Ministry of Transportation

Backgrounder to the GGH Model -

Estimating travel time savings from Highway 413

November 10, 2021

Ontario

Background of Highway 413

- The Highway 413 corridor is a proposed new highway and transit corridor that will help to connect motorists travelling through Halton, Peel, York and Halton Regions
- The corridor connects with the busiest 400-series highways in the GTA including the 401, 407ETR, 410, 427 and 400 and multiple arterial roads
- The Highway 413 is a 52 kilometre controlled access corridor with posted speeds of 100 km/hr connecting highways 401, 407ETR, 410, 427 and multiple arterials
- The corridor is planned to have a 4-lanes cross-section between the 401/407ETR/413 and 413/427 Extension interchanges; and a 6-lanes cross-section between the 413/427 and 413/400 interchanges
- The project includes 4 interchanges connecting to 400-series highways and 11 interchanges connecting to the arterial road network

Source: https://www.gta-west.com/

Ontario

Greater Golden Horseshoe Model Framework

- The forecasts of travel times savings on Highway 413 are estimated using the Greater Golden Horseshoe Model (GGHM) which is MTO's regional long-term multi-modal travel demand and forecasting model
- The model currently supports regional planning studies such as environmental assessments, business cases, strategic long-range plan preparation, and planning and design studies.
- The model captures the potential change in travel demand patterns, i.e., changes in mode or route, under different options/scenarios of transportation (both road and transit and active modes) infrastructure investments.
- The model considers the induced travel demand between different modes and routes. It focuses on estimating the number of trips that would be likely using the new highway if it were operating in forecast year (e.g., 2041), relative to the base case (without the highway).
- It is important to note that growth in the region is already forecasted through the Growth Plan for the Greater Golden Horseshoe and planned through municipal planning exercises to 2041.
- Municipal plans include a distribution of people and jobs based on planned road and transit networks, so they already assume higher density population growth near transit stations and employment along highways, for example.
- The GGHM creates detailed population and employment distribution based on these land use plans and this is a fixed input that yields trip demand. The GGHM does not yield net new growth in a region because of a highway, rather the highway is planned where there is already growth forecasted and planned.

Greater Golden Horseshoe Model Framework

Model simulations determine the mode and route that travellers will choose across the system at a given time (e.g. AM peak). It consider the interactions of multiple components of the transportation system, including:

- The population and employment growth to happen in the horizon year 2041 under the targets, objectives and policies delineated in the Growth Plan for the GGH. This is an input.
- How the GGH residents make everyday decisions and their preferences to travel from home to meet their daily activities such as going to work, going to school, shopping, etc. throughout different times of the day. These are assumptions input to the model based on elasticities of demand and past travel surveys.
- The impacts of commercial vehicles sharing the road network with other travellers (e.g., commuters)
- The make-up of the transportation system including roads and transit services available for making a trip and its physical and operational attributes in terms of geographical coverage, types of facilities, capacities, posted speeds, congestion, crowding and costs of travelling
- The travel times and out-of-pocket costs of travelling such as tolls, transit fares, parking fees and other costs of travelling; and
- The main assumptions built into the model are illustrated on the table to the right

High Level Model Assumptions for Year 2041	
Land use	Growth Plan Targets and Policies (GGH-wide): • Total population: 13.5 million • Total employment: 6.3 million • Total households: 4.9 million
Major highway projects	Committed investments in the Southern Highway Plan (5-years plan)
Major transit projects	Transit projects in Metrolinx Regional Transportation Plan (funded and in-delivery)
Travel demand management policies	Managed lanes, high-occupancy-vehicle and high-occupancy-tolled lanes
Travel costs	Average auto operating costs, transit fares, tolling and daily parking costs.

About the GGH Model

The GGHM provides valuable insights to the questions on WHO travels in the region, for WHAT purpose, WHERE to travel, WHEN to travel and HOW to travel. These questions are usually simulated through distinct steps in the model capturing the complexity of the forecasting framework.

Why

GGH residents need to perform daily activities

- **Who** (e.g. worker, student, retiree)
- **What** (e.g. work, school, shopping, daycare, recreation, doctor…)

Where would the activity take place**?**

- e.g. in-home or out of home; in-office or off-site
- Work location, school location

When?

- Travel in the peak or the off-peak period

How

How residents travel to the activity locations?

- Walking, cycling, driving (as a driver or passenger), taking transit (mass transit or local transit)
- Mixed modes (e.g. drive-transit-walk)
- Driver must decide what roads to use, pay tolls & parking fees, use car sharing, select the best route, etc.
- Transit users must decide transit route to travel, pay fares.

Ontario

Travel Times Savings Estimation for Highway 413

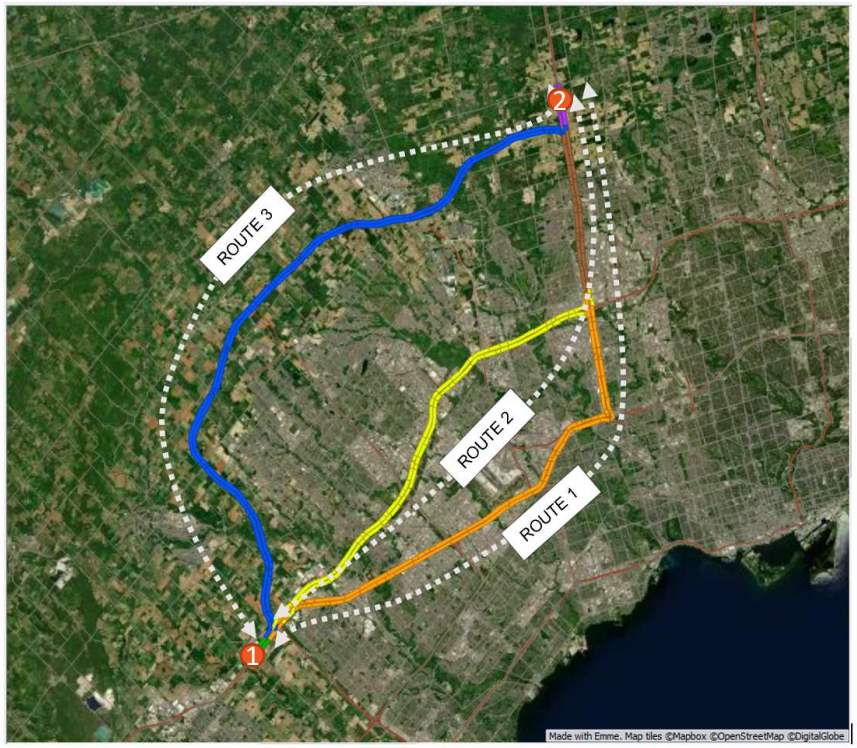
The GGHM forecasts future travel demand and travel times on all segments of the road system in the GGH during the morning rush hour.

Travel times savings for the 413 users were estimated measuring the congested travel times between two points on the highway network for the horizon year of 2041:

- First point: Highway 401 @ Trafalgar Road
- Second point: Highway 400 @ King Road

A motorist can travel between these two points using 3-alternative fastest routes as shown in the figure:

- **Route 1** (401/400): starting on Highway 401 & Trafalgar Rd interchange, turning north on the Highway 401/400 interchange, and continuing driving on the Highway 400 and ending on King Rd
- **Route 2** (401/407/400): starting on Highway 401 & Trafalgar Rd. interchange, switching to the 407ETR through the Highway 401/407 interchange ramps, turning north on the Highway 400 and ending on King Rd
- **Route 3** (401/413/400): starting on Highway 401 & Trafalgar Rd. interchange, switching to the 413 corridor through the Highway 401/413 interchange ramps and turning north on the Highway 400 and ending on King Rd.



The model simulates travel times for the morning rush hour in both directions of travel

Ontario

Travel Times Savings Estimation for Highway 413

Estimations for auto users travelling eastbound between the two defined points on the freeway system include:

- **Route 1** requires driving a distance of 54 kilometres that takes approximately 89 minutes with no out-of-pocket costs;
- **Route 2** requires driving a distance of 49 kilometres that takes approximately 43 minutes with an out-of-pocket cost of $14; and (not including in the travel time comparison because of the toll road)
- **Route 3** requires driving a distance of 56 kilometres and takes 59 minutes with no out-of-pocket costs.

Estimations for auto users travelling westbound, include:

- **Route 1** requires driving a distance of 55 kilometres that consumes approximately 91 minutes with no out-of-pocket costs;
- **Route 2** requires driving a distance of 49 kilometres that takes approximately 43 minutes with an out-of-pocket cost of $14; and (not including in the travel time comparison because of the toll road)
- **Route 3** requires driving a distance of 56 kilometres and takes 59 minutes with no out-of-pocket costs.

	Eastbound			West Bound		
	Kilometers	**Minutes**	**Cost ($)**	**Kilometers**	**Minutes**	**Cost ($)**
Route 1	54	89	0	55	91	0
Route 2	49	43	14	49	43	14
Route 3	56	59	0	56	59	0
Savings (Route 3 – Route 1)	-	**-30**	-	-	**-32**	-

Travel Times Savings Estimation for Highway 413

The model forecasts done for 2041 suggest that during an average morning rush hour a **total of 22,400 users** will travel on **Highway 413** to get to their destinations

About **1,200 users (8% of the total)** are expected to travel the full length of the corridor and receive the full benefits of the travel times savings (30 minutes). However, with **8,800 users (40%)** travelling a minimum distance of **25 kilometres** on the corridor, and the average user travelling an average distance of **19 km,** significant travel time savings are still expected

Overall, the model estimates the corridor saves over **22,000** hours of travel times to all drivers travelling in Peel, Toronto, York, Halton and Simcoe on an average morning rush hour

The model uses posted speeds as the maximum travelling speed, under ideal conditions, ie., when the demand is low. Motorists on 400-series highways can travel as fast as **100 kph** on main segments and up to **50-60 kph** on on/off ramps

The model simulates peak hour conditions when the demand is highest creating congestion

The model simulations between the base case (no-build) and the build-case (with the new highway) are compared to infer potential time savings to the users