Chinook-Manchester

A Low Carbon Sustainable District

Tahir Ahmed
Corey Cooper
Allison Rosland
Mathew Simmons
EVDS 616

Land Use + Mobility

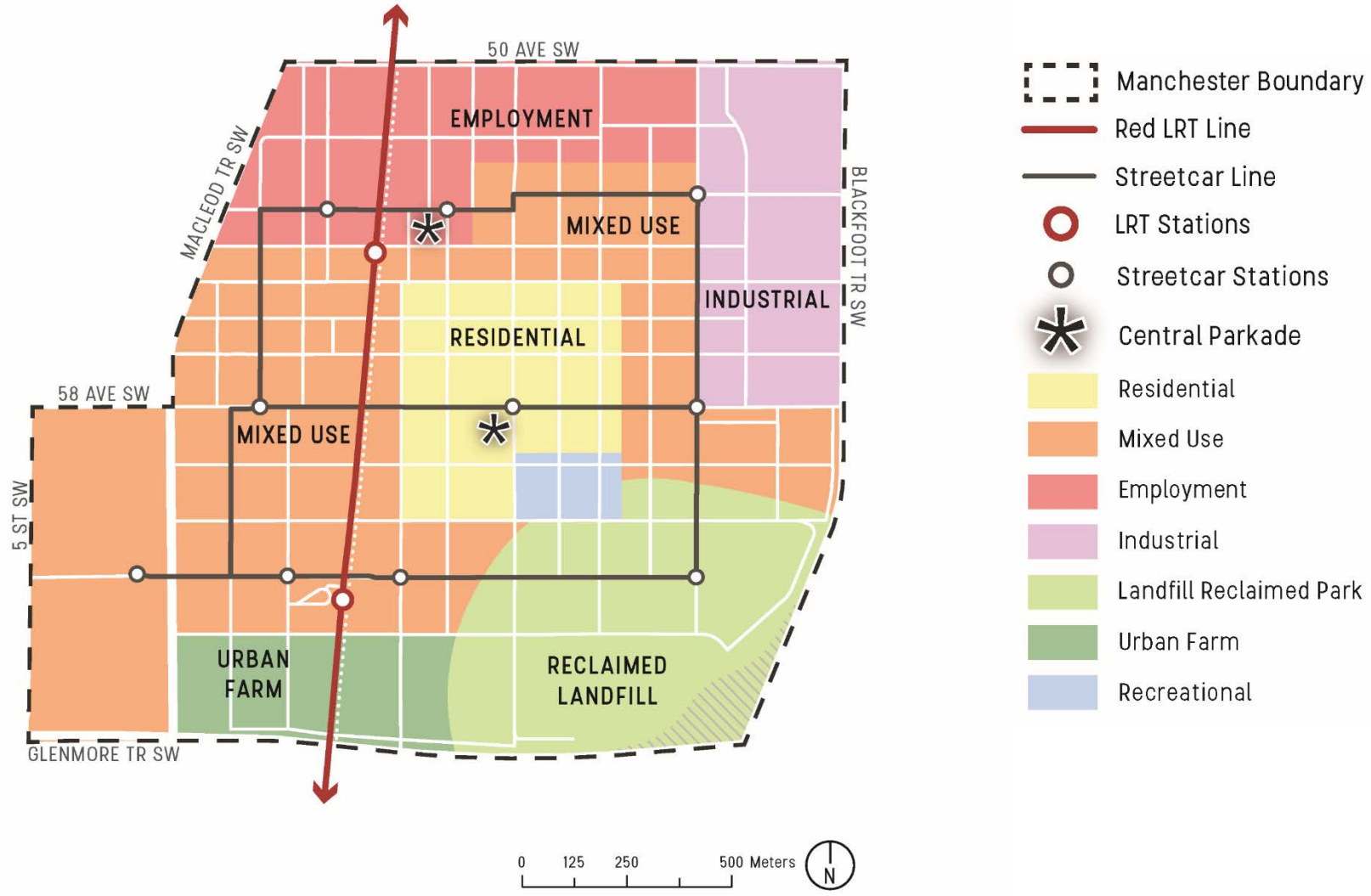
50,000 People

17,000 Jobs

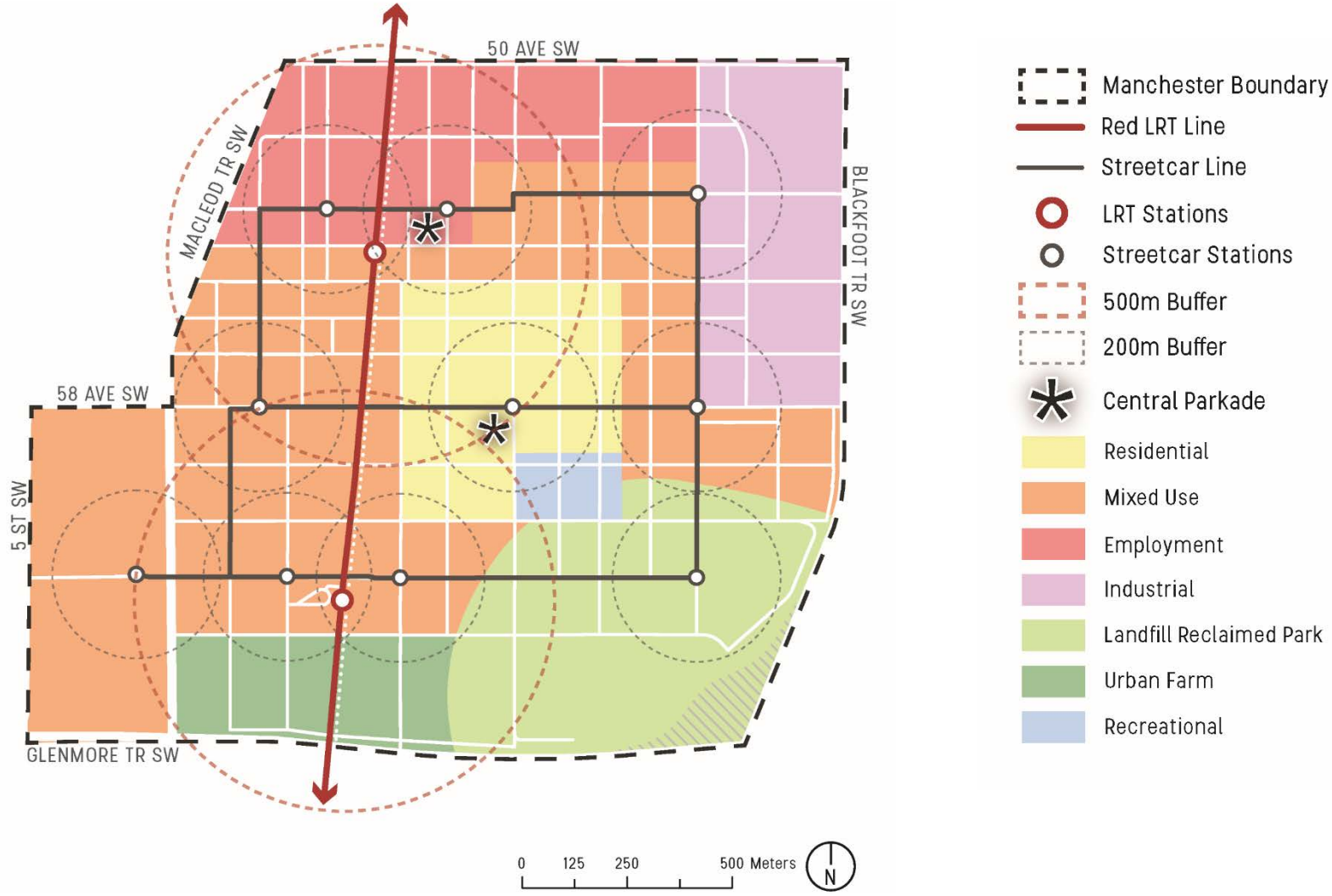
Car Free

80% GHG Reduction

Land Use Map


50 AVE SW
MACLEOD TR SW
BLACKFOOT TR SW
58 AVE SW
5 ST SW
GLENMORE TR SW
EMPLOYMENT
MIXED USE
INDUSTRIAL
RESIDENTIAL
MIXED USE
URBAN FARM
RECLAIMED LANDFILL
0
125
250
500 Meters
N
Manchester Boundary
Red LRT Line
Streetcar Line
LRT Stations
Streetcar Stations
Central Parkade
Residential
Mixed Use
Employment
Industrial
Landfill Reclaimed Park
Urban Farm
Recreational

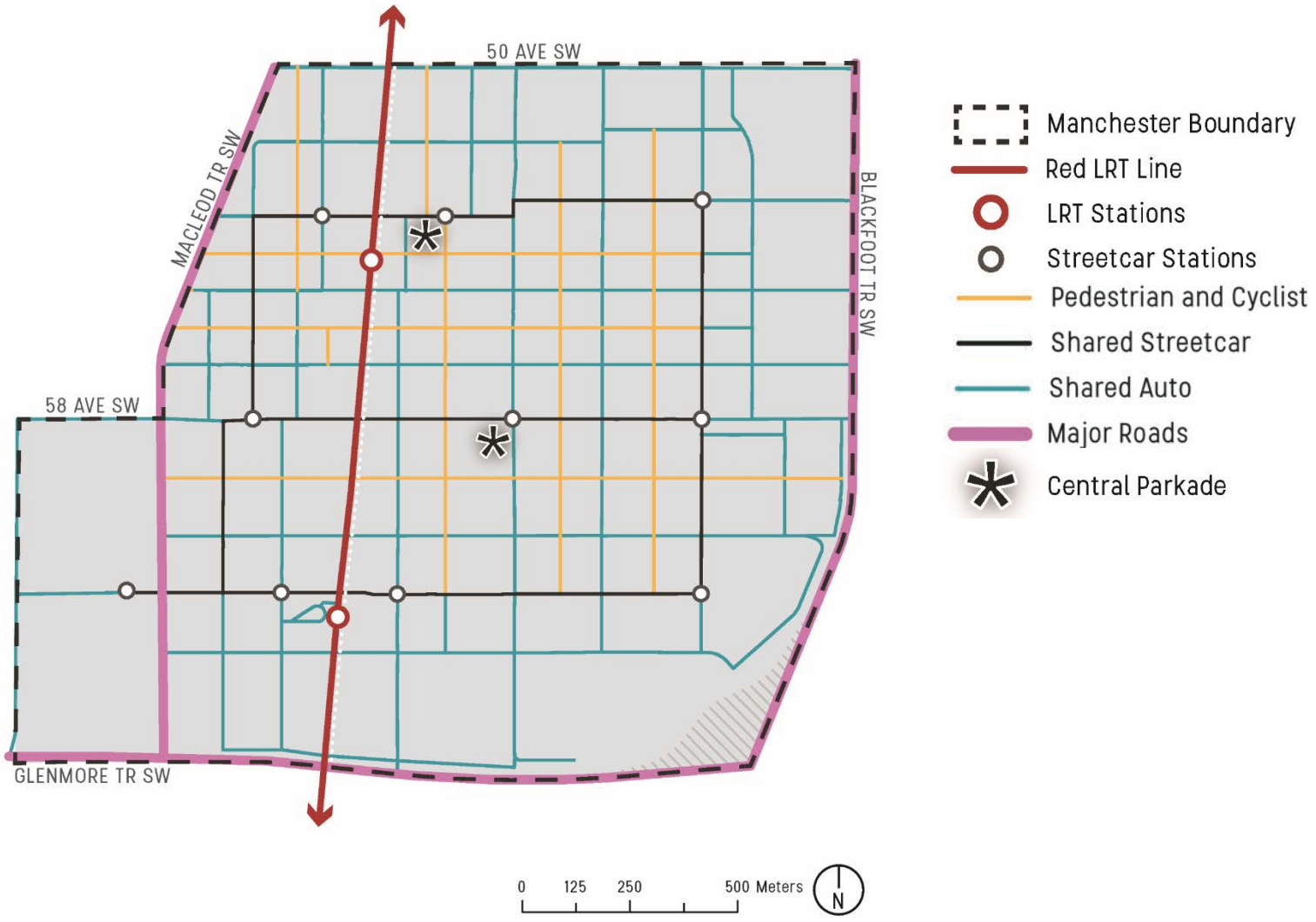
Land Use Map & Transit Areas



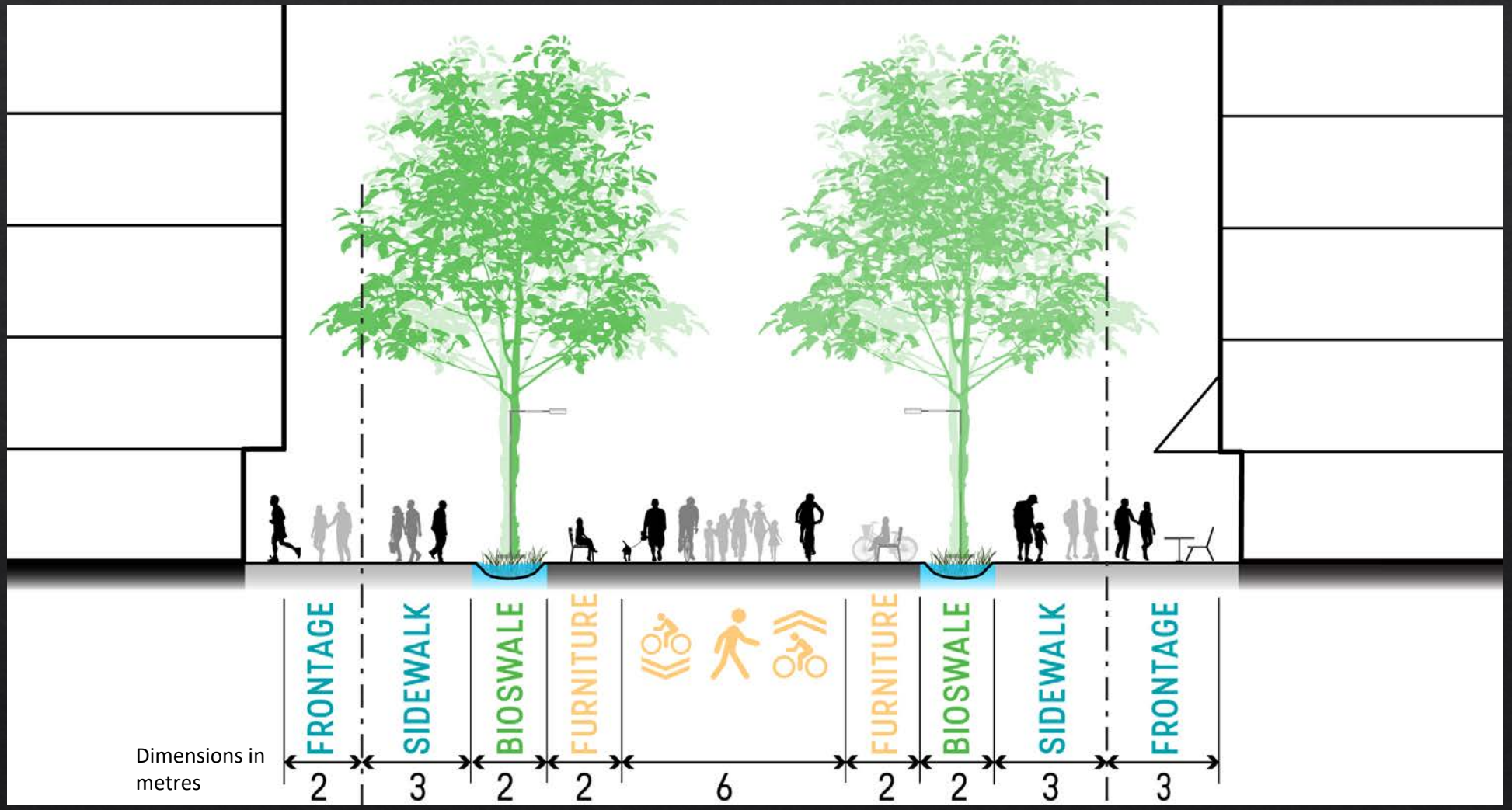
Surrounding Connections

Manchester Boundary
Red LRT Line
Streetcar Line
LRT Stations
Streetcar Stations
500m Buffer
200m Buffer
Central Parkade

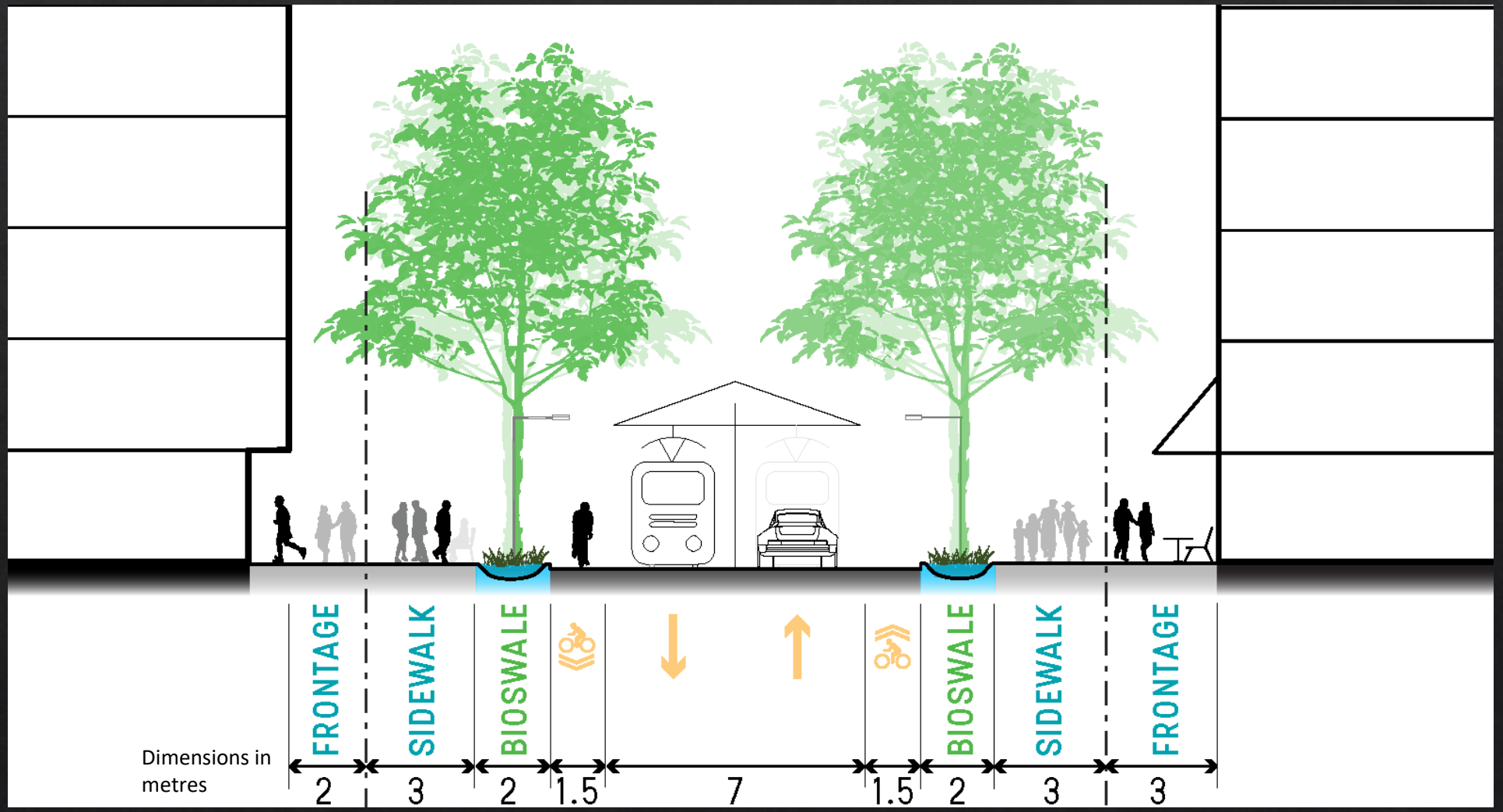
Road Typologies



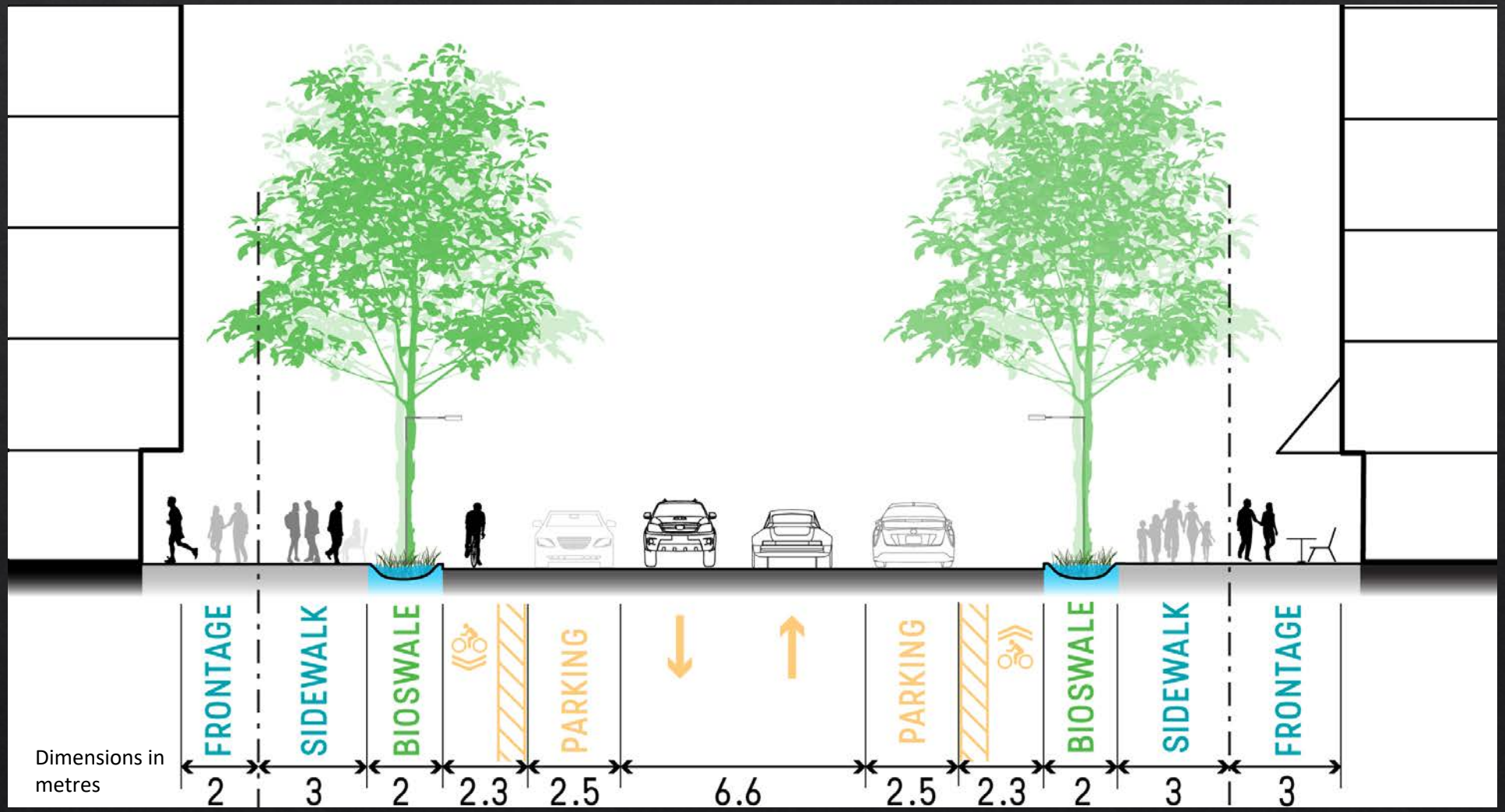
Pedestrian and Cyclist Only Street



Shared Streetcar



Shared Automobile Street



Transportation Membership

Mandatory Fees

- Unlimited streetcar use
- Access to the Manchester Car Pool (MCP)
- Unlimited use of Manchester Bike Pool (MBP)

Optional Fees

- Subsidized Calgary Transit pass
- Unlimited access to all secure bike storage

BIKETOWN, Portland

Secure storage, London

Transportation Membership

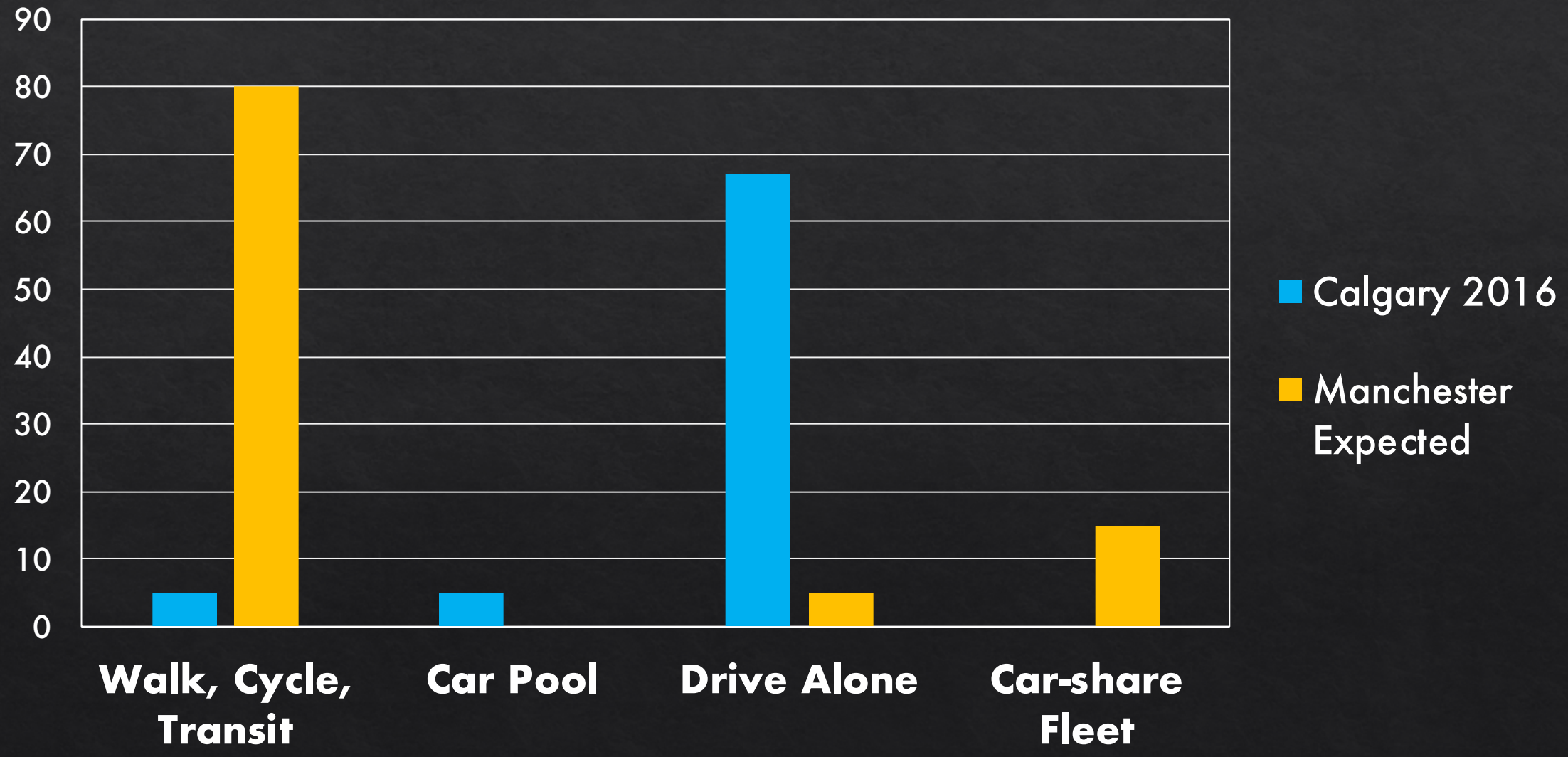
Manchester Car Pool

- Within community: 5 free one-way trips per week (max 1 hr per trip)
- Outside community: minute, hourly, daily rates
- Incremental pricing: frequent use → higher individual prices
- Designated stalls in the central underground parkades
- Drop off / pick up zones throughout community

Manchester Bike Pool

- Designated stalls at LRT and streetcar stations
- Various stalls located throughout the community

Modal Split



2016 Calgary city-wide modal split from City of Calgary Civic Census

Stormwater

Fair Share
Ecological
Footprint

Rain/Snow – Water Consumption

Calgary

Average Monthly Water Usage Per Person

7 cubic meter / month

Average Monthly Rain/Snow fall

320 mm

412 mm

Manchester

Demand

67000 users

469,000 cubic meter per month

Supply

501,369 cubic meter per month

Rainwater Harvesting

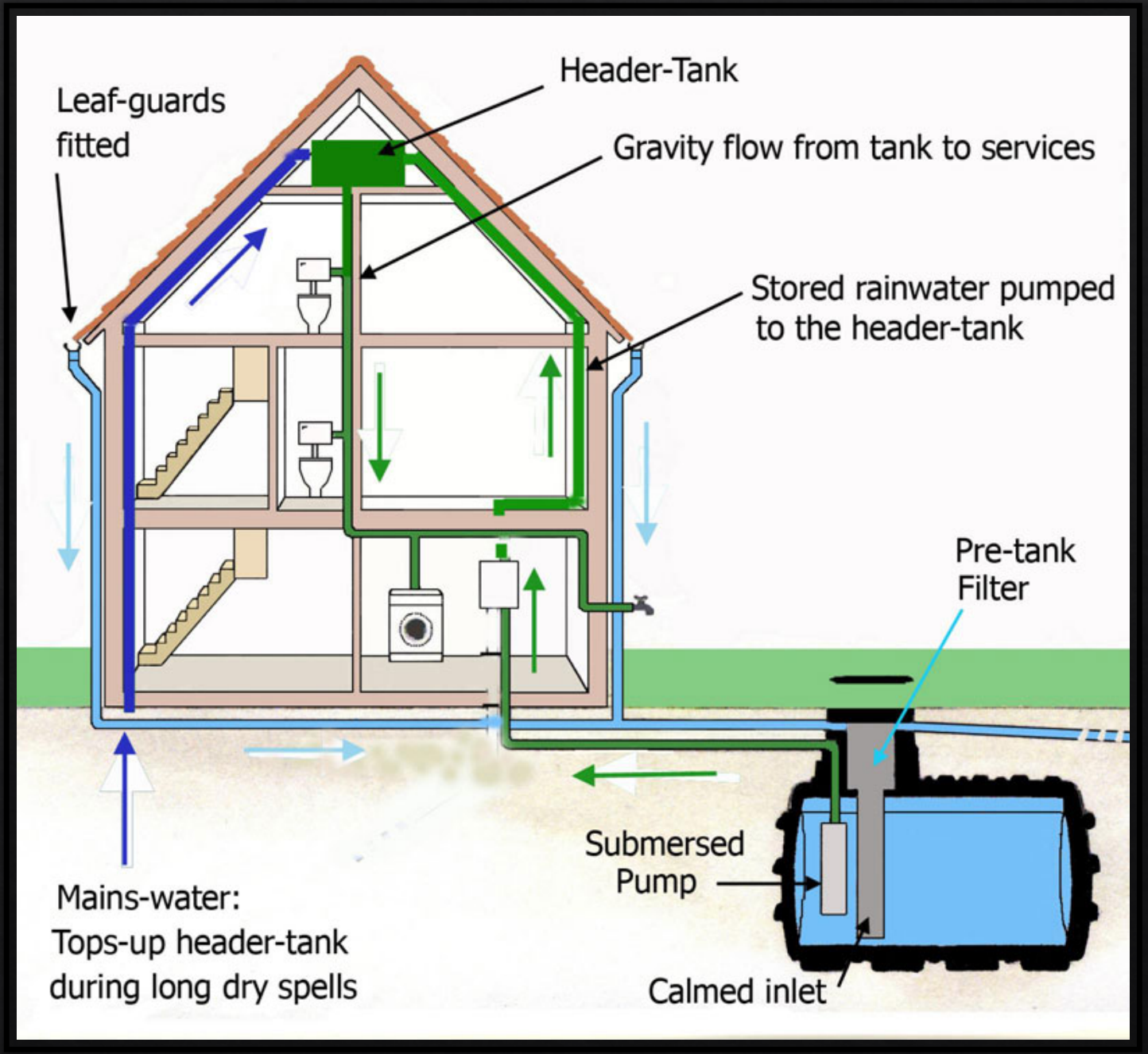
Block Level Water
Collection & Treatment and Supply System

Uses

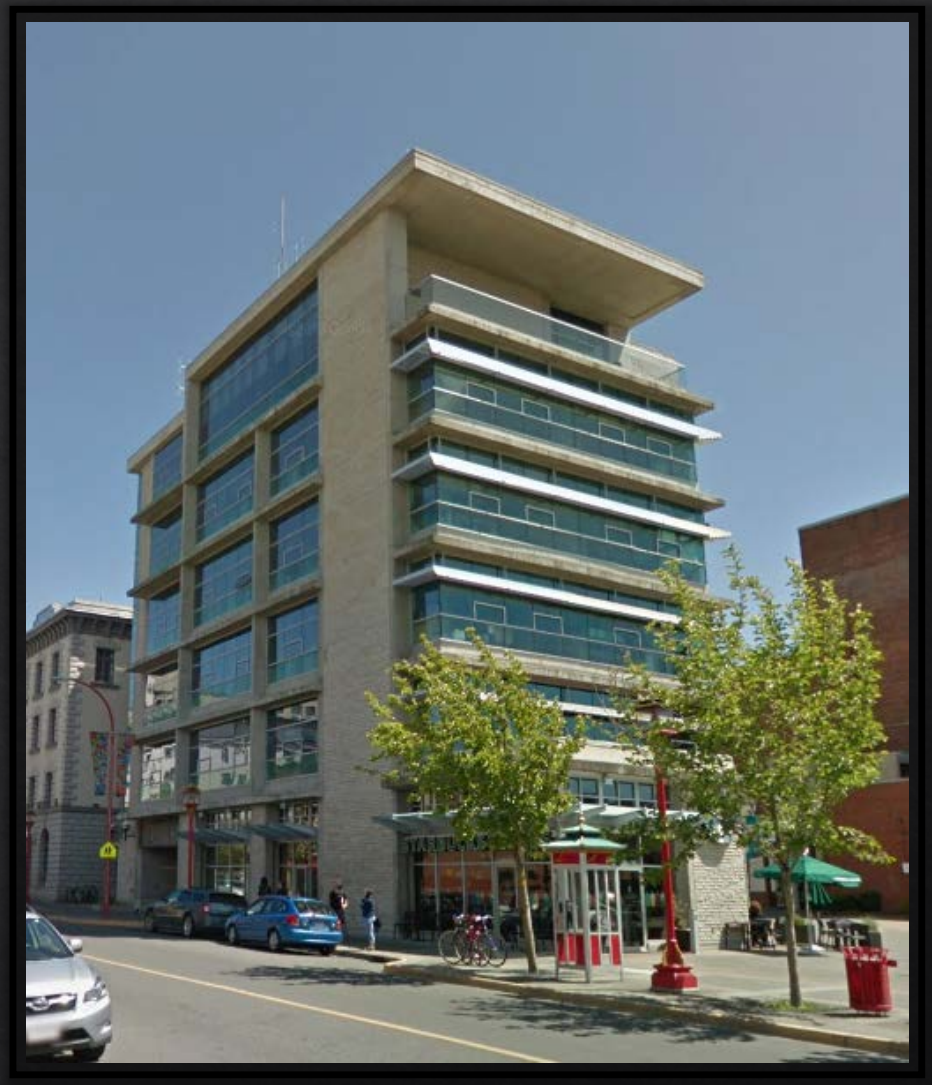
- Irrigation
- Gardening
- Toilets
- Laundry
- Potable Water

Benefits

- Save Money
- Healthier and Faster
- Naturally Soft
- Avoid Water Bans
- Chlorine Free



Retrieved from: http://www.svmarketing.in



Rainwater Harvesting

Capital Regional District

625 Fisgard Street, Victoria, BC

The building uses a 60,000 litre concrete cistern to capture rainwater for reuse in low flow/dual flush toilets. The filtration and chlorination of roof water was required by plumbing code, as was a sign warning toilet users not to drink the water.

Phase two of the building was Victoria's first Gold LEED tm. certified building. Landscaping includes no permanent irrigation.

Retrieved from: https://www.crd.bc.ca

Rainwater Harvesting

Gulf Islands National Park Reserve, Operations Centre

2220 Harbour Road, Sidney, BC

A 30,000 litre underground storage tank for roof rainwater provides water for reuse in low flush toilets and for washing saltwater from marine equipment. Up to 108,000 litres of rainwater can be collected and reused annually.

The building is Canada's first Platinum LEEDtm building, with a minimum building footprint on an existing urban lot. Features include drought tolerant landscaping plants, a saltwater geothermal loop and photovoltaic panels. Energy savings should realize a 3.2 ton annual greenhouse gas savings.

Retrieved from: https://www.crd.bc.ca

Mountain Equipment Co-op

1450 Government Street, Victoria, BC

- Rainwater capture and reuse is being employed for toilet flushing. A total storage capacity of 5682 litres is available under the sidewalk.
- The use of rainwater and dual flush toilets has reduced water use by 48%.

Rainwater Harvesting

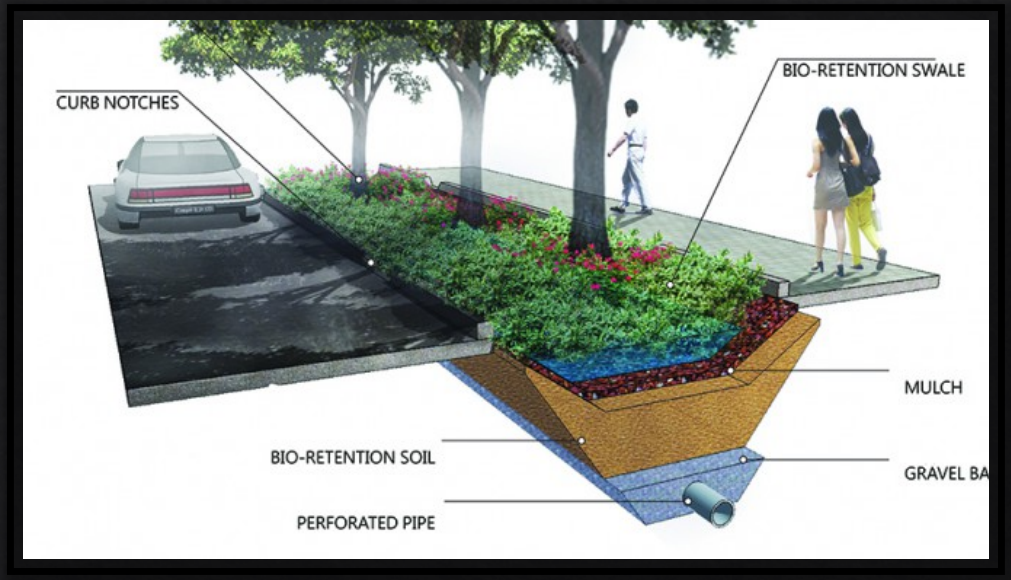
Retrieved from: https://www.crd.bc.ca

Bioswale

Provision of bioswale to
collect and manage storm water

Benefits

- Reduction in peak water flow to our waterways
- Removal of pollutants from storm water
- Improved storm water infiltration
- Decreased downstream/riverbank erosion
- Improving aesthetic of the area



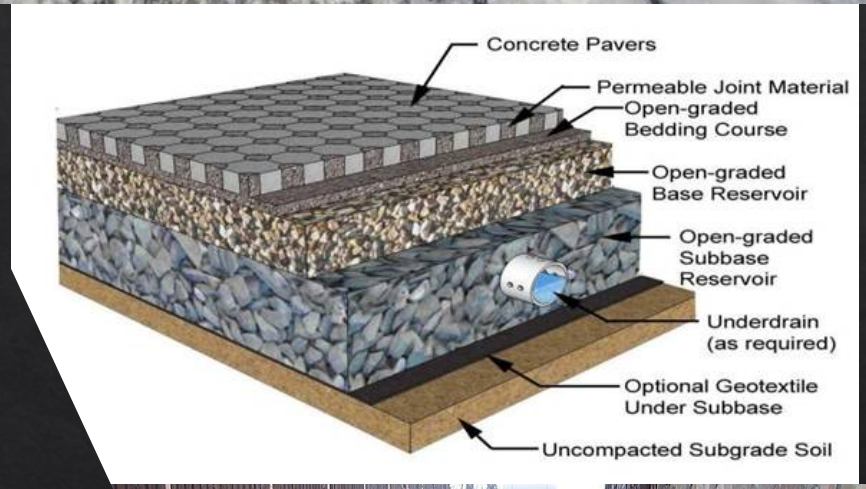
Retrieved from: http://Imgfl.com/whats-a-bioswale/

Permeable Pavement

Provision of permeable surfaces to support storm water management

Benefits

- Allowing ground water levels to be replenished
- Reducing peak runoff periods which can minimize local flooding
- Reducing the total volume of storm water runoff from a catchment area which reduces the potential for erosion of our riverbanks
- Filtering pollutants through the rock drainage layers and the subsoils below.
- Research on permeable pavement shows they are effective in removing pollutants such as total suspended solids, heavy metals, oil and grease.



Retrieved from: http://www.vwrrc.vt.edu

Energy Provision

100% Renewable Energy

80% GHG Reduction

Electricity Demand

Predicted Electricity Demand in South Manchester = 810,000 MWh/year

Required panel efficiency at 50% site coverage = 44%

Assumption

50% reduction in energy consumption by 2060

- Technology and efficiency improvements
- Use of 2015's best available technologies would reduce residential energy consumption 50%, 46% for commercial *(USA Department of Energy, 2015)*
- Passive solar building design – energy savings up to 90% for heating *(Pembina)*

Electricity Demand

NEW Required panel efficiency at 50% site coverage = 22%

OR

NEW Required panel efficiency at 25% site coverage = 44%

* **Assumption** *

44% efficient solar panels readily available in 2060

- 44.5% efficient solar cells tested in 2017 *(Lumb et al., 2017)*
- Spectrolab (Boeing subsidiary) tested efficiency: 40.7%
- Conservative estimate

Providing the Energy: Panel Placement

Required site coverage at 44% efficiency = **25%**

Solar Landfill – 12.5% of site coverage

Solar Roofs – 12.5% of site coverage

Retrieved from: Public Service Electric and Gas Company

Retrieved from: Building4change.com

Natural Gas Demand

Converting Natural Gas to Electricity Demand

How much natural gas energy do we use?

Alberta apartments avg. 0.063 GJ/ft^2*year *(Efficiency Alberta)* = 17.5 kWh / ft^2*year

How much energy per dwelling?

Avg. 900 ft^2/dwelling * 17.5 kwh/ft^2* year = 15,750 kWh/dwelling*year

How many dwellings in our site?

50,000 people/ 2.5 people per dwelling = 20,000 dwellings

Total converted residential energy use?

20,000 dwellings * 15,750 kWh/dwelling per year = 315,000,000 kWh

Total converted natural gas to electricity demand?

Residential = 315,000 MWh *1.3 (30% for commercial/industrial) **= 410,000 MWh**

Natural Gas to Electricity Demand

Predicted Natural Gas to Electricity Demand = 410,000 MWh/year

Required panel efficiency at 50% site coverage = 22%

Assumption

50% reduction in energy consumption by 2060

- Technology and efficiency improvements
- Use of 2015's best available technologies would reduce residential energy consumption 50%, 46% for commercial *(USA Department of Energy, 2015)*
- Passive solar building design – energy savings up to 90% for heating *(Pembina)*

Natural Gas to Electricity Demand

NEW Required panel efficiency at 50% site coverage = 11%

OR

NEW Required panel efficiency at 25% site coverage = 22%

* **Assumption** *

22% efficient solar roadways/facades readily available in 2060

- Colas – Wattway 1km solar road in France constructed in 2016.
- Solar Roadways – Research ongoing, funding through US Dept. of Transportation
- Estimates 30% less power generated than angled panels *(Solar Roadways)*

Providing the Energy: Panel Placement

Required site coverage at 22% efficiency = **25%**

Solar roads/paved surfaces – 20% coverage

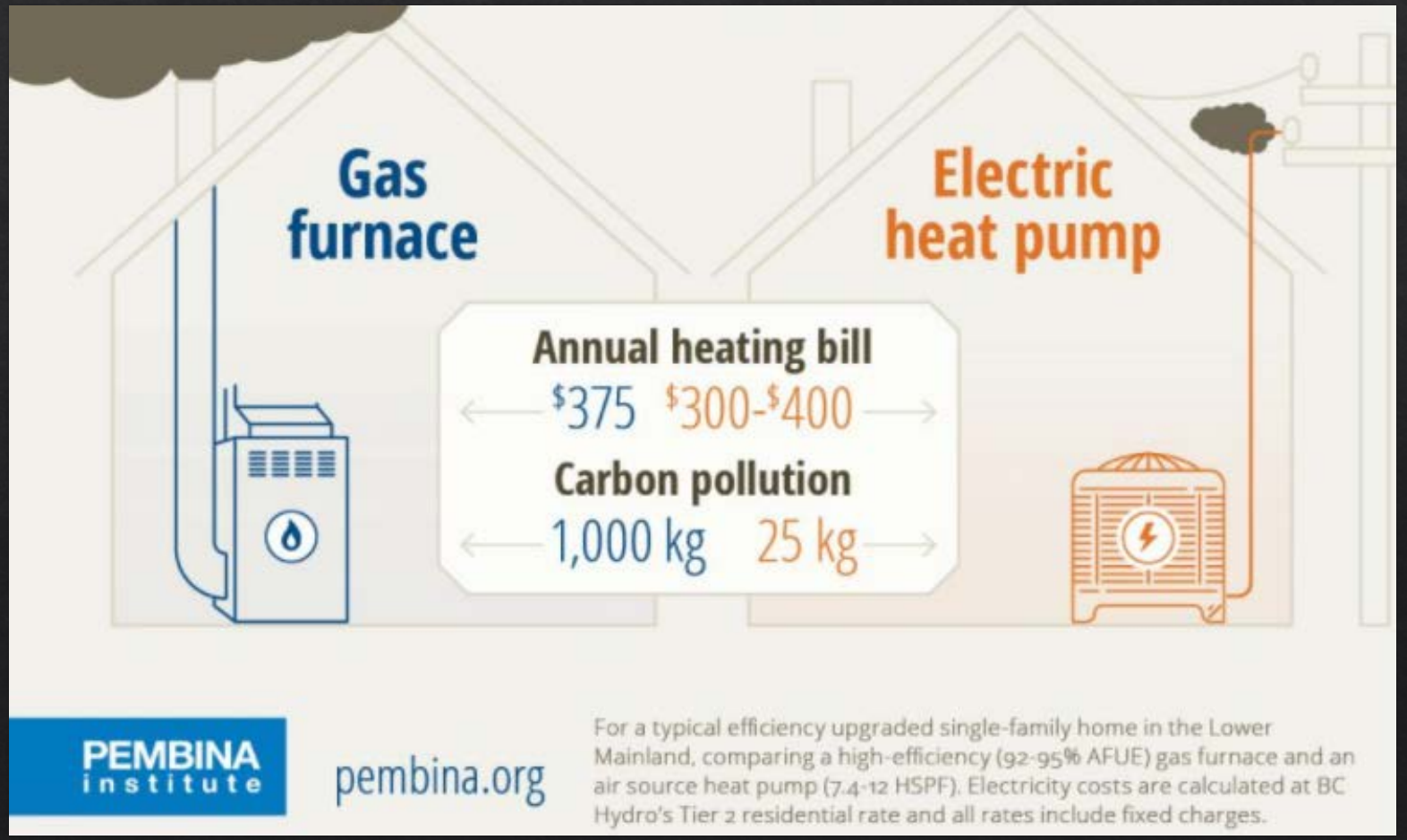
Building Façade Integration– 5% coverage

Retrieved from: wattwaybycolas.com

Retrieved from: portalsolar.com

Going Electric: Reduction in Carbon

GOAL: 80% GHG Reduction



Infrastructure Nexus

Nexus: Mobility + Stormwater

Bio-swale Integration with Roads

- Mobility systems that are designed in conjunction with storm systems are efficient at collecting and filtering stormwater, can reduce cost of paving and pipe infrastructure
- Public realm is enhanced

Retrieved from: pinterest

Retrieved from: midtownatl.com

Nexus: Solar Energy + Stormwater

Solar Green Roofs

Roadway storage, treatment and transport

- Solar Roadways® integrates a stormwater capture system. Storm water is collected, can be pumped to a water treatment facility, or pre-treated on site and released into aquifer

Retrieved from: greenrooftechnology.com

Retrieved from: zinco.ca

Nexus: Solar Energy + Mobility

Infrastructure:

- Powers streetlights, urban furniture, traffic lights reducing infrastructure cost.
- Embedded LED lights replace paint to make road lines and signage, warn drivers of dangers

Winter cities:

- Solar Roadways® panels with integrated heating component maintains a temperature above freezing

Electric Vehicles:

- Can provide the infrastructure needed to charge EV's

Autonomous Vehicles:

- Panel micro processors replace dependence on satellites (GPS) to determine location

https://youtu.be/pnypsmdSTAM?t=83

Supporting Infrastructure

Hickory Ridge: Landfill Reclamation Efforts

- Total Area is 48 acres
  - Largest Solar Energy Generating Facility in Georgia
- Built of a Geomembrane Anchoring System
  - 7,000 Solar Panels on hillside
  - Able to produce 1 megawatt
- Advantages
  - Cheaper than traditional closure procedures
  - Contributes to clean water management
  - Reduces GHG emissions from maintenance of traditional site

Retrieved from: HDR Inc.

Photo Credit: Robynne Boyd

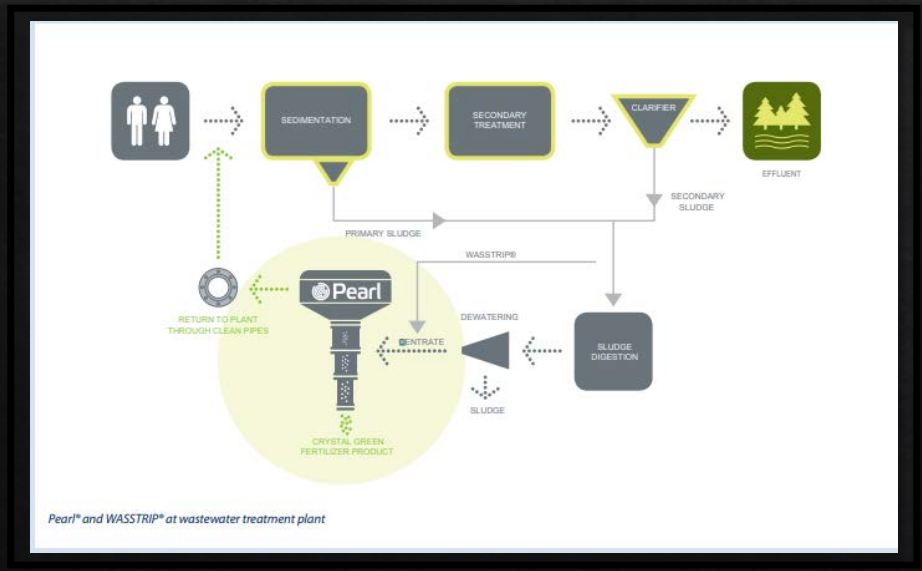
Freshkills: Landfill Reclamation Efforts

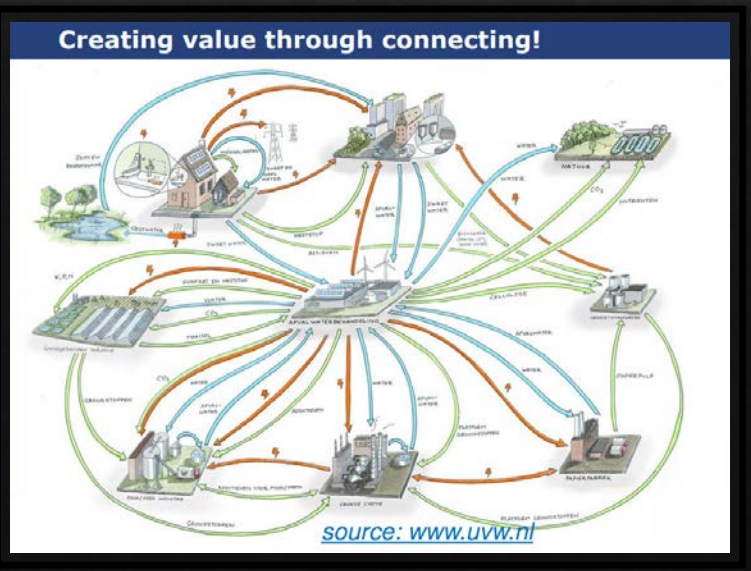
- Previously a Landfill site for New York City
  - Established in 1947
  - Largest Landfill while it was open
- Master Plan was created to reclaim the former landfill site into a large public park for the city
  - To serve the public as a natural haven, but to also reduce the impact of natural disasters prone to the region
- Act as example for other reclamation efforts in the United States

Retrieved from: https://archdaily.com

Retrieved from: NYC Parks

Amersfoort Water Treatment Facility: Mineral Reclamation &Water Purification

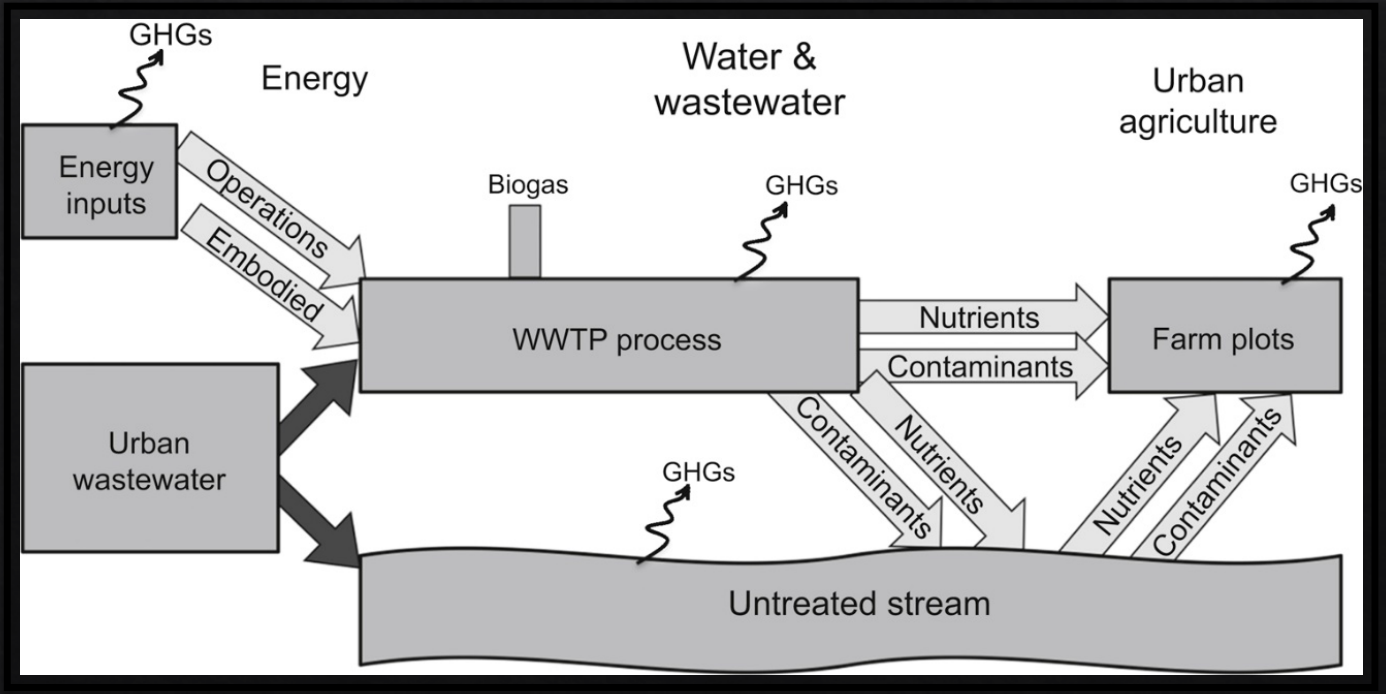




Retrieved from: https://omzerpuntamersfoort.nl

Hyderabad, India: Water Treatment for Agricultural Use

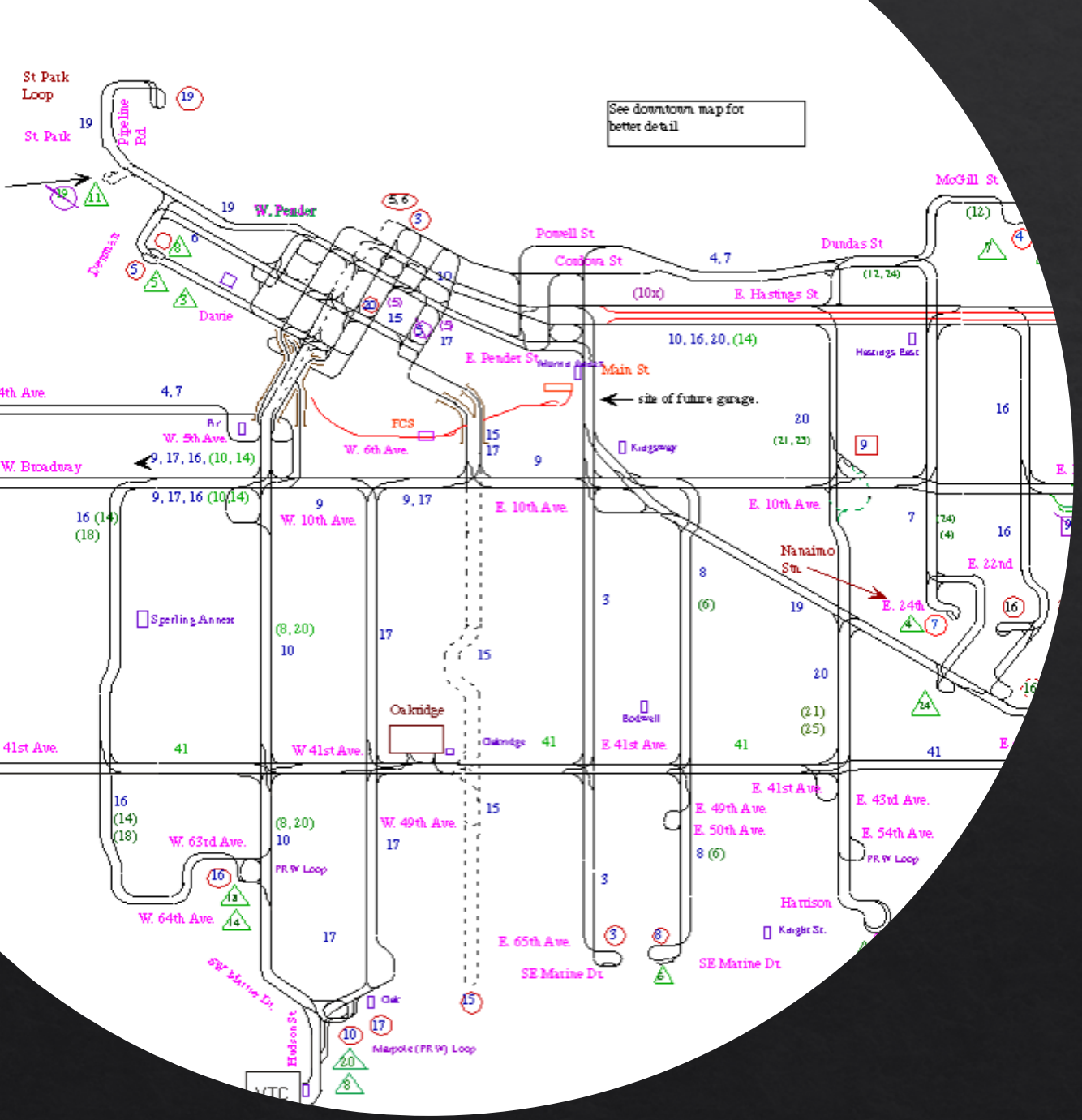
Treatment Process



Treatment Center

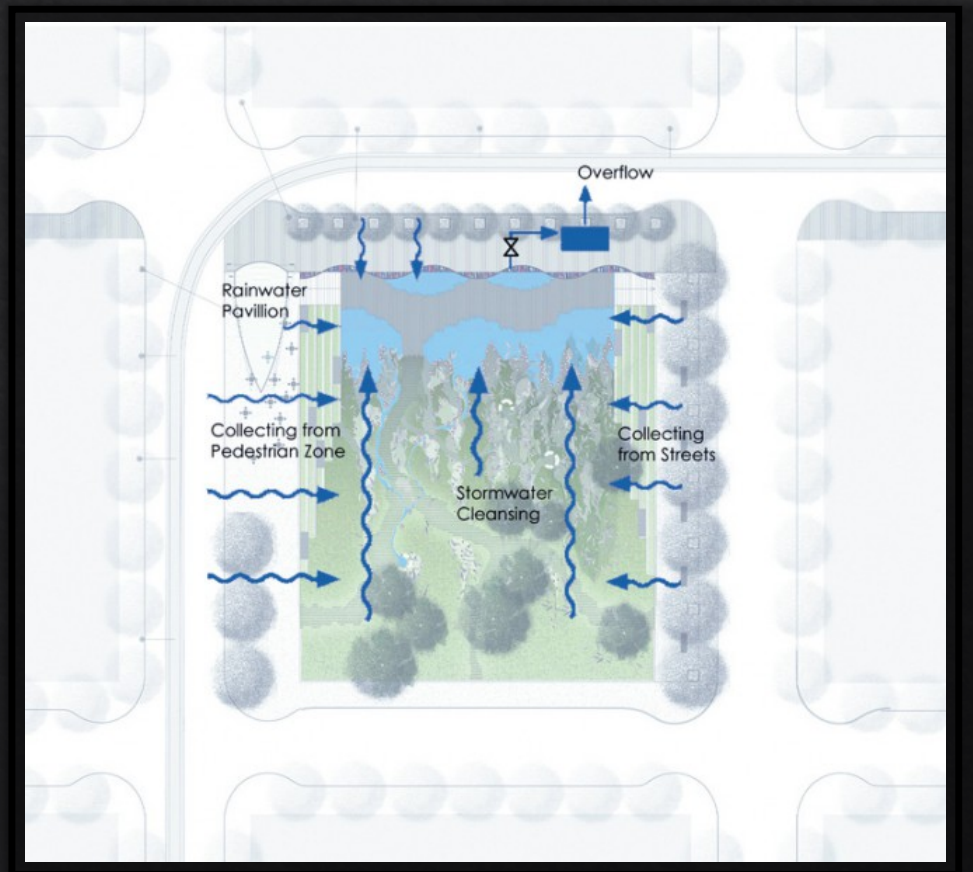
Retrieved from: http://iopscience.iop.org

Vancouver Trolley Buses: Eco-Friendly Transportation



Retrieved from: http://bc.transportaction.ca & https://en.wikipedia.org

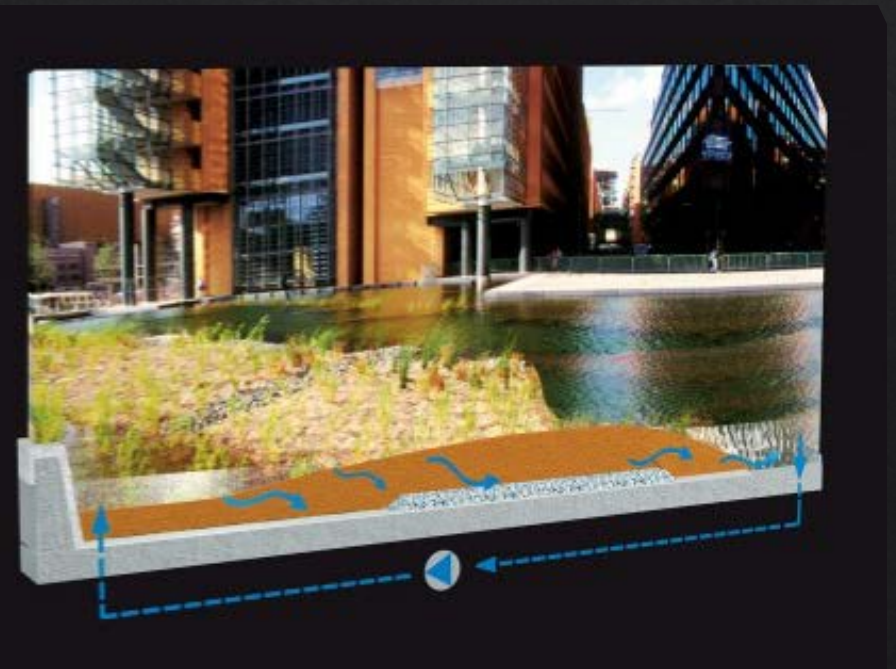
Tanner Springs Park: Stormwater Management



Retrieved from: https://urbanbluegreengrids.com

Urban Storm Water Management: Berlin

- Multiple Interconnected Pools
  - Enhance the Public Realm
    - Reduces heat in surrounding area
    - Collects & removes dust
  - Used for non-potable purposes
  - Reduce water related issues caused in heavy rainfalls
    - Relieve storm water systems



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Thank You

Questions?