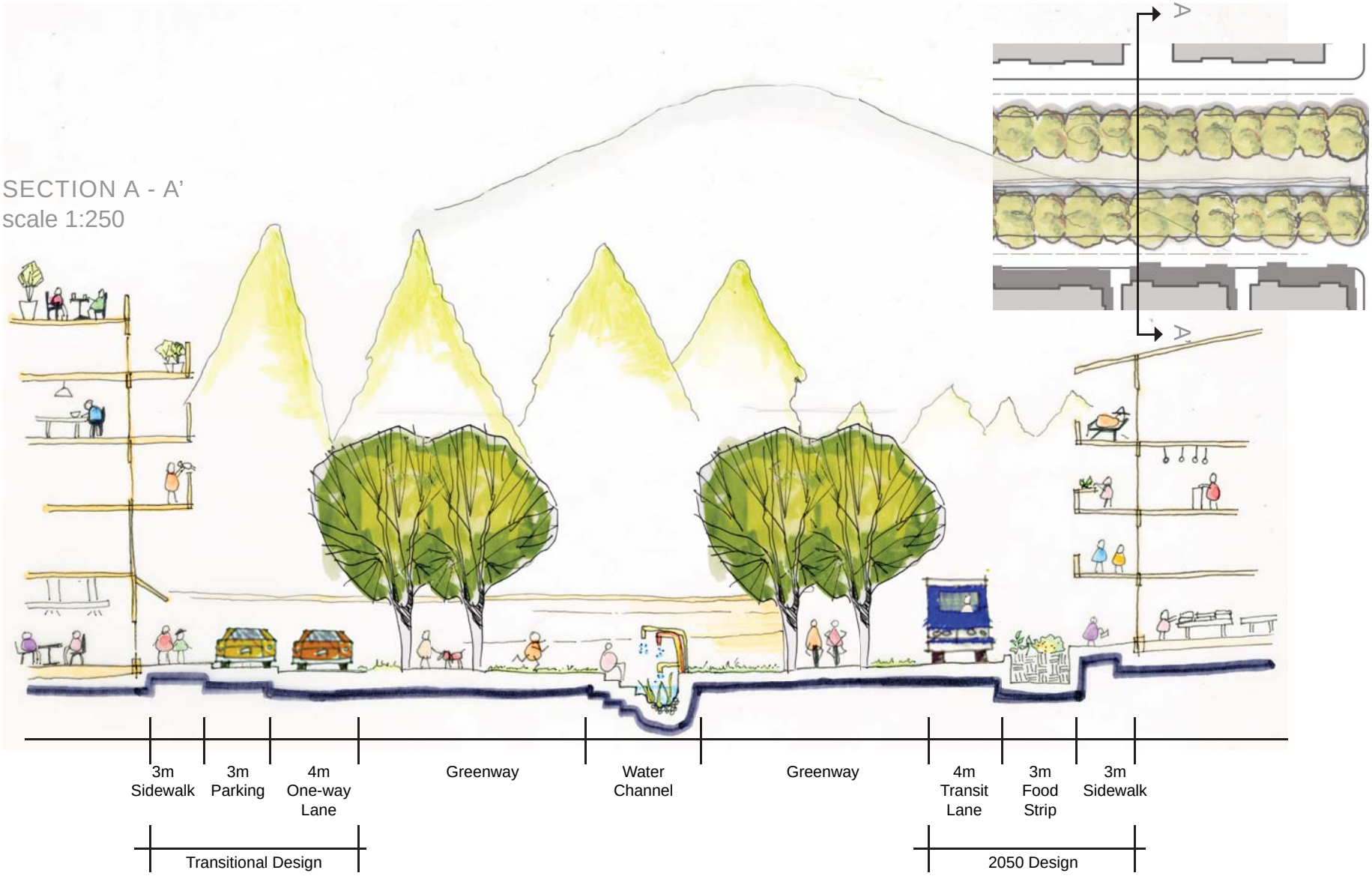

Lonicera involucrata

Top: Tank Farm, Tacoma, WA
Bottom: Portland, OR Right-of-Way storm water filtration and speed reduction pool system.

Plants were selected for their ability to filter toxins from water, and ability to handle wet, polluted, and urban conditions.
Photos: www.flickr.com

greenway cross section

SECTION A - A'
scale 1:250



the greenway experience

The greenway focuses on pedestrian and recreational activities as well as the water channel. Curb-less streets (with 2% grading) allow stormwater to flow directly into the channel or infiltrated by the permeable surfaces. Double lines of alternating trees (Acer rubrum, Robinia Psuedoacacia) frame the 4 meter protecting pedestrian and cyclists traffic on either side of the corridor. The water channel features terraced south facing stairs as opportunities for afternoon lounging and a visual measurement of water usage and storm size, and pipe fountains on each block. An 8 meter open space allows for multiple types of activities, and spill out from events and commercial venues from the adjacent mixed-use buildings.

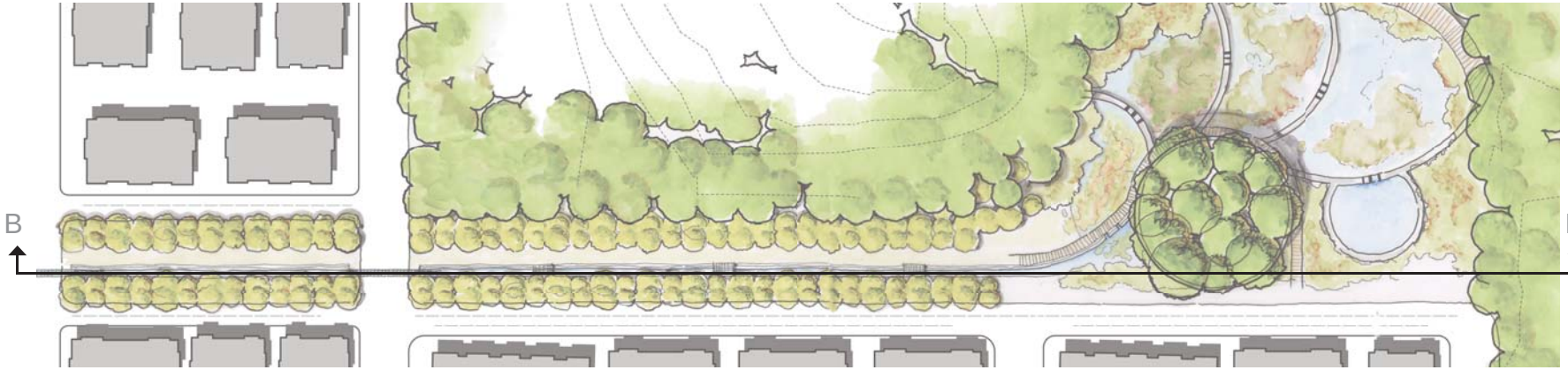
east-west section

SECTION B - B’

Greenway Transect
Urban- Nature Park (6% slope)

Remnant
Oil Tank

Treatment
Wetland



This section demonstrates the 6% slope of the greenway towards the treatment wetland. The greenway acts as a transect moving from the highly dense new community to the the regional nature park.

Educational and Interactive Elements

Elements throughout the site allow for the visibility and interaction with water input, treatment, and redistribution to the system.

A terraced water channel enables passersby to observe changes in water levels. Increases in water height infer large storms or overuse of household water.

Grates cover (but do not hide) the water channel as it flows through North/ South street intersections, and act as bridges to create mid block pedestrian connectivity. Keeping the water channel intact and transparent in its entirety.

Pipe fountains expel treated grey and black water from the neighboring community into the water channel. This creates an awareness by the community of how much water they actually use.

The boardwalk and viewing platform invites people to see the wetlands process then turn and view cleaned water return to the natural stream and Burrard Inlet.

Photo: Top left: Tanner Spring Park, Portland,OR. Top Right: 12th& Mongomery, Portland OR. Bottom Right: Pompidou Center, Paris, France. Bottom Righ: Tanner Spring Park, Portland,OR.

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Photo: Annacis Island Wastewater Treatment Plant