

Chapter 2 – Transportation Needs



407 TRANSITWAY - KENNEDY ROAD TO BROCK ROAD

MINISTRY OF TRANSPORTATION - CENTRAL REGION

2. TRANSPORTATION NEED AND TRAVEL DEMAND

This section explores and confirms the need for higher order transit in the 407 East Corridor and describes the role of the 407 Transitway in the GTA by examining future land use, population and employment trends, and subsequent changes in travel demand. The modelling approach and strategic ridership forecasts are described as well as the impacts of the 407 Transitway and its role within the larger transportation system in the GTHA. The corridor study area, surrounding major trip generators, and connecting transportation services are shown in **Figure 2.1**.

FIGURE 2.1: 407 TRANSITWAY EAST STUDY AREA



2.1. 407 Transitway Role in the Greater Toronto Area (GTA)

The 407 East Corridor and the rest of the outer GTA is projected to continue its rapid growth leading to an increase in east-west suburb-to-suburb travel. The intensification of UGC's in the Cities of Markham and Vaughan, and the Town of Richmond Hill coupled with the development of the Seaton Community in Pickering will increase westbound travel demand in the north GTA during the A.M. peak period. Without convenient rapid transit, this will lead to increased levels of auto congestion while reducing throughput, efficiency and regional economic vitality.

Higher order transit in this corridor would be an important element of a future GTA rapid transit network aimed at meeting growing travel demand, providing mobility for a variety of users, and maintaining acceptable road performance. The 407 Transitway East would be designed with the intention to:

- Serve as a high-speed transit link between Durham and York Region, serving major trip generators such as York University Keele Campus, the future York University Markham Campus, UGC's in the Cities of Markham and Vaughan, and the Town of Richmond Hill, a potential Pickering Airport, and the Seaton development;
- Offer an attractive and competitive transportation alternative to driving with high-speed, frequent, and reliable service;
- Reduce traffic congestion, pollution, and energy consumption related to auto oriented travel and development;
- Provide high-quality transit for suburb-to-suburb travel;
- Provide point-to-point service for long cross-boundary trips in contrast to VIVA, which is oriented towards serving shorter trips and intraregional demand;
- Supply a dedicated transit corridor that is unaffected by auto congestion; and,
- Reinforce the regional transit network as a key spine connecting to the GO rail network, the TTC subway network, existing and future BRT/LRT lines, and local transit services.

2.2. Land Use, Population & Employment

The GTA is one of the fastest growing regions in North America with a 2011 population of 9 million that is expected to increase by nearly 3 million (32%) to approach 12 million residents by 2031. In 2006, recognizing the rapid speed of development, the *Growth Plan* was enacted to create a policy environment that promotes vibrant and self-sustainable communities, curbs urban sprawl, protects farmland, and reduces auto oriented development. These objectives are to be achieved by directing growth to built-up areas through intensification, thereby creating complete communities that are easier to serve with alternative modes. This policy will lead Transit Oriented Development (TOD) that must be served by commensurate high quality transit services to encourage smart travel choices.

2.2.1. Population and Employment Growth

Growth in Durham Region and the 407 East Corridor is projected to outpace nearly every other area in the GGH due to the large amount of desirable and developable Greenfield land which is in contrast to more fully-developed areas like the Cities of Toronto and Mississauga. **Table 2.1** shows 2011 and 2031 population and employment for the study area and the rest of the GGH. Unlike other regions, the 407 East corridor is and will continue to be a net exporter of workers as there are roughly 0.6 jobs per person in the area and this ratio is not projected to change significantly over the next 20 years. This is nearly 0.4 jobs per worker lower than the GGH as a whole and close to half of the level in the City of Toronto. With a steady jobs-worker imbalance and rapid population growth, total net out-commuting from Durham Region and the study corridor is expected to increase significantly over the 20 year horizon, driving westbound A.M. peak period travel demand towards areas with higher employment levels like the City of Toronto, and York and Peel Regions.

More detailed population and employment forecasts for the study area and surrounding communities are shown in **Figure 2.2**. Population growth is expected to occur throughout and near the study area, particularly in the future Seaton community (within the eastern corridor) and in Pickering. Employment growth in the study area will be much more modest in terms of absolute numbers but will increase by more than 75%. Many residents within the corridor are likely to commute to employment opportunities in the nearby Cities of Markham or Scarborough while others may travel even further to the City of Mississauga and Downtown Toronto. Serving internal and cross-boundary travel with convenient and competitive transit services will be a main function of the 407 Transitway East to ensure that travelers making these trips have multiple transportation choices.

TABLE 2.1: 2011 AND 2031 POPULATION AND EMPLOYMENT, STUDY AREA AND GGH

AREA/REGION	POPULATION (IN 000S)				EMPLOYMENT (IN 000S)				JOBS/RESIDENT		
	2011	2031	GROWTH	%GROWTH	2011	2031	GROWTH	%GROWTH	2011	2031	CHANGE
407 East Corridor	148	252	104	70%	45	79	34	76%	0.30	0.31	0.01
Durham	631	970	339	54%	240	357	117	49%	0.38	0.37	-0.01
York	1,072	1,594	522	49%	540	789	249	46%	0.50	0.49	-0.01
Toronto	2,725	3,154	429	16%	1,515	1,658	143	9%	0.56	0.53	-0.03
Peel	1,350	1,764	414	31%	682	875	193	28%	0.51	0.50	-0.01
Halton	520	822	302	58%	255	392	137	54%	0.49	0.48	-0.01
Hamilton	540	683	143	26%	234	306	72	31%	0.43	0.45	0.02
Total GTHA	6,838	8,987	2,149	31%	3,466	4,377	911	26%	0.51	0.49	-0.02
Total Outer Ring	2,192	2,942	750	34%	998	1,279	281	28%	0.46	0.43	-0.03
Total GGH	9,030	11,929	2,899	32%	4,464	5,656	1,192	27%	0.49	0.47	-0.02

Source: Growth Plan for the Greater Golden Horseshoe, Ontario Ministry of Infrastructure

2.2.1.1. Allocation of Growth and Density

The *Growth Plan* is a 25 year plan governing where growth and density will occur in the GGH through 2031 and beyond. The Growth Plan was amended in 2013 to update and extend the population and employment forecasts to 2041. At the time of this assignment, 2041 allocations were available to the municipal level only and had not been officially publicized. All relevant findings and conclusions will be confirmed prior to Detail Design based on official figures at that time. For transportation modelling purposes, future population and employment growth has been allocated to 3,094 traffic zones comprising the GTHA into UGCs, designated Greenfield areas, and intensification within the built-up area. At least 40% of the population growth has to occur in existing urban areas (intensification zones) while the remainder can occur in designated Greenfield areas. UGCs are targeted to have densities of 200 persons plus jobs per hectare outside of the City of Toronto. While there are no UGCs located in the 407 East Corridor, many including the Town of Richmond Hill and the Cities of Markham, Vaughan, Pickering, and Scarborough are adjacent and would be connected by Transitway services.

2011 and 2031 urban density in the 407 East Corridor and surrounding areas is shown in **Figure 2.3**. Generally an urban density of above 80 people plus jobs per hectare is required to support rapid transit such as BRT and LRT while anything over 200 can support heavy rail investments. These densities are important for providing a ridership base as well as local origins and destinations within walking distance of stations. By 2031, densities in the corridor – particularly York Region – are expected to be above 80 jobs+people/hectare throughout much of the Highway 7 corridor. Stations which experience higher densities within 500 meters tend to have a higher potential for walk-in demand. By 2031, densities adjacent to Donald Cousens Parkway and Whites Road stations are expected to be 20 to 50 jobs+people/hectare. The stations of Markham, Ninth Line, and Brock experience higher densities of 50 to 80 jobs+people/hectare. While Markham and Ninth Line stations are situated in more developed areas, the densities for stations on the east end of the Transitway will be dependent on future developments. On the east end, densities will be under the prescribed density threshold but this may not be indicative of overall demand in the corridor especially given the intensification of southern Pickering and Markham. As a result, eastern stations are development driven due to this intensification. While overall corridor densities may be on the lower side – intensification of nodes at UGCs and the development of multi-modal communities would support a service such as the 407 Transitway East which is intended to serve longer distance regional travel rather than short trips within a contiguous urban area. These trends and forecasts support the idea that the Transitway would be better designed as a rapid regional service providing long range travel options rather than one with multiple stops spaced closely together.

FIGURE 2.2: 2011 AND 2031 POPULATION AND EMPLOYMENT IN 407 EAST CORRIDOR AND SURROUNDING AREAS

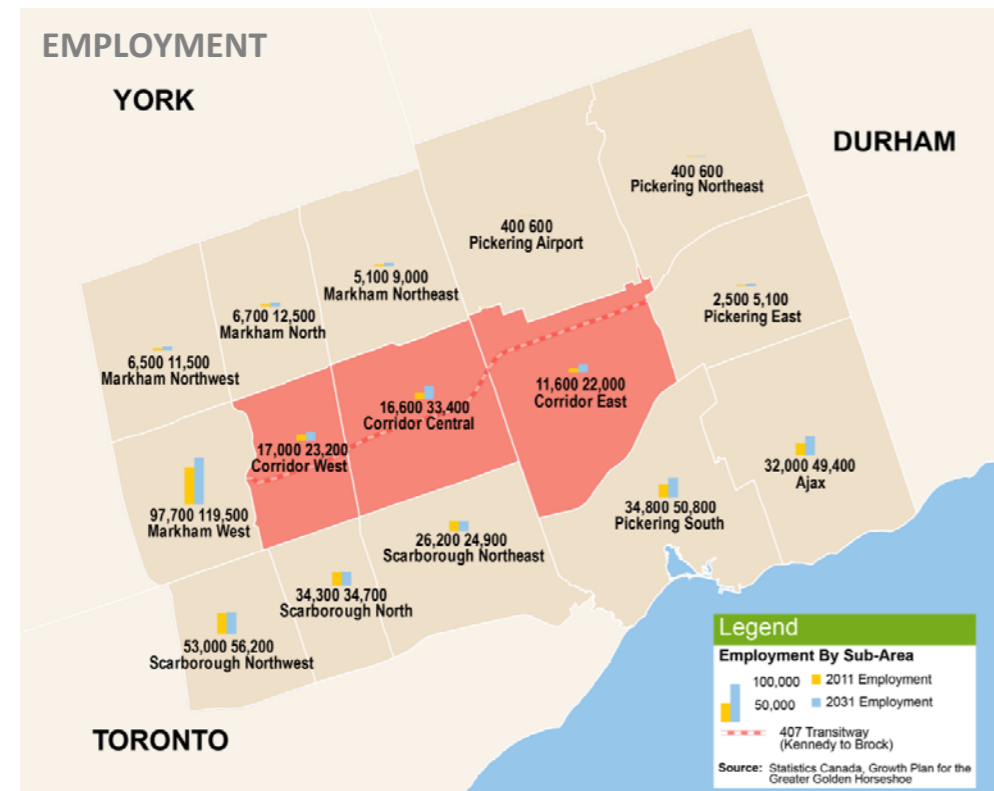
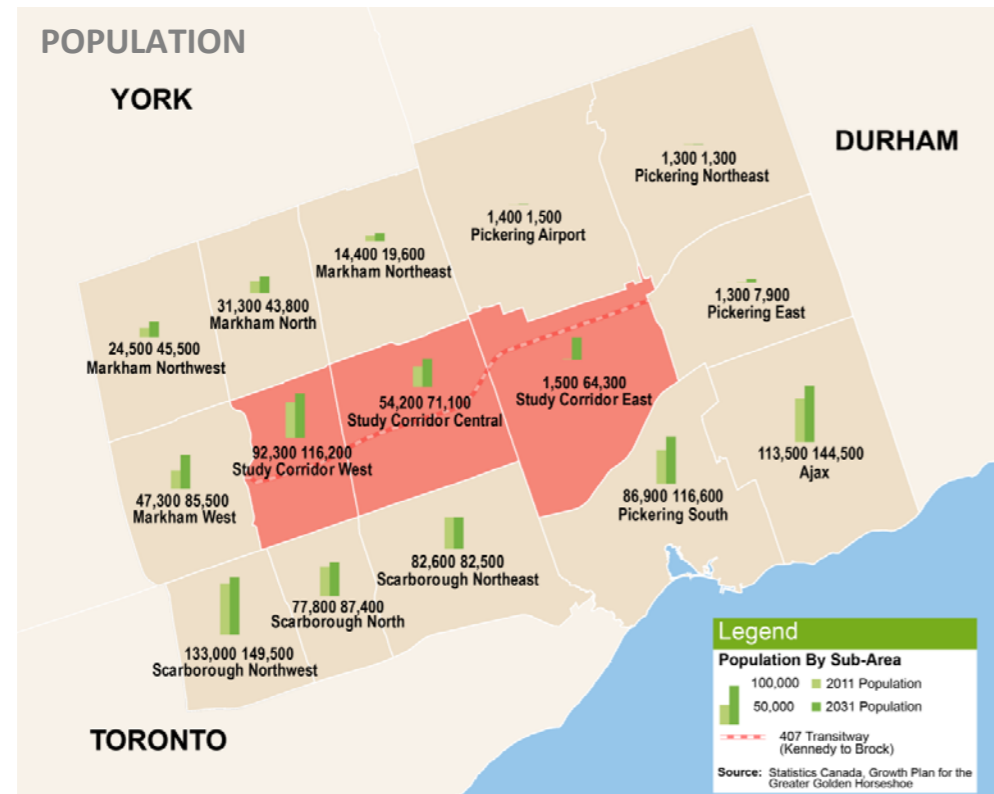
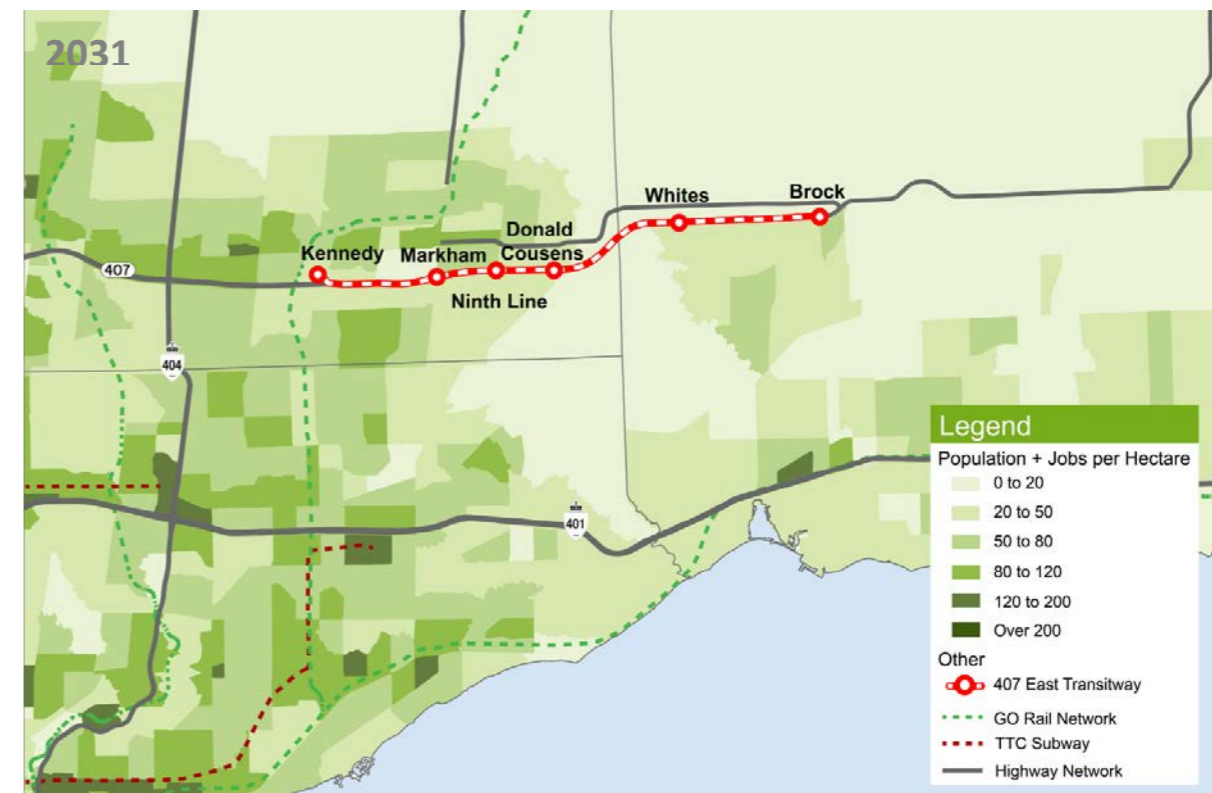
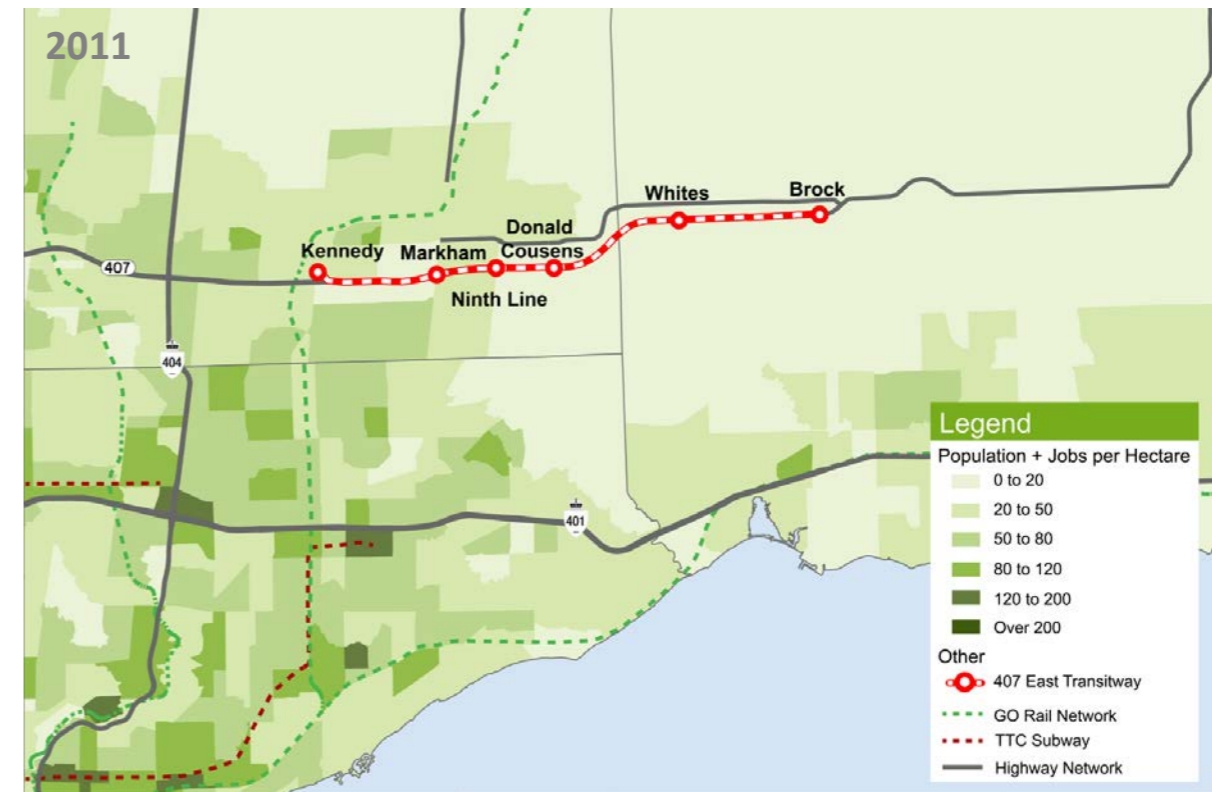


FIGURE 2.3: 2011 AND 2031 URBAN DENSITY IN THE 407 EAST CORRIDOR AND SURROUNDING AREAS



2.2.2. Developments Affecting Corridor Travel Demand

While some parts of the corridor may fall outside of the range of supporting high order transit, there are a number of proposed and potential developments that will have large impacts on land use and travel demand thereby increasing the area's ability to support rapid transit. These include new communities, industrial activity centers, planning districts, and a post-secondary institution:

- **Seaton Community:** The planned community of Seaton is located north of the current urban boundary in Pickering, spanning roughly between Highway 7 to the north, the West Duffins Creek to the west, Sideline 16 in the east, and the CPR Belleville Rail Subdivision to the south. Seaton is anticipated to provide a mix of residential and commercial development, supporting upwards of 30,000 jobs and 70,000 residents. Seaton is located directly in the study area and is projected to be a major driver of transit ridership in the eastern 407 corridor. This will be further reinforced if the development includes a significant affordable housing component, as proposed by the City of Pickering. The Seaton community was included during the modeling and forecasting process with 2031 populations of around 65,000 in 2031.
- **Pickering Airport:** In 1972 the Canadian Federal Government set aside land in north-eastern Pickering as the future location of a second major commercial airport in the GTHA to relieve activity at Toronto Pearson International Airport. As it is not official, the airport was not assumed within 2031 forecasts; however, if commercial flights were to operate out of the Pickering airport, the airport itself and ancillary development that would likely evolve, would be an additional driver and facilitator of rapid transit in the corridor.
- **York University:** In May 2015, the Province of Ontario announced that a new York University campus in Markham Centre would be built either within or very near to the 407 East Corridor. It is expected to have 4,000 students initially and 10,000 students in the next twenty years creating a more vibrant area in downtown Markham and inducing many new transit trips to, from, and around campus. This was included in the forecast, assuming that the university will have 10,000 students by 2031.
- **Ontario Greenbelt:** The 2005 *Greenbelt Act*, passed by the Government of Ontario, was written to protect over 1.8 million hectares of land in the GGH from urban development and sprawl. The Greenbelt traverses parts the 407 East Corridor between Donald Cousens Parkway and York Durham Line. Development will be restricted within these lands meaning that there will be very few trips starting and ending in the Greenbelt. This reality is a major consideration when determining the preferred operating strategy, station locations, and stop spacing.

These developments are projected to affect regional travel in north Durham and York regions and without high-quality, higher order transit – demand would have to be primarily served by an over-capacity road and highway network. Given relatively long trip distances between major generators and attractors – a trip from Seaton to the future York University Campus would be around 20 km – it will be vital to provide convenient and fast rapid transit within and through the corridor in order for the service to be competitive with the private automobile.

2.2.3. Forecasting Approach & Assumptions

This section describes the approach used to forecast travel demand on the 407 East Transitway as well as future network assumptions, other transit services in the corridor and the proposed station, route alignment, and operating strategy.

2.2.4. Model Background

Travel demand modelling activities were performed using the GGHM, a state-of-the-art four-stage multi-modal travel demand model used to estimate future travel demand within and through the GGH. The GGHM was developed to forecast peak period travel patterns in support of *Growth Plan* policies and infrastructure planning. The model was originally calibrated using 2006 TTS data and a 2011 forecast was developed and calibrated using 2011 Census data. Future year forecasts for 2031 were developed by IBI Group and Hemson Consulting. Travel demand and ridership forecasts for this study have been developed for the A.M. peak period, peak direction which is the westbound direction, as eastbound AM transit travel in the Kennedy Road to Brock Road Section is minor.

2.2.5. Model Sensitivity

The GGHM is sensitive to a number of inputs such as increased auto congestion, improved transit services, demographic shifts, changing travel times, and land use patterns. The model is able to predict changes in travel behavior within reasonable accuracy in relation to these factors providing realistic estimates of future travel patterns and network performance.

Though the model is a powerful strategic planning tool, it does come with some limitations. As the model has been calibrated to 2006 travel data, it assumes that the travelers of the future will behave and make choices as travelers do today. This may or may not be accurate given that many users currently perceive transit as inferior to driving – especially in less urban areas. It is possible that society will evolve towards one that is more environmental and energy conscious will make transit more attractive. The GGHM is unable to evaluate the impact of future technologies such as driverless cars and paradigm shifting changes in fuel costs. Likewise, the effect of large-scale changes in urban form – for example the redevelopment of the Highway 7 corridor into a more pedestrian friendly environment with fundamentally shifted transit mode share – is difficult to predict given that the model is calibrated to data from 2006. Finally, as transit ridership forecasts are dependent on land use inputs, the ridership forecasts are only as accurate as the current understanding of where and how the GTHA will develop by 2031.

2.2.6. Transportation Network Assumptions

Future year road and transit networks were developed to represent likely 2031 conditions based on provincial and municipal plans and policies. The original GGHM networks reflects model base year of 2006 and these were revised to represent conditions in 2011 and anticipated conditions in 2031.

Transit network upgrades to 2011 included revising the GO Bus network and modifying local transit routes based on updated agency service plans. Particularly relevant to this study was the inclusion of the DRT Pulse BRT service and updates to the VIVA network.

Transit infrastructure included in the 2031 model came from a number of sources including municipal transit service plans, and *The Big Move* – the 25 year RTP for the GTHA developed by Metrolinx. The following relevant rapid transit projects were included in the 2031 network:

- Toronto-York Spadina Subway Extension;
- 407 Transitway Central Section (Jane Street to Kennedy Road);
- VIVA routes and busways;
- Mississauga 403 Transitway;
- Eglinton Crosstown LRT;
- Sheppard LRT;
- Finch West LRT;
- Yonge Subway Extension to Richmond Hill;
- Two-way all-day GO Rail service (Regional Express Rail); and,
- Scarborough RT Extension.

Two versions of the final 2031 model were run – a base case without the Transitway extension and one that included the 407 Transitway East to quantify and isolate the overall network and travel demand impacts of this facility.

A number of road network improvements were included in the 2031 network – based on a minimum level of expansion assuming committed and funded projects. Highway expansions included in the 2031 model are shown in **Table 2.2**. Other major/regional roads in Durham and York Region were extended and widened, based upon the preferred road network in their respective TMP’s.

TABLE 2.2: HIGHWAY EXPANSIONS INCLUDED IN 2031 NETWORK

CORRIDOR	REGION	FROM	TO	DESCRIPTION
Highway 400	York	Major Mackenzie	Ninth Line	Widening (6 to 8 lanes)
Highway 401	Peel	407 ETR	Highway 403	Widening (6 to 8/12 lanes)
Highway 401	Toronto	Avenue Road	Leslie Street	EB collector widening (+1 lane)
Highway 401	Halton/Peel	Martin Street	Highway 403	Add 1 HOV lane in each direction
Highway 401	Durham	Brock Road	Harmony Road	Add 1 HOV lane in each direction
Highway 403	Halton	QEW	407 ETR	Widening (4 to 6 lanes)
Highway 403	Peel	407 ETR	Eglinton Avenue West	Widening (6 to 8 lanes)
Highway 403	GTHA	Entire length	Entire length	Add 1 HOV lane in each direction
Highway 404	Toronto/York	Highway 401	407 ETR	Widening (8 to 10 lanes)
Highway 404	York	407 ETR	Major Mackenzie Drive	Widening (6 to 10 lanes)
Highway 404	York	Major Mackenzie	Green Lane	Widening (4 to 6 lanes)
Highway 404	York	Green Lane	Ravenshoe Road	New 4 Lane Facility
Highway 404	Toronto/York	Highway 401	Green Lane	Add 1 HOV lane in each direction
Highway 407 ETR	Halton	QEW	Highway 403	Widening (4 to 6 lanes)
Highway 427	Toronto/York	Highway 409	Highway 407 ETR	Add 1 HOV lane in each direction
Highway 407 ETR	Peel/York	Highway 401	Highway 404	Widening (8 to 10 lanes)
Highway 407 ETR	York	Highway 404	York-Durham Line	Widening (6 to 8 lanes)
Highway 407 ETR	Durham	York-Durham Line	Brock Road	Widening (4 to 6 lanes)
Highway 407 ETR	Durham	Brock Road	Highway 35/115	New 4 Lane Tolled facility
West Durham Link	Durham	Highway 401	407 ETR East	New 4 Lane Tolled facility
East Durham Link	Durham	Highway 401	407 ETR East	New 4 Lane Tolled facility
QEW	Halton	Guelph Line	Trafalgar Road	Widening (6 to 8 lanes)
QEW	GTHA	Entire length	Entire length	Add 1 HOV lane in each direction

Source: www.highway407east.com, MTO Southern Highways Program, MTO HOV Lane Network Plan

2.2.7. Transitway Station Locations and Parallel Transit Services

Given the role of the 407 Transitway East to provide high quality point to point rapid transit service connecting major nodes and trip generators in the area – an understanding of existing and future transit services is necessary. This section of the Transitway will operate only in York and Durham Regions meaning DRT and York Region Transit (YRT/VIVA) will be most responsible in providing seamless connections. Additionally, though this section of the Transitway will only span these two regions – other agencies, including GO Transit and the TTC will be affected given current and future projects that may connect to or use the dedicated Transitway alignment. Currently DRT services terminate south of the study area, but the construction of a dedicated rapid transit alignment in the 407 corridor would facilitate improved service through local connections. DRT would be the natural choice to operate many of these routes – specifically those providing connections to Pickering, Seaton, and other population centers in Durham Region. Existing higher order services in the study area were shown previously in **Figure 2.1**.

GO Transit

GO Transit operates rail and bus services within the 407 ETR Corridor. The Stouffville Rail Line provides peak

service connections between the Study Area and downtown Toronto while another planned future service on the Havelock Line, will provide connections between Havelock, the City of Peterborough, the Pickering Airport, East Markham, and downtown Toronto. Currently three GO Rail Stations are located near or within the Study Area, all a part of the Stouffville GO Line:

- **Unionville Station:** This is the main transit hub supporting the development of the Markham Centre Mobility Hub located near 407 ETR and Kennedy Road. This is expected to be a major transportation hub in the future given its location at the intersection of the 407 Transitway, the Highway 7 VIVA rapidway, and the Stouffville GO Line;
- **Centennial Station:** This station is located roughly 2 km north of the potential 407 East Transitway near McCowan Road in the City of Markham; and
- **Markham Station:** This station is also about 2 km north of 407 ETR on Markham Road about 3 km east of Centennial Station.

In the assumed Transitway operation, Unionville Station would provide seamless transfers between the 407 Transitway and the Stouffville GO Line. Centennial and Markham stations could also be integrated with the Transitway using local services, and would also act as alternative stations for park and ride trips to downtown Toronto (and other GO Rail destinations). Introduction of GO Transit service on the Havelock Line would result in one or more additional GO Stations serving the Study Area.

There are also a number of GO Bus routes providing regional services in this corridor including the 70-71 routes providing bus service along the Stouffville Line outside of peak periods and the 52 and 54 407 East routes connecting Durham Region to York University. In future year networks, it is assumed that these services would have access to the Transitway in order to provide the most efficient and convenient services to all travelers.

YRT/VIVA

YRT operates local, express, and VIVA routes near and along the 407 ETR Corridor. VIVA services include the VIVA Purple, Pink and, Green lines, which link the 407 East Corridor to York University, the Markville Shopping Centre, and Markham Centre where connections are available for passengers to transfer to Finch Station on the Yonge Subway and eventually the TTC North Yonge - Richmond Hill Subway extension. Three express routes (301, 303, and 304) make local stops in the City of Markham before travelling express along the 407 ETR to Finch Station. Local YRT services in the study area include Route 1 along Highway 7 from Donald Cousens Parkway to Yonge Street; Route 8 along Kennedy Road from Major Mackenzie Drive to Steeles Avenue; and Route 9 along Ninth Line from 407 ETR to the Stouffville GO station.

The success of VIVA in increasing transit use in York Region is encouraging when considering the addition of new rapid transit service in the eastern 407 corridor. New Transitway services will need to be planned and coordinated with VIVA routes and local services to provide effective first and last mile options, and to ensure the Transitway serves distinct trip markets are not redundant and avoid competing with other agencies. While VIVA routes serve local trips within York Region, services on the 407 Transitway are anticipated to serve a regional purpose focused on long distance and inter-regional travel.

Durham Region Transit

Though there are currently no DRT routes serving the eastern 407 corridor, much of the area is within DRT's service jurisdiction and DRT routes will play a major role in the future. Most DRT routes terminate at or south of Taunton Road as this represents the current urbanized area boundary. In some parts of Durham region, specifically Ajax, development is not expected to occur north of Taunton Road given the location of the Ontario Greenbelt. However in Pickering, the Seaton Community is planned to be built between Taunton Road and Highway 407 ETR East. This development will be served by DRT, likely with local routes connecting Seaton to the rest of Pickering, and rapid transit routes providing regional services via the 407 Transitway East. DRT routes have been assumed in the future network to provide a base LOS in Seaton and to provide last mile connections to Transitway stations at Brock Road and Whites Road.

Toronto Transit Commission

Though the TTC generally operates within the City of Toronto south of Steeles Avenue, there are two buses that intersect the eastern 407 ETR Corridor. Route 129a runs from Major Mackenzie Drive and McCowan Road south to Scarborough Civic Centre, where it connects to the SRT. Route 102D runs south along Markham Road from Mount Joy GO Station to Warden Station on the Danforth Line of the TTC Subway. While these are operated by TTC, they are YRT contracted routes, and integrate with YRT services north of Steeles.

The central portion of the 407 Transitway, west of Kennedy Road, would provide critical connections to two TTC subway lines including the currently under construction TYSSE and the planned Yonge North - Richmond Hill Subway extension. Designing high quality connections to these routes would provide Transitway passengers with several rapid transit options to get from the study area to major work and school destinations in York Region and the City of Toronto.

2.2.8. Route Structure and Operating Characteristics

The proposed route structure was influenced by projected 2031 travel demand, existing agency routes, and designed to be consistent with the preferred route structure developed during the EA of the central section of the 407 Transitway – from Highway 400 to Kennedy Road. The route structure assumes integrated bus operations serving key nodes like Markham Centre, Richmond Hill Centre, York University, and the Seaton Community. In order to efficiently serve all transit markets in the corridor, two service types are suggested: base spine services, and no-transfer services. The full complement of routes and proposed stations are shown in **Figure 2.4** and are described below. Note that the conceptual route structure assumes that the Central Transitway has been built, and that other transit vehicles such as GO Bus and YRT/VIVA are able to access the Transitway for portions of their trips.

Base Spine Services (shown in blue in **Figure 2.4**) will provide continuous line-haul service on the Transitway with a short effective headway of between 3-10 minutes. Routes considered in the conceptual operating strategy include:

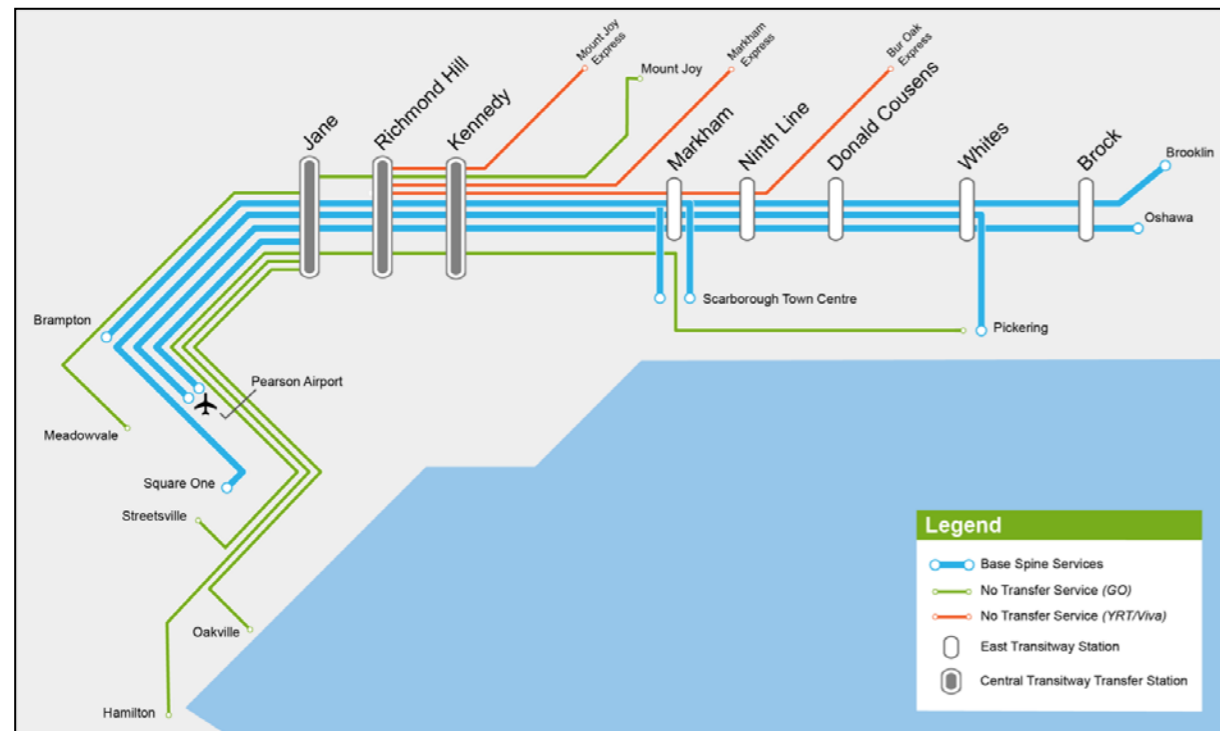
- Bramalea City Centre in the City of Brampton to Scarborough Town Centre;
- Mississauga Square One to Pickering; and,
- Pearson International Airport to Oshawa.

Spine services would operate as a rapid transit service and vehicles would only stop at Transitway stations, their origin, and final destinations. Intermediate stops off of the Transitway could be added but may not be desirable given the impact on travel times. Spine services could also operate as express to provide faster service between major activity centers, but these types of operations would require passing lanes at some stations. Given the flexibility of buses, spine services could be added or modified based on demand and changing development patterns.

No-Transfer Services (shown in red and green in **Figure 2.4**) would provide direct connections between major activity centers and residential areas across the GTA generally with lower headways in the order of 10 to 30 minutes. Eastern routes considered in the conceptual operating strategy include:

- Pickering to York University; and,
- Mount Joy to Richmond Hill/Vaughan.

FIGURE 2.4: CONCEPTUAL 407 TRANSITWAY EAST ROUTE STRUCTURE



Similar to the 407 ETR GO Bus, these routes would serve long-distance trips and connect to local transit at major transfer points. No-transfer services could be integrated into the regional network by operating on other committed and proposed transit corridors such as the 403 Transitway in the City of Mississauga and a potential Transitway on Highway 427. Similar to spine services, no-transfer services could be altered and modified to meet demand. These routes would be served by a combination of GO Transit coach buses and local transit buses.

2.2.9. Station Selection Criteria and Results from the Transportation Perspective

All existing and future 407 ETR interchanges were assessed from a transportation perspective. The results form part of the overall station alternative screening and evaluation process described in **Chapter 4** of the EPR. Criteria used include:

- **Potential transfer demand:** What present or future transit routes are located near the station? What spine or no-transfer services would benefit from this location?
- **Connections to other transportation hubs:** Are there GO Rail Stations or other transportation hubs near the station?
- **Potential walk-in demand:** How many jobs/residents are located within walking distance (1 km) of the station?
- **Major trip generators served:** Are there or will there be any major employment or residential nodes near the station?

Selecting not only the optimal location of stations – but also the appropriate number – were critical considerations when developing the conceptual operating strategy. A higher number of stations would lead to more coverage and potential walk-in demand while a smaller number of stations would limit demand from this particular group. Including too many stations could greatly reduce average running speeds on the Transitway which could result in potential users choosing to drive rather than take transit given disparities in travel times.

TABLE 2.3: 407 TRANSITWAY EAST STATION EVALUATION AND SCREENING PROCESS RESULTS

CRITERIA	KENNEDY (FIXED TERMINUS)*	MCCOWAN	MARKHAM	NINTH LINE	DONALD COUSENS	YORK DURHAM LINE	WHITES	ROSSLAND	BROCK
Potential Transfer Demand	●	◐	◐	◐	◐	○	◐	◐	◐
Connections to Transportation Hubs	●	○	○	○	◐	○	◐	◐	○
Potential Walk-in Demand	◐	◐	◐	◐	◐	○	◐	◐	◐
Major Trip Generators	●	○	◐	○	○	○	●	◐	◐
Overall Rating	●	◐	◐	◐	◐	○	◐	◐	◐

*Kennedy included for context only; it is a part of the Central Section and will not be screened out

Based on the transportation, environmental and engineering feasibility screening (discussed in detail in Chapter 4), the conceptual operating strategy shown in Figure 2.4 was refined and developed to serve only the following stations with the others being screened out:

- Kennedy Road (western Terminus);
- Markham Road;
- Ninth Line;
- Donald Cousens Parkway;
- Whites Road; and,
- Brock Road (eastern terminus).

2.3. Future Travel Demand

2.3.1. Total Trips

Existing and future travel for major travel patterns in the 407 East Corridor is summarized in Table 2.4 and Figure 2.5. These forecasts assume that there is no dedicated rapid transit on 407 east of Kennedy Road and shows the overall need for more transit given rapid travel growth – especially in the west and southbound directions. Overall, extremely large growth of 90% is expected in total corridor motorized travel. Auto trips are expected to grow faster than transit – in terms of a percent and total growth – and some markets see transit percentage share decrease especially for southbound travel. This is due to the addition of the Highway 407 extension which provides a convenient north-south corridor for drivers to travel between Highway 401 and Highway 407. Furthermore, this forecast does not include the Highway 407 Transitway East, so as a result new developments in the area have limited regional transit access. Growth occurs in nearly all directions as a result of the development of the Seaton Community which generates two-way travel as both an employment and population center. The Seaton Community is expected to create a number of new travel markets between the study area, Town of Ajax, City of Pickering, and elsewhere in the Region of Durham. Given a lack of transit services and the prevalence of long trip distances in these travel markets, nearly all of these new trips are forecasted to be made by automobiles. While the 407 Transitway may not address all of these markets it shows that demand exists to support higher order transit that can provide a viable alternative to auto travel in terms of cost and time.

Emerging transit markets are observed to add over 7,000 A.M. peak period transit trips in the west and southbound directions. These trip markets must be supported by quality services to support transit and reduce auto dependency. Travel demand will be driven by activity at UGCs and activity north of Highway 401 in the Cities of Markham, Vaughan, and Scarborough, and the Town of Richmond Hill. By 2031 there are expected to be nearly 30,000 trips from the Study Area to the Cities of Markham, and Vaughan, and the Town of Richmond Hill which is an increase of roughly 10,000 A.M. peak period trips compared to levels today. There are also an additional 7,000 trips from the study area to Scarborough compared to only 800 to downtown Toronto showing a shift in travel patterns as the 407 corridor and the northern GTA become more intensified.

TABLE 2.4: A.M. PEAK PERIOD MOTORIZED TRAVEL IN THE 407 EAST CORRIDOR, 2011-2031

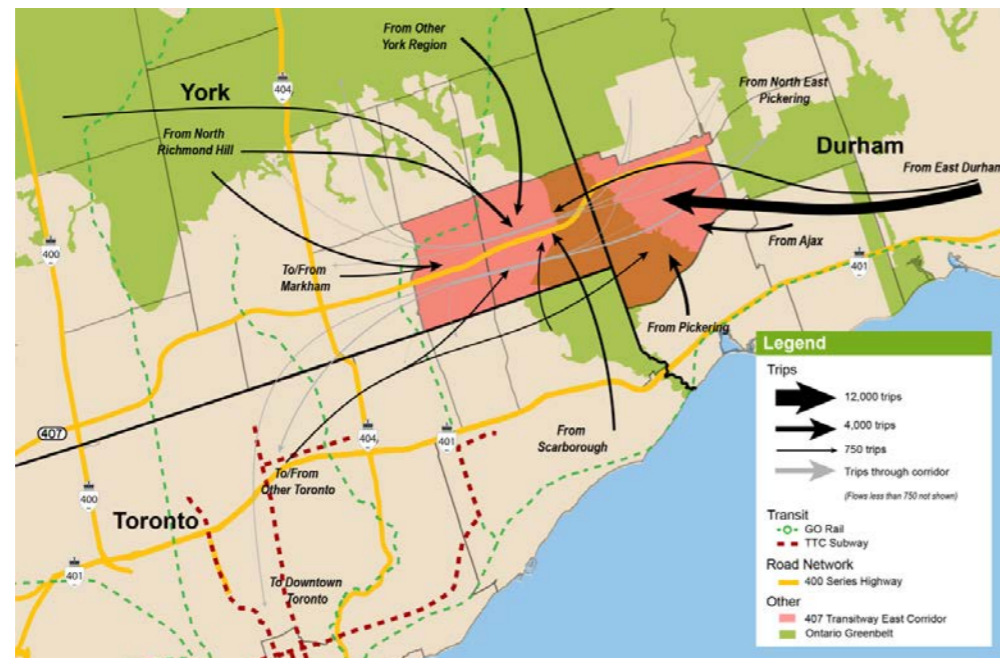
TRIP INTERCHANGE	TRANSIT	AUTO	MOTORIZED	TRANSIT SHARE
2011 A.M. Peak Period				
Within Corridor	500	18,000	18,500	3%
To/From South	8,200	21,800	30,000	27%
To/From West	700	19,400	20,100	3%
To/from North	600	10,100	10,700	6%
To/From East	-	1,800	1,800	0%
Through Eastbound	100	5,000	5,100	2%
Through Westbound	100	10,100	10,200	1%
Total	10,200	86,200	96,400	11%
2031 A.M. Peak Period				
Within Corridor	1,100	24,500	25,600	4%
To/From South	12,500	52,200	64,700	19%
To/From West	3,500	36,000	39,500	9%
To/from North	800	21,100	21,900	4%
To/From East	100	16,500	16,600	1%
Through Eastbound	100	5,200	5,300	2%
Through Westbound	500	8,700	9,200	5%
Total	18,600	164,200	182,800	10%
Growth (2011 to 2031)				
Within Corridor	600 (120%)	6,500 (36%)	7,100 (38%)	2% (59%)
To/From South	4,300 (52%)	30,400 (139%)	34,700 (116%)	-8% (-29%)
To/From West	2,800 (400%)	16,600 (86%)	19,400 (97%)	5% (154%)
To/from North	200 (33%)	11,000 (109%)	11,200 (105%)	-2% (-35%)
To/From East	100 -	14,700 (817%)	14,800 (822%)	1% -
Through Eastbound	- (0%)	200 (4%)	200 (4%)	0% (-4%)
Through Westbound	400 (400%)	(1,400) (-14%)	(1,000) (-10%)	4% (454%)
Total	8,400 (82%)	78,000 (90%)	86,400 (90%)	0% (-4%)

Auto = Non Transit Vehicles, Motorized = Transit + Auto

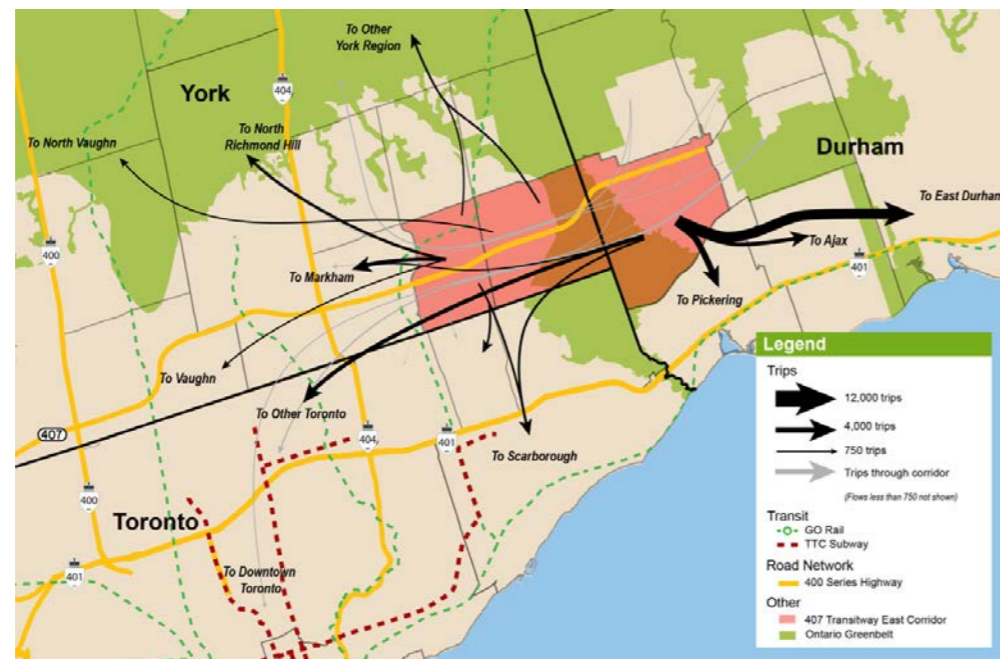
Within Corridor = traffic Increase within study limits.

To/From South = Traffic Increase traveling to the Transitway Corridor from south of Transitway Corridor or vice versa, etc.
Note: Percent growth shown in parentheses; forecasts assume no 407 East Transitway
Source: 2011 and 2031 Greater Golden Horseshoe Model

FIGURE 2.5: 2011 TO 2031 A.M. PEAK PERIOD MOTORIZED TRAVEL GROWTH
A. TRIPS TO THE STUDY AREA



B. TRIPS FROM THE STUDY AREA



Source: 2011 and 2031 Greater Golden Horseshoe Model

2.3.2. 407 Transitway Ridership Forecasts

Ridership for the East Transitway is based on current information available and accepted projects and is subject to change in the future as more accurate information becomes available. The study was developed based on the latest officially approved horizon (2031) at the time of this assignment. 2041 allocations are available to the municipal level only; they have not been officially publicized. All relevant findings and conclusions will be confirmed prior to Detail Design based on official forecasts available at that time.

For 2031, 407 Transitway East ridership forecasts have been developed using the GGHM for the 5 station (6 including Kennedy) alignment and the conceptual operating strategy shown in Figure 2.4. The resulting forecasts are shown for the 2031 A.M. Peak Period in Table 2.5 which shows boarding and alighting estimates by station and Figure 2.6 which shows transit volumes on the Transitway between Kennedy Road and Brock Road. The eastern section has a peak point of 5,000 westbound A.M. peak period passengers entering Kennedy station and the entire Transitway – including the central section – has peak point volumes of 11,500 passengers entering Yonge Station. Demand is highly directional with more than three times as many westbound passengers as eastbound during the A.M. peak period.

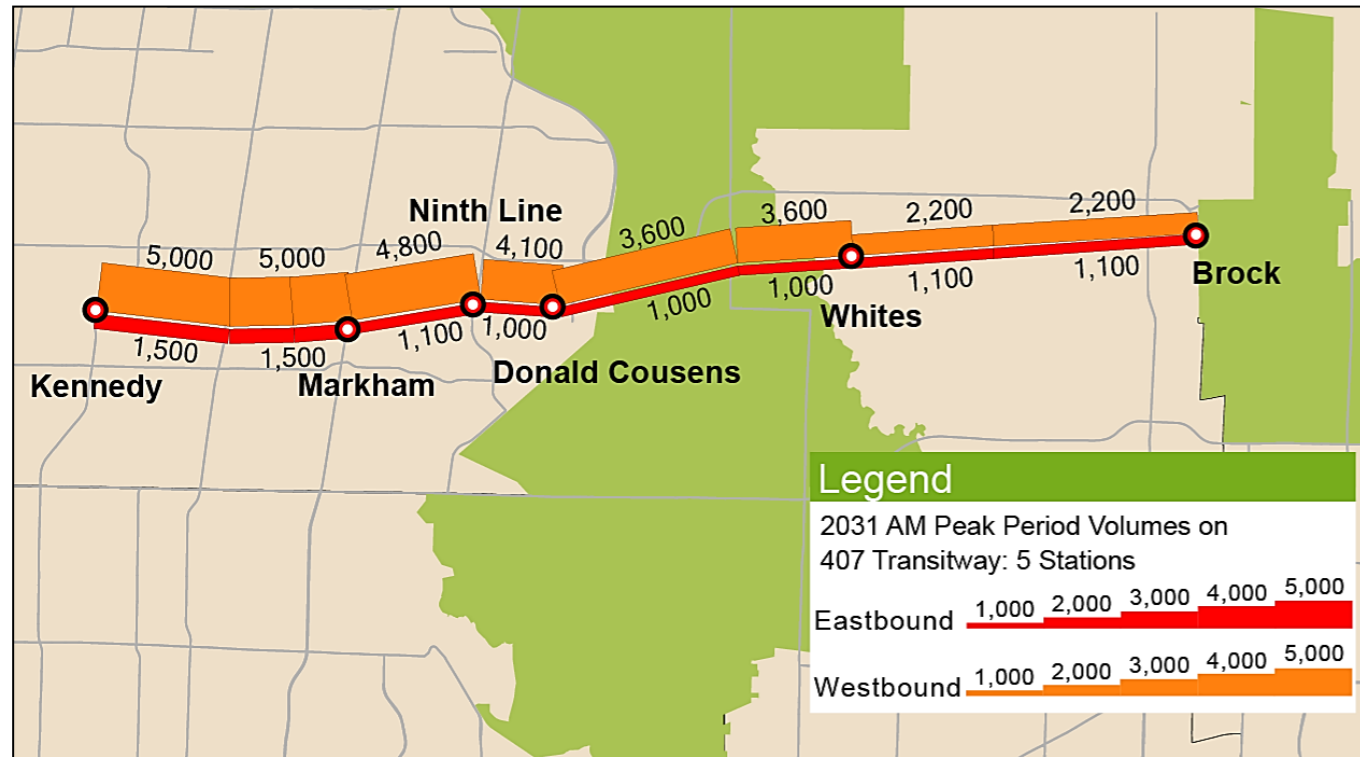
TABLE 2.5: 2031 PROJECTED A.M. PEAK PERIOD BOARDINGS AND ALIGHTINGS AT 407 EAST TRANSITWAY STATIONS

Station	Westbound					Eastbound				
	Station Board	Branch On*	Station Alight	Branch Off*	Volume	Station Board	Branch On*	Station Alight	Branch Off*	Volume
Brock Road	480	1,690	20	0	2,200	90	0	30	1,110	0
Whites Road	580	1,480	600	0	3,600	600	0	10	530	1,100
Donald Cousens Pkwy	510	0	20	0	4,100	30	0	70	0	1,000
Ninth Line	670	0	10	0	4,800	20	0	80	0	1,000
Markham Road	710	100	20	600	5,000	20	80	20	490	1,100
Kennedy Road (Central Section)	4,950	0	430	0	9,500	290	2,000	790	0	1,500
Total	7,900		1,100			1,100		1,000		

Source: GGHM 2011 and 2031

*Refers to no-transfer and spine service transit vehicles entering and exiting Transitway alignment

FIGURE 2.6: 2031 PROJECTED A.M. PEAK PERIOD 407 EAST TRANSITWAY VOLUMES



Source: 2031 GGHM

Table 2.6 shows the access modes for 2031 westbound A.M. peak period Transitway boardings between Kennedy Road and Brock Road. East of Kennedy Road, roughly 53% of Transitway trips are no transfer boardings, 40% are park-and-ride (PnR) with the remaining 7% accessing transit by walking or transferring from other services.

The majority of riders entering the Transitway in the two easternmost stations – Brock Road and Whites Road – will access via no-transfer (base spine) services, boarding buses before they arrive at the Transitway. Buses from Pickering UGC enter the Transitway at Whites Road, while Brock Station serves as the access point for buses starting in Brooklin and Oshawa. The no-transfer services combined with high travel speeds on the Transitway allow for a very attractive travel option for residents of these areas travelling to the Cities of Markham, Richmond Hill, and Toronto. The buses entering at Whites Station would also serve residents of Seaton meaning ridership on this route would be contingent on emerging population and employment in Seaton.

With the exception of users boarding at these two stations – others boarding east of Kennedy Road are highly dependent on park-and-ride for transit access. Park-and-ride percentages at Donald Cousens, Ninth Line, and Markham Road are all around 75% which is in the lower range of park-and-ride mode share observed at GO Rail stations in rural areas and Durham Region. The park-and-ride percentages could be higher in the future if density around stations does not increase and/or local services are not well integrated with the Transitway.

TABLE 2.6: ACCESS MODES FOR 2031 WESTBOUND A.M. PEAK PERIOD TRIPS ON 407 EAST TRANSITWAY

Station	Westbound (peak direction travel)				Westbound (peak direction travel)			
	PnR	Walk/Transit	Interline	Total	PnR	Walk/Transit	Interline	Total
Brock Road	450	30	1,690	2,170	21%	1%	78%	100%
Whites Road	540	40	1,480	2,060	26%	2%	72%	100%
Donald Cousens Pkwy	380	130	0	510	75%	25%	0%	100%
Ninth Line	500	170	0	670	75%	25%	0%	100%
Markham Road	610	100	100	810	75%	12%	12%	100%
Kennedy Road (Central Section)	820	4,130	0	4,950	17%	83%	0%	100%
Total	3,300	4,600	3,270	11,170	30%	41%	29%	100%

Source: 2031 GGHM

2.4. Future Transportation System Needs and Opportunities

Extending the 407 Transitway from Kennedy Road to Brock Road will greatly alter regional transportation trends and choices in Durham and York Regions. There will be positive impacts for auto travel as well given that users would choose transit instead of driving, thereby removing cars from the road. Table 2.7 shows major westbound (peak direction) travel markets served by the Transitway during the 2031 A.M. peak period.

TABLE 2.7: WESTBOUND A.M. PEAK PERIOD TRIPS USING THE 407 TRANSITWAY EAST

Destination	From Corridor	From East of Corridor	Total
To Corridor	40	180	220
To Markham, Vaughan, Richmond Hill	380	350	730
To Other York Region	20	30	50
Total to York Region/Corridor	440	560	1,000
To Toronto PD1	1,400	0	1,400
To Northern Toronto	1,110	1,330	2,440
To Other Toronto	540	630	1,170
Total to Toronto	3,050	1,960	5,010
Total To other	130	80	210
Total	3,620	2,600	6,220

Source: 2031 GGHM

Though this section of the Transitway operates in York and Durham Regions, the City of Toronto is the main destination for Transitway riders, attracting nearly 80% of westbound demand during the A.M. peak period. In the A.M. peak hour, nearly 1,400 riders would use the Transitway for travel between the corridor and Toronto Planning District One (PD1) while the majority of Durham residents would continue to use the GO Lakeshore East line for downtown Toronto travel. About 40% of Transitway trips are destined for north Toronto which includes York University, North York Centre, and other locations between Steeles Avenue and Highway 401. Trips destined elsewhere in the City of Toronto include those destined to Scarborough Civic Centre, Yonge Street and Eglinton Avenue, and other destinations along the Yonge Subway Line. Depending on their final destinations, riders would travel to/from the Transitway to the City of Toronto using the GO Rail Stouffville Line, the Yonge Subway Line, or the TYSSE. The Transitway would be a key east-west transit connection to provide access to these lines and support a regional transit network that makes transit a viable option for the majority of travelers.

Over 1,000 travelers in and east of the corridor are expected to use the Transitway for trips to employment areas in York Region including the Cities of Markham and Vaughan, and Town of Richmond Hill. Connecting the corridor and eastern Durham Region to activity nodes near 407 ETR is one of the main roles of the Transitway and these markets compose about 40% of westbound A.M. peak ridership. Increasing ridership in these markets could be achieved by better aligning no-transfer routes with identified travel patterns, and/or increasing travel speeds to be more competitive with driving. Additionally – shifting land use in the Highway 7 corridor and elsewhere in York Region may also drive up transit demand and produce more than the 1,000 rides included in current forecasts.

Beyond providing new travel options, the 407 Transitway East will have localized and regional travel impacts as summarized in **Table 2.8** showing increases in transit and decreases in auto demand due to the addition of the 407 Transitway East.

The Transitway would have an impact on travel within and through the corridor resulting in an increase of 2,100 A.M. peak period transit trips while reducing auto demand by 1,000 during the same period. Overall transit travel in the study area would increase by 11% due to the eastward extension of the 407 Transitway to Brock Road which represents a significant growth in transit riders.

The 2,100 new transit trips represent approximately one quarter of the 9,000 A.M. peak period boardings between Kennedy Road and Brock Road. These are net new transit trips which indicates that they are choice riders that have shifted from driving to the Transitway. Since nearly one quarter of riders on the 407 Transitway East are choice or new riders, this indicates the 407 Transitway is serving new and emerging markets and not simply replacing or enhancing existing services. This supports the need for higher order transit in this corridor and suggests that there is a strong potential market for this type of service.

Besides new transit users, the remainder of Transitway users would shift from other transit routes with the majority choosing to use the 407 Transitway East over the GO Lakeshore East line and existing GO Bus services. Roughly 1,200 passengers on the GO Lakeshore East would elect to use the 407 Transitway East given the option which represents about 4% of ridership on this line between Pickering and Rouge Hill that would provide significant relief on this corridor.

TABLE 2.8: 2031 A.M. PEAK PERIOD TRAVEL DEMAND CHANGES DUE TO 407 TRANSITWAY

Travel Market	Transit	Auto	Motorized	Mode Split
407 Transitway Central Section (Highway 400 to Kennedy Road) only				
Within Corridor	1,100	24,500	25,600	4%
To/From south	12,500	52,200	64,700	19%
To/From West	3,500	36,000	39,500	9%
To/from North	800	21,100	21,900	4%
To/From East	100	16,500	16,600	1%
Through Eastbound	100	5,200	5,300	2%
Through Westbound	500	8,700	9,200	5%
Total	18,600	164,200	182,800	10%
407 Transitway Highway 400 to Kennedy Road and Kennedy Road to Brock Road				
Within Corridor	1,200	24,400	25,600	5%
To/From south	13,400	51,500	64,900	21%
To/From West	3,900	35,600	39,500	10%
To/from North	900	21,200	22,100	4%
To/From East	300	16,400	16,700	2%
Through Eastbound	200	5,300	5,500	4%
Through Westbound	800	8,800	9,600	8%
Total	20,700	163,200	183,900	11%
Changes due to adding dedicated service on 407 Transitway from Kennedy Road to Brock Road				
Within Corridor	100	-100	0	0%
To/From south	900	-700	200	1%
To/From West	400	-400	0	1%
To/from North	100	100	200	0%
To/From East	200	-100	100	1%
Through Eastbound	100	100	200	2%
Through Westbound	300	100	400	3%
Total	2,100	-1,000	1,100	1%

Auto = Non Transit Vehicles, Motorized = Transit + Auto

Within Corridor = traffic Increase within study limits.

To/From South = Traffic Increase traveling to the Transitway Corridor from south of Transitway Corridor or vice versa, etc.

Source: 2031 GGHM

While demand on parallel east/west transit corridors would decrease, ridership on north/south transit routes would increase with the addition of the 407 Transitway East. Southbound ridership on the Yonge Subway Line would increase by about 3,500 A.M. peak period riders and the TYSSE by about 2,300, of which 1,400 are destined for Downtown Toronto (PD1), and on the Stouffville line by around 100, for an overall increase of roughly 10% in southbound transit travel during the A.M. peak period. These impacts should not be overlooked as adding nearly 6,000 new A.M. peak period riders to these routes could have adverse impacts on service levels and users boarding further downstream. Given that many north/south lines, the Subway Line in particular, are congested even in 2015, any impacts on capacity must be considered and additional routes and/or capacity must be added in order to minimize negative impacts on current and future riders.

Finally, the 407 Transitway East will provide a small amount of congestion relief on regional roads and highways in the study area as measured by comparisons of vehicle kilometers travelled (VKT) with and without the 407 Transitway East. Adding stations east of Kennedy Road results in a 1% reduction in VKT on 407 ETR as well as a 1% reduction in VKT on local and regional roads located within the corridor. Impacts on specific links and streets may be higher but overall, the Transitway alone will not greatly alter auto oriented development in this part of the GGH. Combining the Transitway with targeted regional and local policy and TDM initiatives could cause more transformative reductions in auto travel that cannot be achieved solely by providing transit services.

High travel demand, shifting land uses, and a limit to the amount of road capacity that can and should be built are all driving the need for high order rapid transit in the northeastern GTA. Current 2031 ridership projections show that there is demand to support transit and eventual demand may exceed these forecasts if the Transitway is integrated into communities through policies that create walkable and transit friendly destinations. The 407 Transitway East would serve as a critical piece of an integrated regional transit network in the GGH and the flexibility of no-transfer services could allow quick responses to land use shifts and changes in travel demand. The 407 Transitway East would provide a realistic and convenient alternative to driving, supporting provincial and regional policies, while creating a sustainable region with a variety of travel options.

2.5. Future Travel Demand 2031 to 2051

As explained in Section 2.2.4, the future travel demand modelling activities for this study were performed using the GGHM which applied a future year time horizon of 2031. This is the recognized and approved model and forecast horizon for the GTA. However during the course of this study it was recognized that beyond 2031 there will be further population and employment growth in the corridor and in the GTA which will affect the study area and result in higher passenger demand on the 407 Transitway.

This study recognizes that it is critical to ensure that the Transitway will be able to accommodate growth in travel demand in the corridor beyond 2031. Given the long-term growth, individual stations were examined for potential growth opportunities and needs from 2031 to 2051. For station locations where space is available, protection of additional lands for future expansion of park-and-ride lots was incorporated into the preliminary design and parking lot layouts.