



2009 ITE Quad Conference, Vancouver, 1 May

Planning of Vancouver's Transit Network with an Operations-Based Model

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Overview

- **Transit planning in Metro Vancouver**
- **The Regional Transit Model (RTM):
Transit data integration and
operations analysis**
- **Model Applications**
- **Studies performed**
- **Conclusions and future directions**



Metro Vancouver

21 cities

2.2 million residents, 3.2 million by 2040

- > 294 million transit boardings (unlinked) in 2007
- > 78 annual transit rides (linked) per resident

Major gateway for sea, air and rail freight

- > No urban freeways/motorways

Prior to 1999 no regional transportation agency



TransLink Mandate – Integration of:



Public
Transport



Intelligent
Transportation
Systems



Regional
Cycling



Transportation
Demand
Management



Roads &
Bridges



Vehicle
Emissions
Testing

Intermodal Transit System

- > Commuter rail (West Coast Express)
- > ALRT (SkyTrain)
- > Passenger ferry (SeaBus)
- > Bus (includes trolleybus)
- > B-Line (frequent, limited stop)
- > Community Shuttle minibus

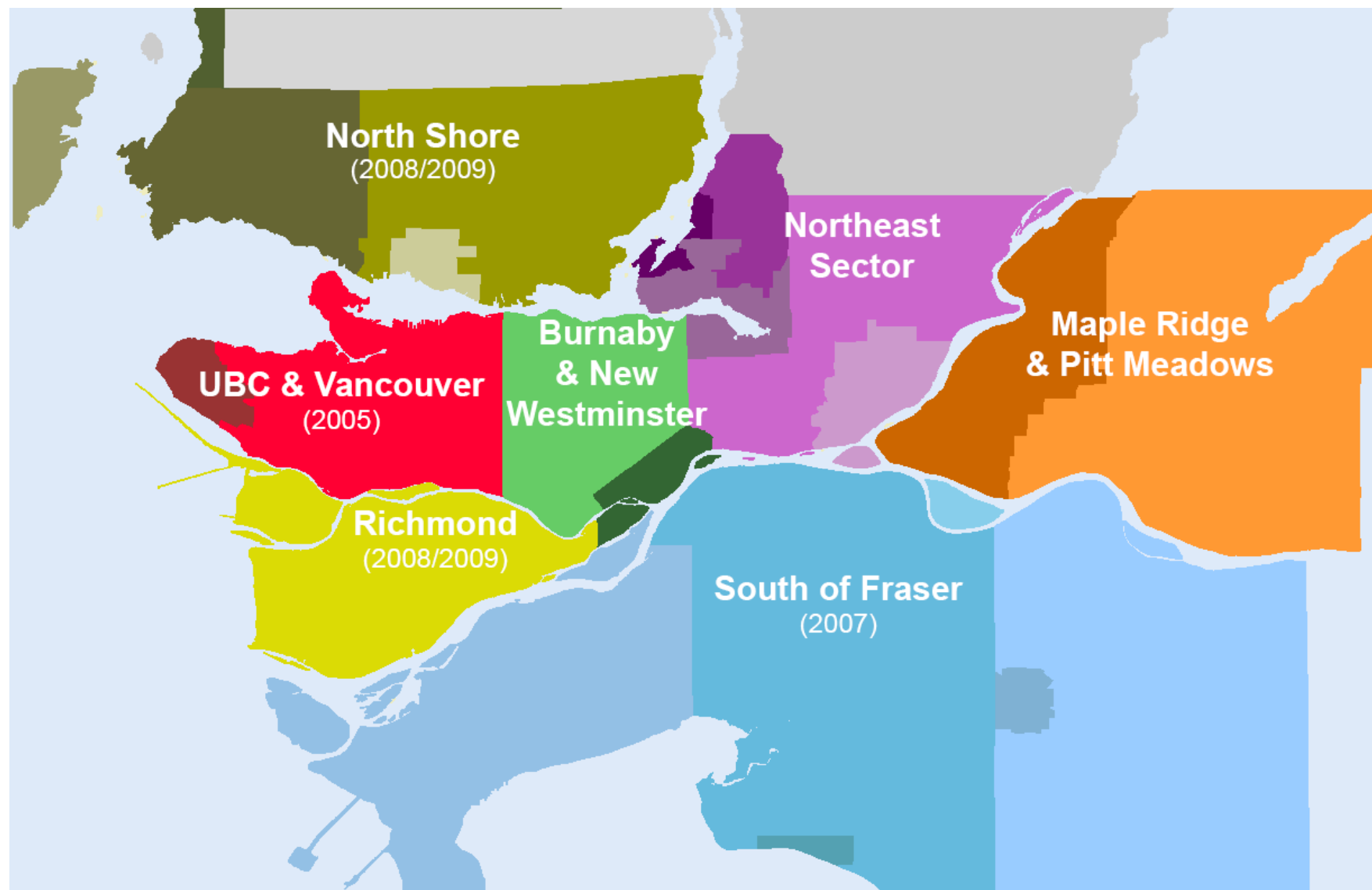


A detailed map of Vancouver, British Columbia, illustrating the city's rapid transit network. The map shows the following lines and stations:

- Canada Line (Red):** Connects the airport area (YVR) to downtown Vancouver, including stations like YVR, BIC, TE, SE, and others.
- Evergreen Line (Green):** A line extending from the north end of the city towards the east, including stations like BC, AL, and others.
- Expo Line (Blue):** A line running through the city center, including stations like BC, AL, and others.
- Millennium Line (Yellow):** A line extending from the city center towards the east, including stations like BC, AL, and others.
- UBC Line (Pink):** A line connecting the University of British Columbia (UBC) to the city center, including stations like UBC, BIC, and others.
- West Coast Express (Orange):** A line connecting the city center to the airport area, including stations like YVR, BIC, and others.

The map also shows various other transit lines and stations, including the SkyTrain, False Creek Ferry, and others. The map is color-coded to distinguish between different transit systems and lines.

Area Transit Plans



TransLink's Regional Transit Model (RTM)

Operational model of the regional, intermodal transit network

Off-the-shelf technology (VISUM)

Integration of existing databases (schedule, bus stops, APC, NAVTEQ)

In-house use of model

Scenarios

- > Optimization: Adjust routes, train assignment and schedules
- > Network extensions (new rapid transit corridors)

Types of analysis

- > Ridership/capacity analysis
- > Vehicle/train use and fleet requirements
- > Cost/benefit analysis

Visualizations and animations that are comprehensible to lay people

Model Components

Supply

- > Nodes and links (routable street network)
- > Stops (stations)
- > Transit lines
- > Existing schedules: imported, future: edited
- > Vehicle model: consists, blocks

Demand

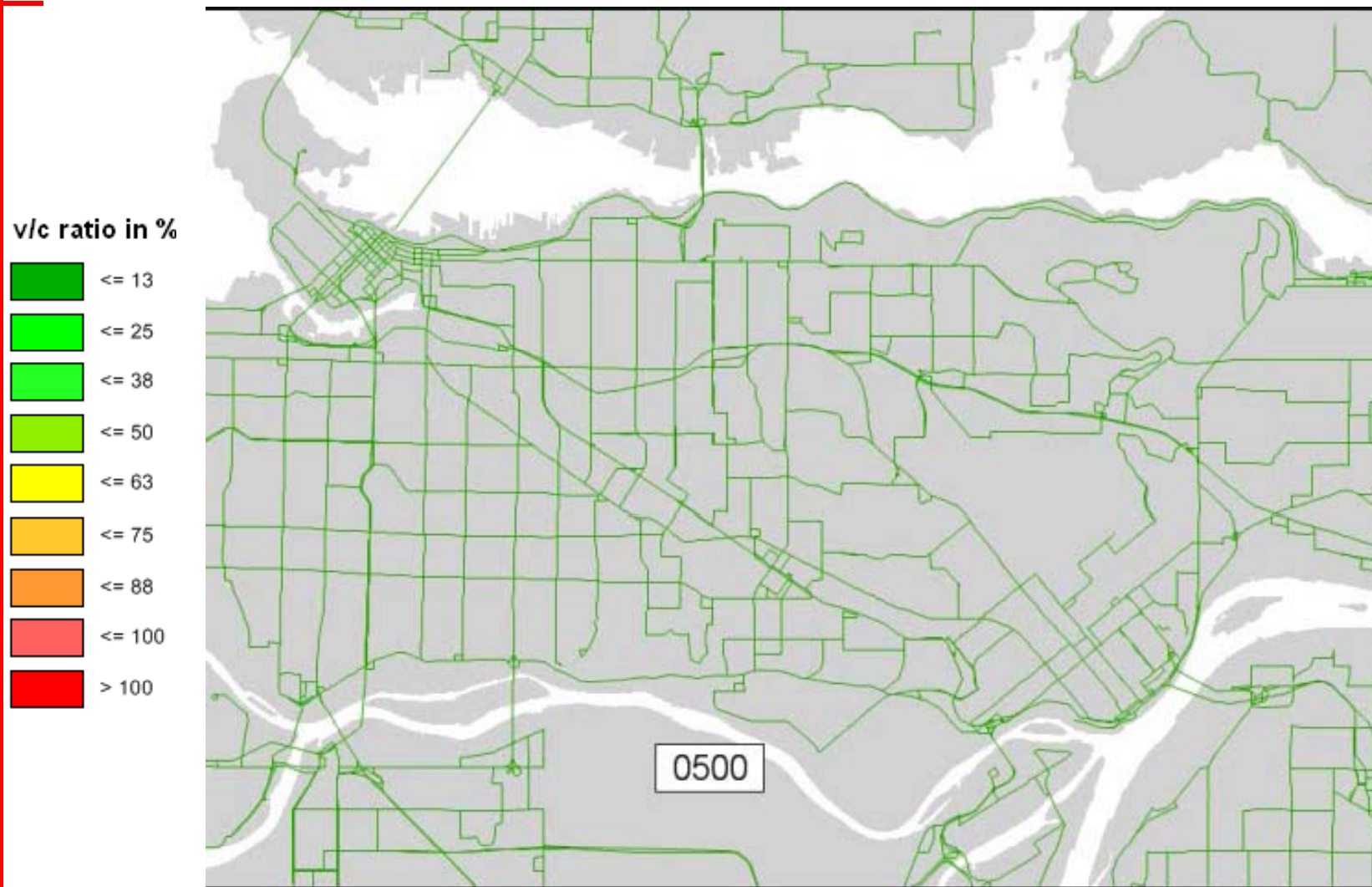
- > OD matrices derived from counts
- > Departure time distributions
- > Time-dynamic passenger flow model

Interactive Tools

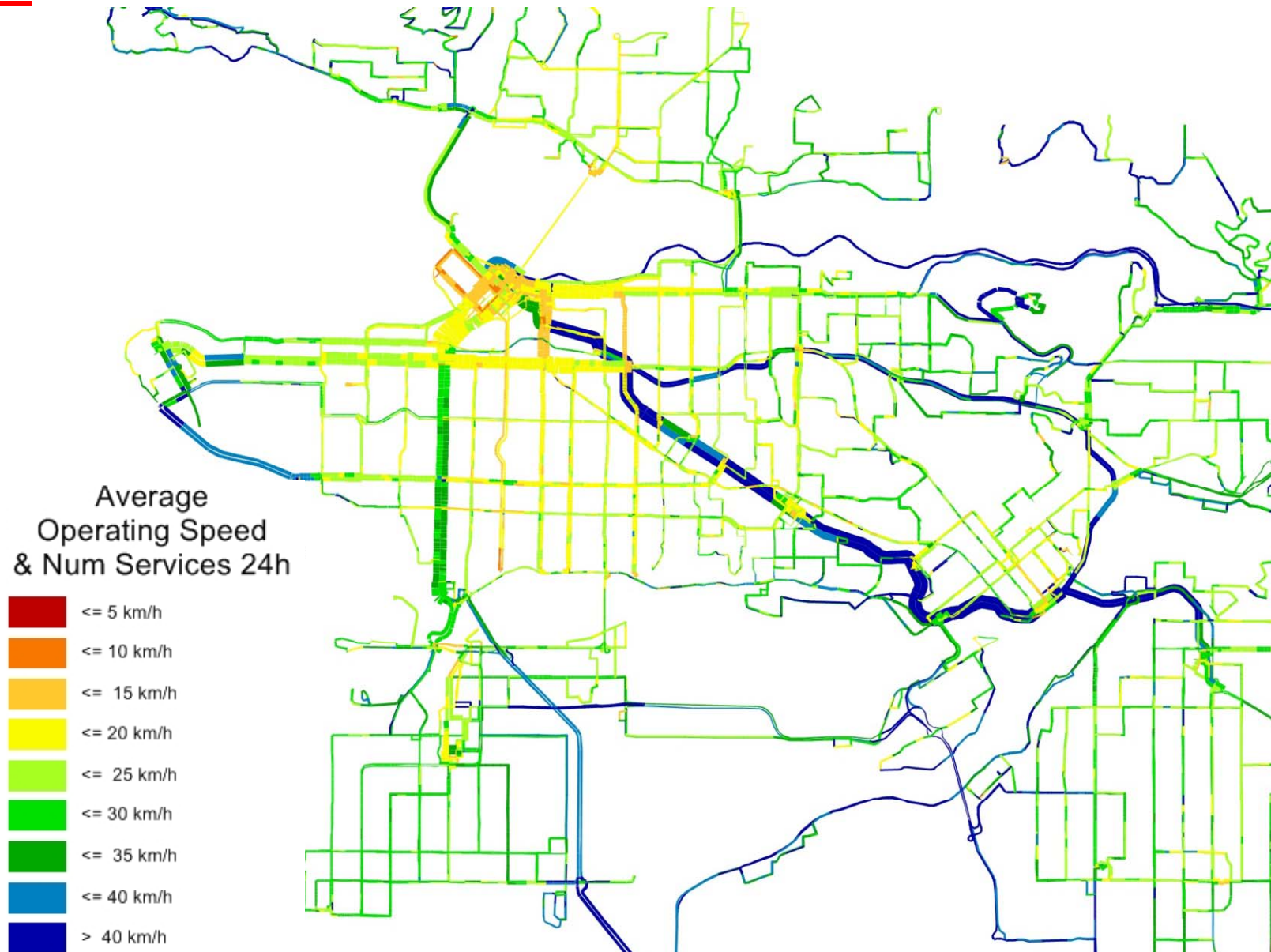
- > Mapping, visualization
- > Editing, analysis



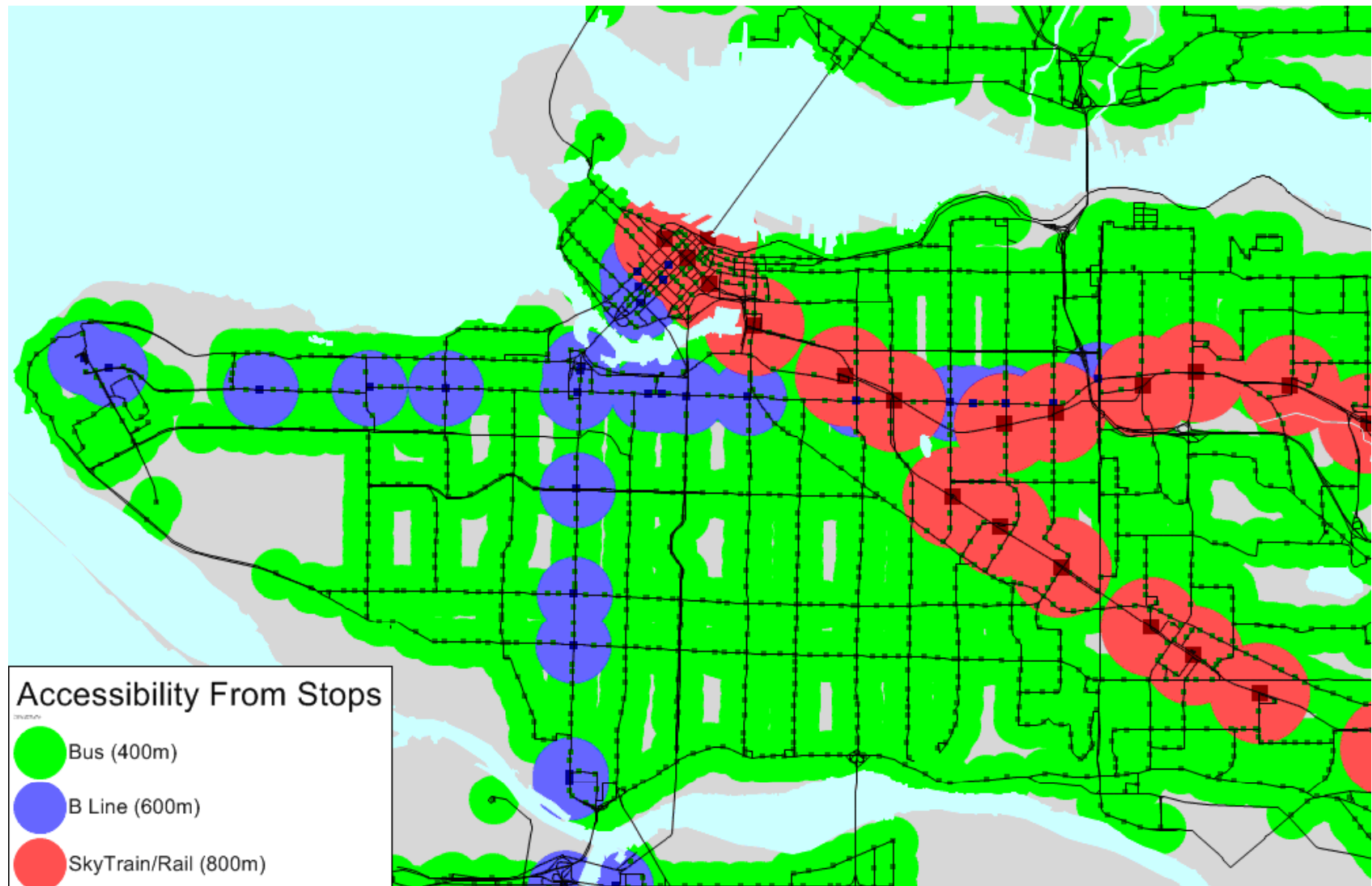
The Rapid Transit Model – 24 Hour Network



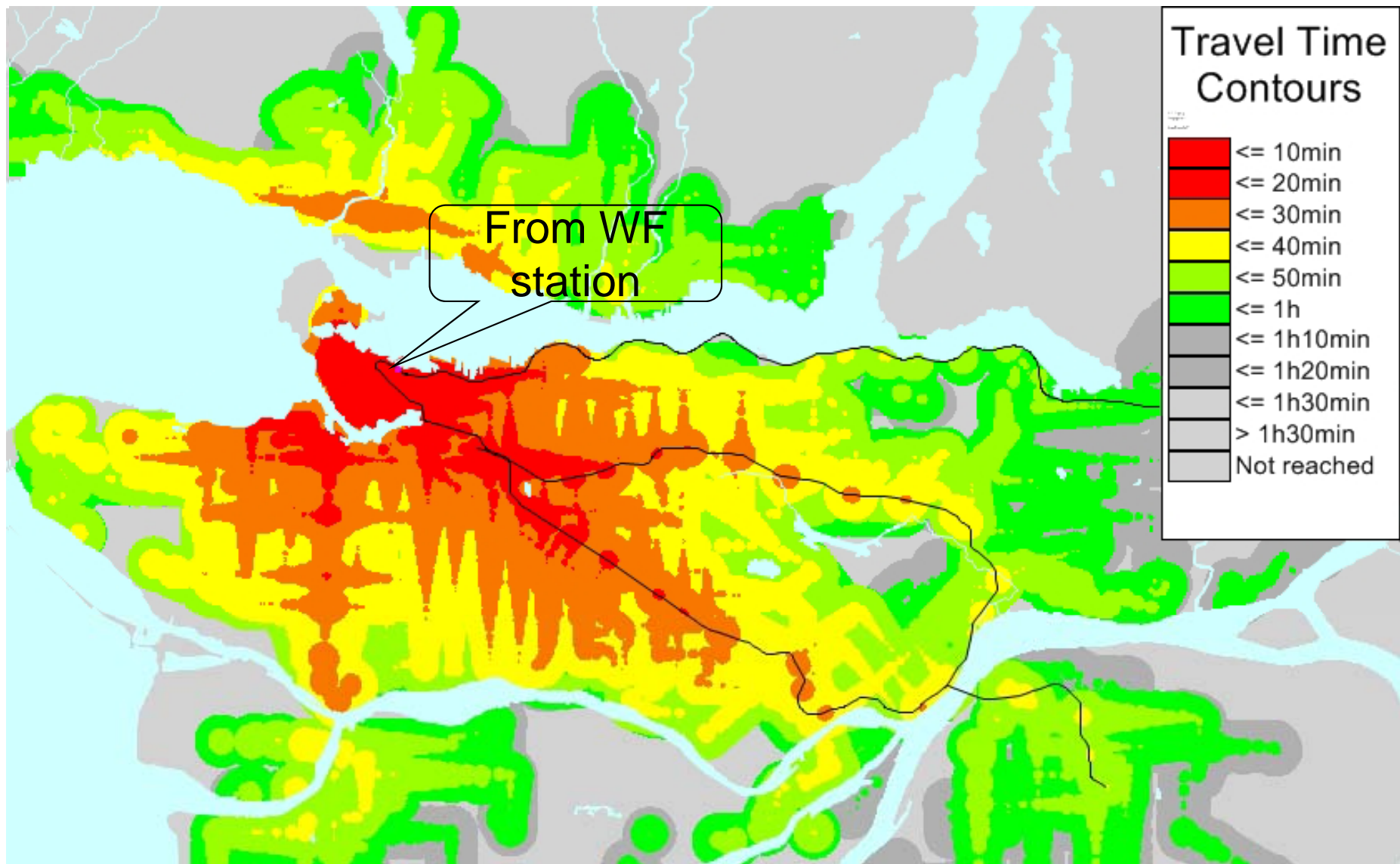
Comprehensive Operations Analysis: Average Speed



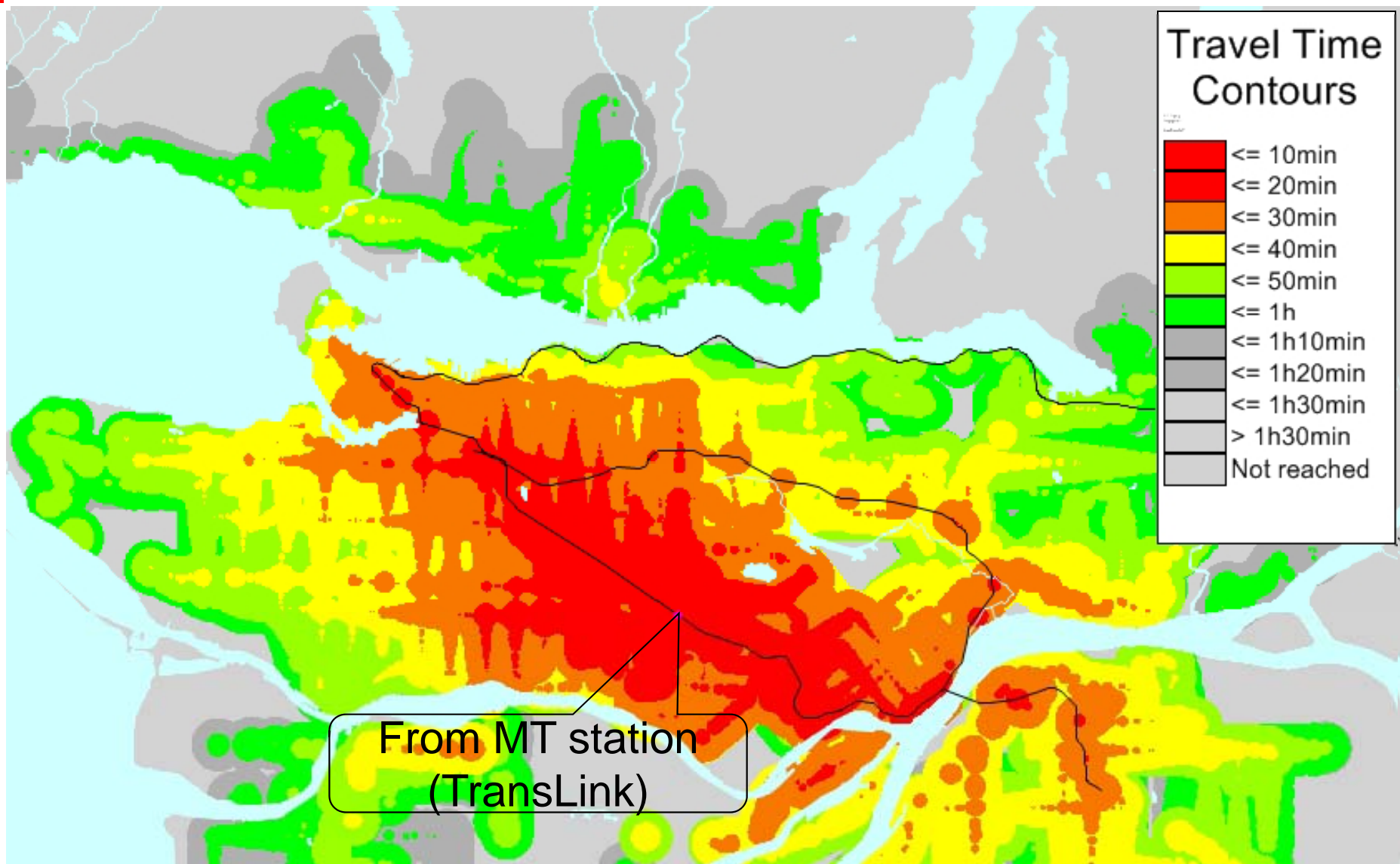
Comprehensive Operations Analysis: Stop Catchment



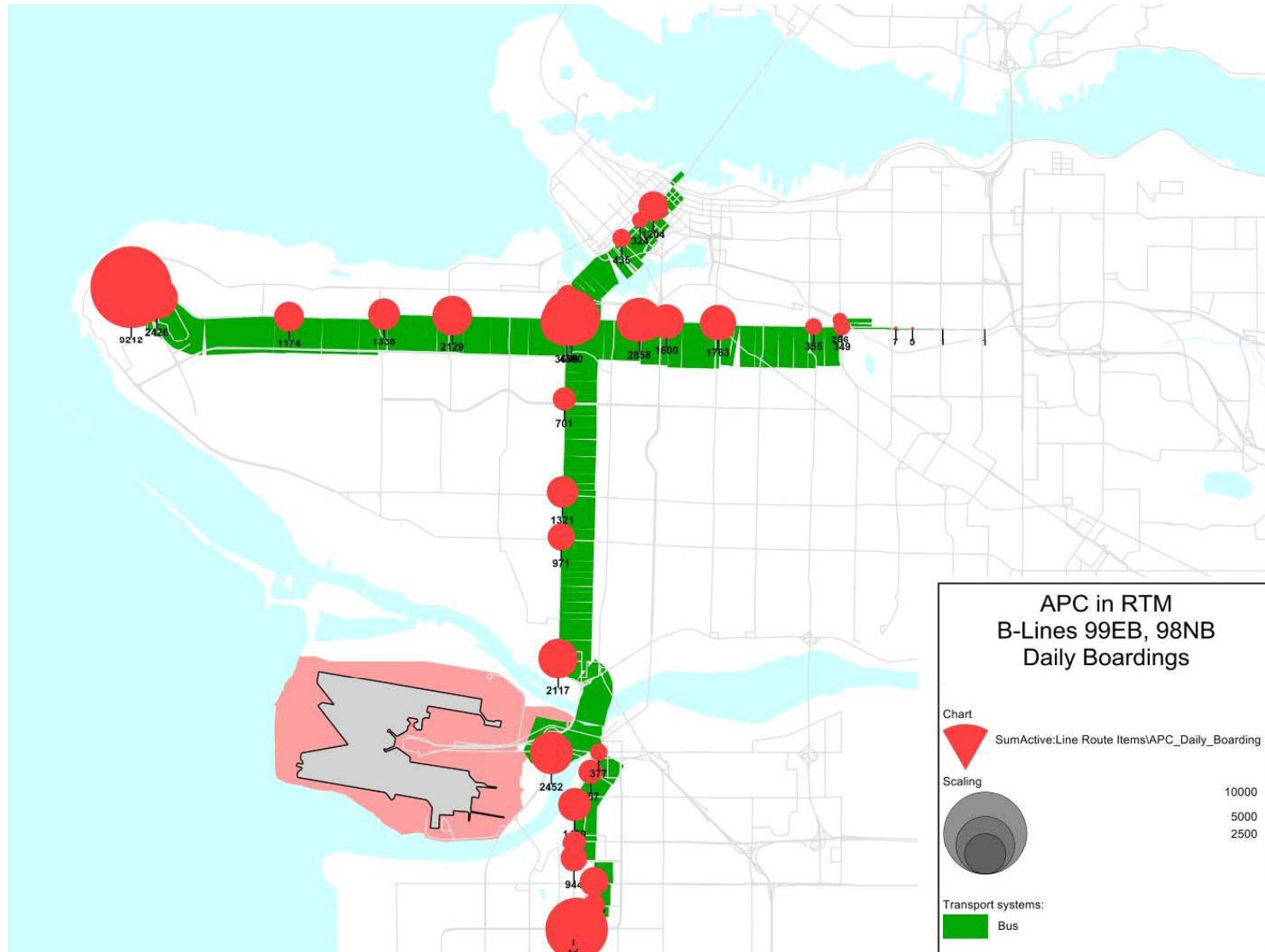
Comprehensive Operations Analysis: Travel Time



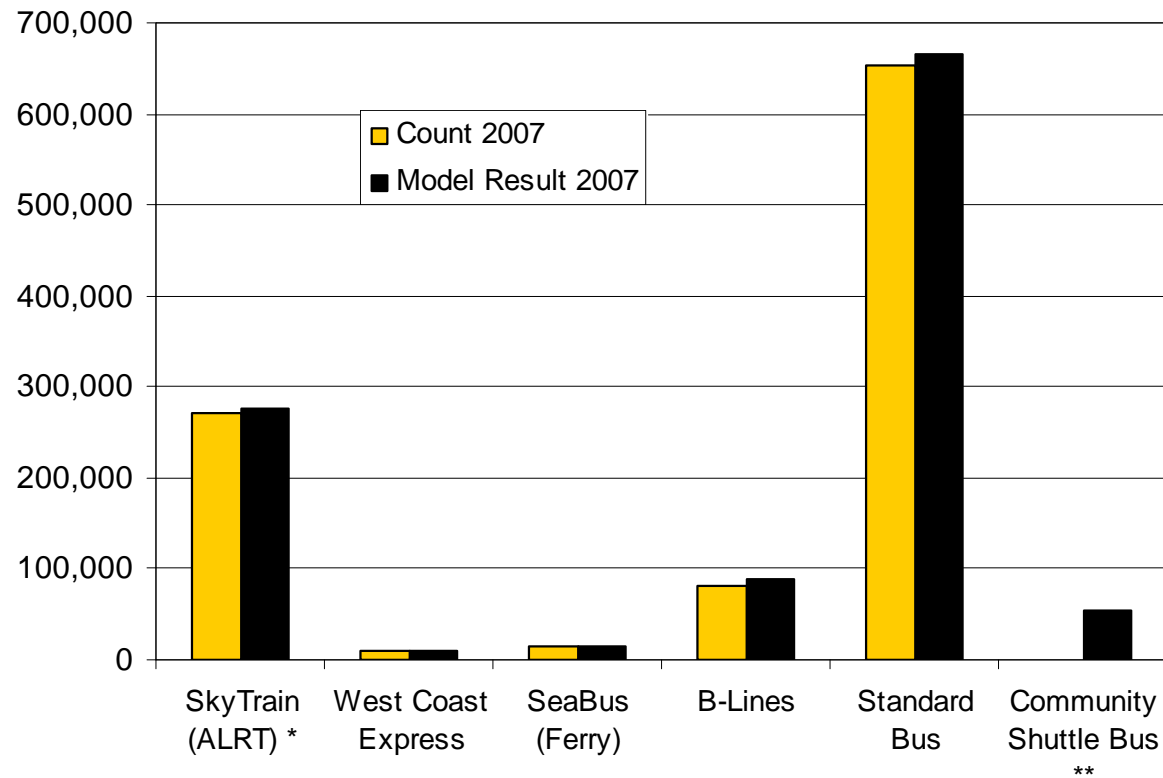
Comprehensive Operations Analysis: Travel Time



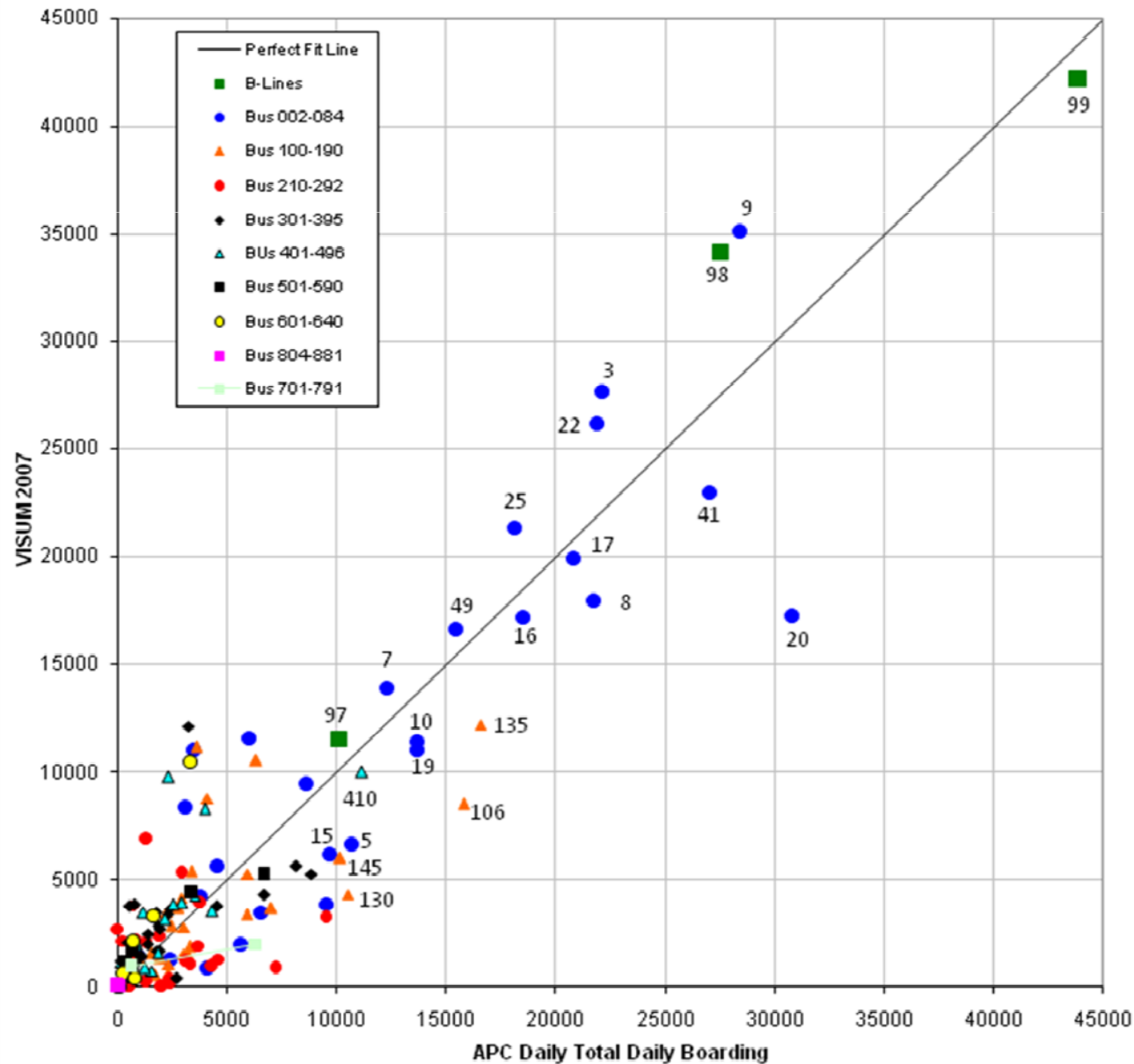
APC Visualization with the RTM



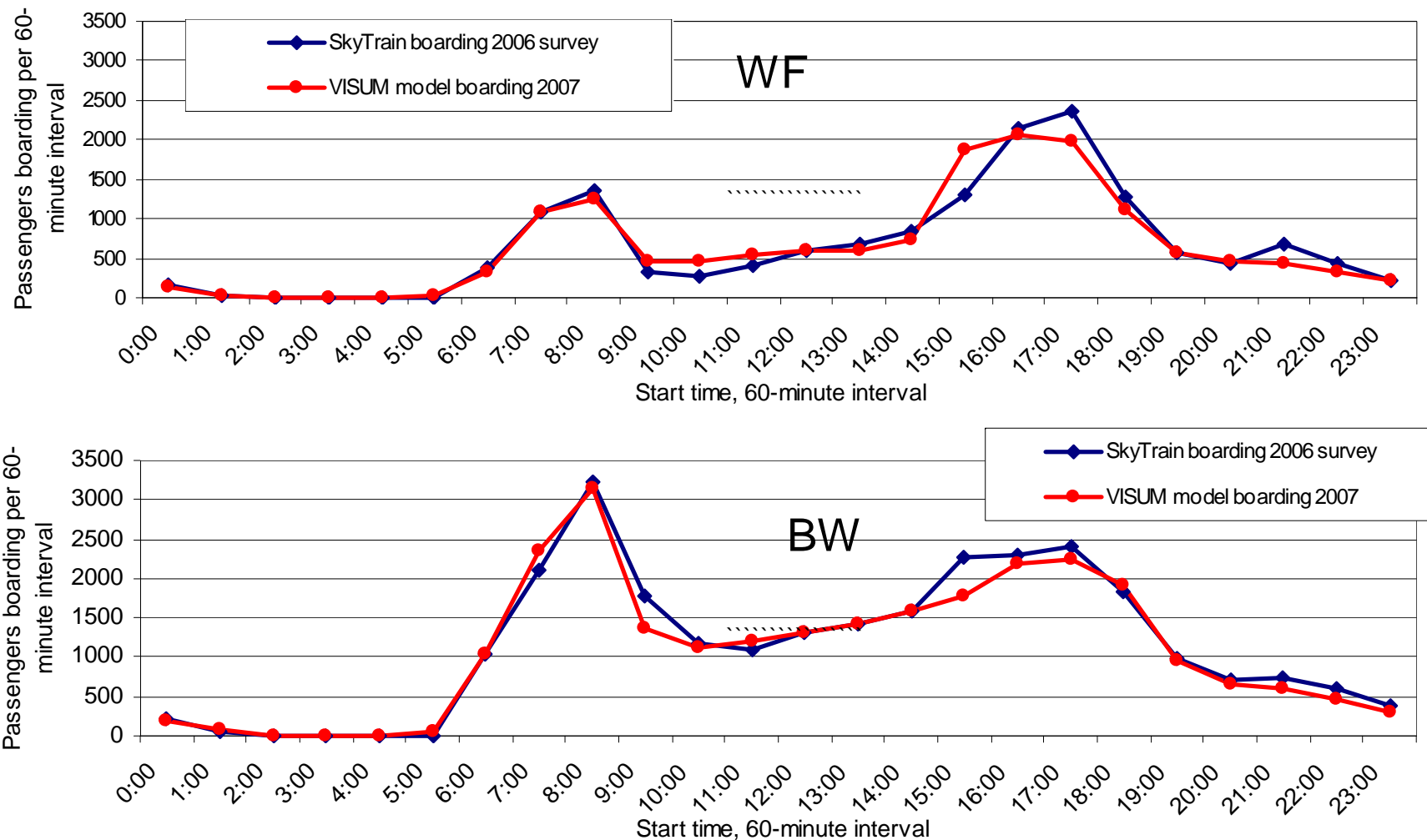
Validation: System Ridership (Unlinked Trips)



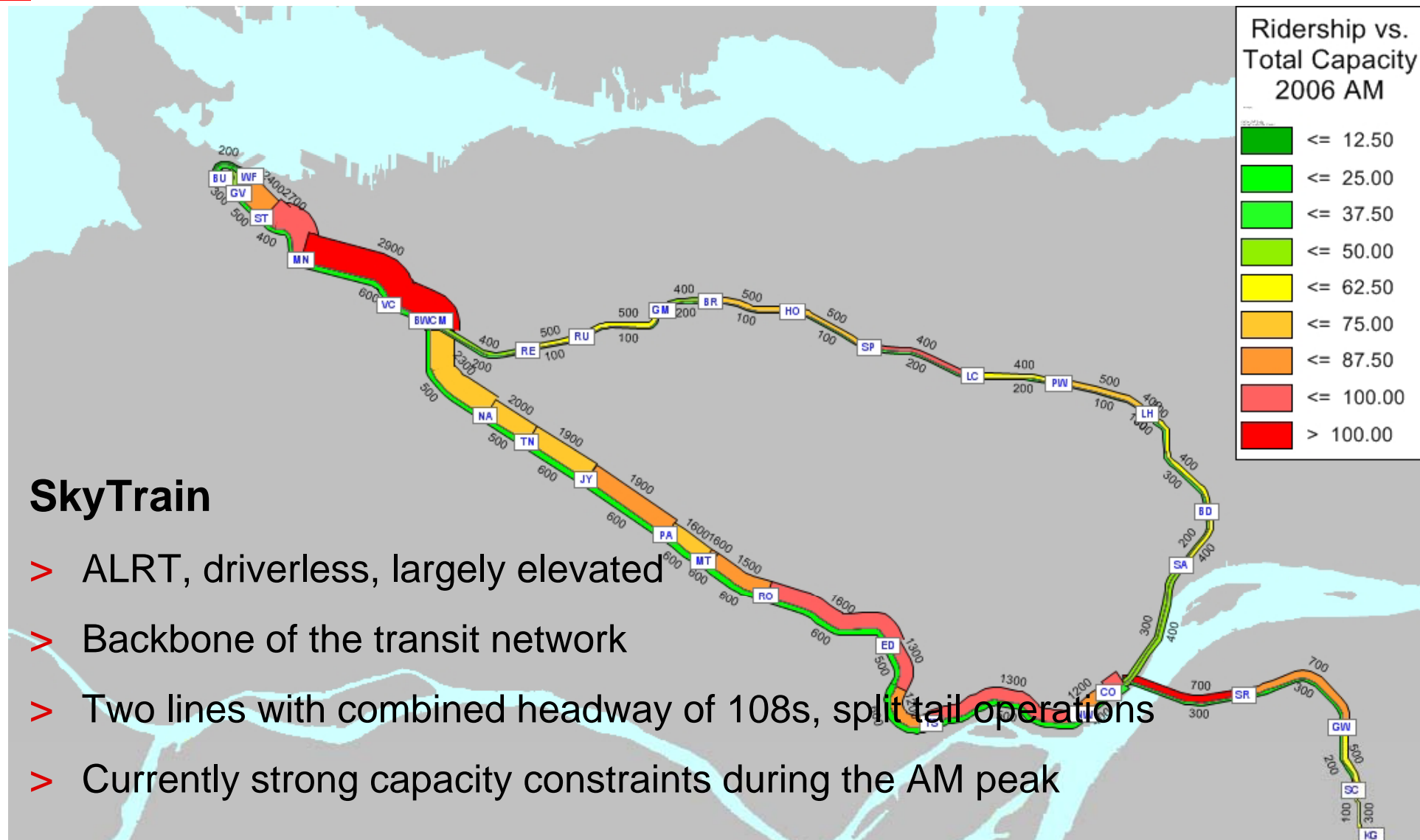
Validation: Bus Boardings (Model versus APC)



Validation: Close Replication of Ridership



SkyTrain



SkyTrain: Contributions to Decision Making

The present operations are optimal with regard to capacity

- > On existing network there is no better way to operate with existing fleet

Future capacity of the critical segment WF-BW can be expanded to 220% of today. Assuming:

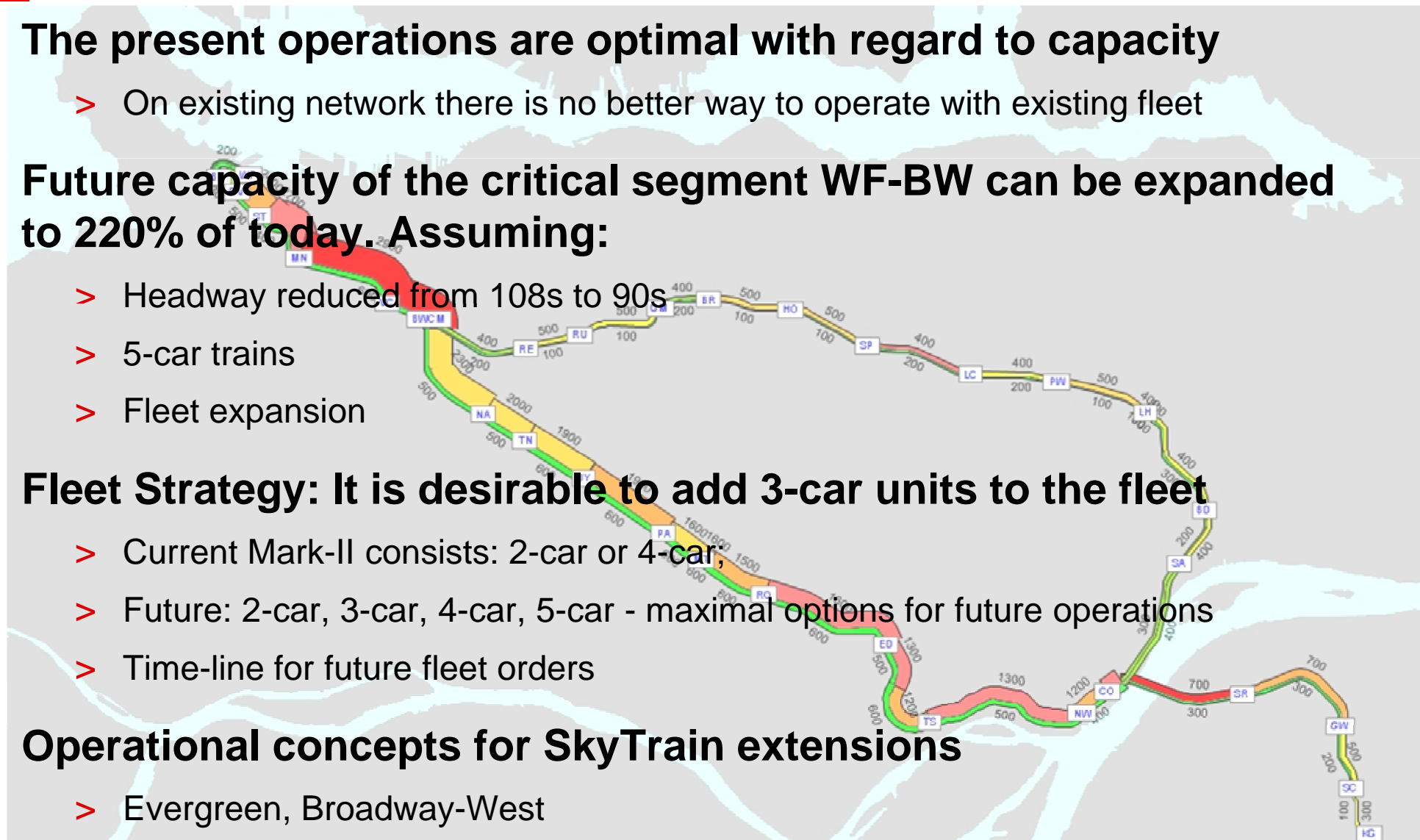
- > Headway reduced from 108s to 90s
- > 5-car trains
- > Fleet expansion

Fleet Strategy: It is desirable to add 3-car units to the fleet

- > Current Mark-II consists: 2-car or 4-car,
- > Future: 2-car, 3-car, 4-car, 5-car - maximal options for future operations
- > Time-line for future fleet orders

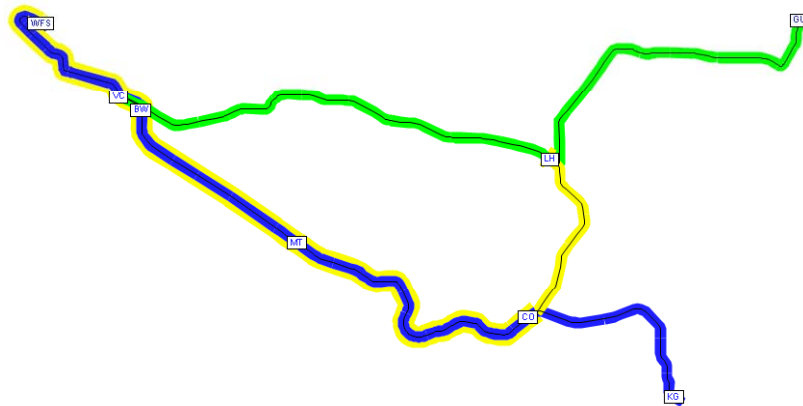
Operational concepts for SkyTrain extensions

- > Evergreen, Broadway-West

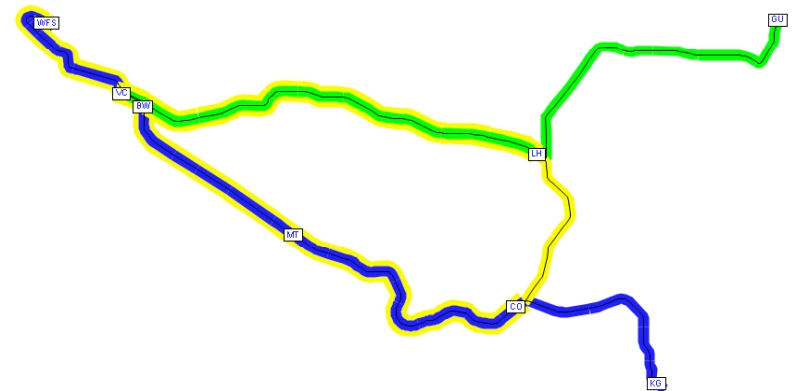


Application: Evergreen Line as ALRT Extension

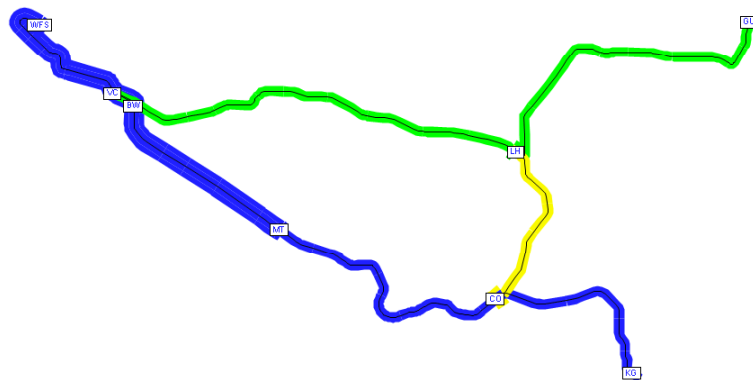
Split Tail



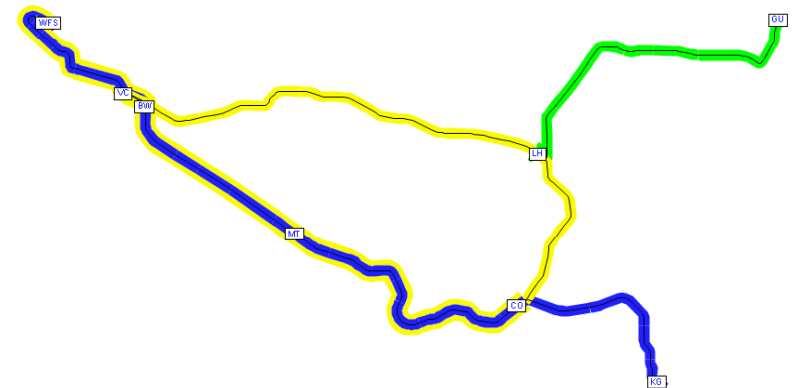
Double-Coordinated



Break at CO
w/ CO-LH shuttle & Expo short turn



Break at LH

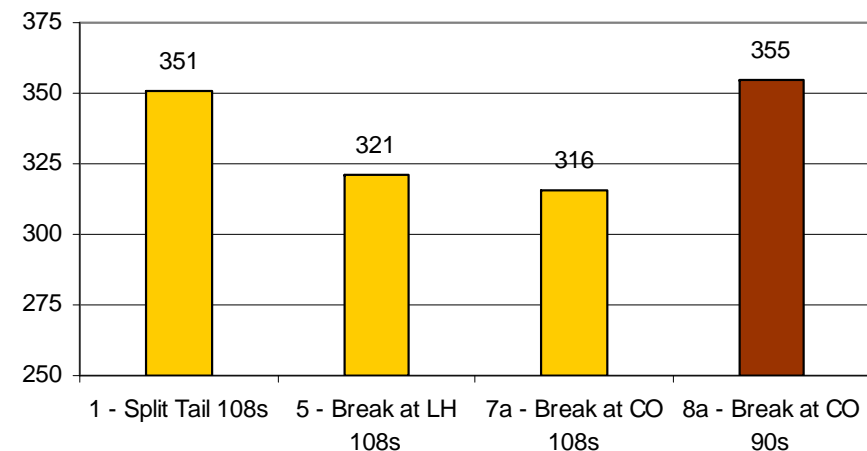


Application: Evergreen ALRT Operations Scenarios

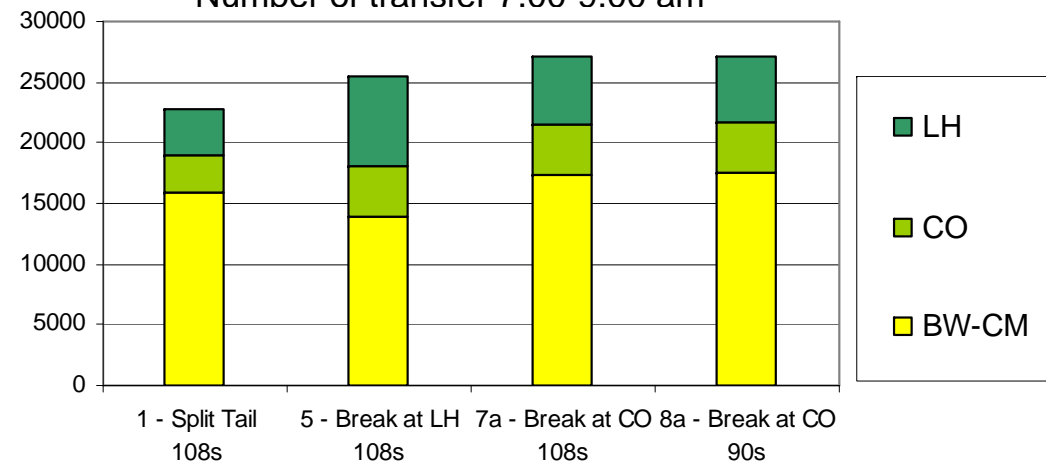
Performance comparison

- > Ridership 2021:
 - > Number of transfers
 - > Pax km, pax hours
- > Operations:
 - > Fleet required
 - > Car km, train km
 - > Car hours, train hours
- > Volume/capacity
 - > Several segments

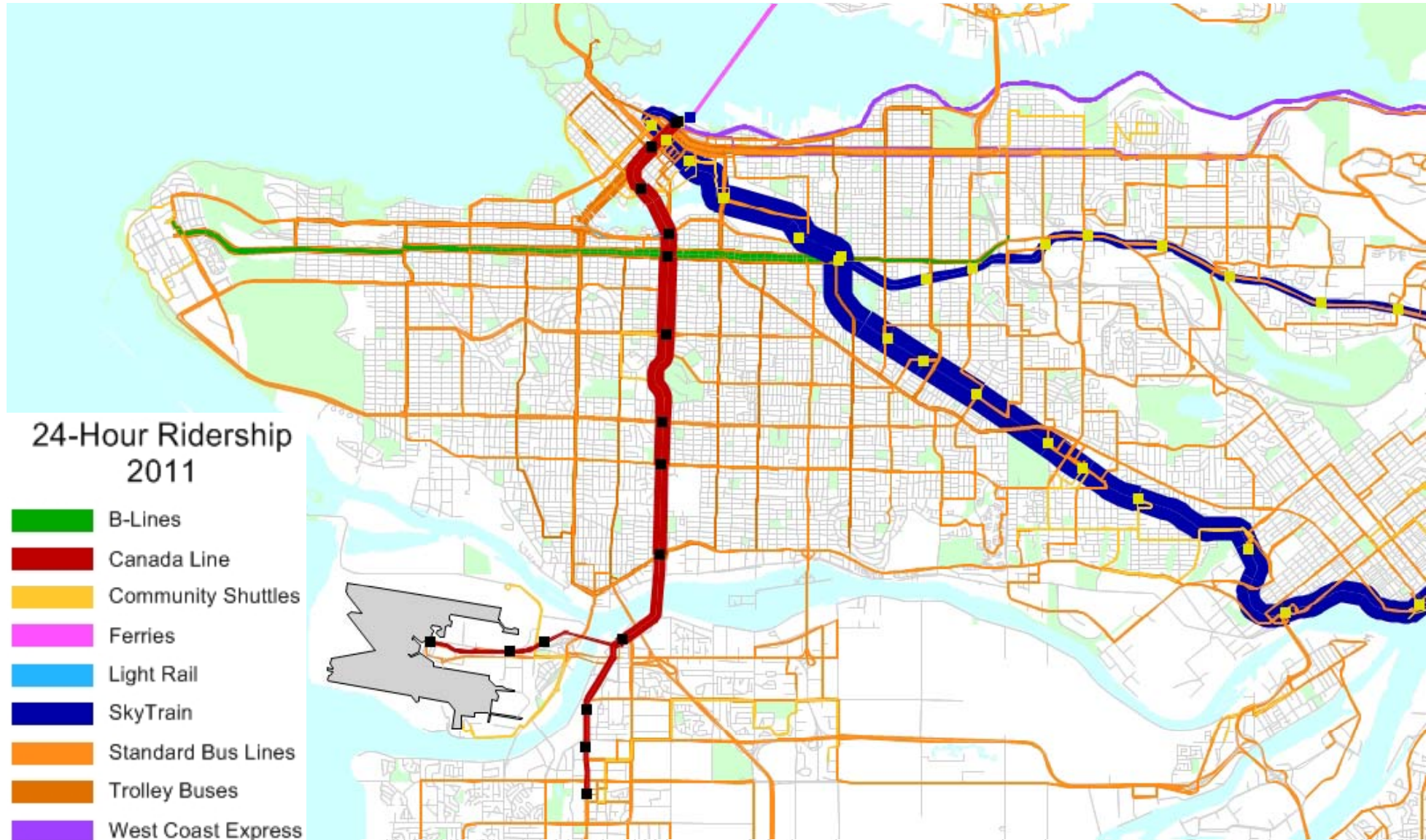
Peak op: # cars needed to operate



Number of transfer 7:00-9:00 am



Application: Canada Line – Bus Service Adjustment



Conclusions and Future Perspectives

TransLink's network and ridership is expanding

- > The RTM is becoming a key resource

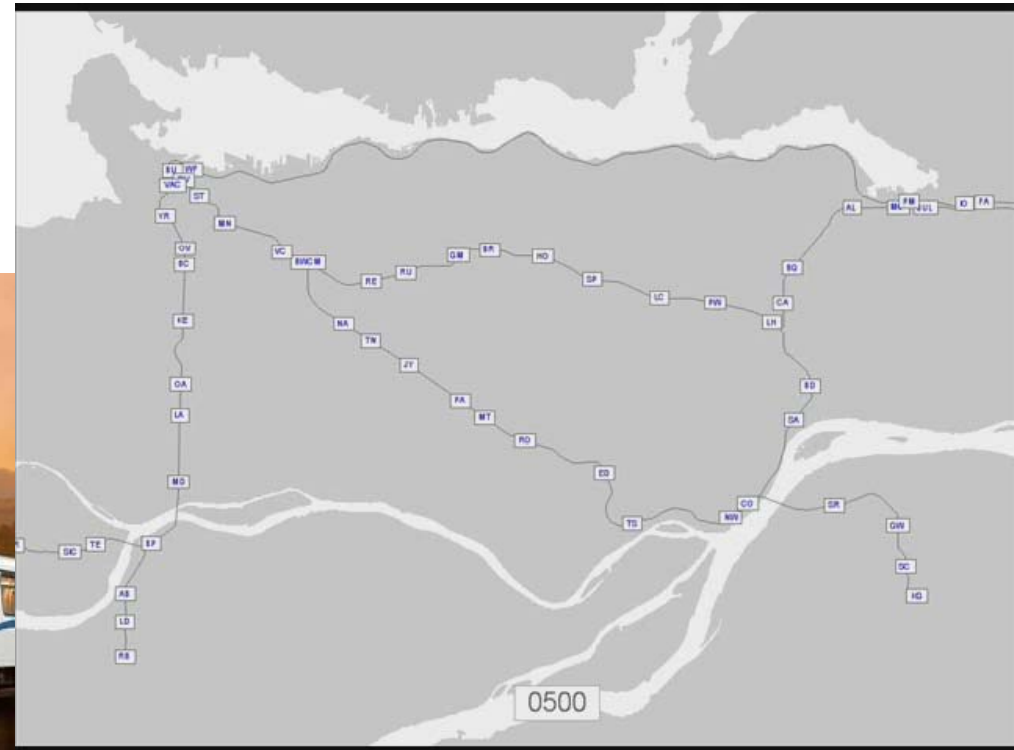
User group of the Regional Transit Model:

- > Several staff have been trained; no full-time staff assignment
- > TransLink has taken ownership – consultant still helps out with studies and model calibration

Next studies:

- > Contribute operations analysis to three major strategic studies:
 - > Expo line study
 - > UBC rapid transit line
 - > Strategic network review
- > Analysis of BRT projects
- > Area Transit Plans

Thank You



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