HIGHWAY 2
TRANSIT PRIORITY MEASURES
CLASS ENVIRONMENTAL ASSESSMENT
Macroscopic and Microscopic Modelling

CITE REGINA – 2015

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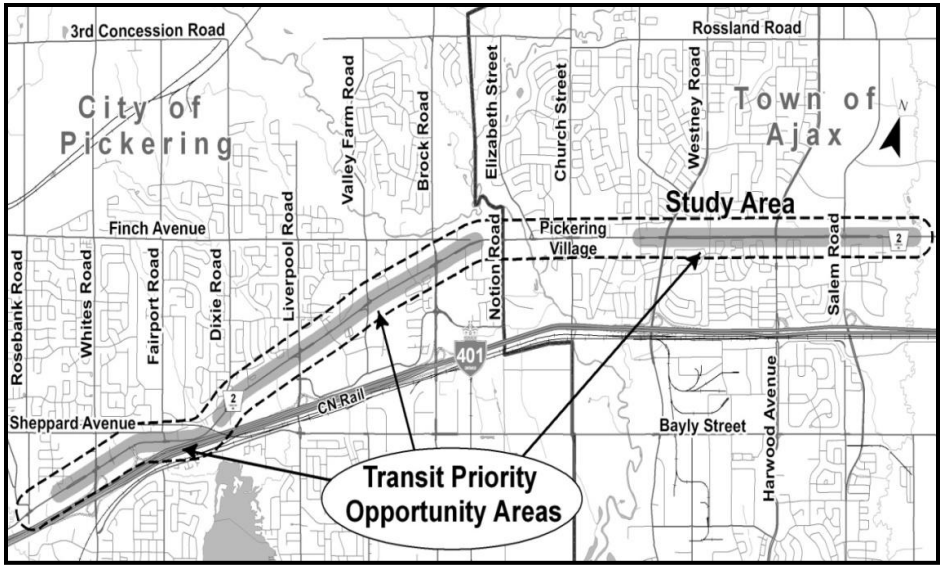
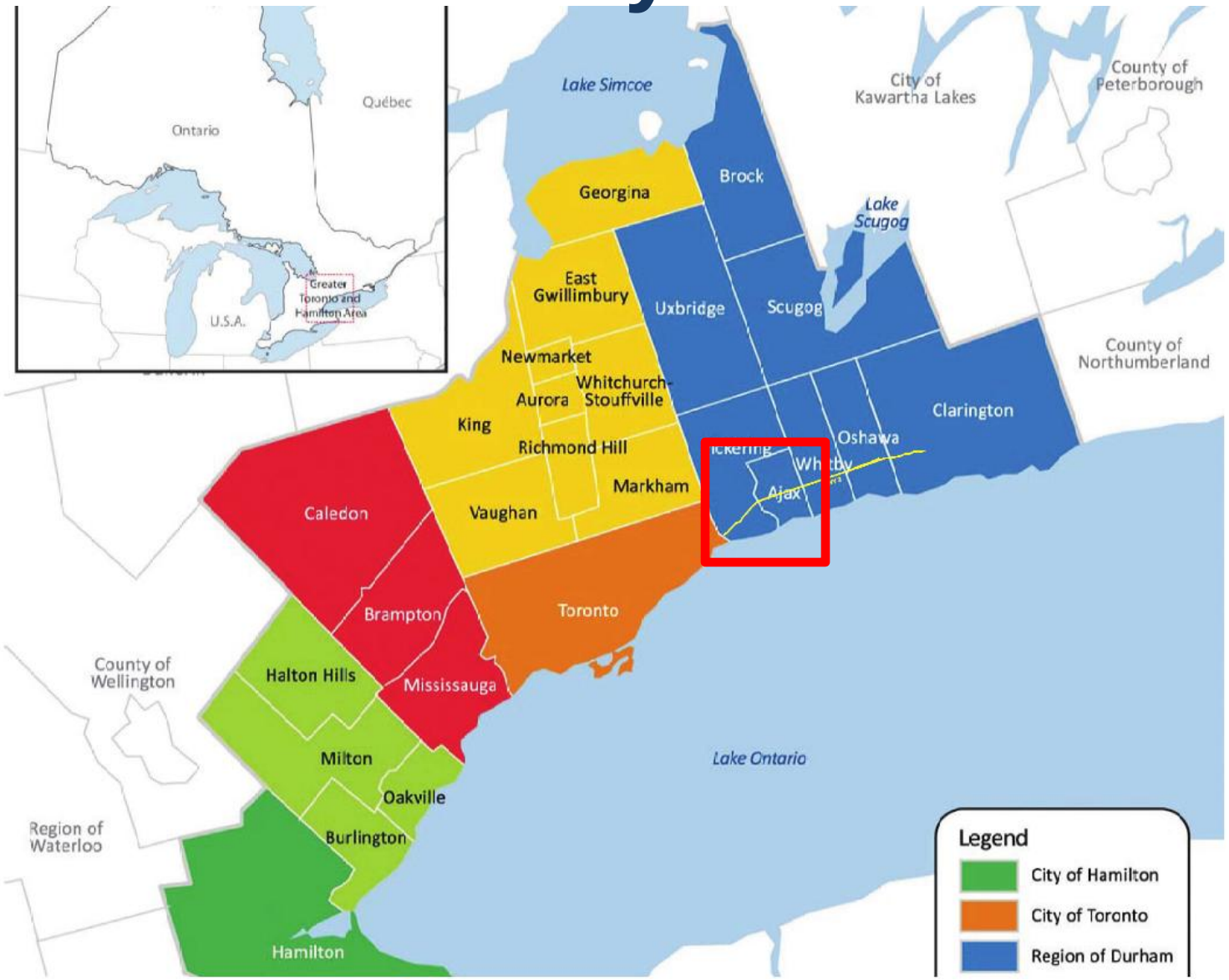
Presentation Outline

- Study Area
- Background and Context
- Modelling Approach
- Challenges
- Macro Modelling
- Micro Modelling
- Hybrid Modelling (Future Conditions)
- Design Alternatives
- Results
- Technical Challenges – Input to Evaluation of Alternatives
- Preferred Design (2016)
- Takeaways



Study Area


Québec
Ontario
U.S.A.
Greater Toronto and Hamilton Area
Lake Simcoe
City of Kawartha Lakes
County of Peterborough
Georgina
Brock
Lake Scugog
East Gwillimbury
Uxbridge
Scugog
Newmarket
Whitchurch-Stouffville
Aurora
King
Richmond Hill
Markham
Vaughan
Clarington
Oshawa
Whitby
Ajax
County of Northumberland
Caledon
Brampton
Toronto
Halton Hills
Mississauga
County of Wellington
Milton
Oakville
Burlington
Region of Waterloo
Hamilton
Lake Ontario
Legend
City of Hamilton
City of Toronto
Region of Durham

Background and Context

Durham Region:

- Population 585,000 (2006) => One million (2031)
- Employment 220,000 => 375,000
- Key arterials are operating close to or at capacity

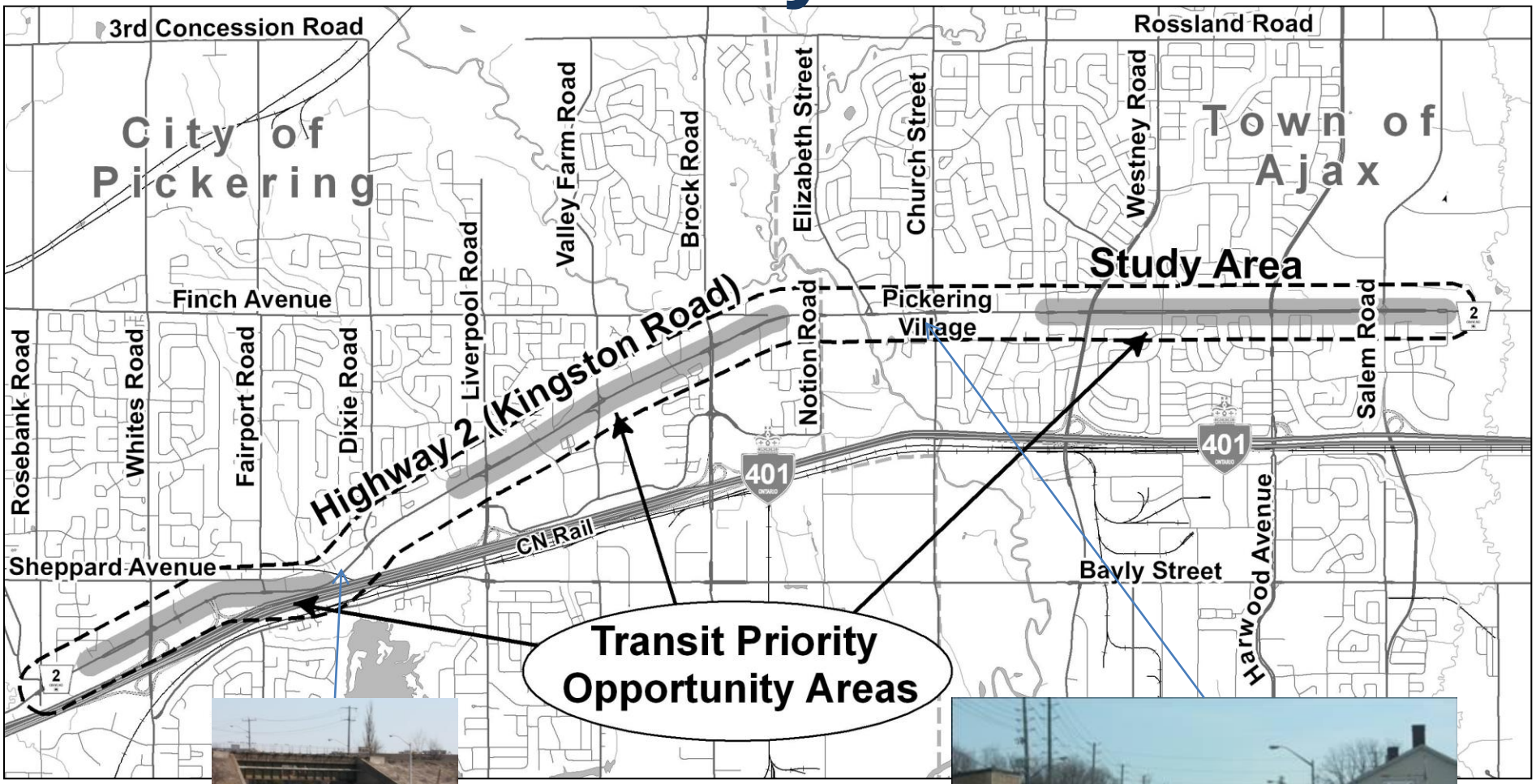
Thus the need to:

- Shift transit mode from 4% to 8%
- Implement Rapid Transit route along HWY 2

Class Environmental Assessment:

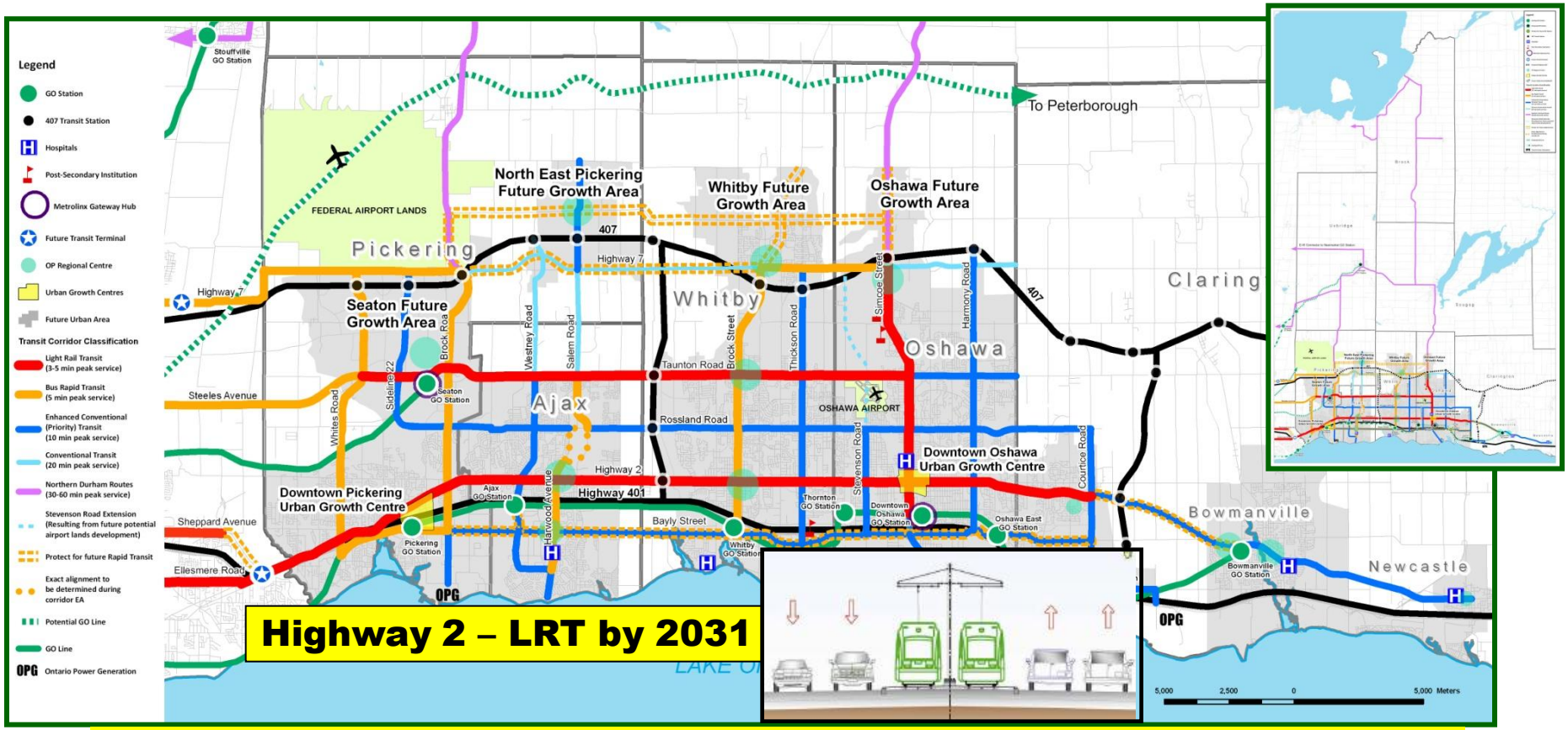
- Need and justification for rapid transit service
- Transit Alternatives: median, curb side, HOV, and mixed traffic

Study Area


3rd Concession Road
Rossland Road
City of Pickering
Town of Ajax
Valley Farm Road
Brock Road
Elizabeth Street
Church Street
Westney Road
Study Area
Finch Avenue
Liverpool Road
Pickering Village
Rosebank Road
Whites Road
Fairport Road
Dixie Road
Highway 2 (Kingston Road)
Notion Road
Salem Road
401
CN Rail
Sheppard Avenue
Bayly Street
Harwood Avenue
Transit Priority Opportunity Areas

Background and Context

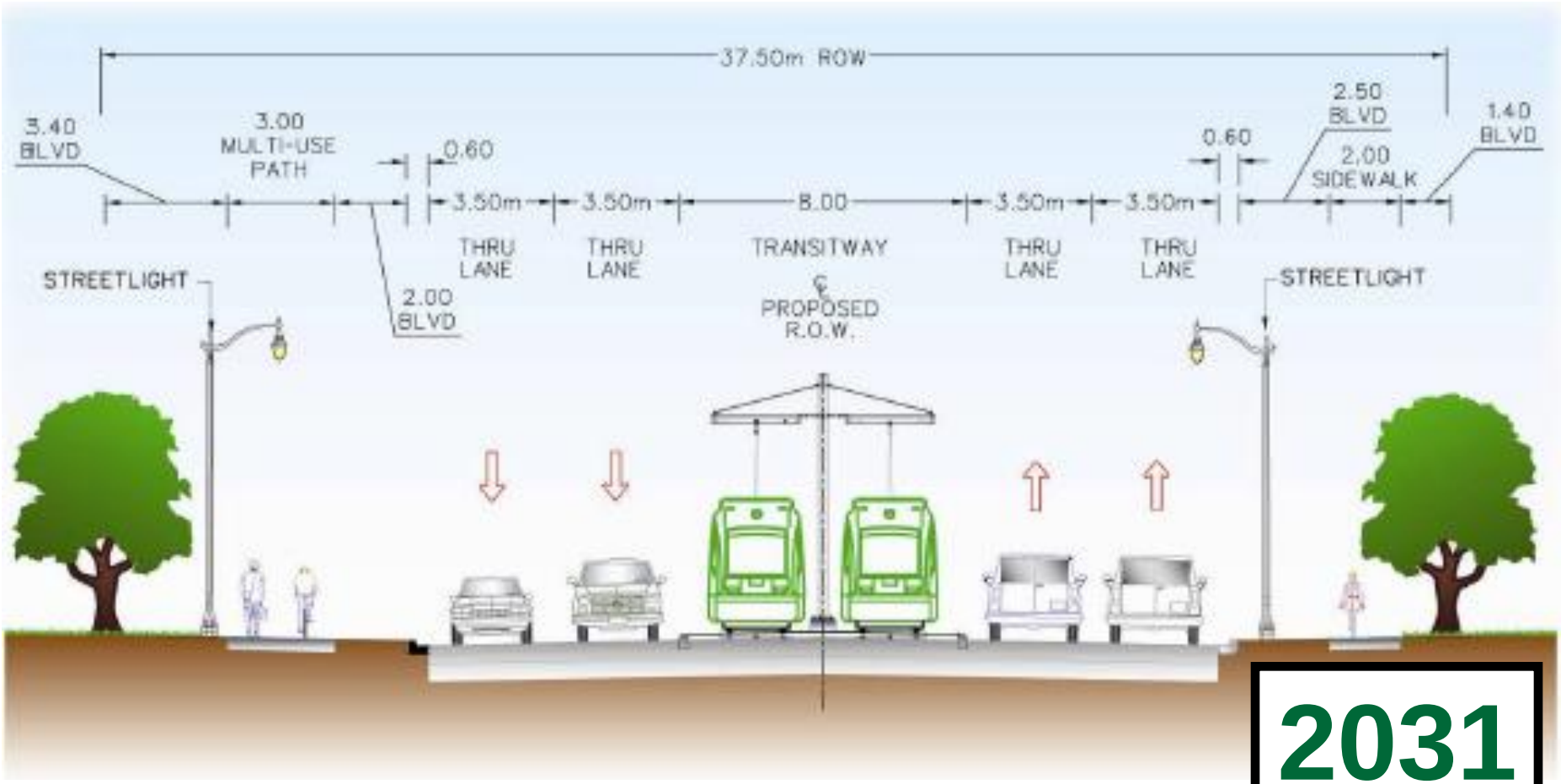
Plans and Studies: OP, TMP, transit amalgamation, MoveOntario, Metrolinx Big Move, LTTS, Regional cycling plan, Quick Win funding



Long Term Transit Strategy (LTTS) – Recommended Plan

Background and Context

LTTS Vision for HWY 2 (2031): Median light rail with four traffic lanes and bicycle facility



Modelling Approach

- Traffic data collection and Quality Control (QC)
- Site visits
- Refining the subarea model (emme)

Hybrid Modelling Process:

- Developing network models (in Synchro and VISSIM)
- Calibration and validation of the models
- Conclusion and recommendations

Challenges

- Large network to model (City of Pickering and Town of Ajax)
- A total of 282 signalized and unsignalized intersections (153 Town of Ajax, 126 City of Pickering)
- Strict deadline to complete the assessments (12 months)
- Long wait time to gather information (from agencies and data gathering)
- Hard to debug VISSIM models
- Slow computer to run simulation on large VISSIM (ver. 5.40) models

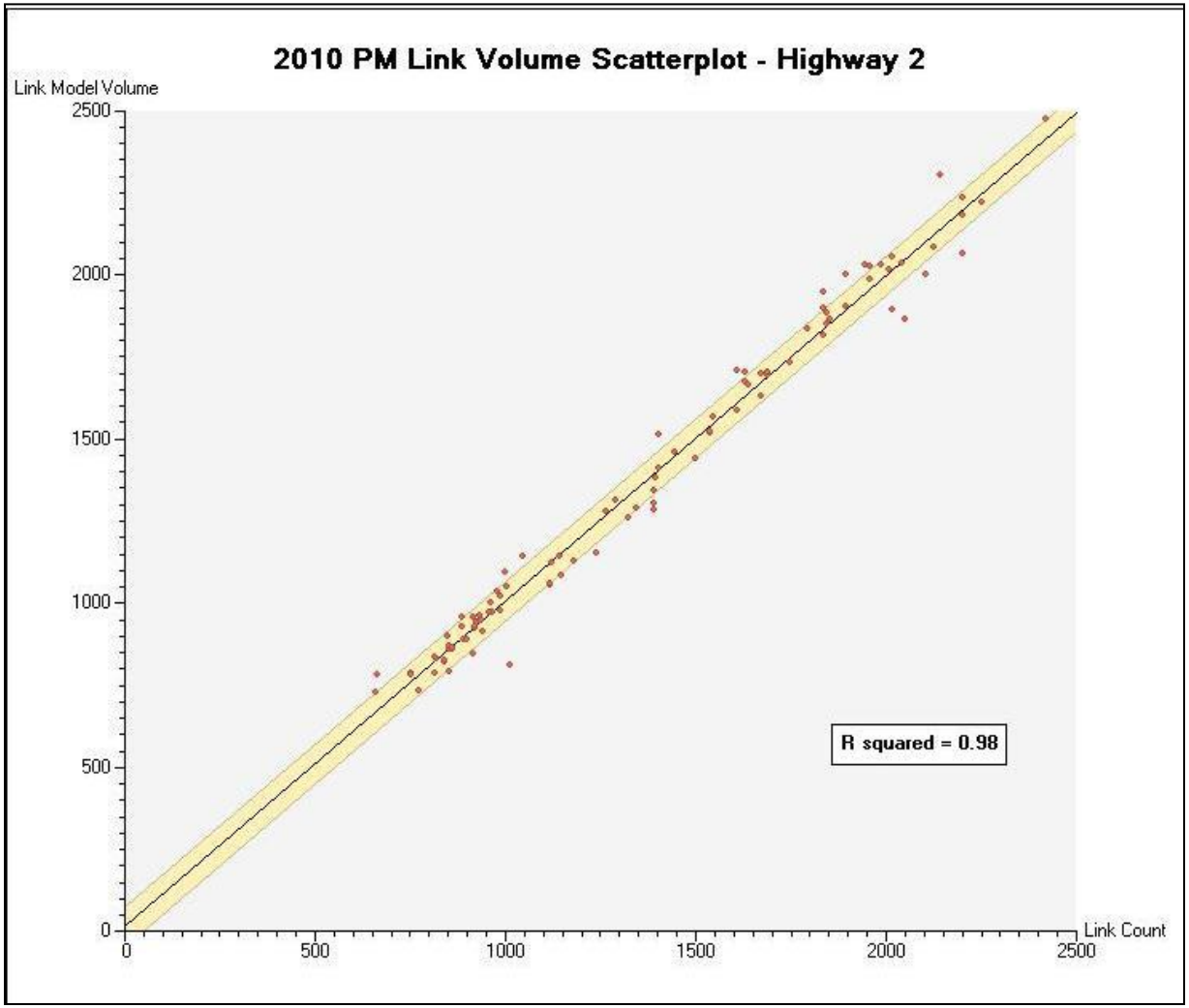
Information Gathered

- Data Collection
  - Collected during the same day (AM and PM) in each municipality
  - Data collected: TMC, AADT, and Speed profiles
  - Travel times
  - Queue lengths at key signalized intersections (50^{th} and 95^{th} percentiles)
- Site Visits
  - Check signal operations
  - Confirm lane configurations
  - Observe drivers' behaviour

Macro Modelling (emme)

- Sub-area network

Macro Modelling Calibration Results (emme)



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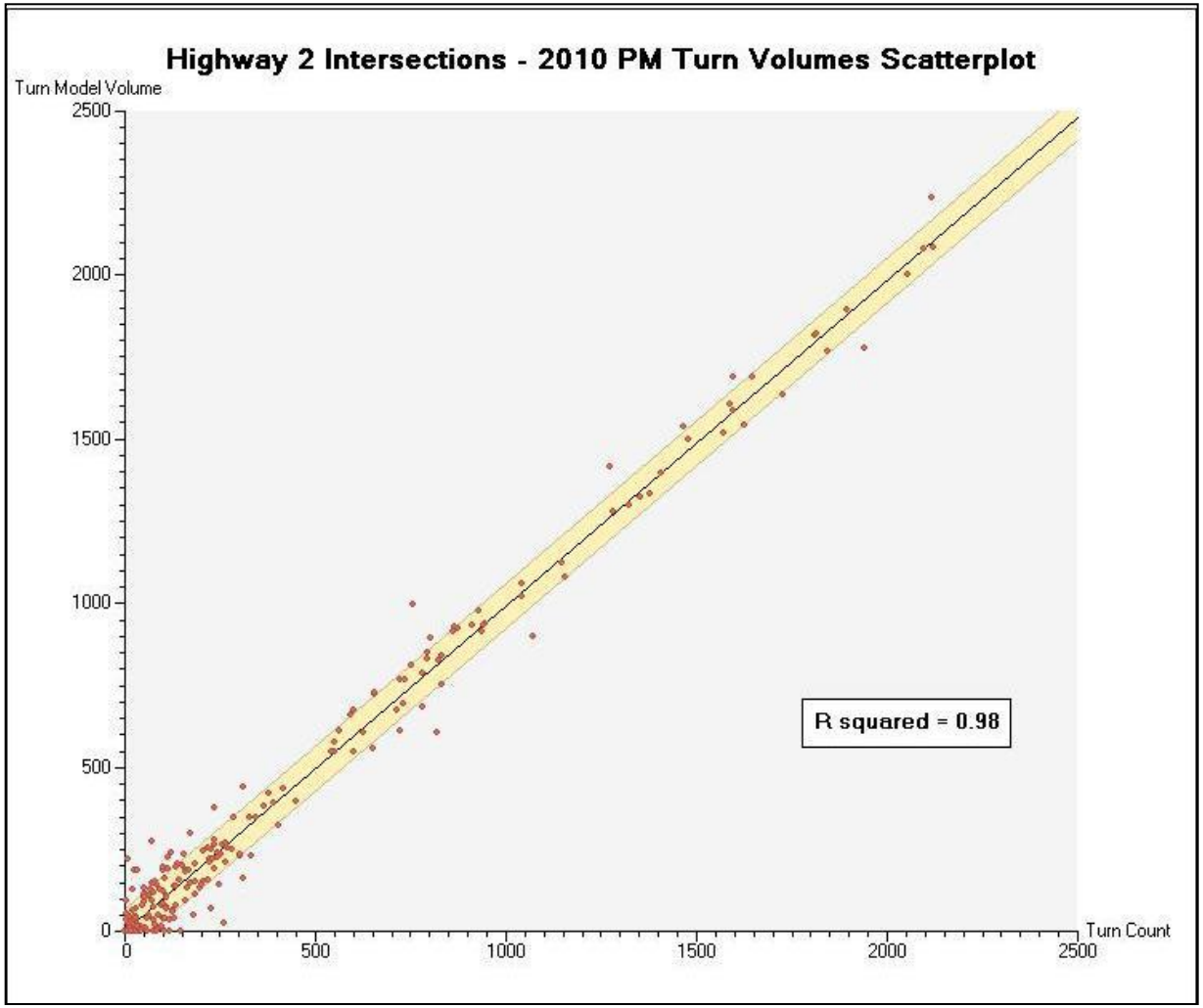
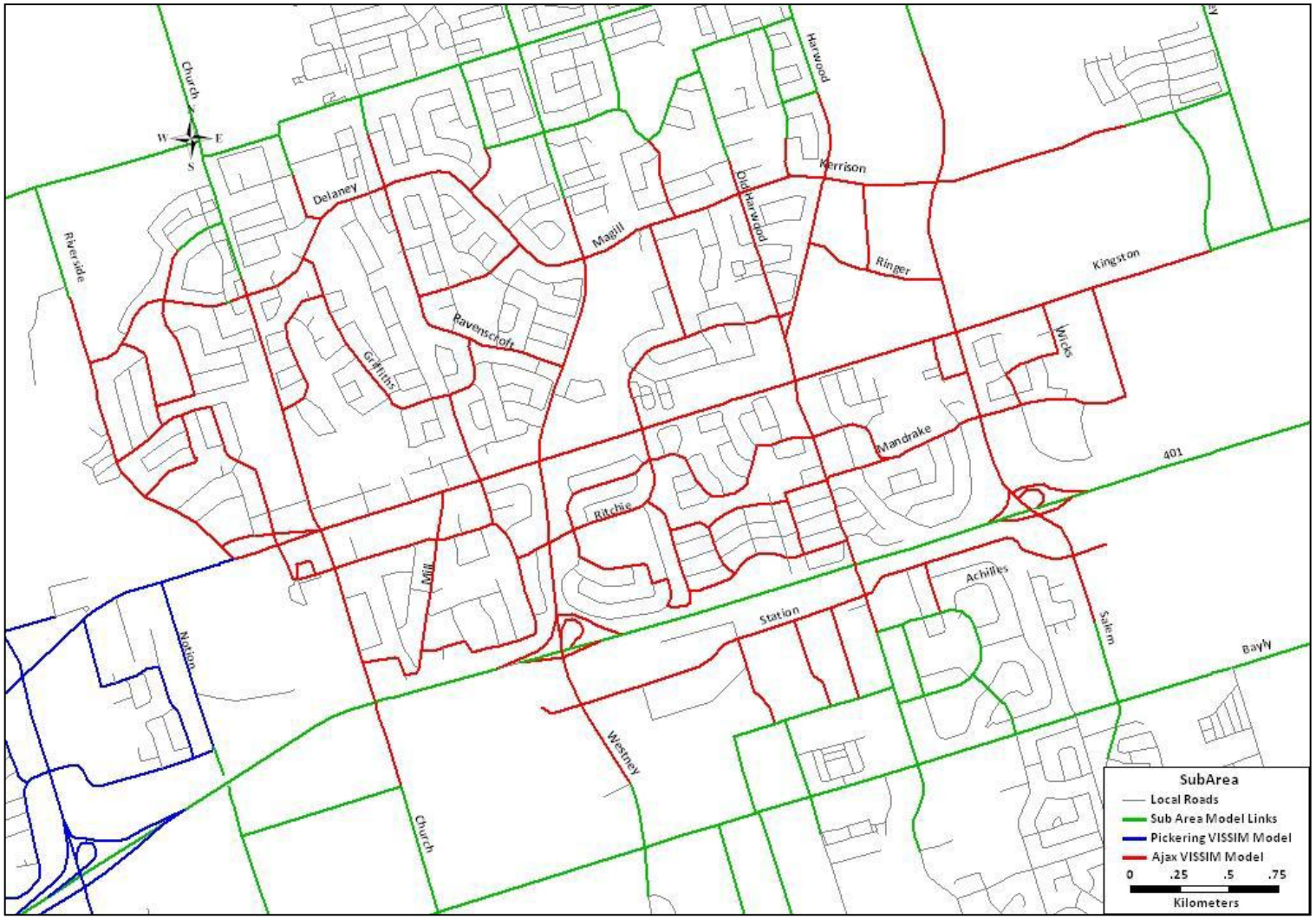


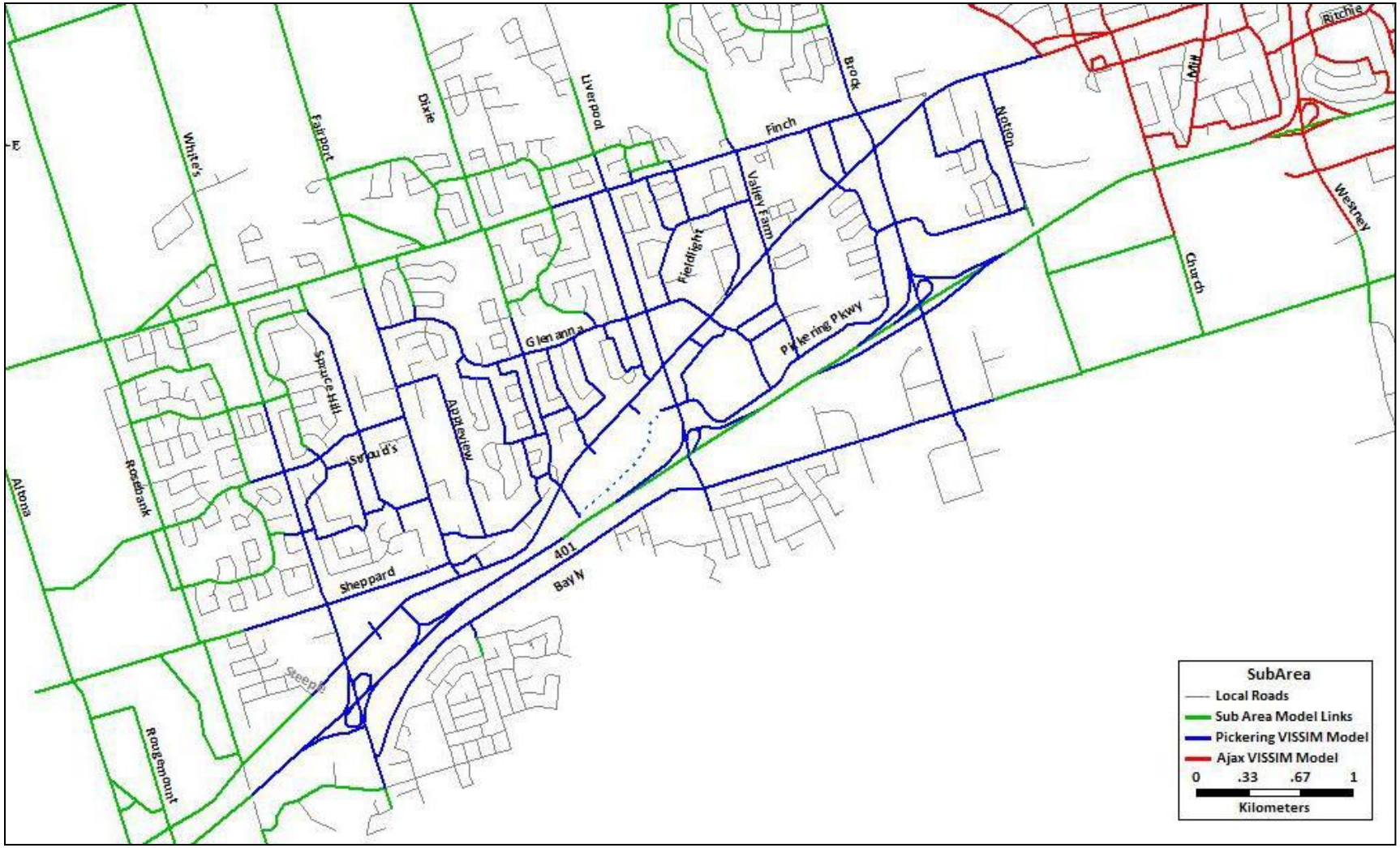
Micro Modelling (VISSIM)

VISSIM Network (Town of Ajax)



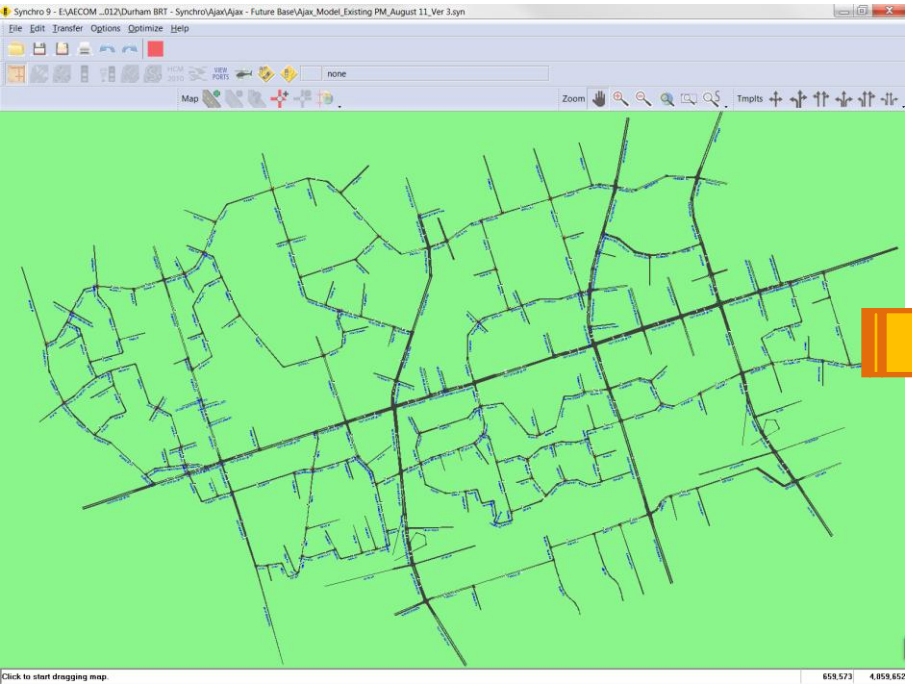
Micro Modelling (VISSIM)

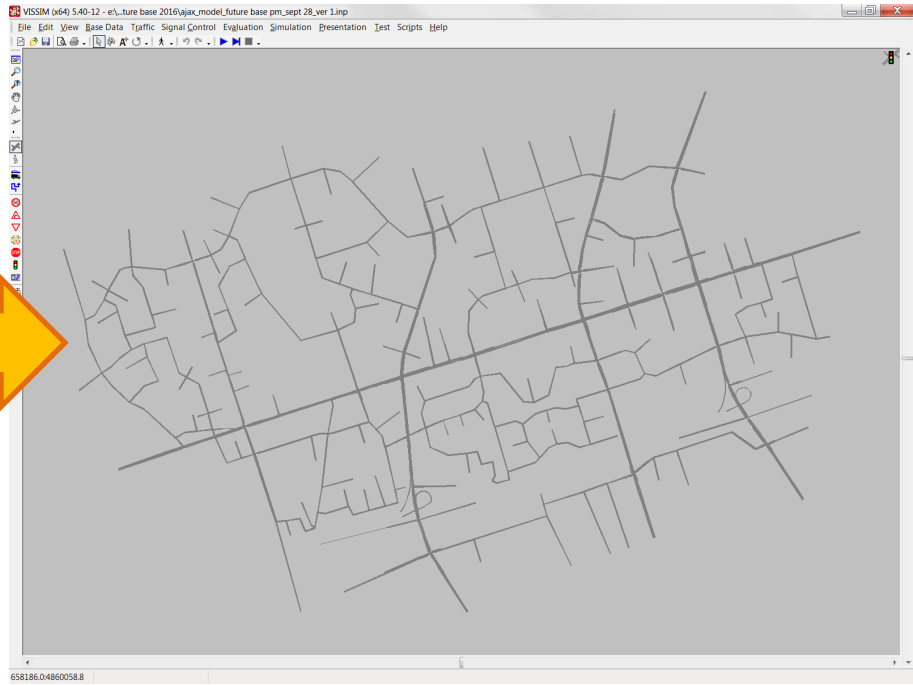
VISSIM Network (City of Pickering)



Micro Modelling (VISSIM)

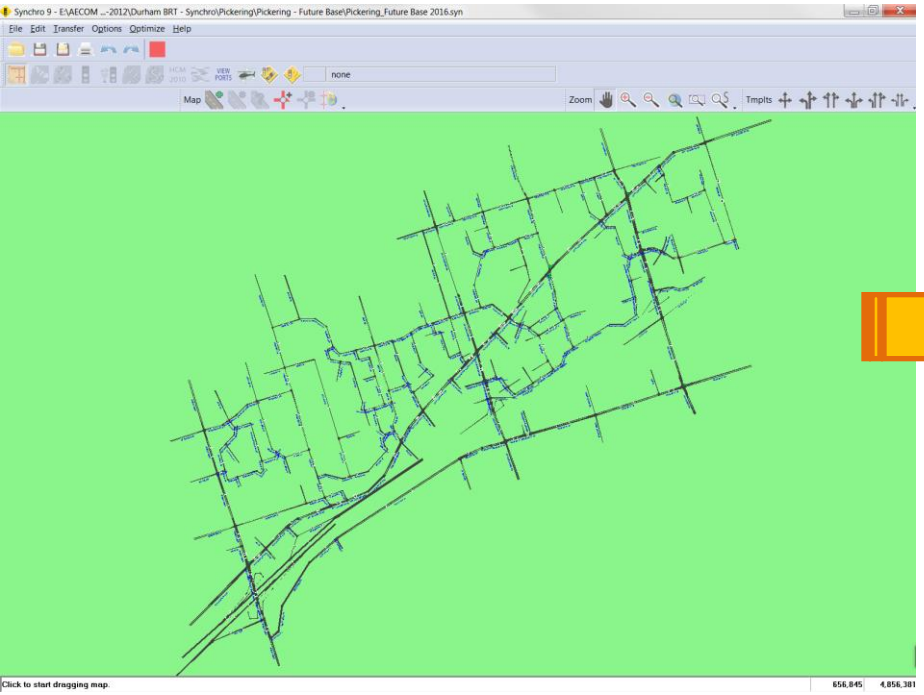
VISSIM Model (Town of Ajax)

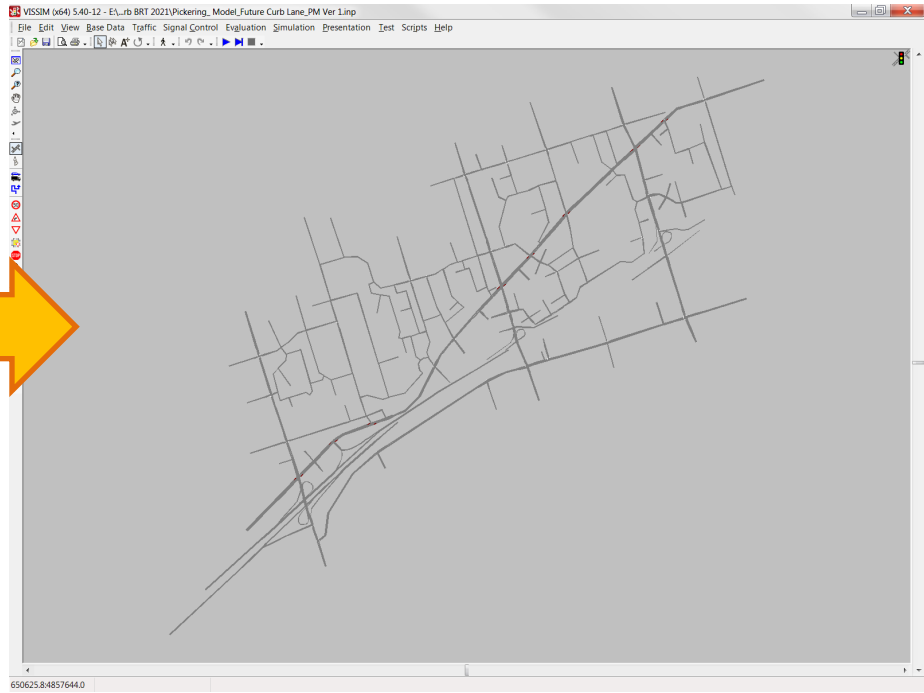




Micro Modelling (VISSIM)

VISSIM Model (City of Pickering)





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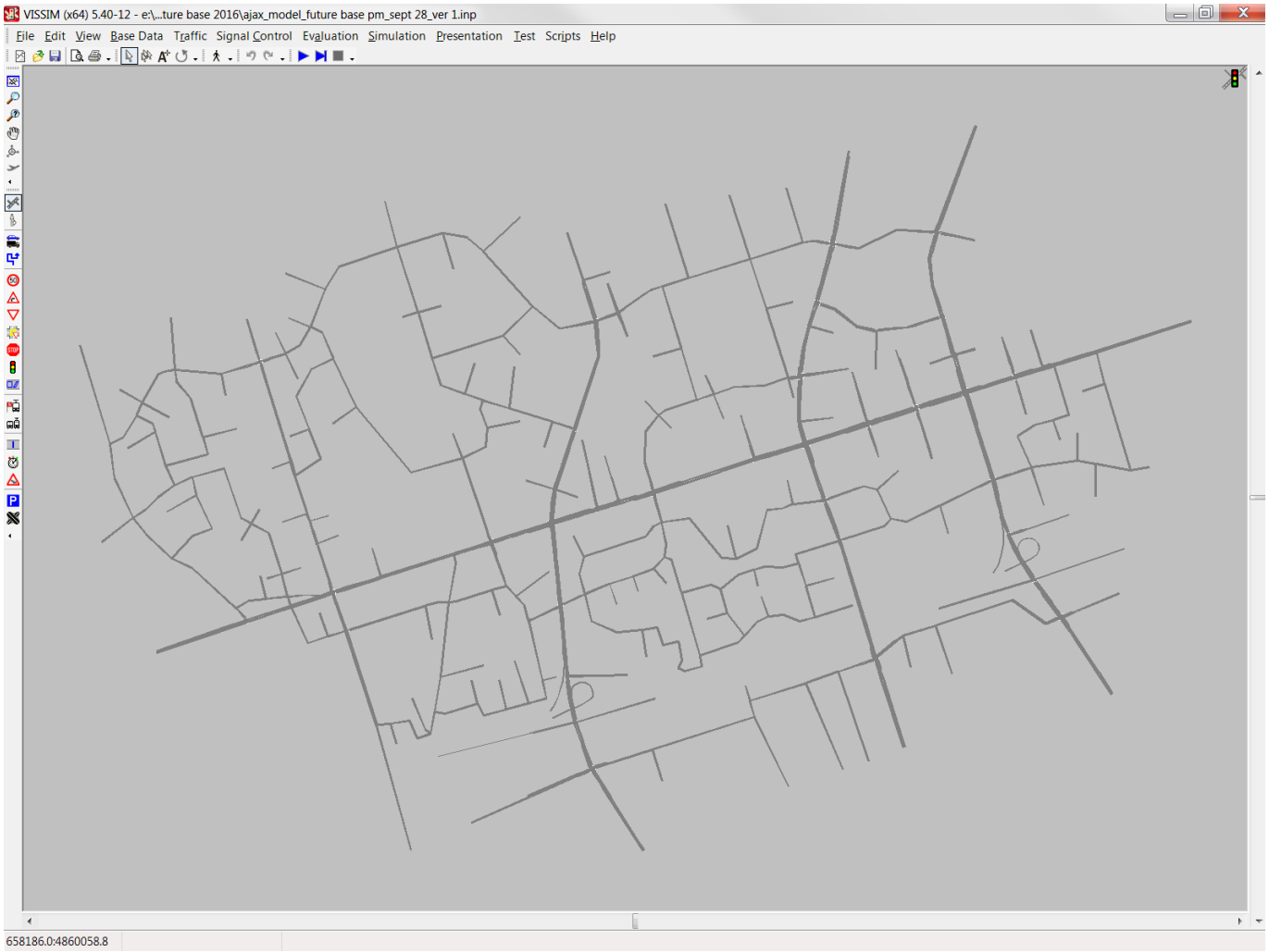
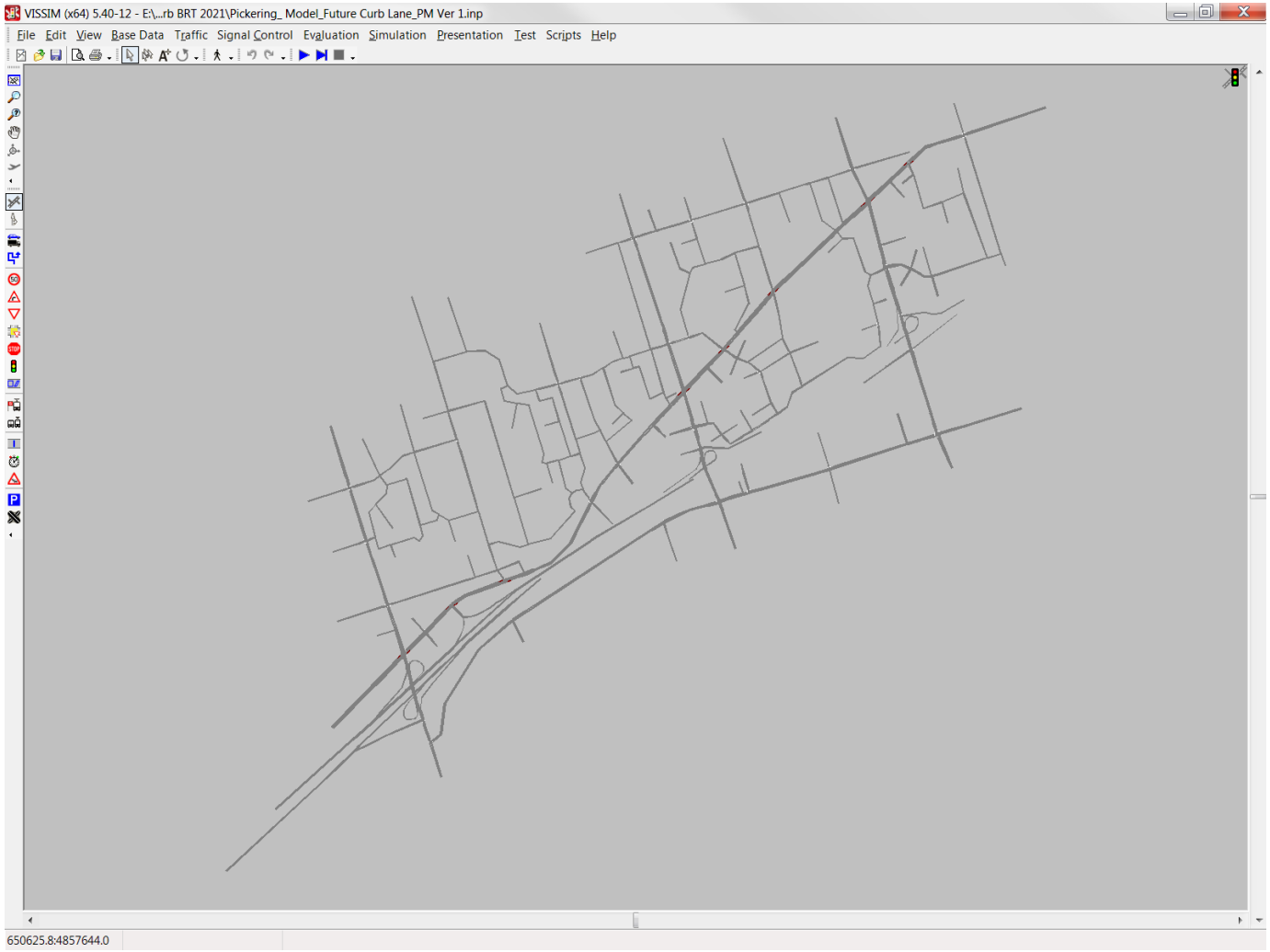


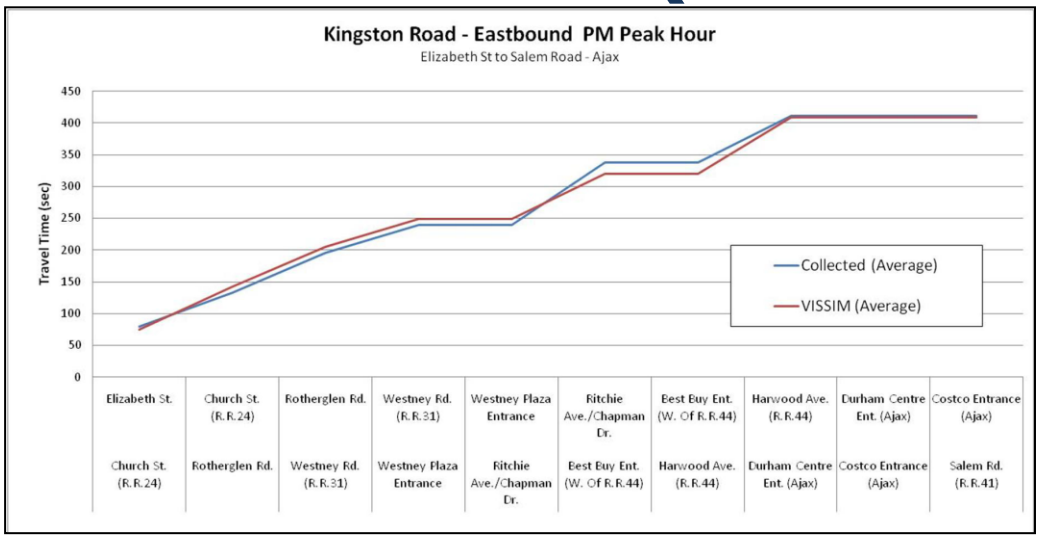
Micro Modelling (VISSIM)

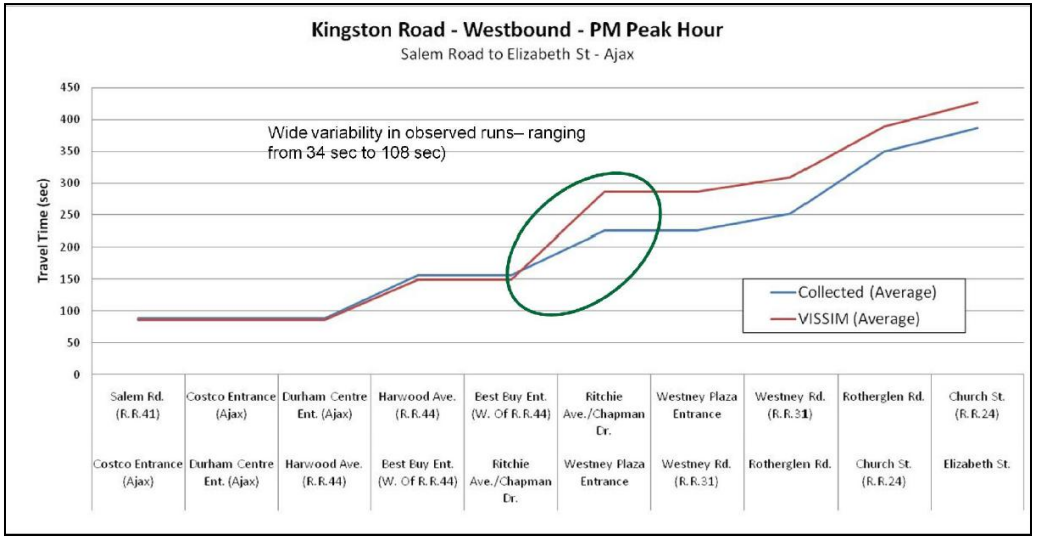
VISSIM Model (City of Pickering)



Micro Modelling Calibration Results (VISSIM)

Calibration Graphs





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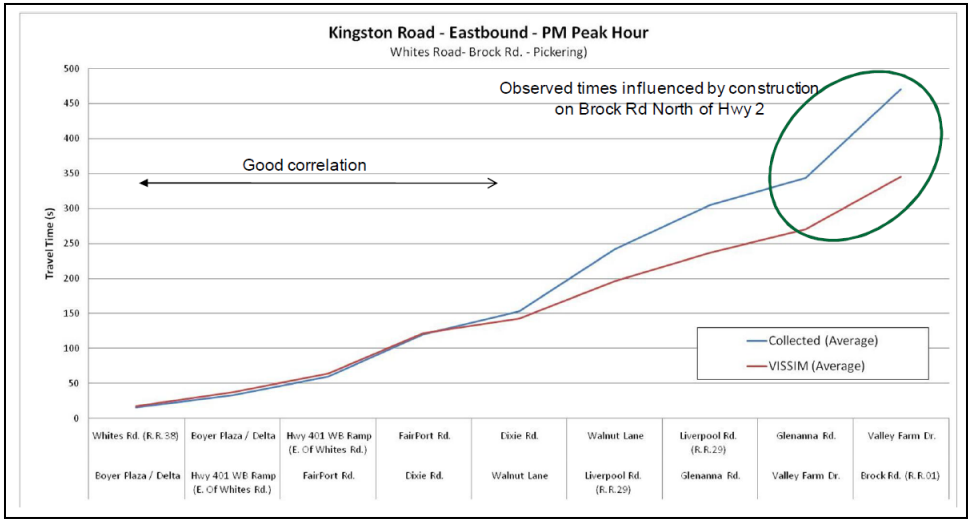
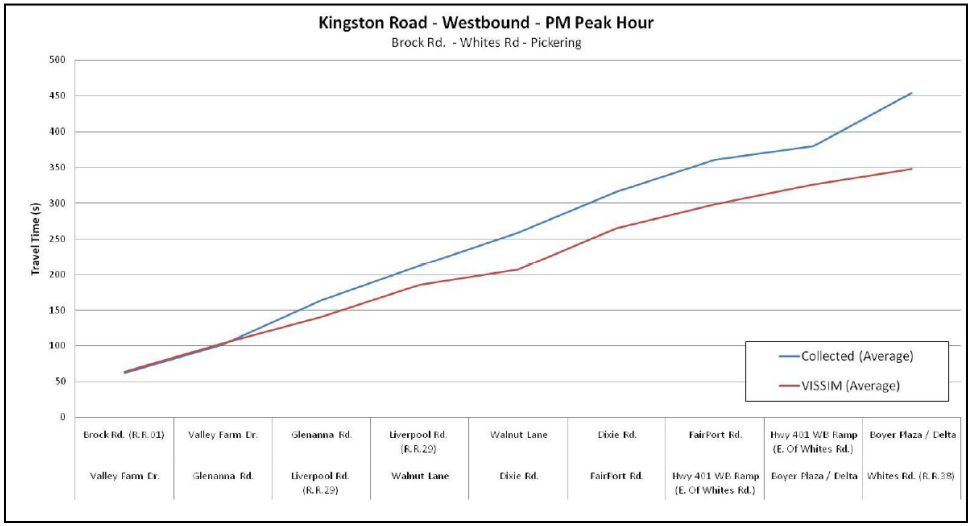




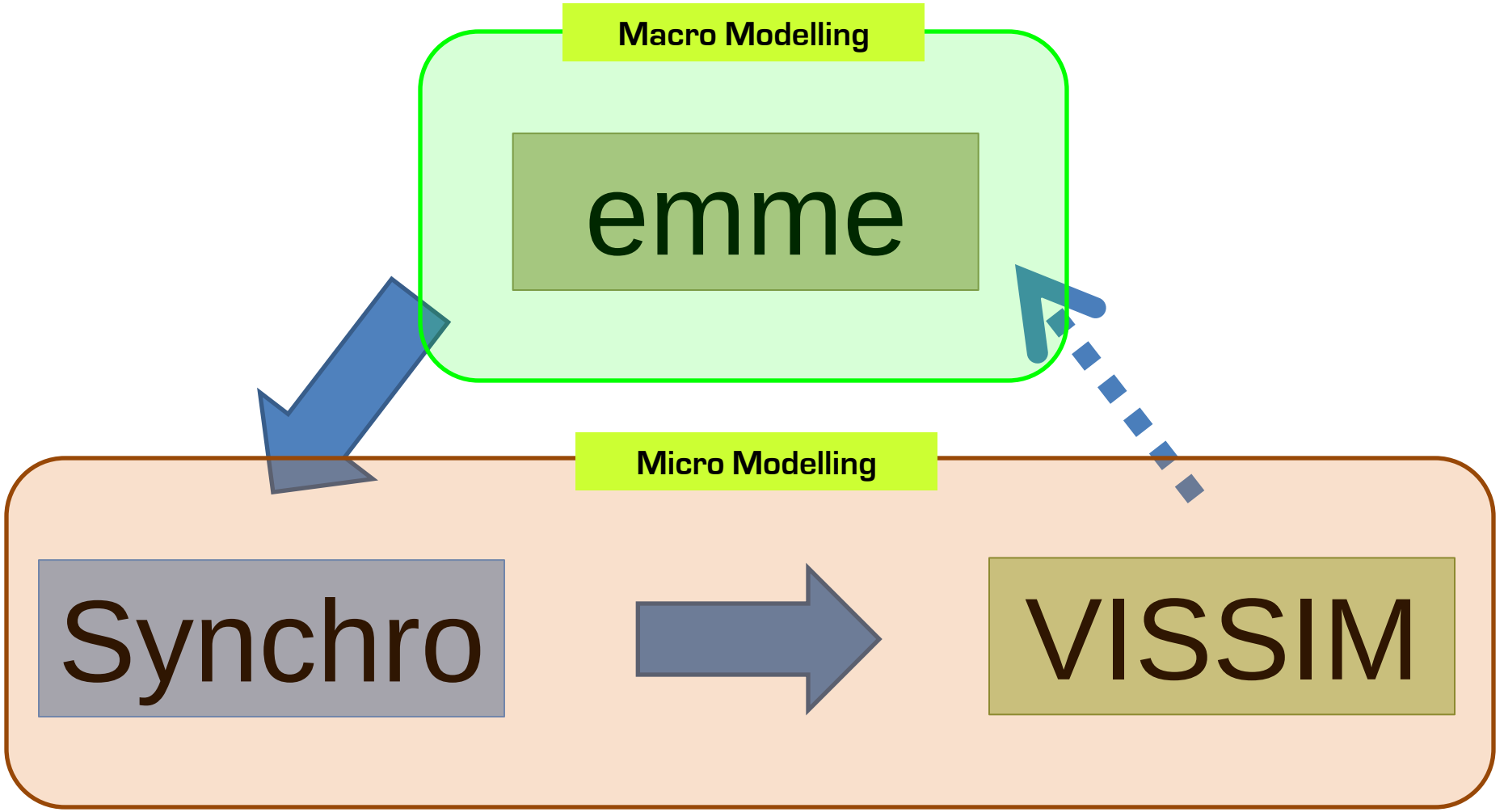
Micro Modelling Calibration Results (VISSIM)

VISSIM Calibration GEH Results

Row Title	% of Turn Volumes GEH <5	% of Turn Volumes 5< GEH <10	% of Turn Volumes GEH >10
All Major Intersections	94%	7%	0%
Highway 2	97%	3%	0%
Westney Road	78%	22%	0%
Harwood Avenue	95%	5%	0%
Salem Road	100%	0%	0%

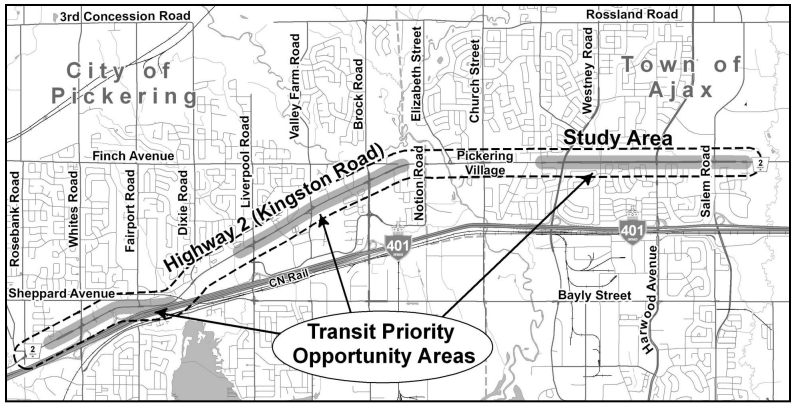
Row Title	% of Turn Volumes GEH <5	% of Turn Volumes 5< GEH <10	% of Turn Volumes GEH >10
All Major Intersections	92%	7%	1%
Highway 2	91%	8%	1%*
Whites Road	91%	9%	0%
Liverpool Road	85%	15%	0%
Brock Road	85%	12%	3%*
Bayly Street	83%	13%	4%*
Finch Avenue	100%	0%	0%

Hybrid Modelling (for future Conditions)



Design Alternatives

Four alternative designs have been considered for widening HWY 2 from 4 to 6 lanes in the three Transit Priority Opportunity Areas



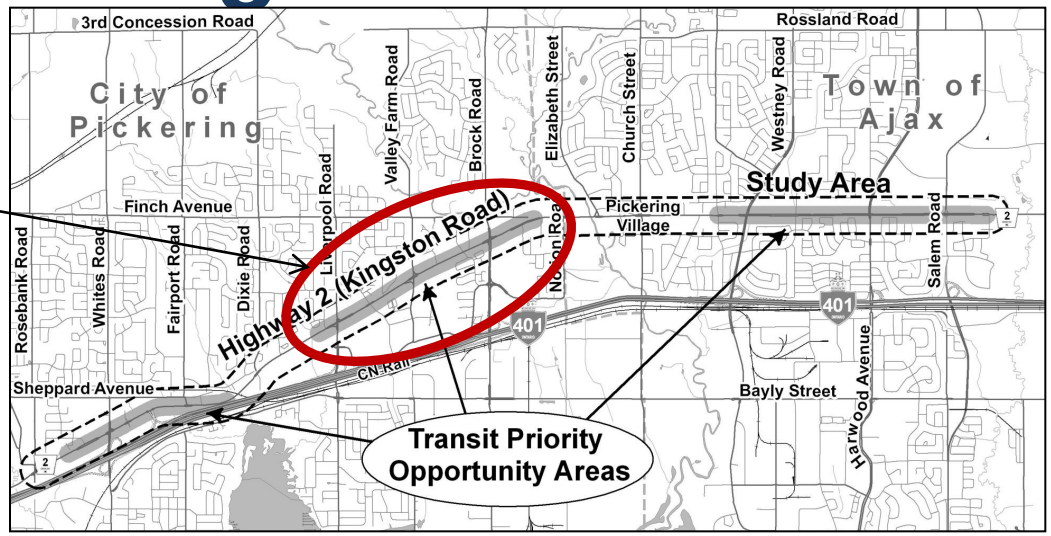
Modelling Results

2016 PM Peak	Mixed Traffic	HOV / BRT Lanes	Curb BRT Lane	Median BRT
Free Flow Time EB (min)	5.9	5.9	5.9	5.9
Transit Travel Time EB (min)	6.4	5.9	5.9	6.1
Delay (min)	**0.5**	**0.0**	**0.0**	**0.2**
Free Flow Time WB (min)	5.9	5.9	5.9	5.9
Transit Travel Time WB (min)	6.3	6.2	6.2	6.8
Delay (min)	**0.4**	**0.3**	**0.3**	**0.9**

2021 PM Peak	Mixed Traffic	HOV / BRT Lanes	Curb BRT Lane	Median BRT
Free Flow Time EB (min)	5.9	5.9	5.9	5.9
Transit Travel Time EB (min)	6.4	5.9	5.9	6.4
Delay (min)	**0.5**	**0.0**	**0.0**	**0.5**
Free Flow Time WB (min)	5.9	5.9	5.9	5.9
Transit Travel Time WB (min)	6.0	6.1	5.9	6.8
Delay (min)	**0.1**	**0.2**	**0.0**	**0.9**

Modelling Results

Segment 2

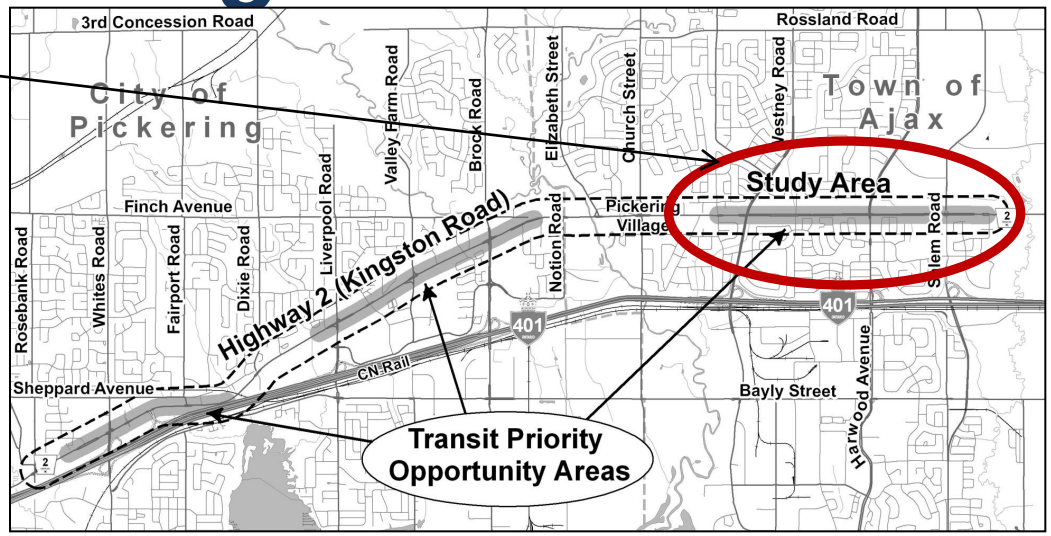


2016 PM Peak	Mixed Traffic	HOV / BRT Lanes	Curb BRT Lane	Median BRT
Free Flow Time EB (min)	7.0	7.0	7.0	7.0
Transit Travel Time EB (min)	10.4	10.3	10.3	12.0
Delay (min)	**3.4**	**3.3**	**3.3**	**5.0**
Free Flow Time WB (min)	7.0	7.0	7.0	7.0
Transit Travel Time WB (min)	8.9	10.0	9.8	10.6
Delay (min)	**1.9**	**3.0**	**2.8**	**3.6**

2021 PM Peak	Mixed Traffic	HOV / BRT Lanes	Curb BRT Lane	Median BRT
Free Flow Time EB (min)	7.0	7.0	7.0	7.0
Transit Travel Time EB (min)	10.8	10.3	10.3	11.7
Delay (min)	**3.8**	**3.3**	**3.3**	**4.7**
Free Flow Time WB (min)	7.0	7.0	7.0	7.0
Transit Travel Time WB (min)	13.5	9.6	10.0	10.5
Delay (min)	**6.5**	**2.6**	**3.0**	**3.5**

Modelling Results

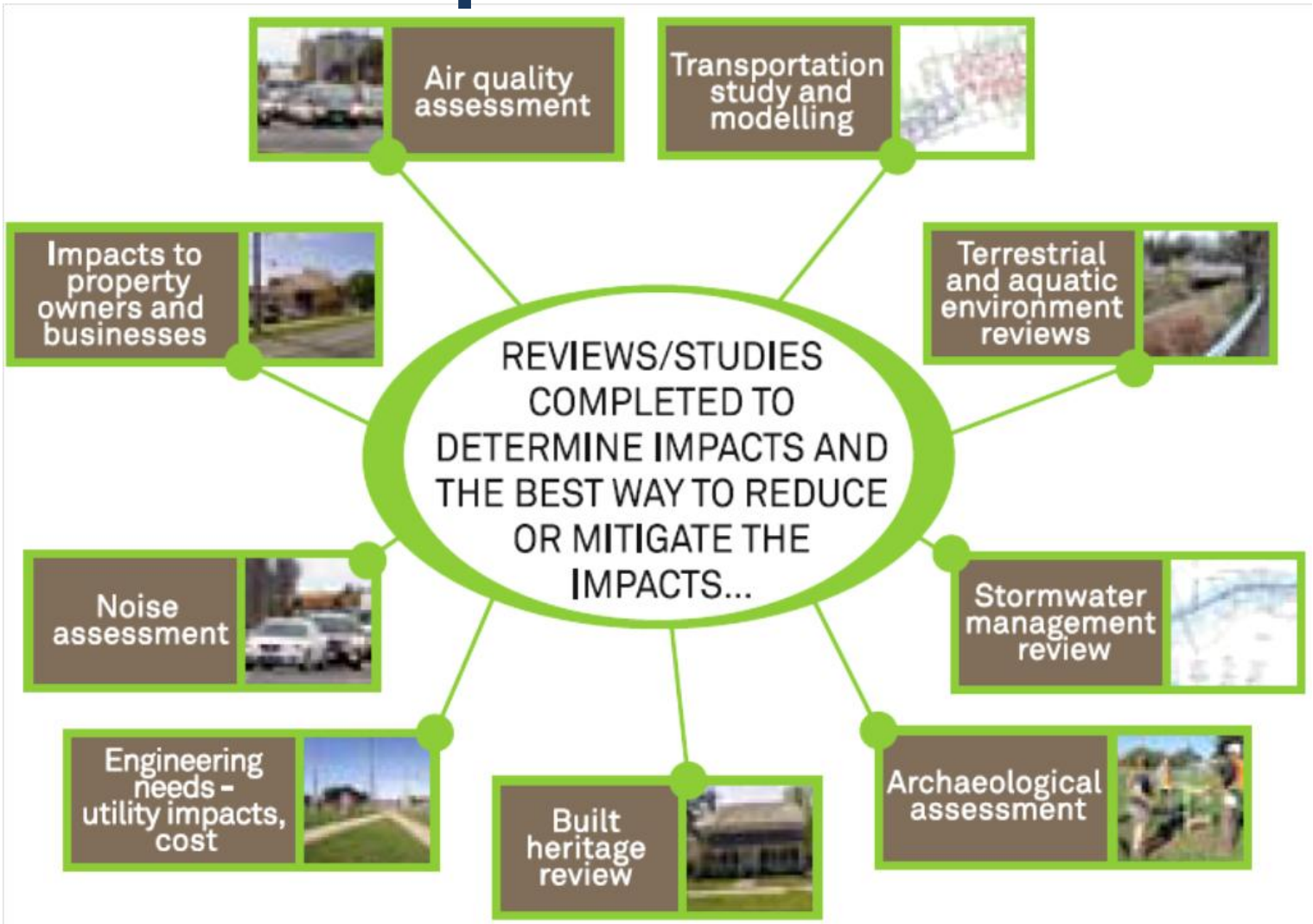
Segment 3



2016 PM Peak	Mixed Traffic	HOV / BRT Lanes	Curb BRT Lane	Median BRT
Free Flow Time EB (min)	12.3	12.3	12.3	12.3
Transit Travel Time EB (min)	16.6	12.9	12.8	12.9
Delay (min)	**4.3**	**0.6**	**0.5**	**0.6**
Free Flow Time WB (min)	12.3	12.3	12.3	12.3
Transit Travel Time WB (min)	13.4	13.7	13.7	13.7
Delay (min)	**1.1**	**1.4**	**1.4**	**1.4**

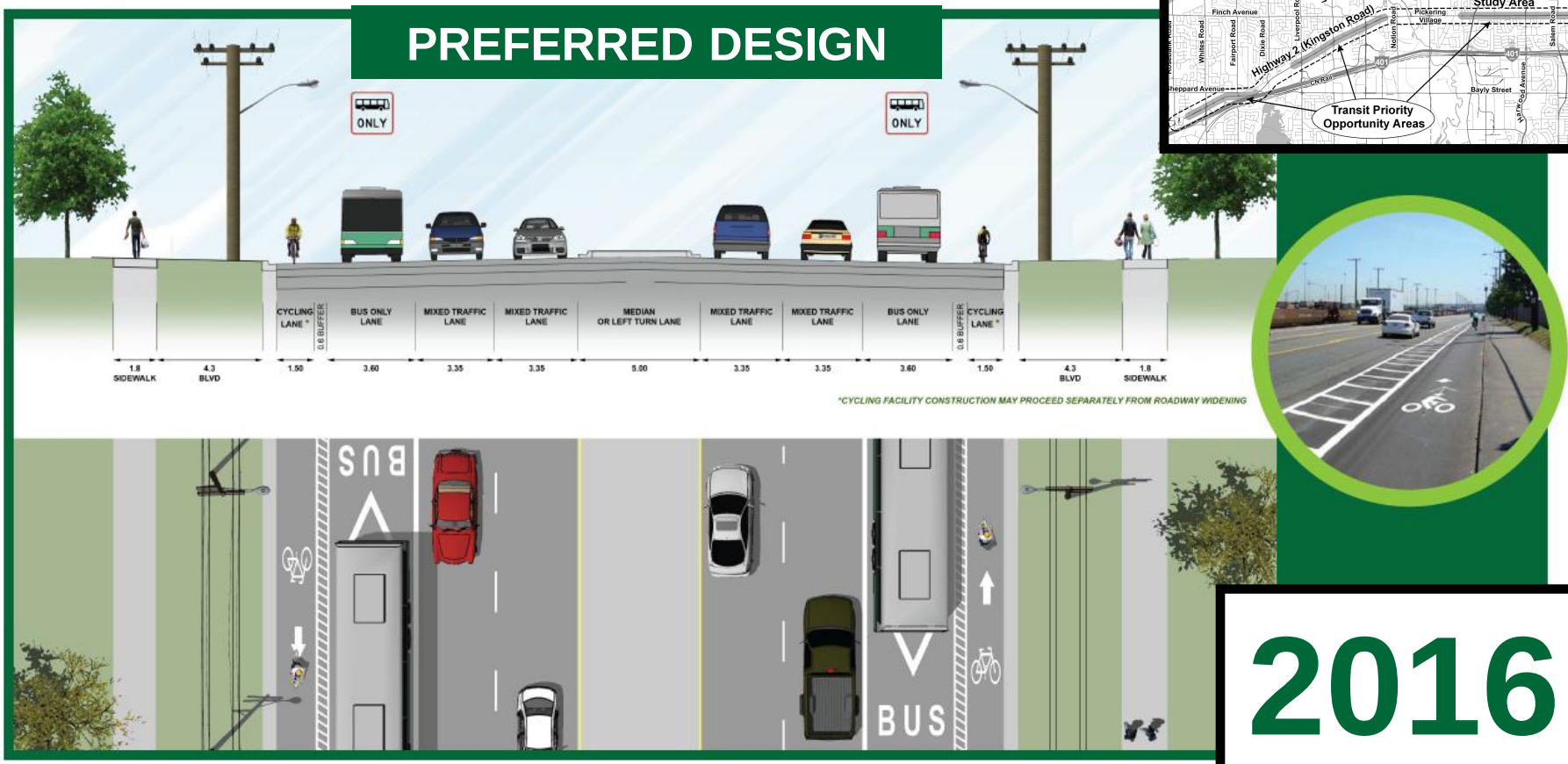
2021 PM Peak	Mixed Traffic	HOV / BRT Lanes	Curb BRT Lane	Median BRT
Free Flow Time EB (min)	12.3	12.3	12.3	12.3
Transit Travel Time EB (min)	17.5	12.6	12.8	11.4
Delay (min)	**5.2**	**0.3**	**0.5**	**-0.9**
Free Flow Time WB (min)	12.3	12.3	12.3	12.3
Transit Travel Time WB (min)	20.8	14.1	14.1	12.7
Delay (min)	**8.5**	**1.8**	**1.8**	**0.4**

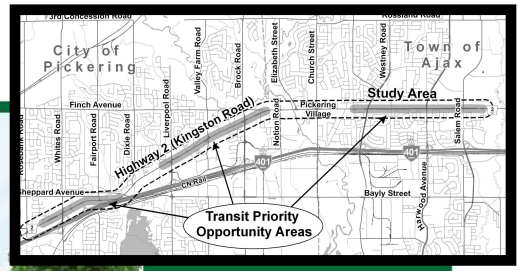
Technical Challenges – Input to Evaluation



Preferred Design (2016)

- Curbside bus only lanes with on-road buffered bicycle lanes
- This short term (5-year) design to have regard for long term median transit vision





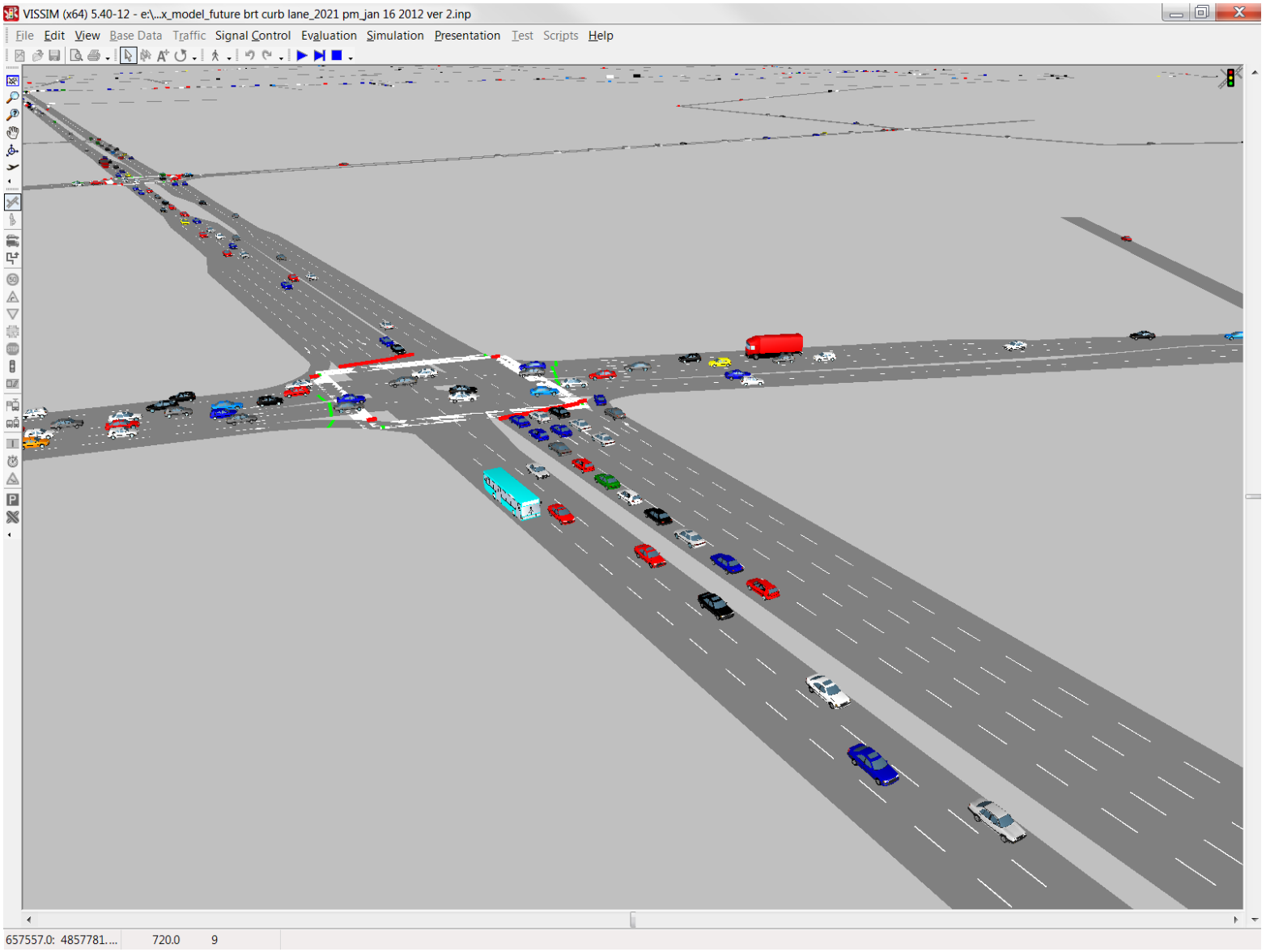
2016

Takeaways

- Have a clear and well laid out study approach
- Know specific data that should be collected (to reduce time for calibration and validation)
- Develop applications (in Excel and/or Access) for faster data processing
- Finally, plan for long computation and simulation times

QUESTIONS?

BRT on Curb Side



BRT on Median Lane