



Building Long-Term Dynamic Traffic Assignment Model: Challenges and Applications

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Agenda

- Motivation
- Model background
- Model building and challenges
- Model results and applications
- Recommendations

Motivation

Why long-term DTA model?

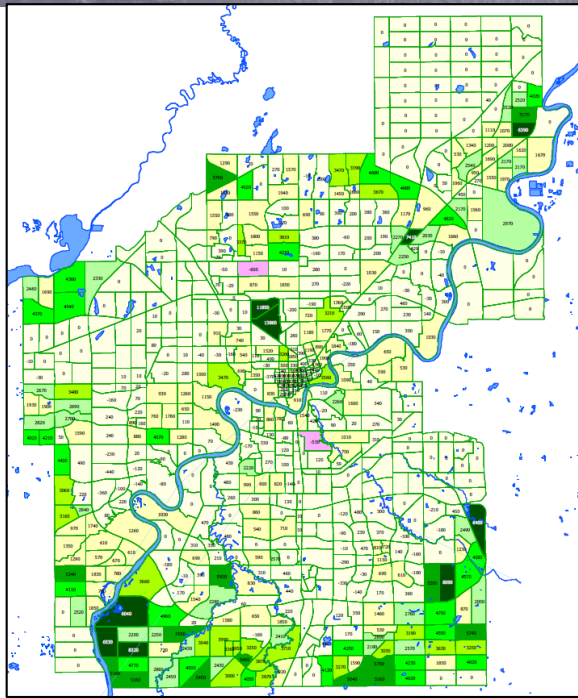
- A detailed operational analysis at planning stage
- STA in macro model makes it less capable to provide reliable intersection volume forecast and traffic performance measures

Future and on-going projects

- LRT network expansion
- Yellowhead trail freeway upgrade
- Construction detour
- Neighborhood renewal

4 long-term model horizons are maintained: 2015, 2027, 2030, 2047 and 2050

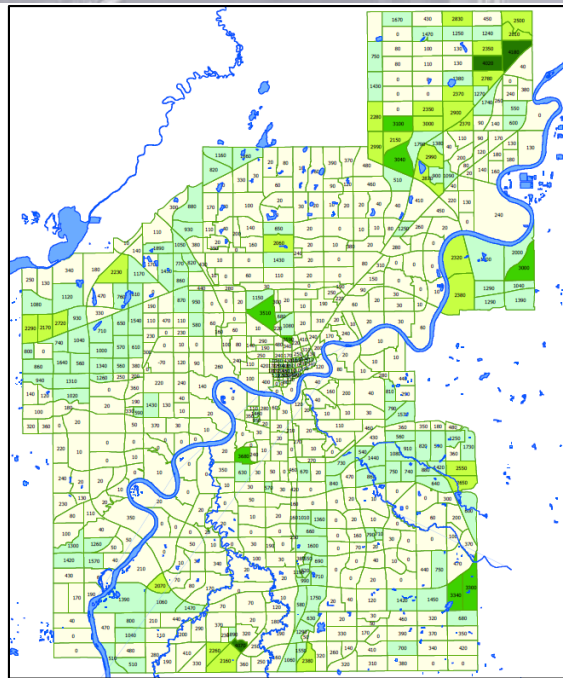
Model Background



Population Difference (2047-2015)

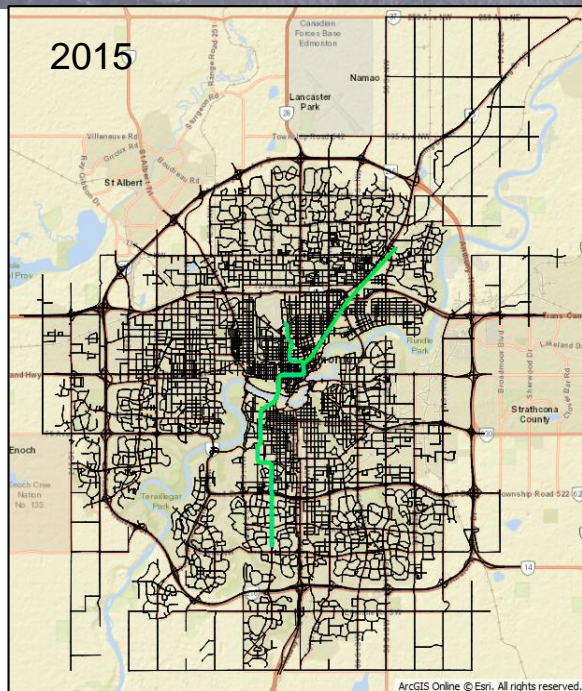
Demand side comparison

- Population increased by 68%
- Employment increased by 71%



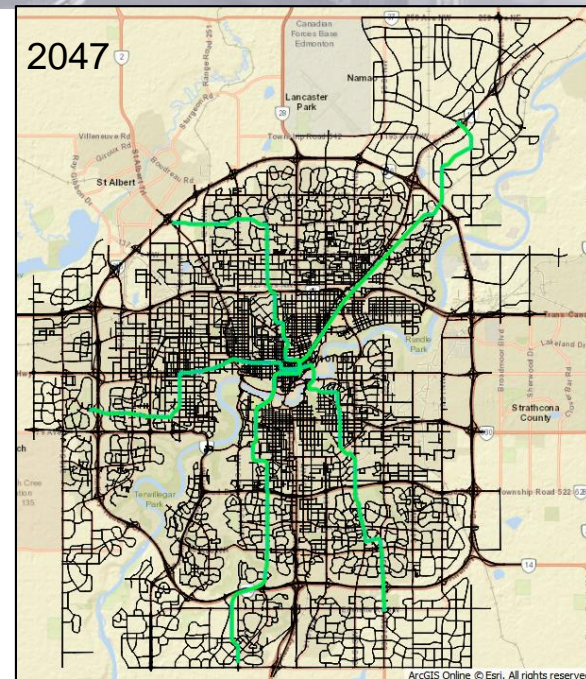
Employment Difference (2047-2015)

Model Background



Supply side comparison

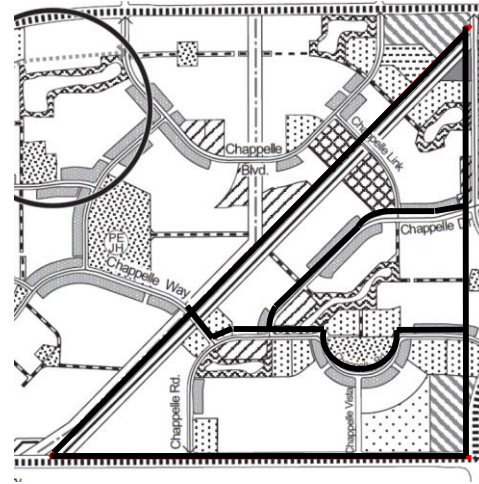
- 10% increase of nodes
- 10% increase of links
- 27% increase of signalized intersection
- 123 km increase in LRT



Model Building and Challenges

Demand preparation

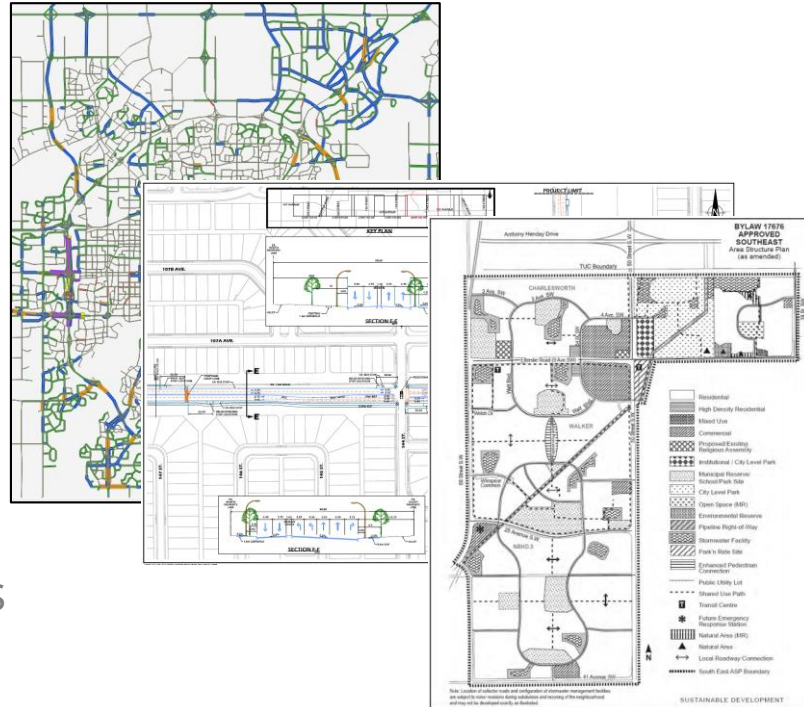
- DTA demand comes from Regional Travel Model (RTM v2.0)
- Zone system in DTA (1140) is finer than RTM v2.0 (698)



Model Building and Challenges

Pre Network Coding

- RTM lane difference plot is a good starting point as a reference
- Future development of existing road network was verified by preliminary design drawings
- Road network for newly developed neighborhood was coded using development plans (ASP, NSP, TIA)



Model Building and Challenges

Post Network Coding

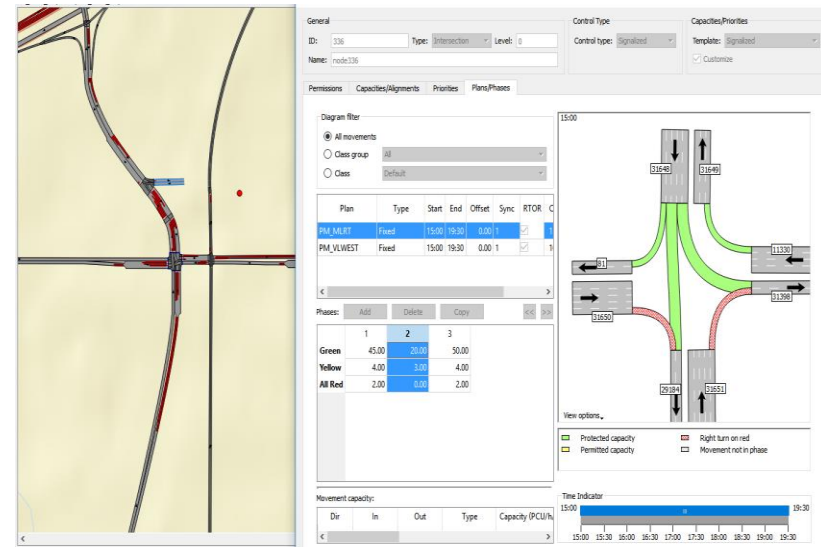
- Initially model convergence plot was checked to find the stability of results
- Origin destination (OD) pair with high relative gap, queue length, link occupancy and zone level waiting vehicle were checked to address coding error and capacity shortage
- Extra attention should be given during zone connector coding



Model Building and Challenges

Post Network Coding

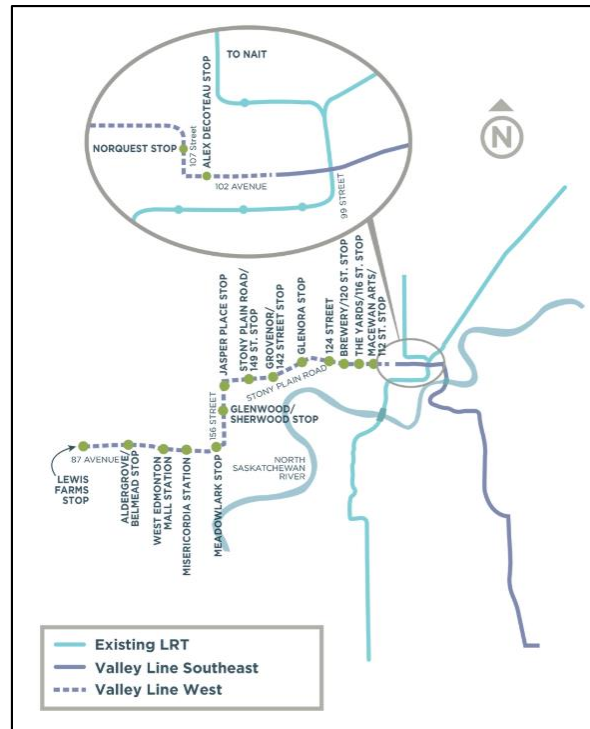
- By understanding the location, adding a simple right turn bay can release a high number of waiting vehicle
- Signal timing update is another common approach to resolve unrealistic congestion



Model Applications

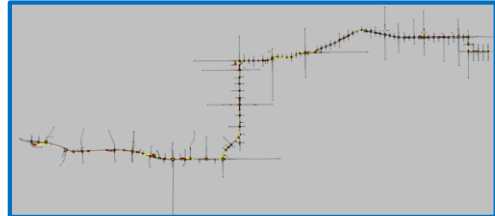
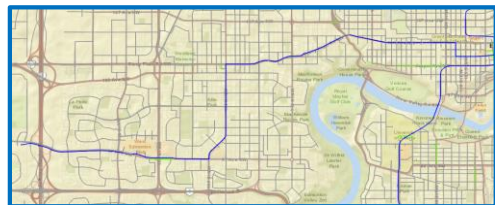
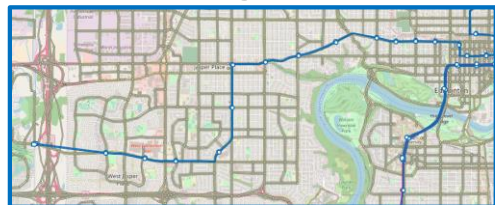
Valley Line West LRT

- 14 km extension from 102 avenue downtown to Lewis Farms
- Low-floor LRT
- 14 street level and 2 elevated stops
- LRT priority at intersections can be full, partial or no priority
- P3 project: performance measures rely on one model forecast



Model Applications

Valley Line West LRT- One City Approach



Regional Travel Model (RTM)

- Demand by modes

Transit demand
P & R demand
GHG emission

Dynamic Traffic Assignment (DTA)

- Traffic routing by modes

Traffic detour
Level of congestion
Network wide traffic delay
Intersection LOS
Travel time impact

Microsimulation Model

- Signal controller update

Signal controller changes
Level of congestion
Intersection LOS

Model Applications



Valley Line West LRT – DTA Results

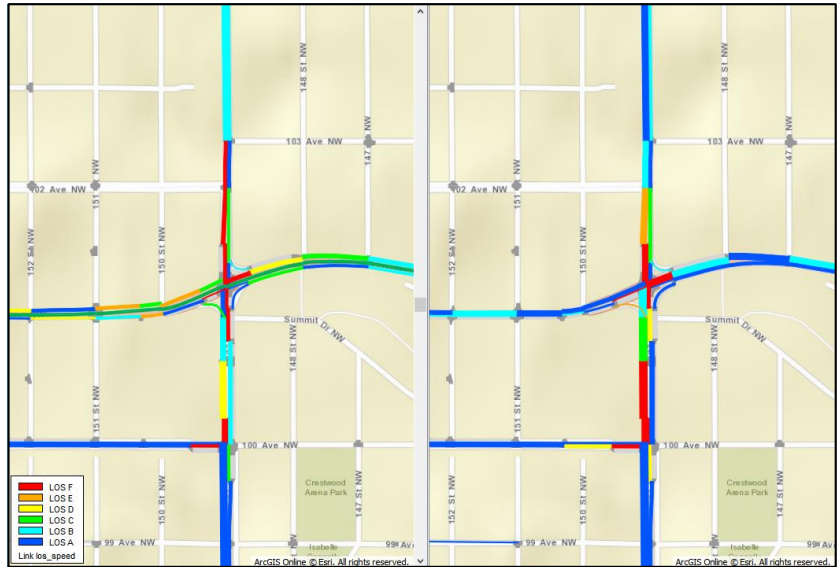
- Traffic Detouring (PM Peak)
 - 156 street (LRT corridor) traffic flow is significantly reduced
 - Competing corridors (170 St & 163 St) are attracting more traffic



Model Applications

Valley Line West LRT – DTA Results

- Level of Congestion (PM Peak)
 - With LRT operation, crossing street is experiencing longer queue
 - Intersection performance can also be evaluated by using LOS plot



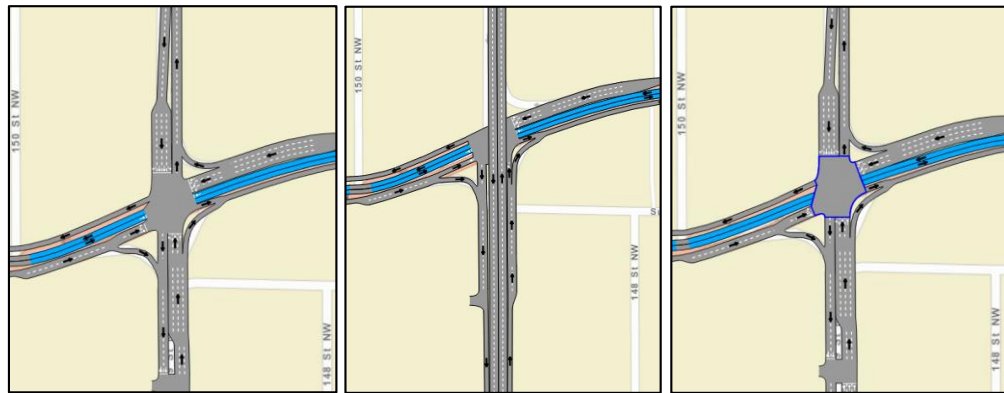
VLWLRRT

No VLWLRRT

Model Applications

Valley Line West LRT – DTA Results

- Design Options Evaluation
 - For city council report, various design options are evaluated in DTA platform
 - Stony Plain Rd & 149 St
 - Scenario 1: at grade
 - Scenario 2: underpass
 - Scenario 3: grade separated

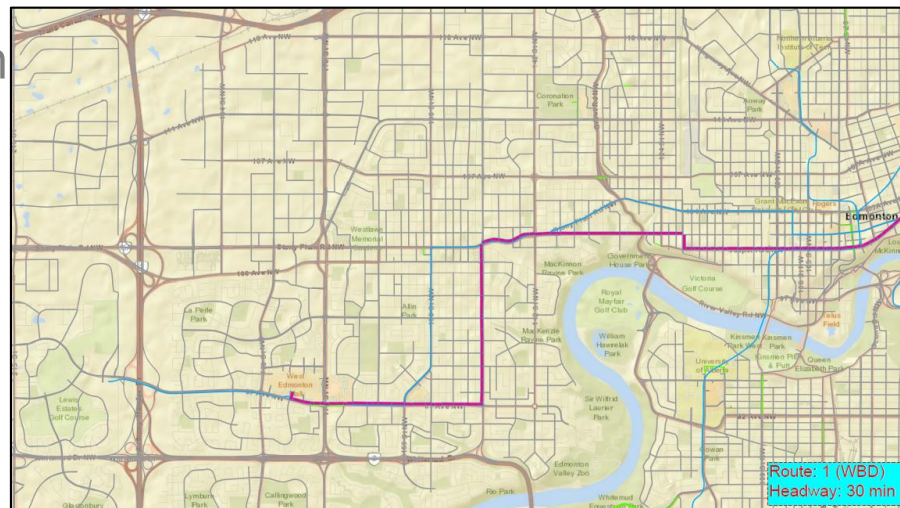


Link flow diversion plot, critical intersection volume difference, queue length and travel time along on and off corridor are provided for engineering analysis

Model Applications

Valley Line West LRT – DTA Results

- DTA inputs for microsimulation model
 - Traversal matrices: zone to zone traffic routings by auto and truck
 - 10 min demand variation
 - Off-corridor intersection volume
 - Transit itinerary



Recommendations

- The DTA model is an effective tool to measure traffic diversion impact due to network supply capacity changes
- Extra attention should be given during demand preparation
- A well-calibrated and validated base year model is very important to build long-term model
- Model results should be verified comparing base year model, typical traffic level in google map and traffic counts

Recommendations

- Appropriate finer zone system and access locations are critical for DTA model development
- Checking of zone level waiting vehicles in a well converged model is highly recommended
- For specific projects, local area review (identifying traffic shortcutting) is required
- DTA has benefits for both the Transportation Planning and Traffic Operations - One City Team Work



Thank you.

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