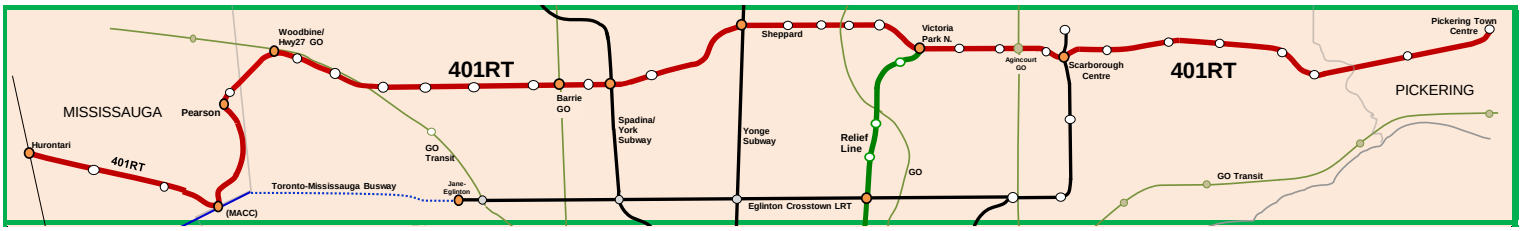

The 401RT: Rescuing Highway 401 and Decongesting Transportation in The Greater Toronto Area

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The absence of a singular east-west inter-municipal rapid transit line through the suburban middle of northern Toronto is the most significant factor in preventing major modal shifts to public transit. A review of MTO's AADT and commercial vehicle survey files indicates that on a typical weekday there are 1.8 million vehicles on Highway 401 between Hurontario Street in Mississauga and Liverpool Road in Pickering. Of these, approximately 1.5 million are non-commercial automobiles, carrying almost 1.7 million persons. As Toronto's population grows by more than 1.3 million by 2051, the functionality of Highway 401 in Toronto will be threatened. Population growth in the municipalities around Toronto will add to traffic pressures. (Note: This document assumes that within a few years COVID-19 impacts will have been overcome.)

Getting across the Greater Toronto Area from Scarborough to Pearson Airport, or from Hurontario Street in Mississauga to any point in North York, or to and from thousands of destinations in suburban Toronto, Mississauga and Pickering normally means driving a car. Most people will not ride a bus from Etobicoke or Scarborough to the Yonge Street or University/Spadina/York subways – it's simply too slow. The result is congestion and gridlock on Highways 401, 427, 409, the 404/Don Valley Parkway, the Gardiner Expressway and on city streets, and high emissions of greenhouse gases and pollutants (as evidenced by the clearer skies during the COVID-19 'lockdown'). Overall, traffic congestion on Highway 401 in Toronto is estimated to cost more than a billion dollars each year.

The Greater Toronto Airports Authority (GTAA) is concerned that more than 90% of all trips to Pearson International Airport are by automobile; the modal split for its surrounding employment area is similar. Forecasted growth in air travel will strain the GTAA's ability to provide access and car parking, and daily trips by more than 300,000 workers and visitors to the overall employment area contribute to clogged roads on Highway 401 and city streets. Because of the threats posed by growth-related congestion in the airport area, the GTAA is advocating the creation of a transit hub on its property at Airport Road. Its intention is to provide linkages among various current and planned bus and rail-based transit services.

Existing rapid transit services in Toronto are inadequate**:** GO Rail provides a radial service to and from the downtown core that is used by just 1% of Toronto residents per day. The Sheppard subway is too short to have an impact on traffic congestion. The Eglinton Crosstown LRT now

under construction is too far south in Toronto to produce a significant reduction in trips by automobile to and from most northern Toronto locations, including longer distance trips. The 18 stops on the planned 11-kilomeetre Finch West LRT will make that service too slow to attract a significant number of new transit riders, although most existing TTC users of the Finch bus will be better served. Improvements to transit in Toronto's employment areas and its underserved communities, particularly in northwest Toronto and eastern Scarborough, are necessary.

In April of 2019, the Ontario government committed to building several new rapid transit lines and extensions in Toronto (the Ontario Line, the Scarborough Subway, an extension of the Yonge subway, a western extension of the Eglinton Crosstown LRT). However, these may generate just 68 million new transit trips per year (+plus 7.7m for the Hurontario LRT). The Eglinton Crosstown LRT and GO Transit expansions may add another 167 million. However, as the scenario in the table below indicates, these will not be enough to stop the growth in trips by automobile, which may increase by close to 900,000 per day.

Estimate of daily trips in Toronto		**Auto Driver + Pssnger**	**Municipal Transit**	**GO Transit**	**Other**	**Total**
Toronto population 2051, adj. from Min. of Finance, ages 11+ only						4,092,709
Total daily trips, Toronto residents, @ 1.95 per day						7,964,100
Modal split, per 2016 TTS		57%	27%	1%	15%	100%
Estimated daily trips by mode, 2051, Toronto residents		4,539,500	2,150,300	79,600	1,194,600	7,964,100
Trips into Toronto from other municipalities, by 2051		340,900	161,500	6,000	89,700	598,000
Total trips in Toronto, by 2051		4,880,400	2,311,800	85,600	1,284,300	8,562,100
TTS 2016 trips in Toronto		3,150,000	1,492,100	55,300	828,900	5,526,300
Increase in total trips, before major transit initiatives*		1,730,400	819,700	30,300	455,400	3,035,800
Less major announced rapid transit enhancements:	Ann.					
GO Transit Enhancements (net; to 200m)	174	-563,800		563,800		0
Eglinton Crosstown LRT	20	-65,000	65,000			0
Finch West LRT Humber Coll to Spadina/York subway	4	-13,000	13,000			
Est. increase in transit trips arising from the 2019 Ontario rapid transit plan (excl.	68	-222,000	222,000			0
Net Increase in trips in Toronto, 2016 to 2051, after modal shifts resulting from current		**866,600**	**1,119,700**	**594,100**	**455,400**	**3,035,800**

* For Municipal transit, it is assumed that the TTC will undertake a variety of day-to-day enhancements over years to existing TTC services, e.g. adding buses & more trains to existing routes, to keep pace with population growth. Excludes new subway and LRT routes or extensions.

N.B. Toronto plans for LRTs on Jane, Sheppard East, Eglinton Avenue East and the waterfront are not included, and may add 110,000 new transit trips per

File: 401RT Demand Calc Re-Worked October 2017.xlsx

Additional practical public transit initiatives need to be constructed. Generally speaking, a rapid transit alternative for the 1.7 million daily non-commercial vehicle trips on Highway 401 between Pickering and Mississauga has not been considered. However, population growth dictates that a new rapid transit line across the northern half of Toronto is necessary if worsening traffic congestion and gridlock are to be avoided.

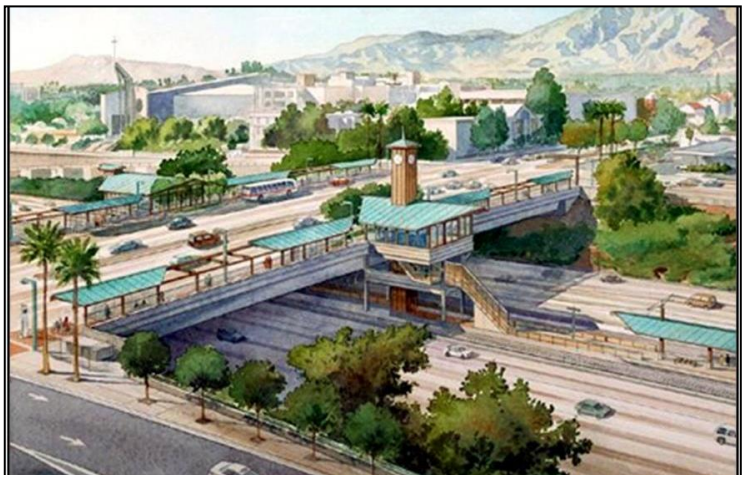
Highway 401RT

This document proposes the construction of a 54-kilometre suburb-to-suburb rapid transit line with up to 30 stations from Hurontario Street in Mississauga to Pickering Town Centre, and that it be mostly at-grade within the highway 401 corridor. This '401RT' is urgent infrastructure, is

practical and affordable, and ***with effort*** can be fully completed in less than 15 years. Planning for its construction should begin now.

The need for an east-west rapid transit line across northern Toronto is accentuated by the very dire consequences of not cutting greenhouse gas emissions that are causing rapid global climate destabilization and warming. Refer to Appendix 2 for more information.

It is estimated that the 401RT plus the addition of more than 400 buses for intersecting bus services will generate 205,000,000 million *new* transit trips per year by 2051, and more in subsequent years as the region's population continues to grow. Another 12 million or more trips per year may transfer from existing parallel bus routes. The 401RT can link travelers to at least nine intersecting rapid transit lines and 25 surface bus routes.



Pasadena California's Gold Mile concept is illustrated. Highway 401 is wider, and 401RT stations would be enclosed.

The 401RT would require a barrier-separated conversion to transit of the leftmost express lane in each direction on Highway 401, plus absorb shoulder lanes for platforms at stations. The width of rail cars can vary, but medium-capacity rail cars would not require that the transit right-of-way be slightly larger than the typical width of a highway lane. The 401RT would divert underground to intersect with the Sheppard Subway, incorporating it into the overall 401RT concept. Other tunneled diversions to and from key off-highway destinations include Pearson International Airport, the Woodbine station on the Kitchener GO Rail line, the Mississauga Airport Corporate Centre (MACC), Yorkdale subway station, Scarborough Town Centre and Pickering Town Centre, plus other destinations as may be desired. At-grade, the 401RT will directly serve northwest Etobicoke and eastern Scarborough, connecting residents to opportunities across all of Toronto. **An illustrative map of the 401RT concept is shown on the last page of this document.**

401RT stations in the highway corridor would use a single centre platform, accessed by station entrances above the highway where intersecting roads run above the highway, and below the highway where arterial roads run below the highway. Platforms would be between 20 and 25 feet wide and only one station (at Keele) would require movement of pillars that support overhead roadways.

An alternative alignment may be to bypass the Sheppard subway and continue the 401RT on the surface in the highway corridor with new stations at Yonge, Bayview, Leslie and Don Mills. This alignment may cost $400 million more than tunneling to/from Sheppard Avenue, but would enable a link to/from the Oriole GO station at Leslie Street. Using GO Transit from Richmond Hill to access the east-west 401RT may be more attractive for many travelers than using the planned extension of the Yonge Subway. With this alignment, travel on the 401RT would be somewhat

faster, with no diversion to the Sheppard subway, one less station stop and a slightly shorter distance. In this scenario, the Sheppard subway would be closed. Sheppard Avenue would be served by enhanced bus services running seamlessly from Scarborough to Etobicoke.

East of the 401-Islington station, the 401RT would run below grade until it can be routed above either the Kitchener GO Line tracks to the new Woodbine GO station and below grade as it approached Airport Road, or it can be routed above Belfield Road and Highway 409 to approaching Airport Road, where the 401RT would descend. The Belfield alignment has assumed that the Etobicoke North GO station would remain operational as the link between the Kitchener GO line and the 401RT, and that access to the close-by Woodbine entertainment area would be by enhanced bus services. Because the overall number of new and transfer trips on the 401RT would continue to increase, plus its integration with the Sheppard subway, and because longer average trip lengths means more occupancy per kilometre on trains, subway rather than light rail technology is the preferred mode.

Modal shifts to rapid transit would ensure that highway traffic would continue to flow well – a modal volume balance would be struck based on relative speeds and convenience between driving and using the 401RT. Overall, the conversion of one lane in each direction reduces Highway 401 road capacity between Hurontario Street and Pickering Town Centre by about 16% and, taking truck traffic into account, would require an average modal shift of cars of approximately 20% during peak periods for most highway segments to maintain current highway speeds. Analysis suggests that a large portion of people who use Highway 401 do so only because there is currently no public transit alternative that is practical, fast, comfortable and affordable. (see Transit Ridership Analysis section below.)

The 401RT diverts from Highway 401 west of Islington Avenue, and rejoins it east of Dixie Road, thereby avoiding lane reductions on one of the most congested parts of Highway 401, while at the same time reducing highway traffic volumes on that segment.

Most on-highway stations are entered from arterial roads crossing the 401 above the highway; others are entered from below, or are off-highway underground stations (Appendix 1). Due to constraints of space, station designs are recommended to be of a simple, practical nature. Passenger car drop-off and pick-up facilities can exist where space allows at Highway 401 on-ramp and off-ramp configurations. For stations where right turn on-ramps to Highway 401 would interfere with the safe movement of buses leaving 401RT station stops, left turns onto the 401 governed by traffic signals can replace circular right-turn on-ramps to the highway; alternatively, signal lights can enable bus merges.

Importantly, the 401RT concept includes 16 additional buses for each intersecting arterial bus route to improve service frequencies, plus a transit shelter at every bus stop on these routes. Most transit trips begin with a bus ride, and ensuring maximum comfort and convenience is essential. These improvements will tend to make the first/last kilometer segments of trips acceptable to more travelers. (Another new factor in enhancing the first/last mile experience is the advent of electric scooters. E-scooters enable relatively fast access to/from bus stops, especially in suburban areas, without muscular effort. Bus stops should include e-scooter and bicycle lock-ups.). Overall, the 401RT itself will generate 158 million new transit trips per year,

while improved TTC bus services on north-south routes that intersect with the 401RT will attract 47 million new non-401RT trips per year (see Transit Ridership Analysis section).

Without a 401RT or other singular rapid transit line of similar length and location across the northern half of Toronto and into Mississauga and Pickering, traffic congestion and its problems and costs cannot be resolved. Highway 401 will become more congested and at times become non-functional. An Ontario Ministry of Transportation official has indicated that the highway will not be able to accommodate travel demand growth much longer, as segments of the highway in Toronto cannot be widened further. It is critical that work on developing the 401RT begin now, as part of current rapid transit plans. Widening the highway is also contrary to the promotion of transit ridership and the reduction of greenhouse gas emissions and congestion on city streets. Very large GHG reductions in urban areas can only be achieved with expansions to mass transit systems.

Appendix 3 Answers a variety of questions or concerns that may be presented.

Indications of potential ridership demand for the 401RT concept can be ascertained via behavioural surveys of the general public, and subsequently tested over two or three years, using buses on a modified alignment, with up to 25 stops and not linked to the Sheppard subway. This test would require dedicated highway collector lanes or shoulder lanes, plus construction to adjust most off- and on-ramps to Highway 401, and traffic signal priority at ramp/arterial intersections wherever possible. Marketing of this express service test to encourage use should be aggressive. The test should include a distribution of additional buses that are proposed for the 401RT, assigned to the test and to arterial bus routes, and which provide both arterial express and local services. The capital cost of the test may be $200 million, and may achieve an operating revenue-to-cost ratio of 50%.

Travel Times

The 401RT would have a substantial positive effect on travel times for transit users, when compared to existing transit services and other proposed increases in LRT services. On average, stations on the 401RT are 1.7 kilometres apart, enabling speeds between stations to reach 80 kilometres per hour. The following illustration shows a selection of trip origins and destinations, and their trip times when using the 401RT compared to other modes.

Traveling on the 401RT:		***Keele at Lawrence to Centennial***		***Kipling subway stn. to***	
Pickering Town Centre to Yonge subway	29	***College in Scarborough:***		***Bathurst at Sheppard:***	
Yonge & Sheppard to Pearson Terminal	23	Using Eglinton LRT +		Using Eglinton LRT	60
Pearson Airport to Hurontario Street LRT	7	Markham bus	49	Using B-D & Yonge subways	58
	59	Using **401RT**	39	Using **401RT**	48
Average speed - 54 km per hour					
		York Mills subway station to		**Yonge & Lawrence to Pearson:**	
St. Andrew subway stn to Pearson Term'l:		***U of T in Scarborough:***		Using Eglinton LRT	7
Using Eglinton LRT	42	Using Eglinton East LRT	59	Using **401RT**	4
Using UP Express train (walk, wait, ride)	46	York Mills bus to Morningside	46		
Using Spadina subway & **401RT**	43	**401RT** to Morningside + shuttle	32	***Eglinton/Don Mills to Pearson Term'l:***	
				Using Eglinton W LRT	37
Sewells Rd at Morningside to		***Union station to***		Using **401RT** to terminal	43
Sheppard W Subway stn.:		***Scarborough Centre:***			
Using Sheppard bus & Sheppard subway	68	Using Bloor-Danforth subway	38	***Keele at Sheppard to UTSC:***	
Using 401RT	43	Using **401RT**	43	Using Keele bus + Eglinton LRT	84
		Eglinton LRT + McCowan bus	56	Using Keele bus + **401RT** + shuttle at Morningside	44

Benefits of a 401RT

The 401RT is of transformative significance, and would affect other transit enhancement decisions in Toronto, Mississauga and Durham Region. The scale of the 401RT reflects the magnitude of the transportation and climate change problems facing the region. The overall traffic congestion problem in Toronto cannot be resolved with constrained approaches. The following list of general benefits is lengthy and significant, and highlights the strategic importance of the 401RT in the Toronto area. Local benefits are generally not included in this list.

1. Up to ten new rapid transit connections are created (Hurontario LRT, Mississauga Transitway, Union-to-Pearson Express, Woodbine GO, Barrie GO, Spadina/York Subway, Yonge Street Subway, an extended Ontario Line, the Scarborough Subway, and possibly a relocated Agincourt GO station).
2. More than 25 new surface bus route connections to rapid transit are created.
3. The first practical transit alternative to driving across northern Toronto is created, bringing rapid transit much closer to many thousands of today's car-driving commuters.
4. Gridlock on Highways 401 is avoided as high volumes of transfers from the highway to rapid transit occur.
5. The viability of Highway 409 as an effective transportation corridor is maintained.
6. The trip capacity of the highway corridor is more than doubled.
7. Traffic congestion on the Don Valley Parkway and Highway 427 is reduced as access to north-south rapid transit via the 401RT becomes a viable option for many travelers.
8. Traffic congestion on city streets throughout Toronto and in parts of Mississauga and Pickering is reduced as major modal shifts to transit occur: all road trips begin and end on local streets.
9. Travel times across Toronto are significantly reduced when compared to current transit services.
10. The 401RT and its proposed increases in intersecting bus services increases municipal transit ridership by 205 million per year by 2051.
11. Intersects with GO Rail services (Woodbine, a potentially relocated Agincourt GO and Leslie-Oriole GO, Barrie GO link) increase planned GO ridership beyond current forecasts.
12. Modal shifts to the 401RT from travel by automobile far exceed those for planned light rail LRT lines in Toronto, including the Jane Street LRT, the Sheppard East LRT (or subway), and extensions of the Eglinton Crosstown LRT, all of whose ridership will largely be transfers from existing TTC bus services rather than being new users.
13. Rapid, affordable, and direct rapid transit access to Pearson International Airport from downtown and from suburban locations across the region is created (Approximately 85% of trips to the airport do not originate from downtown Toronto).
14. The Greater Toronto Airports Authority's plans for a transit hub are transformed to be more effective. Rapid direct access to Pearson International Airport via the 401RT from locations across Toronto makes the Government of Ontario's planned $4.7 billion western extension of the Eglinton Crosstown LRT to Pearson International Airport unnecessary. However, a one-stop extension of the Eglinton Crosstown LRT to Jane Street is recommended.
15. Access to the employment areas surrounding Pearson airport is greatly improved; these employment areas in Mississauga and Toronto revitalize as they become more attractive to business and to workers.
16. Employment opportunities and labour market conditions are enhanced. Fewer people will decline employment opportunities near the airport due to congestion and travel times.

17. The 401RT's intersect with the Danforth subway's extension at Scarborough City Centre increases ridership on that extension.
18. Enhanced access from across all of Toronto to Centennial College (Scarborough), York University, the University of Toronto Scarborough Campus, and the U of T downtown campus is created. Many students no longer need to decide on courses of study based on travel time and distances to campuses.
19. A 401RT makes it unnecessary to build a Sheppard Avenue East LRT or subway, as many of its potential users would opt to use the nearby and faster 401RT. Infrastructure cost savings are approximately $1 billion for an LRT and $2.8 billion for a subway.
20. In general, access to services and to employment across Toronto and to/from Mississauga, Pickering and Brampton become much faster and easier, including especially for those people who are economically or socially disadvantaged.
21. Social isolation is reduced for people who do not own cars or cannot drive, as many destinations across the region become more easily accessible.
22. Access to employment opportunities and services for residents of disadvantaged communities is significantly improved (e.g. northwest Etobicoke, eastern Scarboroough).
23. Current and forecasted road overcapacity situations in the large employment areas around Pearson International Airport are alleviated or avoided.
24. Direct rapid transit access to Mississauga's Airport Corporate Centre from across northern Toronto and Mississauga is created.
25. As an economic stimulus, 160,000 job years are created as the 401RT is constructed – far more than any other public job creation project in the GTA has achieved.
26. Canada and Ontario government capital cost contributions can result in an influx of $14.6 billion into the Toronto area economy.
27. Approximately 3,400 ongoing transit operating jobs are created.
28. Economic losses from traffic congestion are reduced; business efficiency is improved.
29. Economic losses from imports of motor vehicle fuels and automobiles are reduced – more than $75 million per year.
30. The 401RT helps transform Yonge Street north of Hwy 401. With the 401RT and Yonge Subway extension to Hwy 7 operational, east-west access to employment is increased. Modal shifts to rapid transit by drivers who now use Yonge Street to access Hwy 401 increases, and the redesign of Yonge Street is supported.
31. Importantly, greenhouse gas emissions are reduced by more than 440,000 metric tons per year for the 401RT. Meeting and exceeding greenhouse gas reduction targets is ***essential*** for the future well-being of all people, and of the natural systems that support our existence.
32. Toxic vehicle emissions are reduced, and the incidence and severity of respiratory diseases and medical costs is reduced.
33. The number of deaths and injuries from motor vehicle collisions and the traumas and costs borne by the families and friends of crash victims are reduced, as are the associated daily congestion effects of collisions.
34. The operational effectiveness of the Toronto area's pre-existing transit system is improved; for example, more people using existing buses and new buses, as service frequencies improve.
35. Suburban sprawl is eased, as development in the central area of the GTA is attracted by the 401RT, including at, above, or near the highway at 401RT stations.

36. Property tax revenues are increased from new urban development at/near 401RT stations, and from increased property values in parts of Toronto, Mississauga, Pickering and some '905' areas served by GO Transit.
37. Travel costs are reduced for thousands of households as fewer cars need to be owned, or used less. Money saved can be redirected towards other household priorities. After-tax household savings can range to $9,000 per year per vehicle, less the cost of using public transit.
38. Truck transport is improved as gridlock on highways 401 is avoided, even as road lanes are reduced, as car drivers transfer to transit when transit is seen to be as fast or as convenient as driving. (Note: No reductions in road lanes from east of Dixie Road to Islington Avenue.)
39. The operational revenue-to-cost ratio of the Hurontario light rail transit line in Mississauga is improved; additional high-density urban nodal development at and near Hurontario Street is supported.
40. Improved and rapid access to the University of Toronto's Scarborough campus using the 401RT reduces anticipated ridership volumes on the proposed Eglinton Crosstown East LRT extension via Morningside Avenue. Savings from eliminating the LRT extension are approximately $1.7 billion. Enhanced bus services on Eglinton East, Kingston Road, and Morningside Avenue can be adequate.
41. The Jane Street LRT proposed by Toronto is unnecessary as east-west connections provided by the 401RT and Eglinton Crosstown LRT (extended by one stop, from Mt. Dennis to Jane) reduce passenger volumes and trip-length crowding on Jane Street buses. Savings are $1.5 billion.
42. The 401RT provides a significant long-term relief valve against future global energy shocks, and addresses potential future energy shortages head-on.
43. The overall operating revenue-to-cost ratio for the 401RT should reach 90% or higher, better than the overall public transit system of the City of Toronto.
44. In Durham Region and the city of Pickering, the prospects for further development in the Pickering Town Centre area at Liverpool Road and Highway 2 would be enhanced. Future extensions of the 401RT to Brock Road and beyond are possible. A 401RT would be a welcome alternative to what is now a forced daily drive on congested highways.
45. In York Region, the 401RT would ease road congestion to and from Toronto as connecting bus services improve.

A 'Relief Line' for the 401RT

The City of Toronto and the Government of Ontario have recognized the need for a "Relief Line" subway to divert transit ridership from the already-crowded Yonge subway, portions of which will be at or beyond capacity by 2031. In April 2019, the Ontario government announced its commitment to build an "Ontario Line" subway from Ontario Place to Eglinton East at Don Mills Road. The Eglinton Crosstown LRT is scheduled to become operational in 2022. Unfortunately, the Ontario Line is not scheduled to become operational until 2029 or later, long after the opening of the Eglinton LRT. This will be a serious problem for the Toronto transit system and for transit users.

It is ***essential*** that the Ontario Line be extended northward from its currently-approved terminus at Eglinton Avenue East to a 401RT station. Without this connection to/from downtown Toronto, the 401RT will worsen already unacceptable overcrowding on the Yonge Street Subway. North of Lawrence Avenue, the Ontario Line should be veer eastward to a station at Victoria Park Avenue at Highway 401, to better serve trips to and from Scarborough and Pickering. Stations can be at Barber Green, Lawrence East, and York Mills Road, and a station at Sheppard Avenue East. The York

Mills station should be located at the Don Valley Parkway, with a multi-level garage above the intersection, to enable drivers to transfer from the 404/DVP to the Ontario Line.

The 7.5-kilometre northward extension of the Ontario Line would cost approximately $3.8 billion. Net of 1/3 cost-sharing by the Government of Canada, and if it is financed over 30 years at 4.5%, the cost to Ontario would be $153 million per year in peak financing years.

The Eglinton-to-Sheppard Avenue East segment of the Ontario Line would

1. Increase trips by transit between Scarborough and the downtown Toronto area;
2. Reduce much of the traffic congestion on the Don Valley Parkway (DVP);
3. Create direct access to the 401RT east of Yonge Street, and its stations across Toronto;
4. Enable fast transit access to/from the corporate employment area at and north of Eglinton Avenue East and Don Mills Road;
5. Improve the flow of road traffic through the downtown core;
6. Increase utilization of the Eglinton Crosstown LRT;
7. Avoid overcrowding on the Yonge Street subway by creating an alternative access to downtown Toronto for significant numbers of new and current transit users;
8. Increase ridership on the Ontario Line as residents have relatively fast access to new Ontario Line stations, and many other rapid transit network options;
9. Generate 14 million new transit trips per year, plus transfers from existing bus services (primarily Don Mills buses);
10. Promote urban infill and intensification at and near Highway 401 along its route to accommodate ongoing population growth and economic growth in Toronto;
11. Reduce overall road traffic along Don Mills Road and nearby streets, while promoting urban infill and intensification;
12. Increase the utilization of intersecting surface transit services (Lawrence East, York Mills/Ellesmere, Victoria Park, Sheppard East);
13. Reduce crowding on the Don Mills bus service;
14. Reduce greenhouse gas emissions from modal shifts to transit, including by DVP drivers who would otherwise drive long distances to destinations in Toronto;
15. **Together with enhancements to GO Transit, reduce or eliminate the perceived need to rebuild the Gardiner Expressway east of Jarvis Street**; and
16. Increase attendance at the Ontario Science Centre.

Affordability

Beyond the basic numbers, there's something to be said about doing more than we think we can afford. Until recently, the Ontario government has declined to build more than about 3 (three) kilometre of municipal rapid transit per year (Eglinton LRT, Spadina subway extension), blaming a lack of fiscal resources for not undertaking more projects. The Ontario government's new $28.5 billion rapid transit plan for the GTA would add an average of 6.2 kilometres per year, if spread over the next ten years. The 401RT and OLX would add another four kilometres per year, if spread concurrently over the next 15 years. While this seems to be a great deal compared to past years, it is relatively small when compared to the growing multi-billion-dollar annual cost of road congestion and the devastating impacts of climate change (Appendix 2).

The money for more and better rapid transit services exists within Ontario's $750 billion (2019 est.) annual gross domestic product. It is fundamentally a decision about the allocation balance of the GDP between supporting and enhancing public life and favouring private wants; to date, the public realm has been considered to be secondary to assumed private needs. The 401RT and OLX will cost Ontario $700 million per year in interest once completed – less than 0.09% of GDP.

The gross capital cost of a 54-kilometre 401RT (excluding Sheppard subway segment) that extends from Liverpool Road to Hurontario Street in Mississauga is estimated to be $16.3 billion, or $303 million per kilometre. At this cost per kilometre, the mostly-at-grade 401RT is significantly less expensive to build than the Spadina subway extension into York Region ($370 million per km). The capital cost estimate includes construction of the tunnels, rights-of-way and tracks, 322 rail cars, 480 buses, adjustments to bridges and ramps, 30 new stations, power systems, land acquisition, a maintenance yard and equipment.

Although gross costs are substantial, they are affordable when compared to the benefits of the 401RT and the negative impacts of its absence. A 401RT funding scenario is shown below, incorporating an assumption that upper levels of government have a direct and significant interest in ensuring the free flow of people and goods on major highways. In this scenario, the Ontario and Canada governments fund 100% of on-highway costs and two-thirds of tunneled off-highway costs, and municipalities would fund 100% of additional buses on intersecting routes. If costs are amortized at an average of 4.5% over 30 years, Toronto's share of the gross capital cost would be approximately $940 million once the 401RT is operational. With 30-year 4.5% financing, the daily municipal cost per Toronto household would be as low as 9 cents per day. This can be considered affordable.

The overall capital cost of the 401RT can be reduced if air rights over Highway 401 for private development are sold, and which can require the developers to build 401RT stations of basic design at little or no cost to government. Potentially, this may reduce the cost of building the 401RT by up to $2 billion. Segments constructed above ground can also reduce overall costs.

Because there is significant benefit to the federal government in terms of improved access to Pearson International Airport, contribution to federal greenhouse gas reduction targets, and increased employment, a one-third federal contribution is assumed to be attainable. Similarly, provincial funding is also appropriate because of positive impacts on provincial finances from employment, improved traffic flow for freight transport, and reduced importation of motor fuels and automobiles.

A 401RT + Ontario Line Extension Funding Scenario (m$)	Toronto - 401RT	Durham - 401RT	Miss'ga. - 401RT	GTAA - 401RT	Totals for 401RT	Toronto - OLX
Gross Capital Cost	11,100	1,300	2,200	1,600	16,200	3,800
Canada share @ 33.3%	3,700	430	730	530	5,400	1,300
	7,400	870	1,470	1,070	10,800	2,500
Ontario share*	88%	83%	79%	68%	84%	80%
Ontario share	6,500	720	1,160	730	9,100	2,200
Ann. Ontario cost in peak years**	392	44	71	44	552	133
Municipal/GTAA share	900	150	310	340	1,700	300
Mun./GTAA cost in peak years**	55	9	19	21	103	18
Residential share (approx.)	75%	75%	75%	0%		75%
Est. no. of Households in 2041	1,307,700	396,700	282,000		1,986,400	1,307,700
Avg. municipal cost/household/day	$0.09	$0.05	$0.14			$0.03

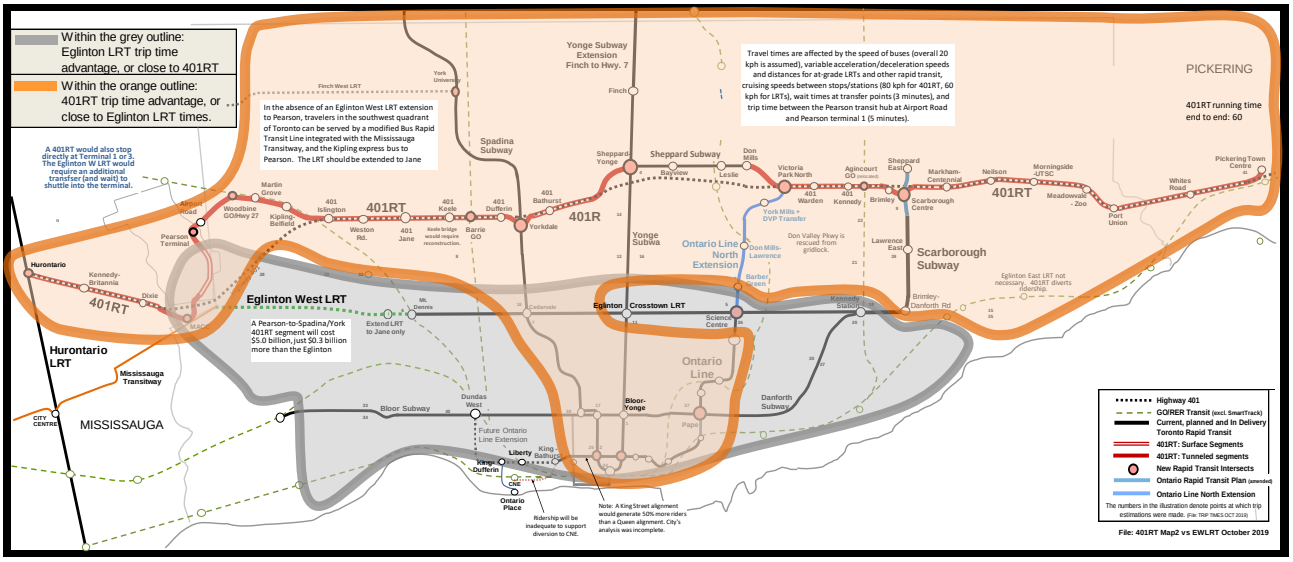
* For the 401RT, Ontario share is a mix of 100% of on-highway costs and lower percentages for off-highway diversions.

** $Millions per year, at 4.5% over 30 years.

The Ontario government has committed to constructing an Ontario Line subway to Eglinton Avenue East. A further 7.5-kilometre Eglinton-to-401RT extension (OLX) would cost $3.8 billion to construct, at an average of $500 million per kilometre. If, for example, Toronto contributes 25% of the gross capital cost, the average daily municipal cost per Toronto household, assuming the extension is amortized at 4.5% over 30 years, would be three cents during peak financing years after the extension becomes operational.

Eglinton West LRT

The cost estimates for the 401RT exclude a recommended cost avoidance of $4.7 billion that has been committed by the Ontario government to an Eglinton West LRT extension to Pearson International Airport. **This extension becomes unnecessary** with a 401RT in place; the 401RT will be able to deliver more people to and from the airport area than the LRT (including from downtown Toronto), and will divert ridership from the Eglinton West LRT. The cost avoidance can be applied towards construction of an initial $6.5 billion 401RT segment from Yonge Street to Pearson.



Generating New Transit Ridership

Operational viability of the 401RT depends on ridership, operating costs and the fare structure. Based on an analysis of Transportation Tomorrow Survey data for 2011, population forecasts by the Ontario Ministry of Finance, and a number of assumptions and estimations about

- proximity of trip origins and destinations to either side of the 401RT, by Ward,
- effects of congestion on modal shifts, and
- projections of trip growth in the GTA – 2011 to 2041, and 2041 to 2051

it is estimated that by 2051, a 401RT plus its arterial road feeder buses would carry 205 million new transit riders annually, plus transfers from existing local transit services.

An important viability factor is that the longer the length of an urban rapid transit line, with stations added along the way, the more intensively it is used. As length is increased and new

stations are added, new ridership not only originates at each new station added; the new stations also become a destination for additional transit riders whose trip origins are at pre-existing stations and who can now easily access the new stations. The relative shortness of the Sheppard subway (5.5 km.) is the principal reason why it is not operationally viable.

Ridership on the 401RT would come from a variety of sources, including

- Modal shifts by drivers using Highway 401 between and beyond the east and west 401RT terminals at Pickering Town Centre and Hurontario Street in Mississauga;
- Modal shifts from local roads and current and planned transit services;
- Future growth in suburban travel demand that cannot be accommodated by the 401 and other roads due to congestion;
- Toronto drivers whose trip origins and/or destinations are in close proximity to Hwy 401, principally on intersecting arterial roads;
- Drivers who use the Don Valley Parkway and Highway 427 to travel downtown but who would, via a 401RT, have quick access to the Line 1 subway and the extended Ontario Line;
- People who currently drive to the airport and its employment area from trip origins near the existing rapid transit network;
- Travelers who wish to access destinations directly at the 401RT (such as Pearson International Airport and Scarborough Town Centre);
- Downtown residents who would have access to suburban destinations via existing rapid transit (GO, and the Line 1 subway);
- Transfers from existing nearby east-west surface transit routes (including Sheppard Avenue, Wilson Avenue, Belfield Road, and Ellesmere Road);
- Transfers from GO Transit: the Barrie GO Rail Line, the Kitchener GO Rail line, possibly at Kennedy Road/Agincourt, and Oriole GO Station (if the 401RT does not divert to incorporate the Sheppard subway);
- Travelers whose trip origins and destinations are in close proximity to the extended Ontario Line and locations in Scarborough and Pickering that are near the 401RT;
- Future residential and commercial development over, adjacent and near to the Highway 401 corridor and at off-highway stations in Mississauga (Dixie, Kennedy-Britannia) and Pickering (Whites Rd);
- People who live or work close to north-south surface transit services that link to 401RT stations;
- Non-401RT users who are attracted by increased bus service frequency on local north-south arterial routes, and by new shelters at every transit stop;
- From many other locations in the GTA, people who wish to reduce their household cost of transportation;
- People who face financial hardship caused by motor vehicle ownership;
- Drivers and automobile passengers who are 'fed up' with the stresses and delays of daily gridlock on highways and city streets.

The fact that the 401RT would not be located in a high-density urban corridor is not as important a factor as the speed and comfort of the 401RT service, the linkages to other transportation services, the relatively inexpensive cost of using the service, and the frustrations of traffic congestion. As with most suburban transit nodes, boardings onto 401RT trains would be mostly

via transfers from feeder bus services and (where appropriate) adjacent commuter parking lots. This is similar to GO Transit's Lakeshore Line, which is highly successful. Ridership on the 401RT is enhanced by the fact that it is long enough to serve both shorter- and longer-distance travelers. Importantly, a 401RT would have no rapid transit competition – it fills a critical void in the transit network, and is unique.

Estimating new transit trips for the 401RT:

Because of the uniqueness of the 401RT, no comparable ridership forecasting methodology was found. However, it is estimated that the 401RT itself would generate 158,000,000 ***new*** transit trips per year after it becomes fully operational. The estimate is based on the Ontario Ministry of Transportation's 2011 Transportation Tomorrow Survey's origin-destination matrix for trips by residents by automobile for 24 hours for 44 wards in Toronto plus 16 close-by wards in neighbouring municipalities, and was adjusted to 2041 and 2051 for population growth. Modal shift factors to transit were assigned based on the proximities of trip origins and destinations to the Highway 401 corridor and by length of trip. Additional ridership was added for extreme road traffic congestion resulting from travel demand growth beyond 2041 (including growth in truck traffic), new high-density urban development assumed to occur at and near 401RT stations, trips to/from Toronto by residents living beyond the 60 Wards, positive impacts on GO/RER ridership, the effect of direct access to Pearson International Airport from across Toronto, and driving costs.

The 401RT's 480 bus component assumes that ridership would increase on bus routes in Mississauga, Toronto and Pickering that intersect with the 401RT for trips not involving a transfer to or from the 401RT itself, due to improvements in service frequencies, a mix of express and local services, shelters at every (*every)* bus stop, and more comfortable buses. It is estimated that overall ridership volumes on intersecting bus services would increase by 25%, or 47,000,000 by 2051. Bus ridership increase estimates are preliminary and should be further reviewed.

401RT: New Ridership Estimate	
112,000	New 401RT trips 2051 by residents per day: modal shifts by auto driver and psngr
1.020	Factor re non-resident trips using 401 (i.e. travelers living outside the 60 Wards)
114,000	
308	Annualization factor
35,112,000	Annual new transit trips from auto driver & passenger
23,000,000	New urban development at/near/above 26 401RT stations; @ higher transit % share
58,112,000	
4,010,000	Estimated effects of GO RER intersects with 401RT (stouffville, Kitchener lines + some trnsfrs re Lakehr).
62,122,000	
84,000,000	Add'l. Hwy 401 congestion shift 2041 to 2051 (hwy unable to accommodate 50% of demand growth).
4,170,000	Reduction in 90% auto share of air passenger trips to/from Pearson, (i.e. more than in the basic modal shift)
150,292,000	Total
1.05	Driving cost Increases (tolls, energy)
1.00	Other factors
157,800,000	**TOTAL - New TTC Riders using 401RT by 2051**
47,000,000	Bus component new ridership
204,800,000	
205,000,000	by 2051
12,000,000	Transfers from nearby TTC routes (FYI only)
217,000,000	Total users by 2051

401RT Bus Component Ridership:		
2011 Daily Boardings on 36 intersecting bus routes		558,700
Travel demand growth to 2041		27%
Boardings 2041		709,549
Number of existing buses	551	
401RT: Additional buses	480	
Ridership spread over all buses		1,031
Boardings per bus		688
Assumed ratio fares to boardings		70%
Total fare boardings per bus 2041		482
Assumed effect of improved service frequency + comfort		25%
New fare ridership per bus		120
Total buses on 36 intersecting routes		1,031
New ridership/day re 401RT impact		124,171
Annual equivalent @ 308 FTE days		38,245,000
Increase 2041 to 2051		12.0%
		42,834,000
Add'l modal shifts re road congestion , e.g. shared AVs, transit priorities		1.05
Driving cost increase scenario		1.05
	Annual	47,000,000
	Daily	152,597

The Eglinton East-to-401RT Ontario Line extension (OLX) is estimated to generate 14 million new transit user trips per year, plus transfers from existing transit routes, such as the Don Mills Road bus service. Ridership is based on a broad assumption of 1,000 new fares (both directions) per peak AM hour per station extrapolated to a full day, plus a 25% modal shift of daily DVP traffic volumes between Don Mills and the 401, and then extrapolated to a year, based on a 308-day annual conversion factor. More detailed analyses can refine estimates. The OLX is essential for the operational viability of the Yonge Street subway segment of the Line 1 subway in Toronto, and will encourage new transit ridership on the Yonge Street portion of the subway.

		Car Driver + Pssnger	Municipal Transit	GO Transit	Other	Total
Increase in number of daily trips, after implementation of current transit plans, to 2051		**866,600**	**1,119,700**	**594,100**	**455,400**	**3,035,800**
Recommended additional transit infrastructure:						
401RT - Pickering Town Ctr. To Hurontario Street	205.1	-666,000	666,000			
Ontario Line N extn. Eglinton to 401RT & Sheppard E	14.2	-46,000	46,000			
DELETE Eglinton West LRT to Pearson*	- 7.4	24,000	-24,000			
Extend Eglinton LRT W to Jane only (1 stop)	0.9	-3,000	3,000			
Net change, to 2051	281.2	**175,600**	**1,810,700**	**594,100**	**455,400**	**3,035,800**
Approx. average vehicle occupancy		1.16	persons			
Increase in automobile traffic - 2016 to2051		**151,000**	icles per day			

* The 401RT will draw ridership from the Eglinton West LRT, which can be replaced by a modified BRT integrated with the Mississauga Transitway.

Operating Revenue-to-Cost Ratios

401RT Rail Component		401RT Bus Component	
No. of stations	30	480	No. of buses
Unit Cost	$7,000,000	$400,000	Unit Cost
	$210,000,000	$192,000,000	
New fares	157,800,000	47,000,000	New fares
Average fare	$2.32	$2.07	Average fare
Revenues	$366,740,000	$97,480,000	Total Revenues
Net	$156,740,000	-$94,520,000	Net
Combined	$62,220,000		
Rev/Cost ratio	115.5%		

Annual operating costs for the completed 401RT and expanded feeder bus services would be approximately $400 million annually, based on $7 million for each of 30 new stations (compared to an estimated $4.2 million for each of the new Spadina subway extension stations), and $400,000 for each of 480 new buses on intersecting transit route. Overall, it is estimated that fare revenues would cover operating costs. No segmentation of 401RT operating outcomes has been estimated for Mississauga, Toronto and Durham transit systems.

Urban Development Impacts

The alignment of the 401RT provides opportunities for development and redevelopment at most stations. In particular, off-highway stations, such as the Scarborough Town Centre area, at/around Pickering Town Centre, the planned Woodbine/Hwy 27 GO station (to replace the Etobicoke North GO station) and the Mississauga Airport Corporate Centre are surrounded by land that may be underutilized and can generate both residential and non-residential property taxes.

Development potential exists adjacent to many stations that are in the highway 401 corridor, within a three- to five-minute walk from station entrances. In addition, development rights over the highway and over highway stations can be sold or leased. The government of Ontario is

currently planning to offer opportunities for private development at new subway stations, in return for building and funding the capital cost of the stations themselves.

TESTING AND PHASING

Indications of potential ridership demand can be determined by surveys of the general public. Ridership demand for the 401RT can then be tested over two or three years, using buses on a modified alignment in the Highway 401 corridor, with up to 25 stops and not linked to the Sheppard subway. This test would require dedicated highway collector lanes or shoulder lanes to bypass highway traffic congestion, plus construction to adjust most off- and on-ramps, and transit signal priority at ramp/arterial intersections wherever possible. Marketing of this express services test should be aggressive. The test should include a distribution of approximately 200 additional buses of *superior comfort* that are proposed for the 401RT, assigned to the test route and to arterial bus routes that can provide both arterial express and local services. The capital cost of this test would be approximately $220 million.

The years needed to complete the 401RT depends on the intensity of the implementation effort. Given the urgency of climate change action, transportation, economic, and other problems caused by the absence of a singular east-west high-speed transit line, the short completion timeframe concurrent with the extended Ontario Line should be set. The Ontario Line connection to the 401RT will need to be in place when the eastern half of the 401RT becomes operational. Much of the development and construction of segments of the 401RT will work concurrently.

As an alternative to phasing in portions of the 401RT based on a hierarchy of priorities, a 'big bang' approach could be used, whereby the 18 kilometres of tunnelled segments are concurrently constructed first, over a number of years, and the 36 kilometres of at-grade segments and stations quickly constructed in a single one- to two-year push. This alternative would minimize the inevitable highway traffic disruptions.

Unaffordable Not To Do

The costs of traffic congestion in the Greater Toronto and Hamilton Area are oft-quoted, totalling billions of dollars a year (with ranges from $1.5 billion to $5 billion to $11 billion per year). Unless dramatic measures are taken, the problem will continue to worsen as travel demand continues to grow. Implementation of current rapid transit plans by Metrolinx and others will slow down the deterioration of conditions, and with luck might hold congestion to current costly levels for a short while, but will not result in absolute improvements.

As mentioned above, major modal shifts to public transit are necessary as part of efforts to stabilize the impacts of rapid climate change. The body of scientific evidence pointing to rapid deterioration of the Earth's natural life support systems is now conclusive. A recent report by the United Nations Intergovernmental Panel on Climate Change warns that global greenhouse gas emissions need to be cut in half by 2030 if devastating and unstoppable consequences for humankind and the biosphere are to be avoided. **This is critical information.** **Refer to Appendix 2 for more information.** A 401RT, an extended Ontario Line and other new transit initiatives are ***essential*** if that goal is to be achieved.

Based on a broader definition of affordability – beyond the narrow public budgetary definition – not building the 401RT or a similar alternative, and an extension of the Ontario Line to Sheppard Avenue East at Victoria Park Avenue, is unaffordable. Detailed feasibility and impact studies should begin now, as amendments to the current Ontario Rapid Transit Plan for Toronto.

Prepared by John Stillich

APPENDIX 1: **401RT STATION LOCATIONS**

STATION	**LOCATION**	**ELEVATION**
1. Pickering Town Center	Liverpool Road at Highway 2	Underground
2. Whites Road	Whites Rd on Hwy 401	Entry above arterial
3. Port Union	Port Union Rd. at Hwy 401	Entry above arterial
4. Meadowvale	Meadowvale on Hwy 401	Entry above arterial
5. Morningside	Morningside on Hwy 401	Entry above arterial
6. Nielson	Nielson Rd. on Hwy 401	Entry above arterial
7. Markham Road	Markham Rd. at Hwy 401	Entry below Hwy 401
8. Scarboro/McCowan	Scarborough Town Ctr. At McCowan	Underground
9. Brimley	Brimley Rd. S. of Hwy 401	Underground
10. 401-Kennedy	Hwy 401 W. of Kennedy Rd.	Entry below 401
11. Stouffville-401 Link	Hwy. 401 South of Agincourt GO stn.	2-platform transfer stop

N.B. Agincourt GO intersect with Kennedy North 401RT station may not be practical – Would require a 350-400 metre walkway between Kennedy and the rail line, plus a new GO station under the 401, 1 kilometre south of the existing Agincourt station. (N.B. Proposed Parklawn GO stn is 1.5 km east of Mimico GO stn.)

12. 401-Warden	Hwy 401 at Warden Ave.	Entry above arterial
13. Victoria Park-Relief Line	Victoria Park Ave. on Hwy. 401	Entry above arterial, plus underground access to Relief Line Subway platform.
14. Don Mills (Sheppard subway)	Don Mills at Sheppard Ave.	Underground
15. Leslie (Sheppard subway)	Leslie Street at Sheppard Avenue	Underground
Bessarion (Sheppard subway)	Recommended to be closed.	
16. Bayview (Sheppard subway)	Bayview Avenue at Sheppard	Underground
17. Sheppard/Yonge	Yonge St at Sheppard Ave.	Underground
~~Avenue Road~~	~~Avenue Rd. on Hwy 401~~	~~Entry above 401~~
18. 401-Bathurst	Bathurst at Hwy 401	Entry below Hwy 401
19. Yorkdale	401 at Northwest subway	NW subway above 401

N.B. If no agreement by Yorkdale Mall to contribute financially to tunneled diversion, 401RT station is in 401 ROW; new Spadina Line station would be constructed.

20. 401-Dufferin	Dufferin St. at Hwy 401	Under Dufferin Street
21. Barrie GO Link	Below 401 at GO Rail at 401	2-platform stn, no arterial
22. 401-Keele	Keele St. on Hwy 401	Entry above 401
23. 401-Jane	Jane St. at Hwy 401	Entry below Hwy 401
24. Weston Road	Weston Rd. on Hwy 401	Entry above 401
25. 401-Islington	Islington Ave. below Hwy 401	Entry above 401
26. Kipling-Belfield*	Kipling Ave. at GO tracks	Underground
27. Martin Grove*	Martin Grove Road	Underground
28. Woodbine/27/GO*	Highway 27	Underground
29. Airport Road	Airport Rd. at Hwy. 409	Underground
30. Pearson Terminal	Pearson International Airport	Underground
31. Orbitor or Explorer	Eglinton Avenue	Underground
Option: an additional station at Spectrum & Matheson		
32. Dixie Road	Dixie Road at Hwy 401	Entry above 401
33. Kennedy/Britannia	Kennedy Rd. at 401	Entry below 401
34. Hurontario	Hurontario Street at Hwy 401	Entry above 401

If the Sheppard Subway is by-passed:

35. Don Mills	Don Mills above 401	Stn. above 401
36. Leslie/Oriole GO	Leslie under 401	Stn. at GO Parking lot
37. Bayview	at 401 & Bayview	Entry below 401
38. Yonge	at 401 & Yonge Street	Entry below 401

* If the 401RT runs above Belfield Road, the Martin Grove and Highway 27 stations would be above Belfield Road, and the Kitchener GO link with the 401RT would need to be at the current Etobicoke North GO station.

Appendix 2 - Rapid Climate Change

The Devastating Blows to Survival from Rapid Climate Change

Climate change is happening now, hundreds of times faster than natural changes in the past. It has consequences that will dramatically damage us in our lifetimes, and become far, *far* worse for our children and grandchildren.

An indication of a frightening global change is in the past: 250 million years ago, the Permian-Triassic extinction that left only a few species of life on earth alive was caused by rising carbon dioxide levels in earth's atmosphere, and also by huge releases of methane, resulting in a 5° Celsius warming of the planet. We are adding carbon dioxide into the atmosphere at a rate that is, by most estimates, ten times faster, and humanity is also now causing methane to be released from permafrost. There is right now a third more carbon in the atmosphere than at any time in the last 800,000 years*.

The rapid destabilization and heating of the earth requires actions much greater in scale than are currently planned, and they must be undertaken ***now***. The UN's Intergovernmental Panel on Climate Change (IPCC), reflecting the conclusions of thousands of scientists around the world, said bluntly in October of 2018 that unless global GHG emissions are cut by 40% to 45% by 2030 (now just 10 years away), we will not be able to limit global heating to 1.5° Celsius above pre-industrial norms, and will face devastating consequences.

Instead of decreasing, global GHG emissions are still rising. The 1.5°C. target will be exceeded by between 2030 and 2052*. ***According to the IPCC, current nationally stated commitments to cut GHGs, if achieved, will result in a 3.2° increase in global temperatures by 2100, and higher beyond that***. If we do not meet those reduction targets, the 2100 average temperature increase will be more than 4°, very close to the levels of 250 million years ago. Temperatures in northern latitudes will be higher. Because North Americans produce a very disproportionate share of global GHG emissions, GHG emissions in North America need to decrease to almost *zero*.

Rapid global warming of 3.2° will have the following devastating and inter-connected impacts. Each of us will be affected as temperatures move rapidly higher to that level by 2100.

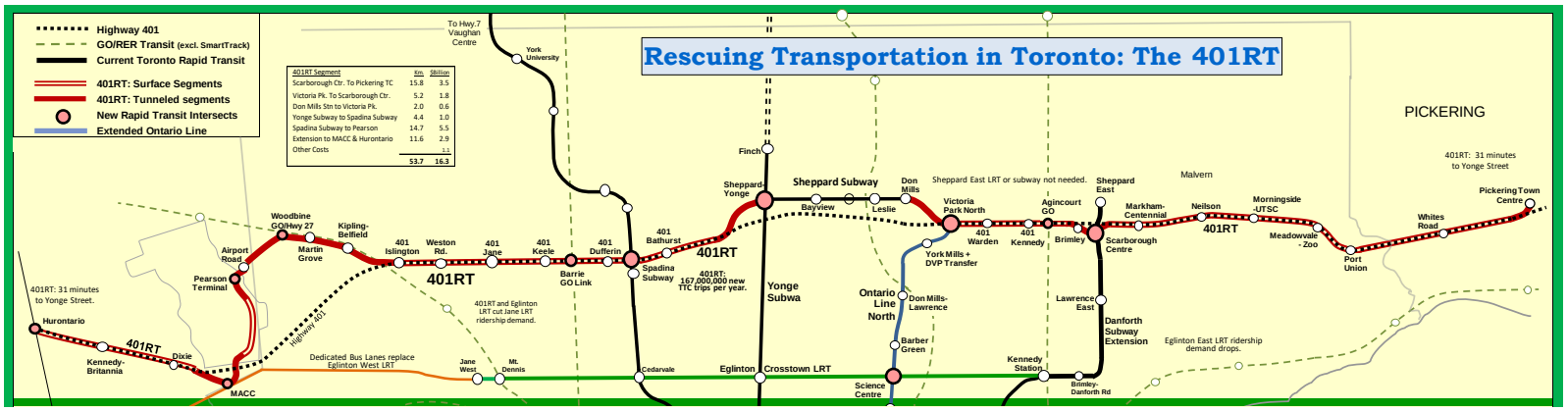
1. Every natural ecosystem will be at risk of collapse, and many will have collapsed.
2. There will be a much higher frequency of droughts and precipitation deficits, and lasting for longer periods. This will affect food production; food prices will be much higher than today, where food is available.
3. Extreme heat events will become normal, and will last longer. Costs to cool buildings will more than double. The mid-latitudes (including southern Canada, much of the USA, the Mediterranean, central Europe) will experience an average rise of 4° Celsius (7.2° Fahrenheit).
4. Heat-related morbidity and deaths will multiply, and be especially deadly in low latitude countries. Conflicts and economic dislocations will become widespread.
5. The loss of livestock and declines in livestock health will affect prices and human diets everywhere.
6. The number of wildfires will multiply and be more widespread. Controlling them will become more difficult, and drain public finances. The devastating fires in Australia, at the beginning of its summer season, is a current example.
7. Rising temperatures and dryness in parts of the USA will make much of its southern regions unlivable by 2100. Canada will experience a massive flow of climate refugees that will strain our ability and desire to accommodate them.
8. Heating and habitat loss will decimate plant, insect and other animal populations. Rates of extinction will accelerate beyond already extreme rates.

9. Arctic ice will continue to melt, at a more rapid rate than is happening now, and will not stop. Sea levels will rise by metres (6 metres once all of Greenland becomes ice-free), to the point that coastal cities will become at least partially flooded, and today's coastal marshes will be lost. By 2100, almost all ocean beaches will have disappeared.
10. Less arctic ice means more heat from the sun will be absorbed into the oceans, creating a feedback loop that will melt more ice.
11. Permafrost is thawing *now*, emitting billions of tons of methane, a greenhouse gas 20 to 25 times more powerful as a GHG than carbon dioxide. The permafrost will thaw faster, and may never freeze again. A feedback loop is already occurring that will accelerate global heating.
12. Boreal forests will be degraded, and some will be lost.
13. Vector-borne diseases will migrate with climate changes.
14. The ocean is becoming and will become more acidic, and will experience oxygen loss. Coral reefs will face total die-off. Populations of fish dependent on them will, in turn, be threatened. Food production from fishing and aquaculture will drop. Land animals will become a greater source of food in many regions; extinction rates of land animals will increase.
15. Armed conflicts will increase as famine and human-caused disasters spread. North America will likely not be without some strife. Military costs and emergency aid to other countries will increase.
16. National, regional and local economies will be strained as more financial resources are allocated towards adaptation and mitigation of climate events and trends. Employment dislocation and poverty rates will increase (with artificial intelligence systems as an additional factor), constraining the ability of governments to keep up with its social costs. Enforcement of laws to limit crimes of desperation will be more difficult. Politically-driven tax cuts to offset increased household costs of climate change will cripple the ability of governments to keep up with change. Delays in moving to net-zero carbon energy production will make necessary actions more difficult to undertake.
17. Political and monetary pressure from fossil fuel industries will make a rapid transition to energy based on non-fossil fuels very difficult, and perhaps dangerous (How far will fossil fuel energy producers go to protect their industries?).
18. A multitude of small regional and local effects will require solutions.

Adequacy of action is and will be constrained by denials of the existence and/or severity of the scientific evidence and, unfortunately for some, climate change has become politicized, **at the expense of our children's future well-being**.

* Per sources identified in the book "The Uninhabitable Earth: Life After Warming", by David Wallace-Wells.

Appendix 3 – Answers to Questions and Concerns



Why A 401RT? – Answering Doubts, and Rescuing Highway 401

An east-west rapid transit line across the northern half of Toronto is essential to the Toronto area's economic and social prosperity and environmental sustainability. Its absence is a costly handicap to progress. It has been presented as a "401RT" extending from Pickering Town Centre to Hurontario Street in Mississauga, with up to 33 stations over a 59-kilometre length (including Sheppard subway segment). Although a great deal of work is now underway on other rapid transit initiatives, it is important that w***ork to study the feasibility and impacts of a 401RT begins now.***

Although the Eglinton Crosstown LRT and expansions to GO Transit are underway, and plans for new subway and LRT lines are developing, the scale of what is needed to cut road traffic congestion and Its costs is being missed, and measures being taken to date are a collection of piecemeal actions.

Concerns of those who are skeptical of the 401RT idea as workable and important for Toronto are addressed here:

1. <u>Removing a highway lane when traffic is already congested is a non-starter.</u>

- A survey of Highway 401 users is very likely to show that a high percent of them would take an east-west rapid transit line across the city to their destinations or to north-south transit. If the modal shift is in excess of 20%, the lane loss is offset.
- Failure to construct a rapid transit line that can compete with Highway 401 means worsening congestion and gridlock as Toronto's population and employment continues to grow. The 401RT will rescue the 401 from gridlock.
- Locating segments of the 401RT at grade in the 401 corridor is the least expensive construction option.
- Highway 401 in the core of the Toronto area will soon be unable to accommodate more population- and employment-based travel demand growth.

- The need for major modal shifts away from using automobiles is a vital part of reducing rapid climate change impacts.

2. The suburbs are not the place for subways; ridership will not be enough.

Several factors will make a 401RT operationally viable:

- Over many decades, jobs and people have gravitated towards locations near Highway 401 or are along major arterial roads that intersect with the highway.
- Transit connections will make it work. A 401RT will create potentially up to ten north-south rapid transit connections, and two dozen stops at major arterial roads.
- The 401RT would deliver many people close to final daily destinations (for example, Pearson International Airport and Scarborough Town Centre).
- GO Transit operates almost all of its rail stations in the suburbs and is an operational success; about 96% of its riders go to a single high-density stop (Union Station).
- Estimated ridership for the 401RT is 205 million new transit trips per year, and 14 million new transit trips per year for the Ontario Line extension north of Eglinton East.
- Note: An extension of the Ontario Line north of Eglinton Avenue East is necessary to avoid adding to congestion on the Yonge subway.
- Many people today are forced to drive a car because of the absence of east-west rapid transit in northern Toronto.

3. The Ontario government is already doing what it can to reduce road traffic congestion in the GTA.

- No, it is not. Politically-determined budget decisions constrain what is done.
- Current transit initiatives funded by Ontario – the Eglinton LRT, GO Transit expansion, and the new subway plan – will not be enough to stop growth in road traffic congestion in Toronto. While altogether they may generate up to 280 million new transit trips per year, the total number of trips by automobile will still grow by more than 800 million per year by 2051. A 401RT across the northern half of Toronto and Ontario Line extension to Sheppard East will cut that growth by 219 million.
- The key to real cuts to congestion is to maximize modal shifts, but most riders on the Eglinton LRT and new subways will be transfers of existing transit riders from current transit services.

4. We can't afford it. There's a deficit and taxes are already too high.

- Failure to adequately address road congestion is much less affordable. Estimates of the cost of congestion in the Toronto area is in the billions of dollars per year. 1.8 million people in cars and trucks on Highway 401 between Hurontario Street and Liverpool Road suffer from congestion and car costs ***now***, and that is unaffordable.
- The infrastructure cost of the 401RT is $16.3 billion, plus the $3.8 billion Ontario Line extension north of Eglinton Avenue East, less the $4.7 billion Eglinton West LRT rendered unnecessary by the 401RT, and less a $6.7 billion Canada share = $13.3 billion cost to

Ontario and municipal/GTAA partners. In peak financing years, this is $800m per year (@4.5%), approximately equal to 0.4% of a projected 2051 Ontario budget.

- In a larger context, Toronto's GDP is about $750 billion per year. A $400 million annual debt financing cost of the 401RT is less than 0.1% of its GDP to resolve a major issue that plagues travelers almost every day.
- A 401RT partly at grade in the Highway 401 corridor is the least expensive way to move people onto a viable rapid transit line across the northern half of Toronto.
- If the 2019 Ontario Plan for Rapid Transit for Toronto is considered worthwhile, a 401RT is much more so – 401RT is a more than four times as cost-effective, based on cost per new transit user.
- Whether taxes are too high is a subjective opinion, based on the degree to which people have prioritized their after-tax incomes.
- ***It makes sense to undertake the 401RT analyses now***, so that construction can begin when the time is right, such as when job-creation measures are especially needed, as during an economic recession, or when current project work begins to wind down.
- Up-front analyses cost relatively little.

5. The northern parts of Toronto will be well-served by the Eglinton Crosstown LRT, especially when it is extended.

- The Eglinton Crosstown LRT is geographically within the southern half of Toronto. The northern half, home to 1.3 million people and hundreds of thousands of jobs – including the airport employment megazone north of Pearson, and Pearson itself – will remain very poorly served by east-west rapid transit.
- It should be noted that the essential 401RT would render the western and eastern extensions of the Eglinton Crosstown LRT unnecessary, while with those extensions a 401RT is still necessary – in other words, building those LRT extensions will be a duplicative mistake.

6. There would be too much disruption during construction.

- Work on building a 401RT should begin before highway volumes increase further; delays will make construction more difficult and congestion worse.
- Locking Toronto into permanent disruption via worsening congestion and gridlock will be much worse. That must ***not*** be allowed to happen. A few years of construction is not much different than what occurs now.
- Construction can begin with off-highway segments, including to/from: Pickering Town Centre, Scarborough Centre, the Sheppard Subway, Yorkdale station, the off-highway diversion to/from Pearson, and the Mississauga Airport Corporate Centre.
- Once tunneled segments rise onto the surface of the 401, multiple construction companies can, within even a single year, construct and complete the on-highway stations and at-grade tracks between stations.
- During construction, the TTC can provide special east-west express bus services to/from key destinations.

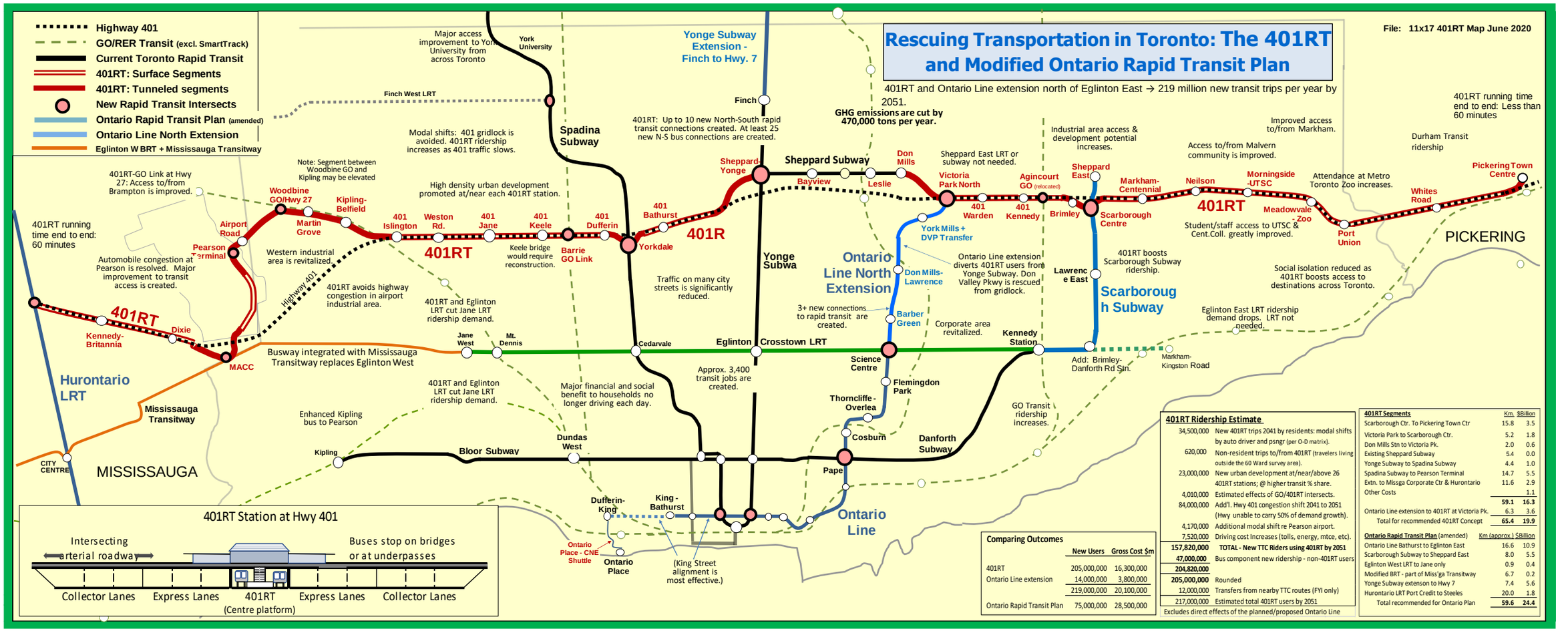
A full-length east-west rapid transit line from Pickering Town Centre and Hurontario Street across the northern half of Toronto and an extension of the Ontario Line north of Eglinton East to Sheppard Avenue East will rescue Highway 401 from becoming non-functional for extended periods of time each day, will rescue the Don Valley Parkway, and will transform transportation across the region. It is inevitable and needs a full detailed analysis by transportation agencies on an urgent basis.

Quite simply, if a 401RT or rapid transit line of similar length and location is not built soon, with its many north-south linkages, there is no hope of containing a worsening of road congestion and environmental demand in the core of the GTA.

The Highway 401RT: Essential. Urgent. Affordable.

Why a 401RT?

1. Current rapid transit plans will not generate enough modal shifts to transit to stop increases in road congestion or greenhouse gas emissions. By 2051, close to 900,000 more cars will be on Toronto's roads each day.
2. The functionality of the Highway 401 corridor in Toronto is at risk. The 401 will not be able to accommodate much more travel demand growth resulting from population and job growth.
3. Trips to, from and within northern Toronto, including cross-boundary trips, are poorly served by rapid transit. A 401RT rescues trnasportation in northern Toronto.
4. The Eglinton Crosstown LRT is too far south in Toronto to be useful to most travelers whose trip origins and destinations are in the northern half of Toronto.
5. The 401RT is affordable. Economic, transportation, environmental, social and household benefits exceed the costs of building and operating the 401RT.
6. The 401RT and the Ontario Line extension northward from the Eglinton LRT are essential if growth in road traffic congestion in Toronto is to be stopped.
7. Mass transit is part of the effort to fight climate change. The urgency of reducing greenhouse gas emissions is emphasized in warnings about drastic and permanent damage to earth's climate and all life forms.



Note: A 401RT makes four planned LRTs unnecessary: Jane, Sheppard East, Eglinton West extension to Pearson, Eglinton East extension to UTSC and Malvern. Up to $7.9 billion in capital costs can be saved.

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More information can be found at www.401RT.ca .