Draft for Discussion

Input to Traffic Modelling Discussion with York Region on Arterial Road Widening through Established Communities

Submitted by URA to York Region

Peter Miasek, on behalf of URA, April 16, 2020

URA-scenariosformodeling2020

Preamble: Although this note is provided as input to traffic modeling, it is important to remember that an investment decision must be based on other factors in addition to traffic volume and demand, including road safety, community health, environmental impacts, community impacts, connectivity enhancement and costs.

Table of Contents

I – SPECIFIC ALTERNATIVES PROPOSED IN URA'S RESPONSE TO 16TH AVE. EA

The URA submission to the 16th EA suggested several specific alternatives requiring more study. Although specific to 16th, any learnings should have broad applicability to all of York Region. We would like to discuss if a modeling approach can be used to evaluate these ideas. Our alternatives were:

- Arterial Intersection Improvements only . If major arterial intersections were widened to three through lanes, this should increase capacity by about 50%, less some friction from the merge after the intersection. This should allow substantially more traffic through on each green cycle. In addition, we feel that optimizing left turns should be studied:
    - Double left turn lanes (reduces dedicated green time needed for left turns). Length of turn lane to be optimized per projected flow
    - The use of displaced left turn intersections per the US FHA standards. A copy was provided to the 16th EA team. This tactic would eliminate the need of dedicated time requirements for the left turn and enhance performance and safety.

  We also need to evaluate placement of bus stops at the far side of intersections, where space permits. Bus stops should be bays where possible.
- Traffic Signal Optimization. We have been told that the Region's arterial road signal system is essentially state of the art. However, major collector roads, such as Rodick, Birchmount, Enterprise, Dennison and others are under Markham jurisdiction, and do not have this level of control. Is there a benefit to bringing these under the Region's umbrella?
- Reversible Centre Bus-only Lane. This involves either (a) a single centre bus lane that simultaneously accommodates buses in both directions, using a signal system. York uses this approach on Highway 7 at Highway 404. It is also used in Eugene Oregon for a longer road segment (b) or a single lane that goes one direction in morning peak and the other direction in afternoon, with non-peak direction buses using curb-side stops.
- Alternative East/West Corridor, e.g. Major Mackenzie or new 404 crossings. It seems that widening of an adjacent corridor to 16th, e.g. Major Mackenzie, was not modeled in the report. Bypasses have been used for decades to reduce traffic impacts to established communities. The effect of vehicle/capacity ratio for 16th from a widening of Major Mac needs study. There is also the relief potential that arises from new crossings of Highway 404, which will divert traffic from 16th. This diversion will improve flow between Woodbine and Leslie, which may have a positive backwater effect to the east and west.
- Reduced Lane Widths. As cited in our letter, reductions from 3.5 m to 3.2 m for HOV lanes and from 3.3 m to 3.0 m for general purpose lanes have already been proposed for constrained sections in the EA for Kennedy Rd. What is the effect of using narrower lanes across the entire corridor length? Narrow lanes are very common in Europe.

II – FUTURE SCENARIOS TO STUDY LONG-TERM NEED FOR ROAD WIDENING IN ESTABLISHED COMMUNITY AREAS

II. 1. Background

URA has long worried about the long term strategic fit of York Region's plans for a multibillion dollar investment in arterial road widenings from 4 to 6 lanes through established communities, including about $500M in Markham. Is this a good investment in the light of likely future mega changes , such as younger generations being less car-centric, transportation technology, e-commerce, climate change and the desire for attractive communities? At our meeting with York Region staff, they were sympathetic to the need to "future proof" any transportation investment.

One way to study this is to model a broad range of reasonable, but boundary-stretching, future scenarios to account for an uncertain future. This is the same advice that was given to the Ministry of Transportation by its 2018 advisory panel appointed to recommend whether to build a very controversial new expressway between northern Vaughan and Milton (GTA-West, or Highway 413).

This section will present suggested scenarios for modeling.

II. 2. York Region Travel Demand Model

The 2016 Transportation Master Plan offers very little detail about the model used. However, the modelling in the 16th Ave EA indicates it is based on EMME. As I understand it, EMME is a multimodal transportation forecasting system developed and sold by INRO, a software company based in Montreal. I believe the entire GTHA uses this EMME for planning.

Back in January, 2008, during the previous cycle of road widening EAs in Markham, York Region staff (Loy Cheah!) gave me an excellent briefing on the "Strategic Travel Demand Model" at the time, also based on EMME. Although certainly the current 2020 model will have expanded capabilities, a summary of the 2008 model is helpful, as it gives us an idea of what input variables can be changed.

Back in 2008, the model was structured as:

- AM peak period (6:00 to 8:59 am)
- Five motorized travel modes
    - Auto only
    - Local transit only (YRT/VIVA)
    - Local transit with auto access (park and ride with YRT/VIVA)
    - GO train with non-auto access
    - GO train with auto access (drive to GO)
- Study area – GTHA plus a few adjacent counties

- 1800 traffic zones across study area – 353 in York Region (for example, there are now 8 zones between Woodbine to Kennedy and 16th to Highway 7, based on the modeling in the 16th Ave EA.)

The model inputs were

- Road network, based on
    - Type of facility (expressway, arterial , collector, etc.)
    - Number of lanes
    - Posted speed limit
    - Lane capacity (function of friction, i.e. traffic lights)
- Transit Network, based on
    - Transit routes
    - Transit stations and stops
    - Park and ride facilities
    - Operating speeds
    - Headways (frequency)
- Socio-demographic variables
    - Total population and employment per traffic zone. Three work occupation categories – office, manufacturing and professional.
    - Proportion of workers and students
- Travel costs
    - Transit fares
    - Parking charges (note: price of gas was not an input)

A four stage modeling process was used

- Trip generation (based on population and jobs per zone)
- Trip distribution (based on a "gravity model", where trips between any two zones are proportional to jobs x population divided by square of the distance)
- Modal split (See below. It is iterative with the other stages.)
- Trip assignment onto the road network or transit network (I'm not sure how it assigns trips to a particular road link – based on travel time minimization or travel path minimization)

The basic model outputs were

- Auto times and volumes on road links or at intersections
- Shortest travel paths
- Transit volumes on transit links or at transit stops

The model was calibrated/validated using recent Transportation Tomorrow Survey (TTS) data. It can also be checked with Cordon Count data.

In a followup email with staff, more detail was provided on inputs into the modal split calculation. These were

- Average time spent travelling in-vehicle by mode
- Average access, wait and boarding time for all forms of transit
- Average out of pocket travel cost by mode (parking, transit fare)
- Urban density at origin and destination zones
- Land use mix at origin and destination zones
- Auto ownership rate at origin zone
- Average household income at the traffic zone level
- Adults per household at the traffic zone level

I also learned that "factors such as carpooling or flexible work hours were not explicitly used in the 2008 model, but were represented through surrogate variables. For instance, carpooling was captured through the use of auto passenger trip rates, while staggered work hours were reflected through different peak hour factors".

No doubt, some of these gaps have been filled in the 12 intervening years to today. For example, the 16th EA shows the mode share to auto passenger ("carpooling") and also seems to explicitly differentiate between general purpose lanes and HOV lanes.

Questions that arise about the model include:

- Are there other new features that have been added since 2008?
- How are office jobs estimated, recognizing that office space per employee has been plunging?
- Are any other techniques used to calibrate the model, such as Bluetooth data or tracking data from insurance companies offering PAYD insurance?

II. 3. Future Scenarios for Potential Modelling

Our goal is to propose reasonable, but boundary-stretching scenarios that can be modelled using the York model to see the impact on travel and traffic. Is there a need for road widening in established communities if some or any of these future scenarios "become true"? These scenarios are up for discussion.

Some foundation inputs into the base case:

- As per the EAs, the simulation year should be 2041.
- Although the Region has not yet finished its comprehensive review of the Official Plan, there appears to be adequate 2041 population and employment data available for each traffic zone (e.g. 16th EA, Appendix F). Presumably the data for the zones is fine-grained enough that new developments can be modelled as complete communities, as per TMP page 133.

- The road network needs discussion. We presume the starting point would be the 2041 network in the TMP, other than current 4 lane roads passing through established communities would not be widened to 6 lanes This would then include
    - projects where missing links are being filled such as Langstaff Rd in Vaughan and Don Cousins Parkway in Markham
    - projects building a finer road grid network (e.g. Hwy 404 crossings)
    - projects in rural areas involving widenings from 2 to 4 lanes or 4 to 6 lanes.
- Whatever road network is chosen, include coordinated traffic signal times.
- The trunk transit network should be as per 2041 plans e.g. Map 7 of TMP plus planned 2041 TTC network (including rapid transit projects - Ontario line, Scarboro Subway Extension, Eglinton and Finch LRTs).
- Transit fares as today, i.e. two fare wall with TTC.

Seven scenarios are proposed: A-E are future changes in transportation, and F-G are future changes in work practices or destinations. Clearly some of these can be combined into larger combos.

II. 3.a Scenario A – Enhanced Transit and/or Vanpooling

This scenario proposes an excellent shuttle bus system feeding the rapid transit and frequent transit trunk networks of Map 7+ TTC. Autonomous (driverless) shuttle buses, as currently under test in many parts of Canada, can offer low cost, short waiting times, curb-side on-demand pickup service at all origins and destinations across the GTHA. In summary, almost as convenient as driving a private car to transit.

Also, the GO RER system is implemented across the GTHA with electrification for faster travel time, more stations and short headways. The VIVA and YRT service has traffic signal preemption and 5-10 minute headways during the peak period. The YRT frequent transit network service has queue jump lanes, traffic signal preemption and 5-10 minute headways during peak period.

The TTC bus service is improved in a similar manner to YRT.

There is fare integration between all transit systems with a low co-fare.

There is a related scenario where driverless vehicles can offer an Uber-like service for carpooled vans for work, reducing number of vehicles and saving the worker the cost of a second vehicle. This would also impact transit usage.

II. 3.b Scenario B - Active Transportation for trips < 5 km

This scenario proposes, as per Markham's approved Municipal Energy Plan which seeks to reach net zero energy carbon emissions by 2050, 50% of all trips < 5 km are by active transportation or e-scooter.

II. 3.c Scenario C - Autonomous or Connected Vehicles

It is assumed that all vehicles become AV or CV. Per page 91 of the TMP, "such vehicles would be able to travel at much faster speeds and likely increase the capacity of roadways given the ability of vehicles to safety drive much closer together".

II. 3.d Scenario D - Higher Cost of Auto Travel – Paid Parking or Road Pricing

a) Paid parking for all business parking lots is implemented to reduce congestion and raise revenue for transportation. This scenario was studied by Metrolinx in their Investment Strategy, and by other groups like the Toronto and Region Board of Trade. A reasonable assumption might be to charge the equivalent of a transit bus trip per day, e.g. about $3/spot/day. This study would be similar to what is recommended in the TMP Action 81, page 136.

b) Road pricing is seen by most experts as the most effective way to reduce congestion and raise revenue, especially in an era when revenue from gas/diesel taxes are expected to fall due to conversion to electrics or hybrids. Concrete examples including central city congestion charges (London, Stockholm, Manhattan pending), HOT lanes, toll roads/bridges. The best for the GTHA is likely a broad-based road pricing (VKT Fee) regime, as tested in Oregon and Germany. This uses GPS technology to track vehicle usage and charges drivers a fee per km, based on time of day, type of road (expressway, arterial, collector) and location. For modeling purposes, rates could be $0.10/km (peak period) or $0.05/km (off peak) with no differentiation on type of road. This is roughly the price level that was proposed by Toronto for tolling the Gardiner and DVP Expressways.

II.3.e Scenario E - More Intensive Transportation Demand Management (TDM) – PAYD Vehicle Insurance +??

The TDM measures identified in the TMP (pg. 131) are modest and have had little effect on shifting behavior (my opinion). More intensive TDM measures should be explored via modeling.

This scenario is a "leandown" from Scenario D, which is bold but has been proven to be politically challenging.

This scenario assumes society adopts pay-as-you-drive vehicle insurance or time-of-day insurance. These options have already been implemented by some insurance companies with positive uptake. This could be made mandatory by the province for universal adoption.

There may be other, more aggressive but politically feasible TDM measures that could be brainstormed into this scenario.

II. 3.f Scenario F - Work and Shop from Home

This scenario assumes that technology improvements and social dictates (eg fallout from Covid-19 pandemic) result in a high fraction of office and professional jobs becoming work-from-home. Also, shopping and goods movement are largely arranged from home, with bulk community delivery by truck to a central spot, and drone doing the last mile.

II. 3.g Scenario G - More Jobs in York's Urban Growth Centres and Corridors

This scenario assumes that employment in these growth centres and corridors is double that identified in current official and secondary plans, with concurrent drop in projected jobs in City of Toronto (to maintain correct number of total jobs in GTHA). This is not an unreasonable scenario, in view of post-pandemic drive for more office redundancy, more use of remote offices and increasing real estate prices in Central Business District.

II. 4. Next Steps

Following submission of this note to York Region, we will meet to adjust/refine/add to/amalgamate the scenarios. For example, in the "add to" list could be Mobility as a Service (MaaS), TMP Pg 129.

Once we agree on the scenarios, we will need to sit down and agree on specific input parameters and assumptions and identify key model outputs.