LECTURE 2_19:
MAR. 20, 2014

URBAN ENVIRONMENTAL MANAGEMENT

URBAN SUSTAINABILITY & BEST PRACTICES

Text Reference: Dearden and Mitchell (2012), Ch. 13, pp. 473-488.

Geography/Environmental Studies 1120/1140
T. Randall, Lakehead University, WA 2014

Outline

Source: Dearden and Mitchell (2012)

- Upcoming Class Lectures:
  - March 11 (Sustainable Urban Development I)
  - March 13 (Sustainable Urban Development II & Map Literacy 5)
  - March 18 (Environmental Issues in Cities)
  - March 20 (Urban Sustainability and Best Practices in Urban Areas)

Recall from last lecture

Urban Issues:

- Physical
- Socio-Economic
- Political

- Urban issues (**physical**)
  - Sprawl
  - Farmland loss
  - Air pollution
  - Air quality
  - Urban heat island
  - Hydrological impacts
- Urban issues (**socio-economic**)
  - Changing economic functions
  - Declining and aging cities vs Rising cities
  - Immigration to and within cities
  - Gentrification
  - School closures

- Urban issues (**political**)
  - Urban growth boundaries
  - Farmland protection vs development rights (e.g., Ontario Green Belt)
  - Neighbourhood preservation vs freeway construction
  - Transit
- Urban issues (**environmental / solutions/best practices**)
  - Sustainability
  - Transit-oriented developments (e.g., Vancouver's Regional Town Centres)
  - Walkability
  - Intensification
  - Smart Growth
  - Brownfield Development
  - Green Building Practices
  - LEED[1] (and other) green building certificate systems

1: LEED = Leadership in Energy and Environmental Design

Case Studies of Sustainability Successes

- **Whistler, BC** (text) … Comprehensive Sustainability Plan
- **Sudbury, ON** (text) … Remediation of Mined Landscapes

Whistler, BC

- Whistler is one of Canada's best-known resort towns
- Tourism destinations have very high energy use
- Whistler implemented several strategies to reduce internal energy consumption and GHG emissions, and was the first Canadian municipality to have completed all 5 milestones in the "Partners for Climate Change Protection Program":
  1. Comprehensive transportation strategy
  2. Municipal vehicle fleet efficiency
  3. New and redeveloped building energy efficiencies
  4. Natural gas as a primary energy supply
  5. Small-scale and localized renewable energy resources

Image credit and interesting web site about sustainability:
http://www.whistler2020.ca/explorer

Sudbury, ON

- **Remediation of Mined Landscapes**
- a mining-based community notorious for environmental degradation from mining activities (smelters)
- The landscape was so like the moon's surface, that during the 1970's, astronauts practiced here, in preparation for their moon landing

The stereotypical Sudbury landscape (credit: http://themovablebeast.files.wordpress.com/2009/11/nickelminesudbury.jpg)

Inco stack exported problem elsewhere http://flickrhivemind.net

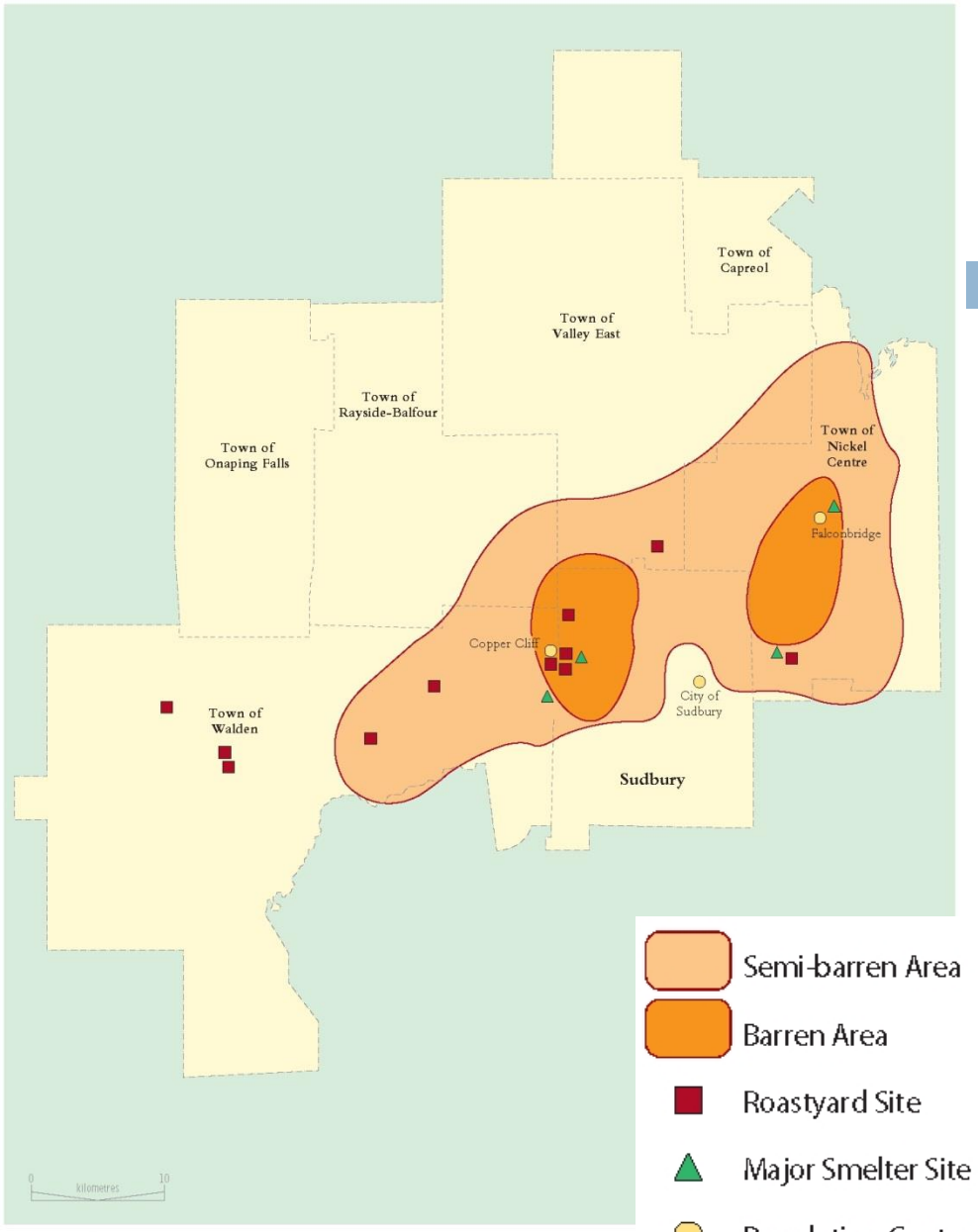


Figure 13.4 | Sudbury: Extent of barren and semi-barren landscape. *Source: Lautenbach*

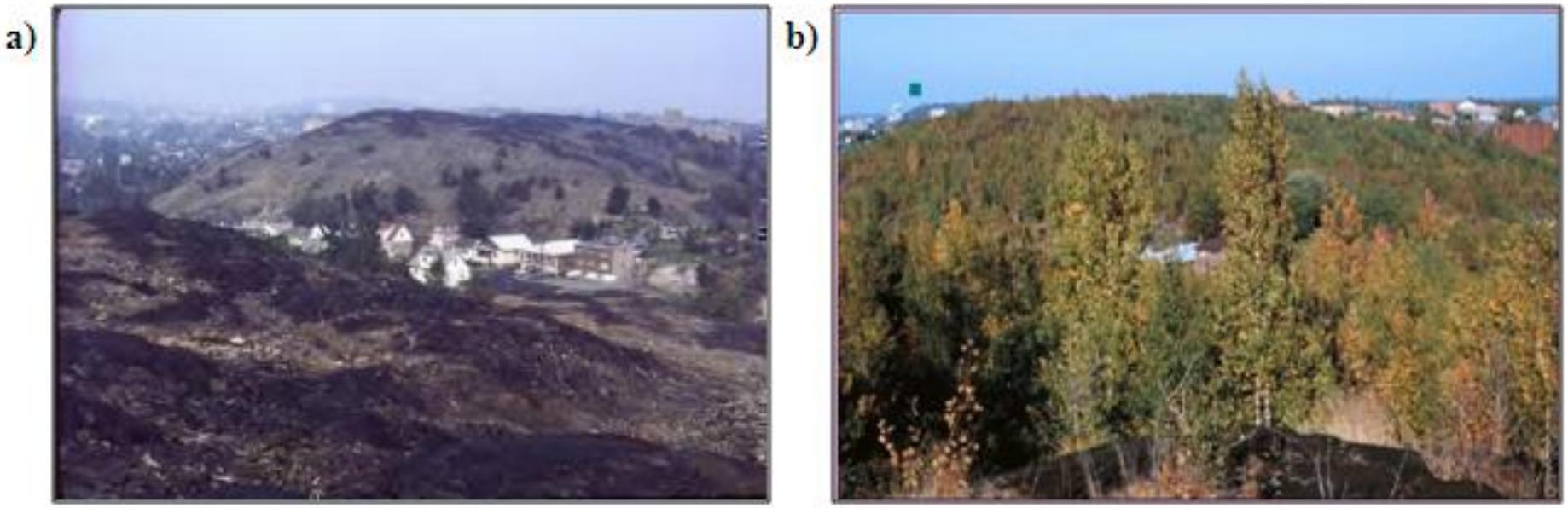
Figure 13.4: Sudbury – extent of barren and semi-barren landscapes attributes to smelting and mining activities. Source: Lautenbach (1985) via D&M 2012

Sudbury, ON

- Starting in the 1970s, the city undertook initiatives to rehabilitate the landscape and restructure the economy, resulting in landscape rehabilitation and positive attention for Sudbury both within and outside Canada
- **VETAC**[1]'s Mandate is to work towards the recovery of self-sustaining, indigenous terrestrial and aquatic ecosystems in Greater Sudbury
- Between 1978 and 2008, the "Greening of Sudbury"
  - ~3,400 hectares limed and seeded, and >8.9 million trees planted.
- Environmental improvement may not have generated direct economic benefits, but has contributed to creating conditions for positive economic changes

1: **VETAC** = Vegetation Enhancement Technical Advisory Committee

Sudbury: before and after



A metal contaminated site in Sudbury, Ontario, Canada; a) before remediation and b) after remediation (photos courtesy of Keith Winterhalder and David Pearson from Laurentian University).
Source: Melanie Mehes-Smith *et al* (2013)

Smart Growth

Definition

"*land use and development practices that limit costly urban sprawl, use tax dollars more efficiently, and create more liveable communities*"

From: Can. Mortgage and Housing Corp. (2005)

Photo credit: https://railforthevalley.wordpress.com/tag/smart-growth/

Indicators of Smart Growth *(Dearden & Mitchell p479)*

- Denser, mixed-use development in greenfield areas
- Intensification to moderate greenfield development
- Taking advantage of specific intensification opportunities
- Increasing transportation choice and reduce car usage
- Increasing the supply of new affordable housing
- Improving the range of housing types
- Preservation of agricultural lands
- Preservation of lands to maintain regional ecosystem functions
- Directing employment to strengthen the core and sub-centres
- Provision of infrastructure to reduce ecological impacts

- All but two of the indicators can be demonstrated via an exploration of the Greater Vancouver Regional District (GVRD's) Livable Regions Strategy

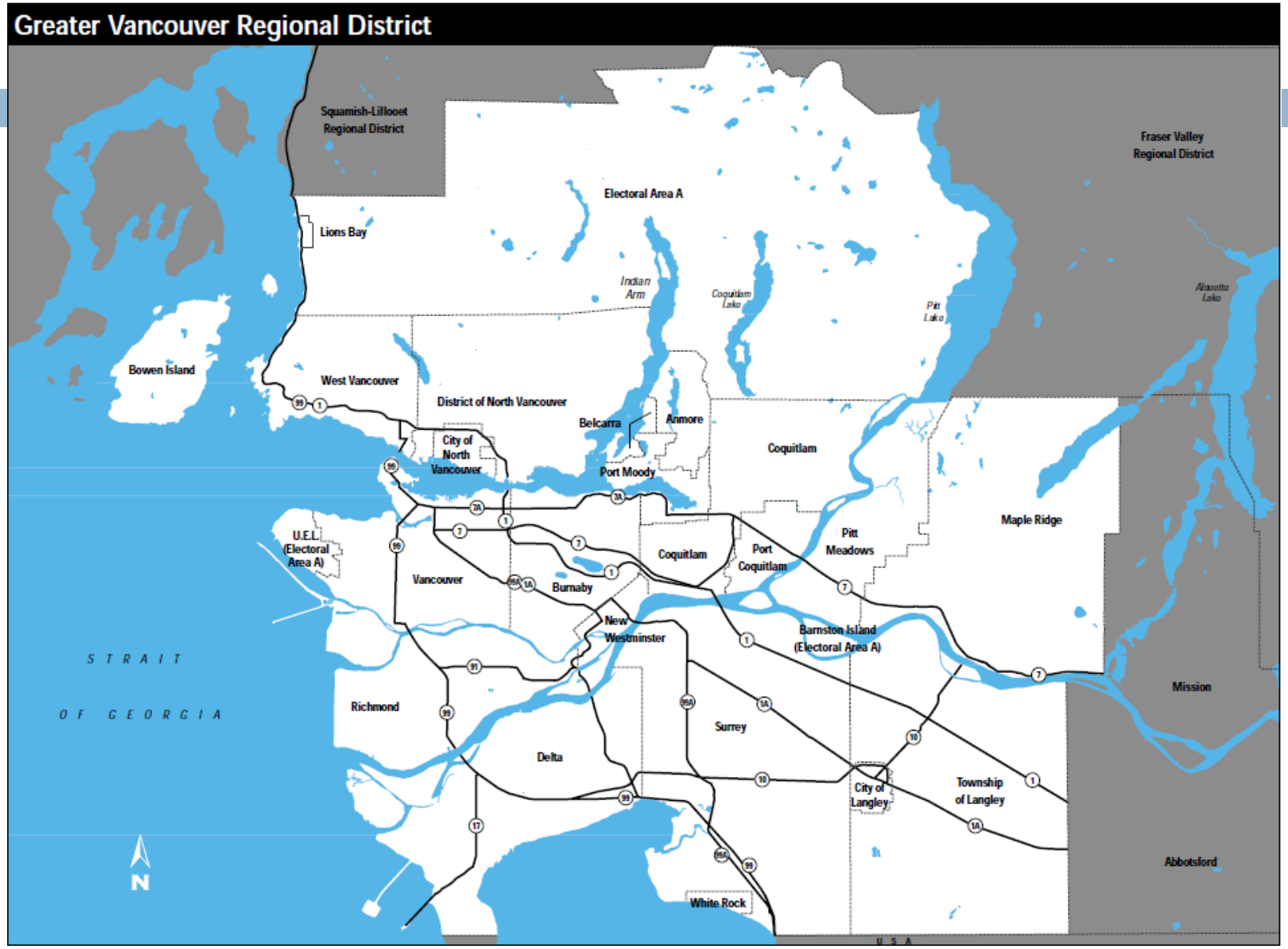
- Preservation of lands to maintain regional ecosystem functions
  - (e.g. Oak Ridges Moraine as "recharge zone" for major aquifer underlying Metro Toronto)
- Provision of infrastructure to reduce ecological impacts
  - Green Building Technology/Approaches
  - Xeriscaping / Naturalized Landscaping
  - Stormwater Management Systems

- Greater Vancouver's strategy to accommodate growth
- Adopted by Metro Vancouver (GVRD = Greater Vancouver Regional District) in 1996
- Focuses on land use
- Livability equated with 'quality of life'

GVRD (1996)

Photograph by: Ric Ernst/PNG, National Post

GVRD, comprised of 21 member municipalities and one electoral area



GVRD (1996)

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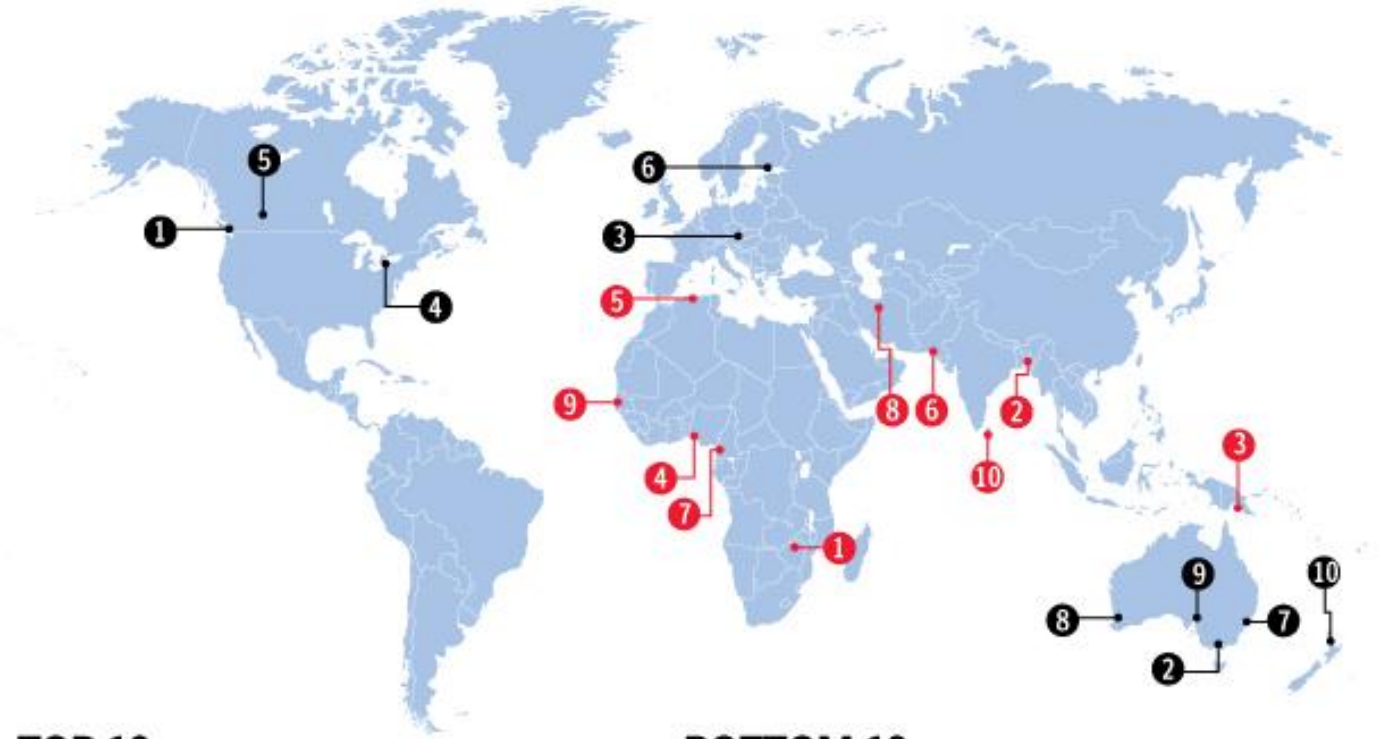
THE WORLD'S TOP 10 AND BOTTOM 10 MOST LIVABLE CITIES

in 2011



TOP 10

1. Vancouver, Canada	6. Helsinki, Finland
2. Melbourne, Australia	7. Sydney, Australia
3. Vienna, Austria	8. Perth, Australia
4. Toronto, Canada	8. Adelaide, Australia
5. Calgary, Canada	10. Auckland, New Zealand

BOTTOM 10

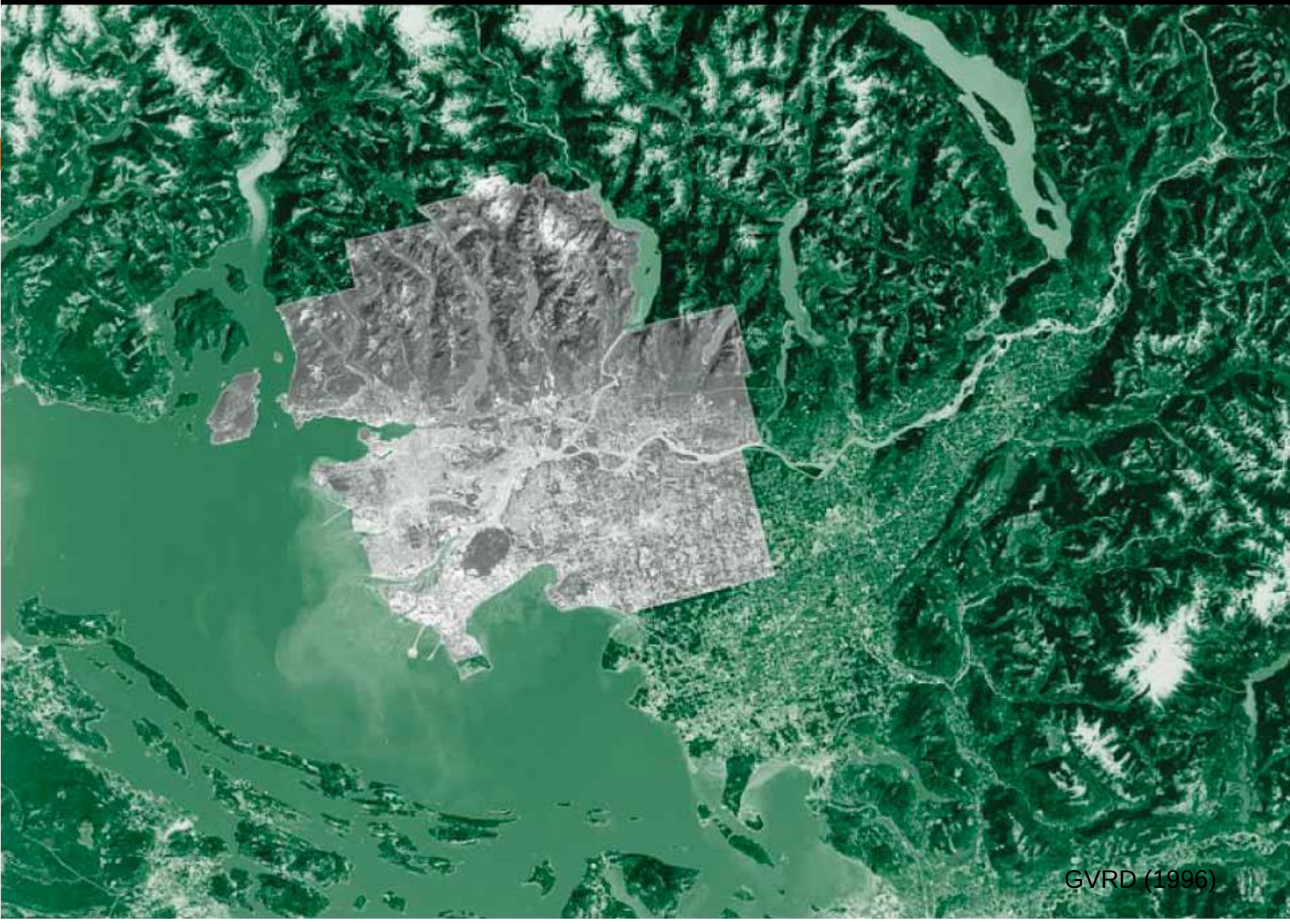
1. Harare, Zimbabwe	6. Karachi, Pakistan
2. Dhaka , Bangladesh	7. Douala, Cameroon
3. Port Moresby, Papua New Guinea	8. Tehran, Iran
4. Lagos, Nigeria	9. Dakar, Senegal
5. Algiers, Algeria	10. Colombo, Sri Lanka

SOURCE: ECONOMIST INTELLIGENCE UNIT

ANDREW BARR / NATIONAL POST

Andrew Barr / National Post, http://news.nationalpost.com/2011/02/22/map-the-worlds-most-%E2%80%94-and-least-%E2%80%94-livable-cities/

The GVRD and its Context

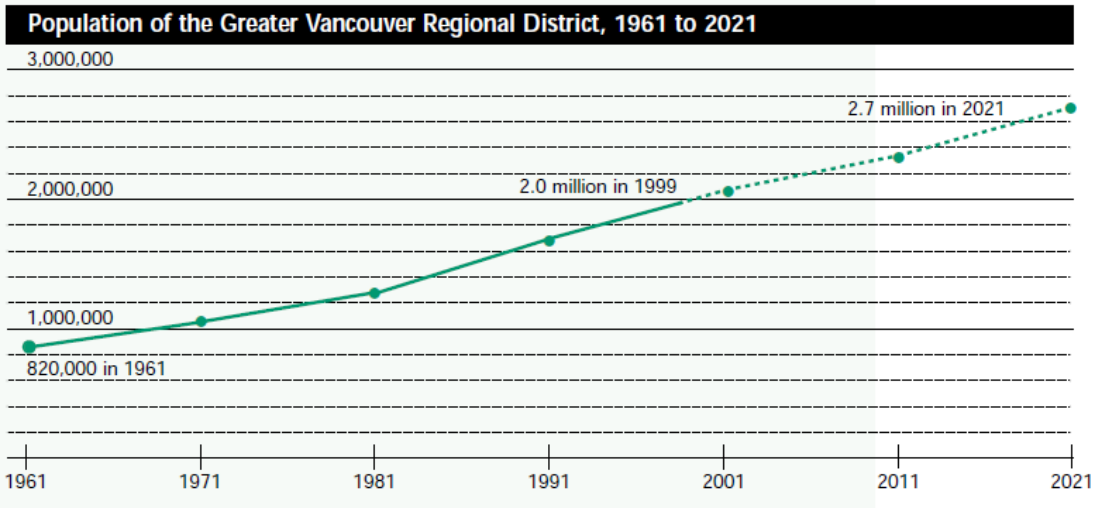


GVRD (1996)

Overall LRSP objectives

1. Help the region develop in a way that maintains and protects the environment;
2. Guide the location of urban activities to create a high quality of life;

GVRD (1996)

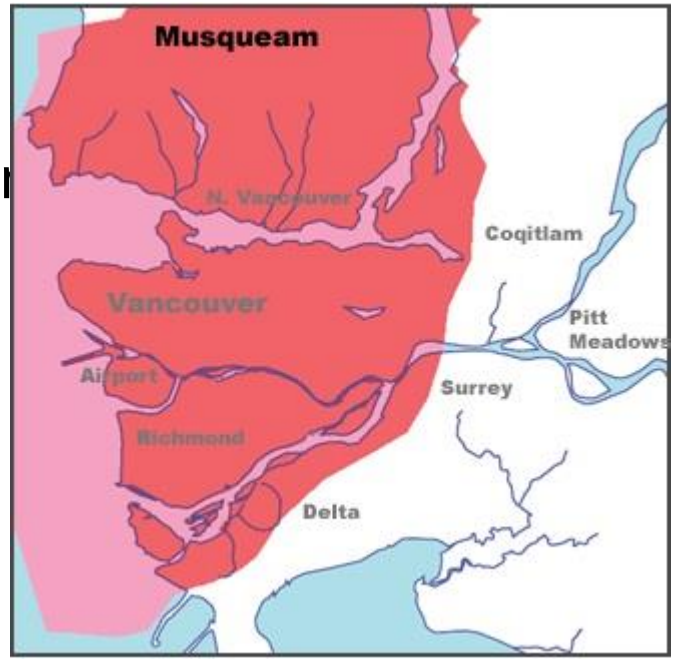


The Challenge!!

- Population (2006, 2.2 million) will grow to 3.4 million in 2041 (Metro Vancouver, 2009)
- The LRSP provides a framework for making *regional* growth management and transportation decisions.

Plan Stakeholders

- 21 Member municipalities and Electoral Area A
- Greater Vancouver Transportation Authority
- First Nations
- Senior Governments
- Voluntary & Private Sector Organizations
  (e.g., Smart Growth BC)



http://www.johomaps.com/na/canada/bc/vancouver/firstnations/fnmusq.gif

LSRP

- Contains 4 fundamental strategies:

1. Protect the Green Zone
2. Build Complete Communities
3. Achieve a Compact Metropolitan Region
4. Increase Transportation Choice

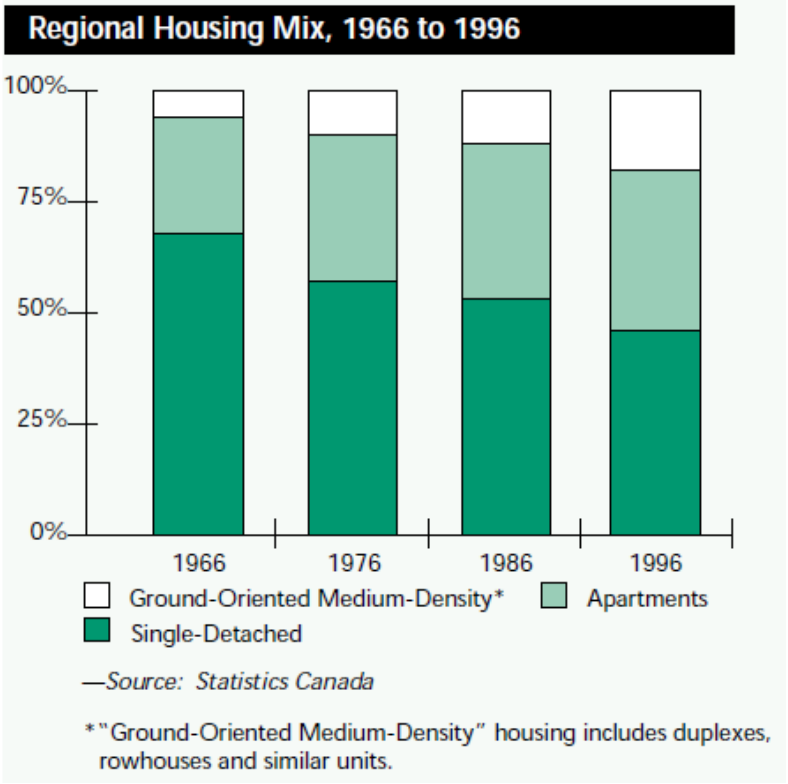
LRSP Strategy 1: Protect the Green Zone

- Protects Greater Vancouver's natural assets:
  - Major parks
  - Drinking water supply – Capilano, Seymour and Coquitlam watersheds;
  - Ecologically important areas and resource lands (farmland); 54,000 ha of land within GVRD is part of the Agricultural Land Reserve (GVRD 1996)
- Set a long-term boundary for urban growth

Photo credit: http://www.vancourier.com/Letter+week/4032655/story.html

LRSP Strategy 2: Build Complete Communities

- Those having …
  - a wider range of opportunities for ‘day to day’ life
  - jobs closer to where people live
  - shops and services near home
  - wider choice of housing types
- Regional Town Centre model

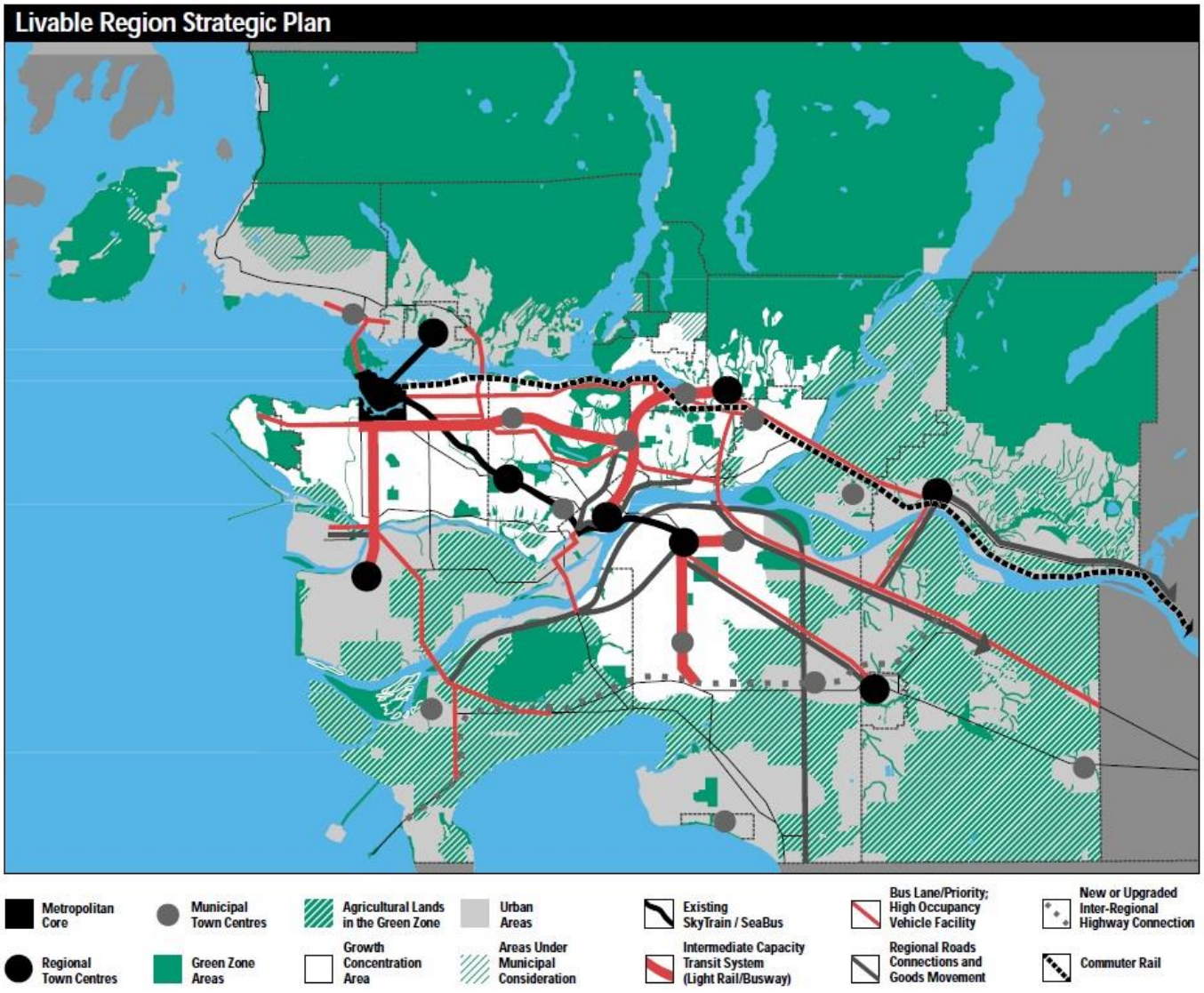


GVRD (1996)

http://www.smartgrowth.bc.ca/Default.aspx?tabid=195

Vancouver's Regional Town Centres (RTCs)

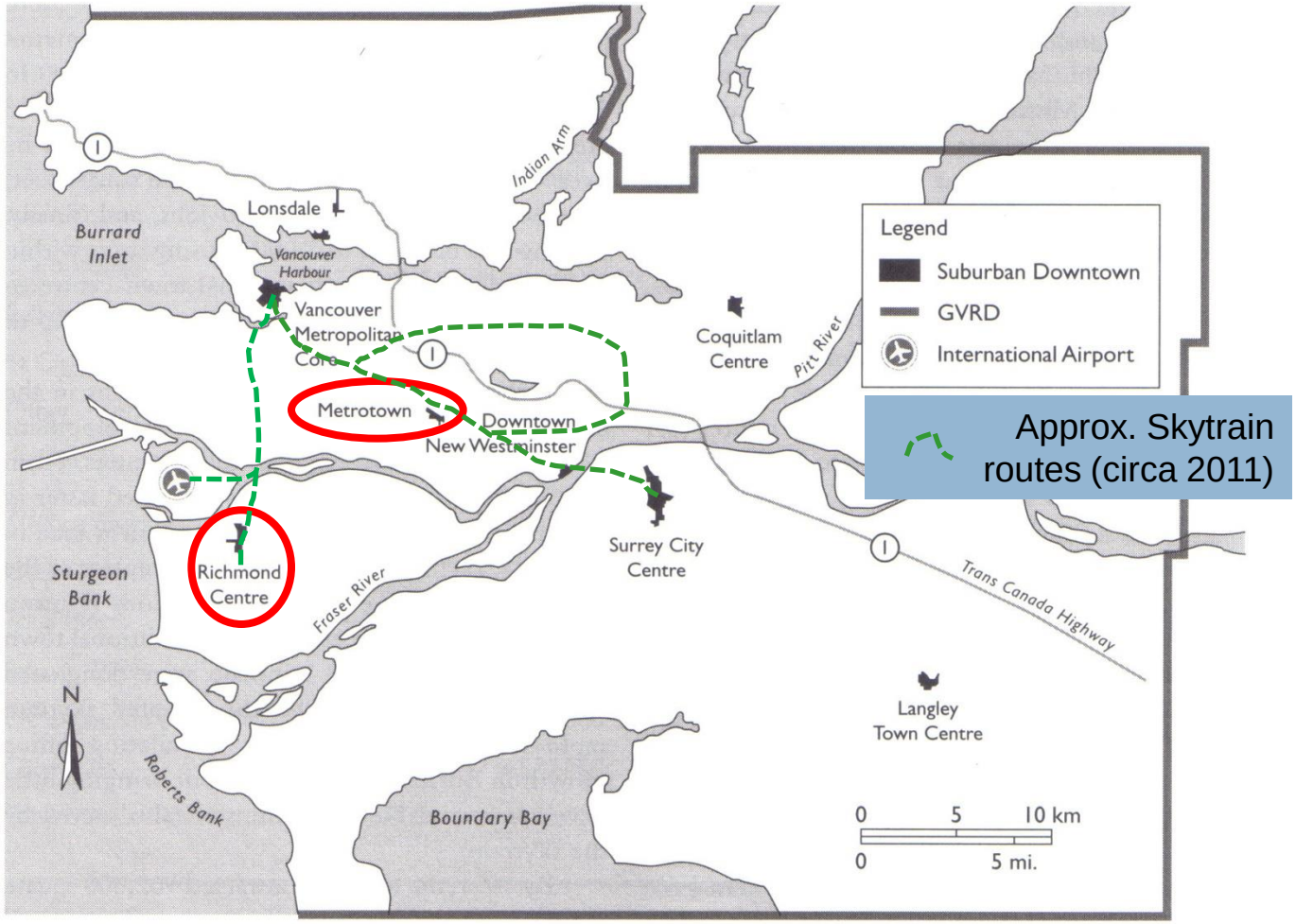
- 3 types of centre:
- Metro Core
- Municipal
- Regional



GVRD (1996)

Vancouver's Regional Town Centres (RTCs)

Figure 11.5 **Location of Vancouver Suburban Downtowns**



From: Gad and Matthews (2000)

Vancouver's Regional Town Centres (RTCs)

- were part of the Livable Region Strategy (1976→), included 4 measures …
  1. *encourage increased housing density near CBD*

Vancouver's Regional Town Centres (RTCs)

2. *decentralize jobs to four RTCs in the suburbs*

Table 11.3 **Vancouver's Regional Town Centres**

	Office Space (sq. m.)		Retail Space (sq. m.)	Employment
	1983	1991–2	1991	1991–2
CBD	1,596,000	2,183,000	1,305,000	173,000
Broadway	318,000	418,000		
Metrotown	77,000	223,000	227,000	17,000
Richmond	52,000	139,000	281,000	20,400
Lonsdale	30,000	111,000	92,000	15,300
Other 3 RTCs	129,000	182,000	362,000	27,400
Total RTCs	288,000	655,000	962,000	80,100
Other	1,285,000	1,770,000	3,700,000	561,000
Total GVRD	3,487,000	5,026,000	5,967,000	814,100

Sources: GVRD (1991, 1993a, 1993b).

50% in CBD

40% in CBD

From: Gad and Matthews (2000)

3. *improve public transportation*

Express Bus (B-line), Richmond Town Centre Photo Credit: J. Jorgensen

SkyTrain Extension (Canada Line to airport) Under Construction June 2006

Vancouver Transit Map - Windows Internet Explorer

http://davidpritchard.org/maps/vantransit.html

File Edit View Favorites Tools Help

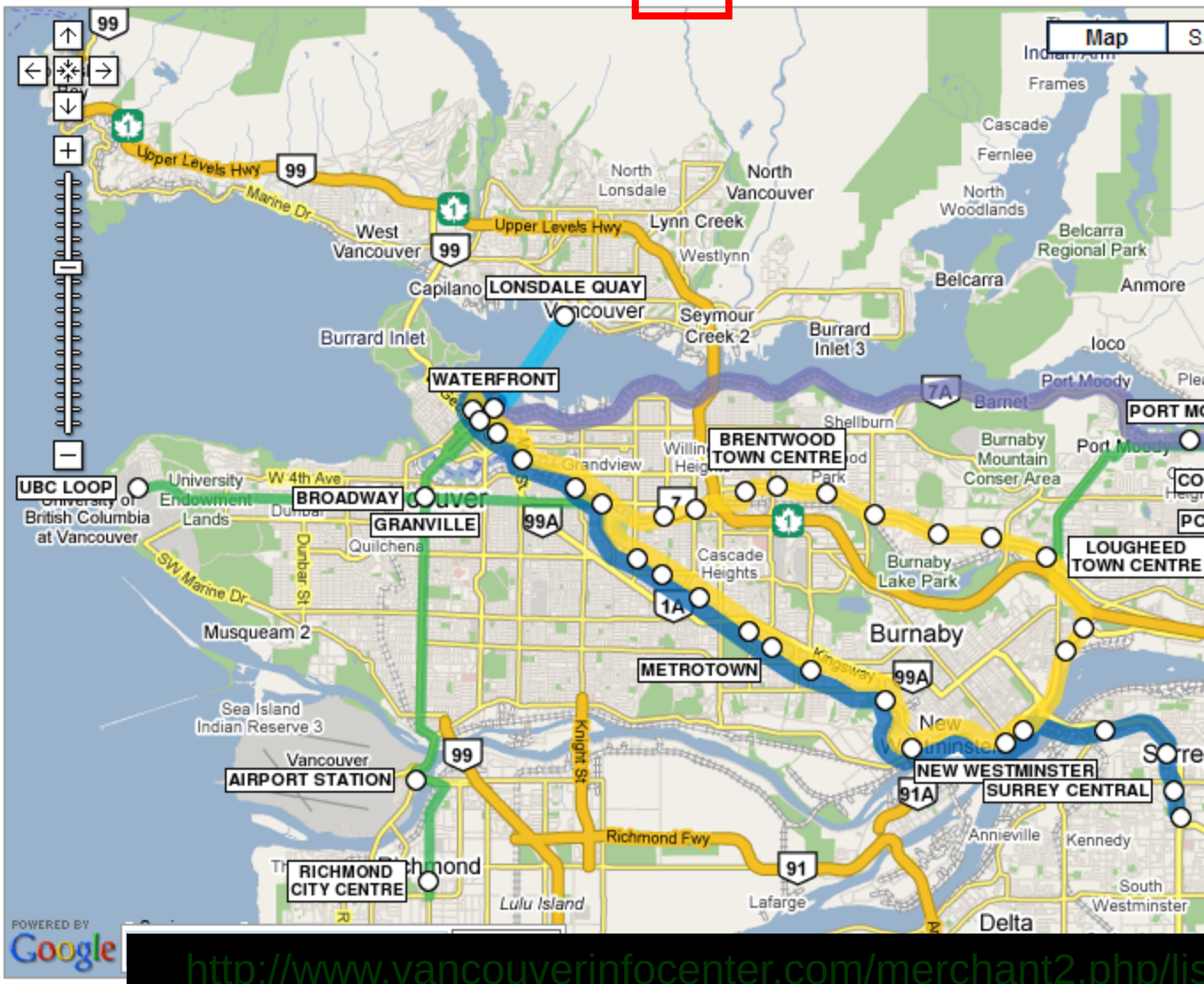
Vancouver Transit Map

Vancouver Transit with Google Maps

Routes [today | future] KML [today | future] Link

- Expo Line (SkyTrain)
- Millenium Line (SkyTrain)
- Canada Line (SkyTrain, 2010)
- Evergreen Line (Light Rail, future)
- B-Line (Rapid Bus)
- SeaBus (Ferry)
- West Coast Express (Suburban Rail)
- Bus
- Bike Lockers
- Park and Ride

Bus routes may not be up-to-date. Visit TransLink for the real maps, schedules, etc.



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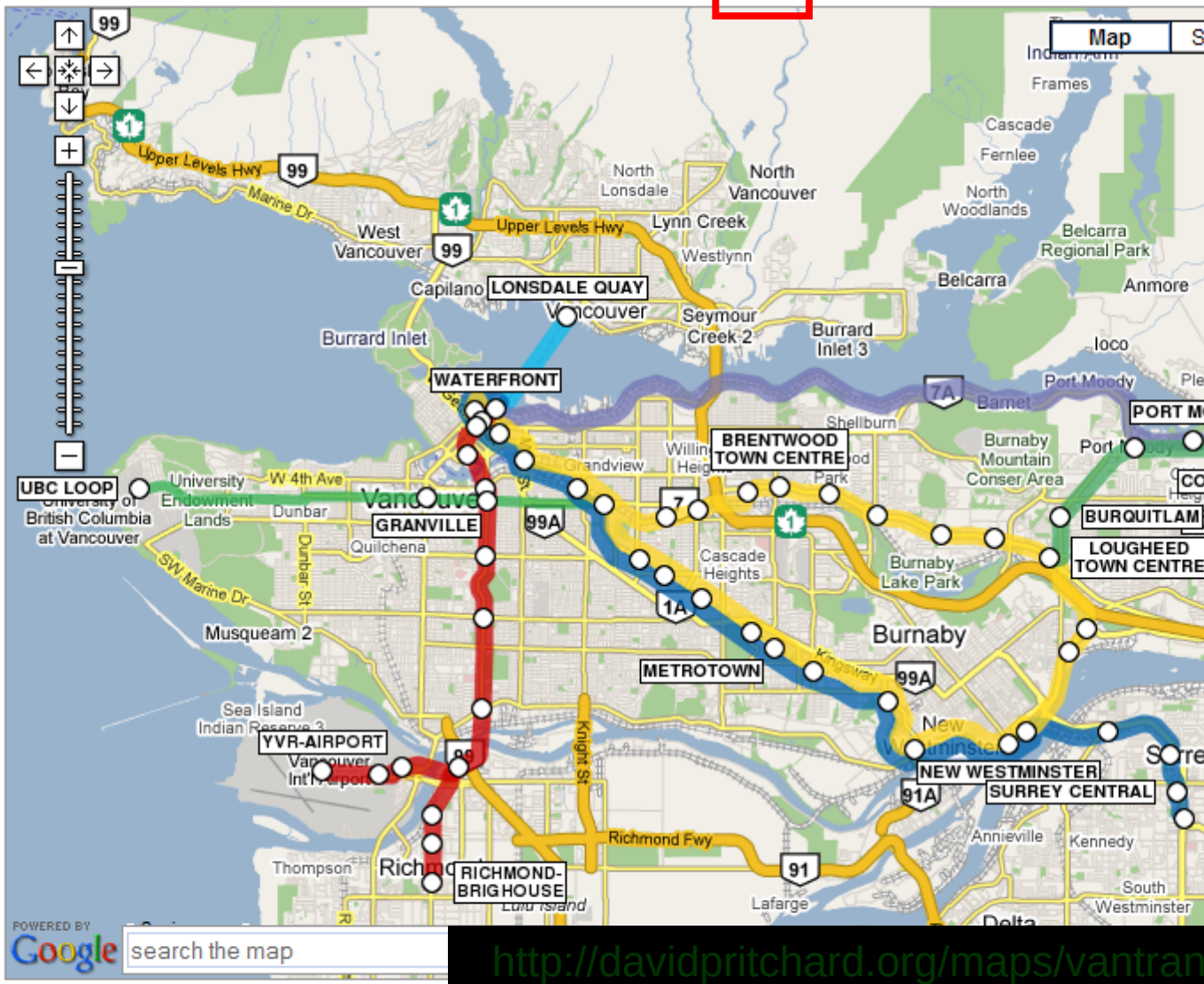

http://davidpritchard.org/maps/vantran

Vancouver's Regional Town Centres (RTCs)

4. *seek to balance jobs and housing in each part of the GVRD*

Table 11.3 **Vancouver's Regional Town Centres**

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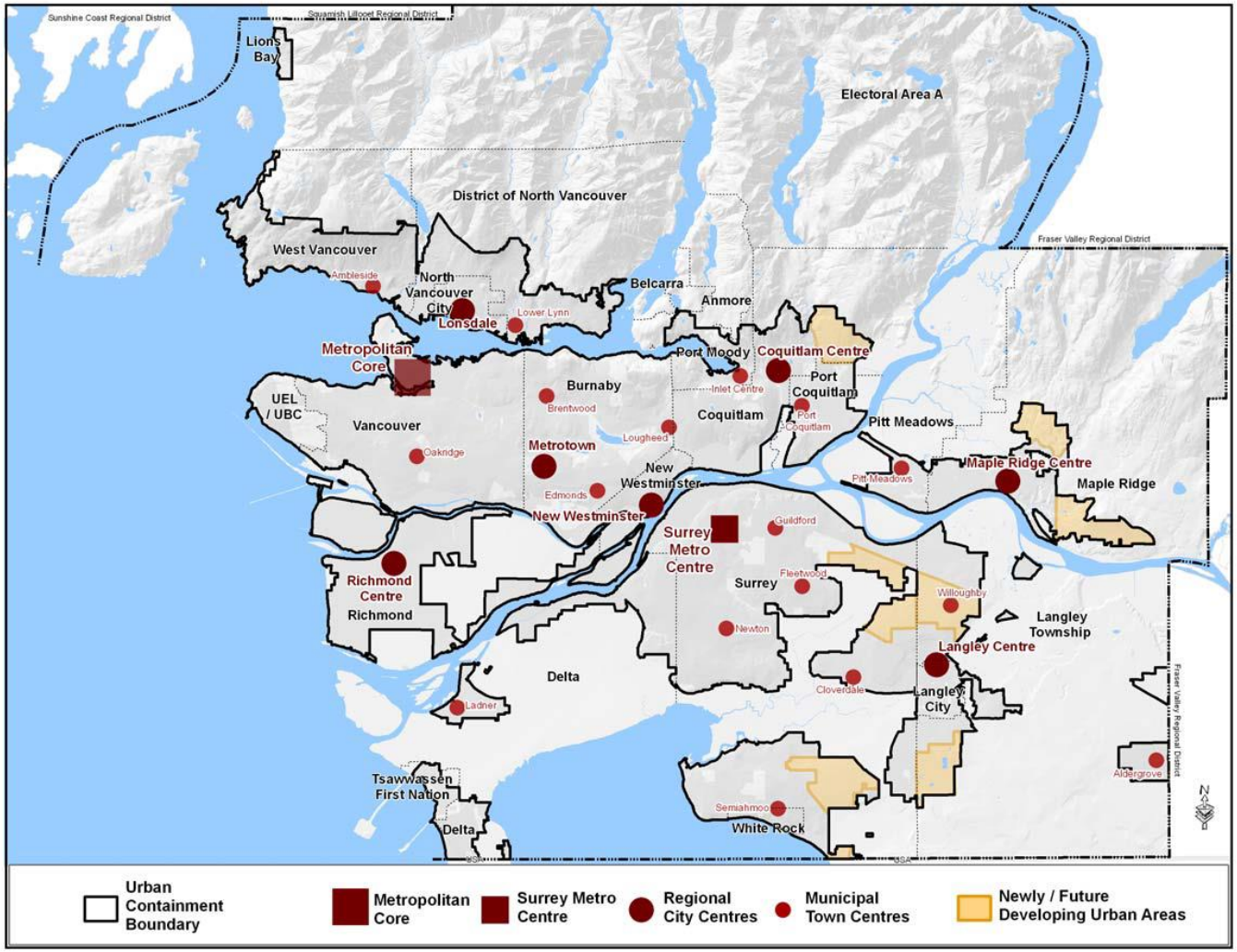
Sources: GVRD (1991, 1993a, 1993b).

50% in CBD

40% in CBD

From: Gad and Matthews (2000)

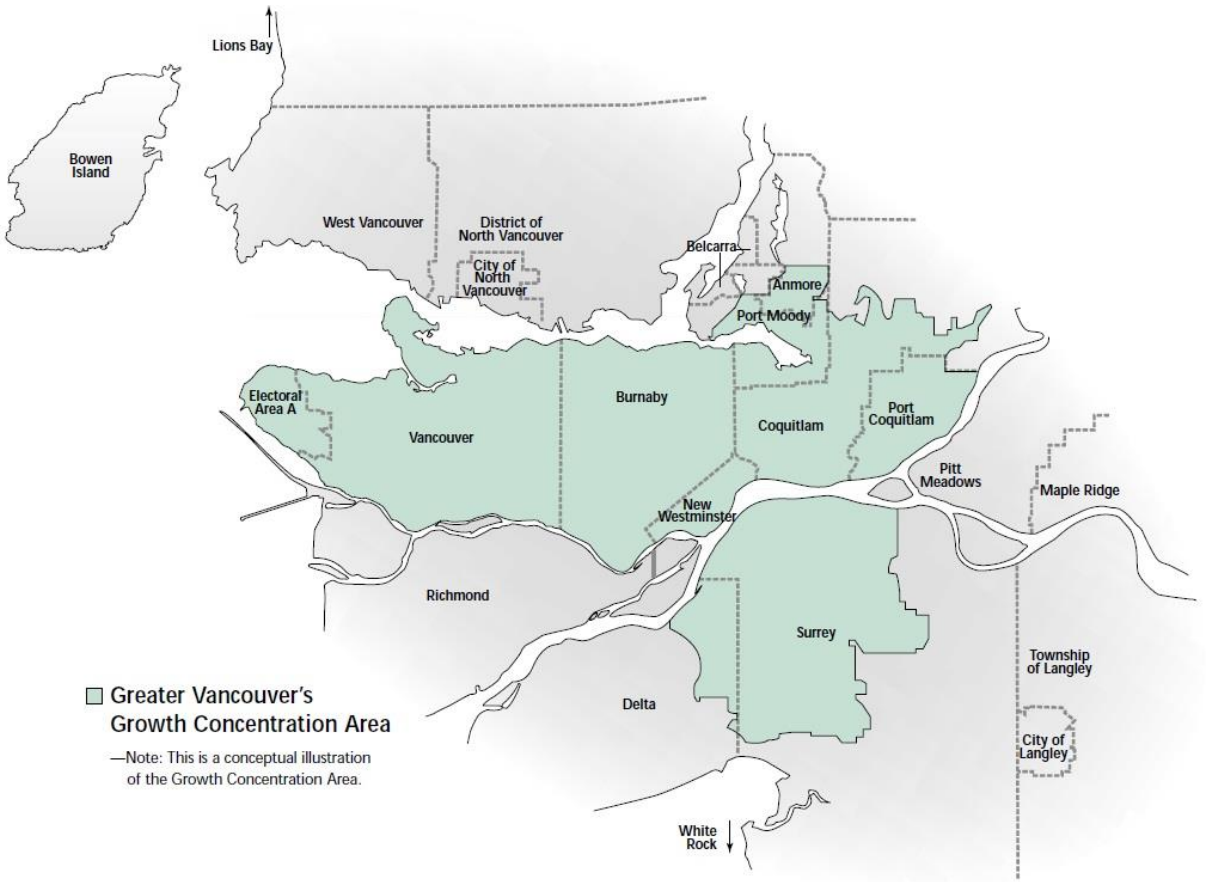
Figure 2. Metro 2040 – Create a Compact Urban Area



Metro Vancouver (Nov. 2009)

LRSP Strategy 3: Achieve a Compact Metropolitan Region

- Goal: 70% of GVRD population in the Growth Concentration Area by 2021 (GVRD, 1996)



GVRD (1996)

Achieve a Compact Metropolitan Region

- Avoid widely dispersed development
- Concentrating growth
  - encourage people to live closer to the jobs;
  - better use of transit and other community services;
  - lessen land consumption on the urban fringe;
- Compact develop supports an efficient cost-effective transportation system;

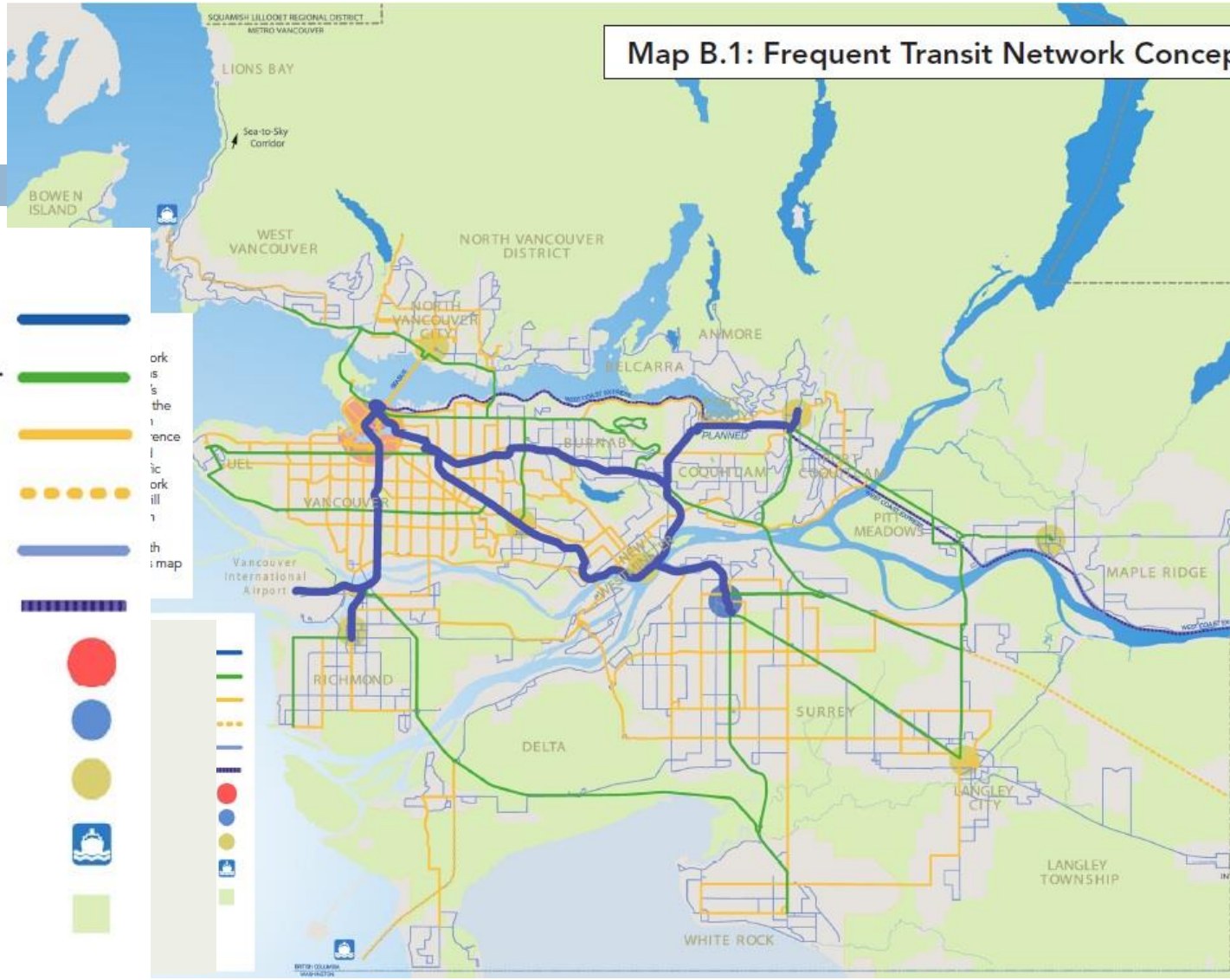
***Table 2* Transit Density Requirements** (based on Pushkarev and Zupan 1977)

Mode	Service Type	Minimum Density (Dwelling Units Per Acre)	Area and Location
Dial-a-Bus	Demand response serving general public (not just people with disabilities.	3.5 to 6	Community-wide
"Minimum" Local Bus	1/2-mile route spacing, 20 buses per day	4	Neighborhood
"Intermediate" Local Bus	1/2-mile route spacing, 40 buses per day	7	Neighborhood
"Frequent" Local Bus	1/2-mile route spacing, 120 buses per day	15	Neighborhood
Express Bus – Foot access	Five buses during two-hour peak period	15	Average density over 20-square-mile area within 10 to 15 miles of a large downtown
Express Bus – Auto access	Five to ten buses during two-hour peak period	15	Average density over 20-square-mile tributary area, within 10 to 15 miles of a large downtown
Light Rail	Five minute headways or better during peak hour.	9	Within walking distance of transit line, serving large downtown.
Rapid Transit	Five minute headways or better during peak hour.	12	Within walking distance of transit stations serving large downtown.
Commuter Rail	Twenty trains a day.	1 to 2	Serving very large downtown.

This table, based on research by Pushkarev and Zupan (1977), indicates typical residential densities needed for various types of transit service. Such requirements are variable depending on other geographic, demographic and management factors.

LRSP Strategy 4: Increase Transportation Choice

- Supports the use of public transit and reduced dependence on the single occupant vehicle;
- Cycling networks
- Pedestrian-oriented development:
  - → vibrancy, amenity viability, connectivity (to amenities) and safety in neighbourhoods in core / regional / municipal centres and around transportation hubs;



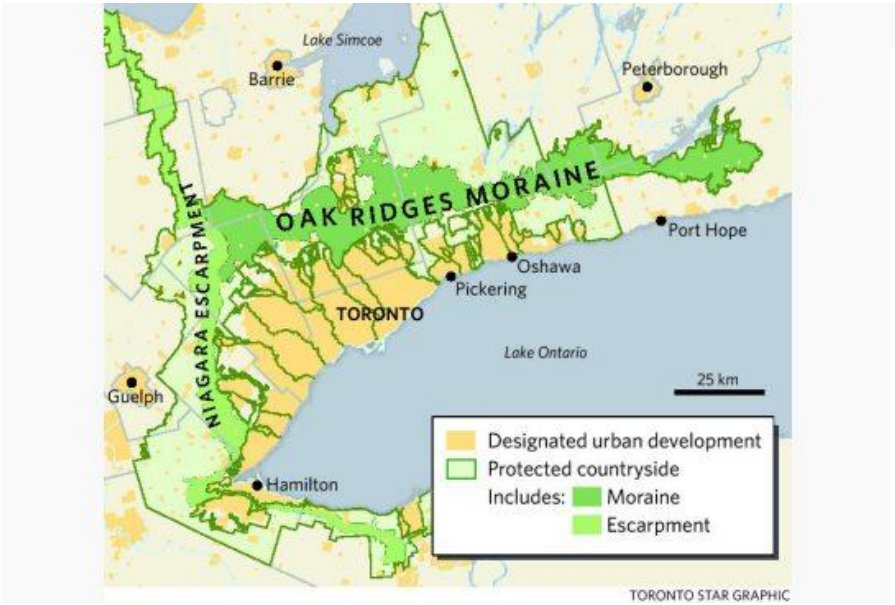
Source: Translink (Metro Vancouver transit planning authority)

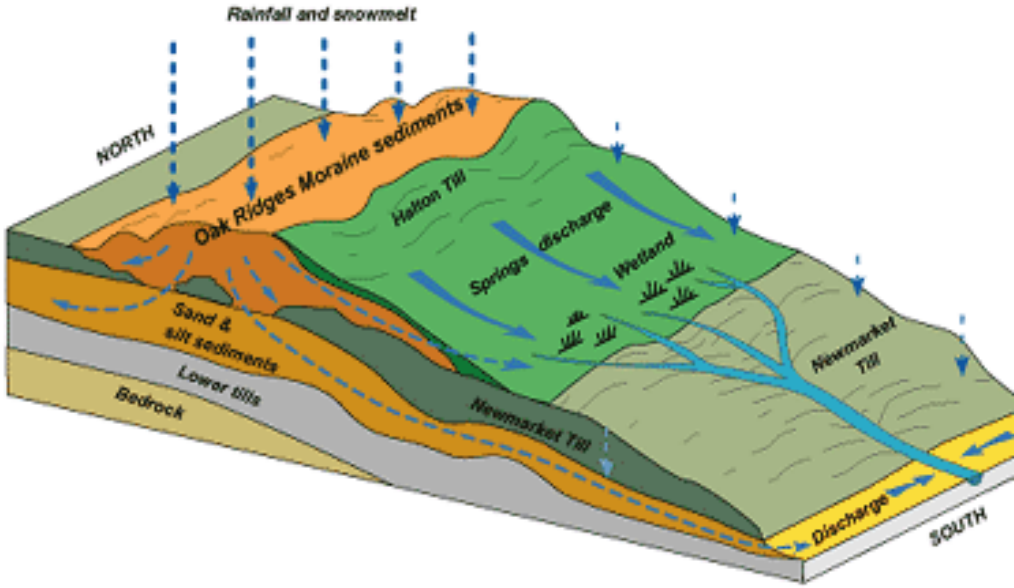
Indicators of Smart Growth (Dearden & Mitchell p479) *… How has LRSP done?*

- Denser, mixed-use development in greenfield areas
- Intensification to moderate greenfield development
- Taking advantage of specific intensification opportunities
- Increasing transportation choice and reduce car usage
- Increasing the supply of new affordable housing
- Improving the range of housing types
- Preservation of agricultural lands
- Preservation of lands to maintain regional ecosystem functions
- Directing employment to strengthen the core and sub-centres
- Provision of infrastructure to reduce ecological impacts

Preservation of lands to maintain regional ecosystem functions

- E.g. Oak Ridges Moraine (Metro Toronto)

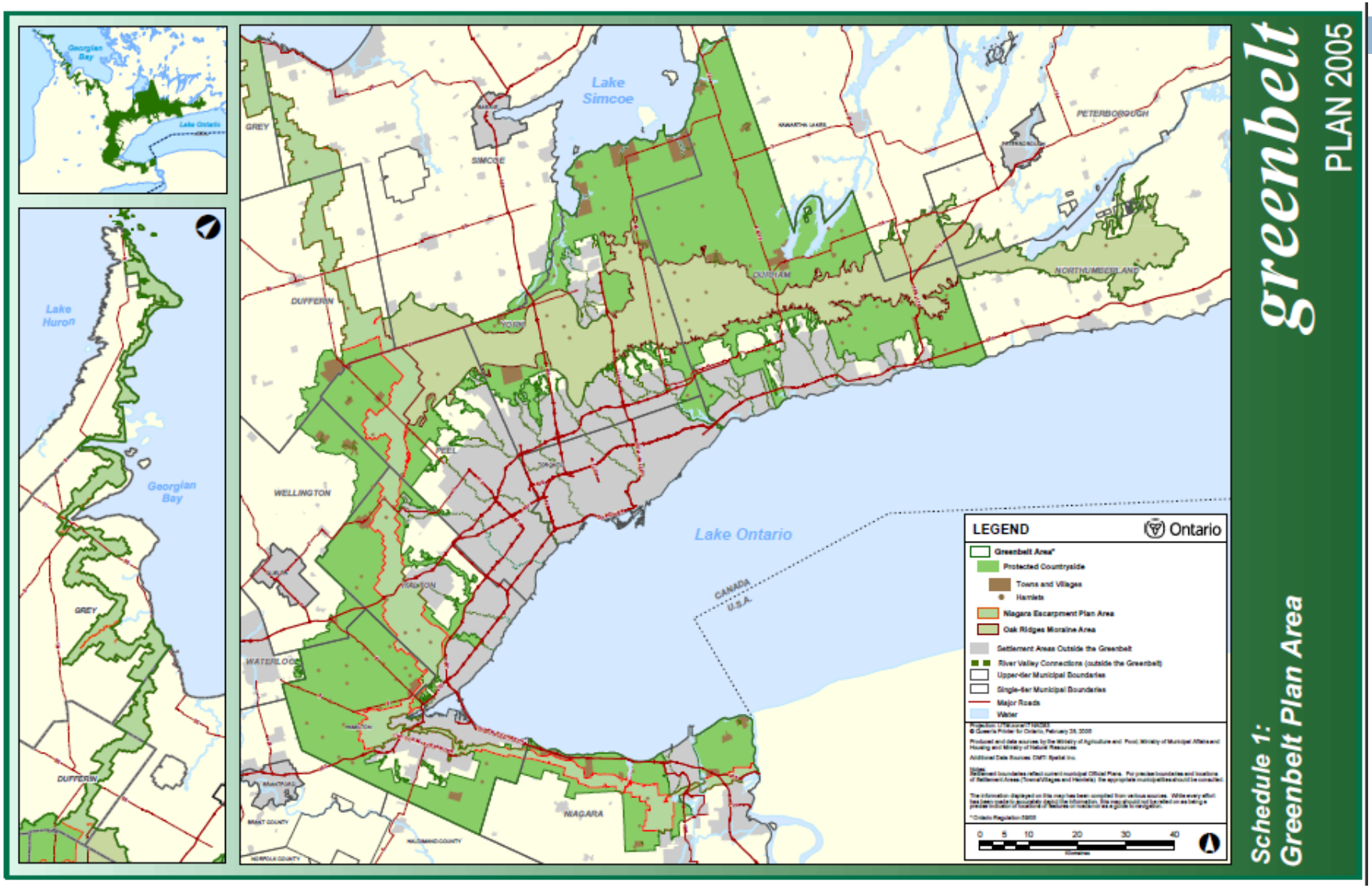




Thetorontostar.ca

In the diagram (courtesy of GEOSCAPES; Natural Resources Canada), you can see how the precipitation that falls on the Oak Ridges Moraine is absorbed into a sandy layer that is actually hundreds of meters deep. Here, it is filtered and stored eventually draining out via the many streams and rivers that originate from the Moraine. Clean and cold, the rivers begin here

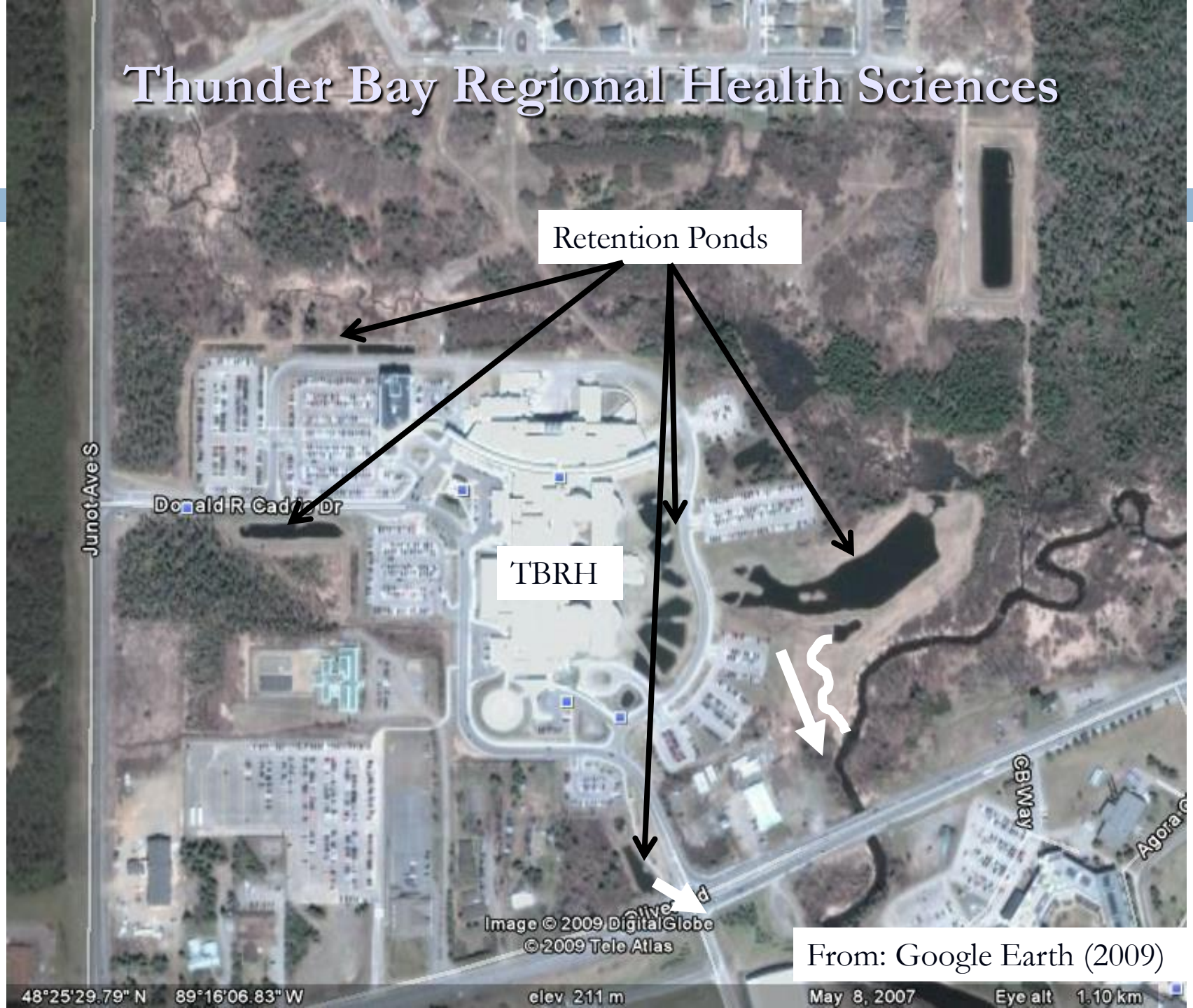
Ontario's Green Belt – since 2005



Provision of infrastructure to reduce ecological impacts

- Examples:
  - Stormwater Management Systems
  - Xeriscaping and Naturalized Landscaping
  - Brownfield Reclamation
  - Green Building Technology and Materials
    - Green Roofs

Thunder Bay Regional Health Sciences



From: Google Earth (2009)

Series of retention ponds along east side of TBRH structure. Fountains to reduce/prevent mosquito larvae. TBRH site (Fall 2004).

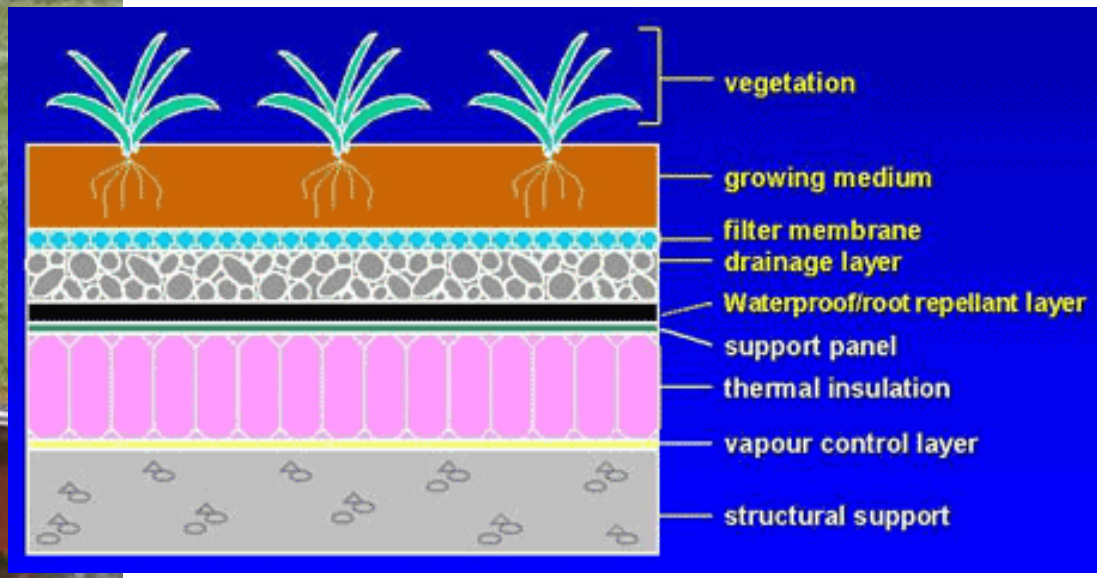
Channel (LHS) and **curbless** parking lot. TBRH site (Fall 2004).

Gravel channel (dry) carries parking lot runoff to holding ponds. TBRH site (Fall 2004).

Green Roofs

- (*definition*) part or all of the roof area is covered with vegetation, planted in a layer of soil that sits on a membrane directly on the roof surface;

Source: www.premiumplants.net



Source: NRC 2004

Green Roofs – examples from Toronto

- “concept …to replace the vegetated footprint lost when the building was constructed” (Schneider 2006)

http://www.toronto.ca/greenroofs/what.htm

Benefits of Green Roofs

- Stormwater retention
- Insulation
- Cooling
- Air quality improvements
- Energy conservation
- Sound absorption
- Food production
- Bird/insect habitat

Herb garden on top of the Fairmont Hotel in Vancouver.

www.greenroofs.ca

Brownfield Development – land re-use

Bethlehem Steel Warehouse

Photo Credit: Sean M.L. Galbraith Photography

Thunder Bay Waterfront – potential like many cities…

http://www.opinionatedbastard.ca/?p=321

Waterfront Project
(October 2010)
Construction Phase One

References

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