

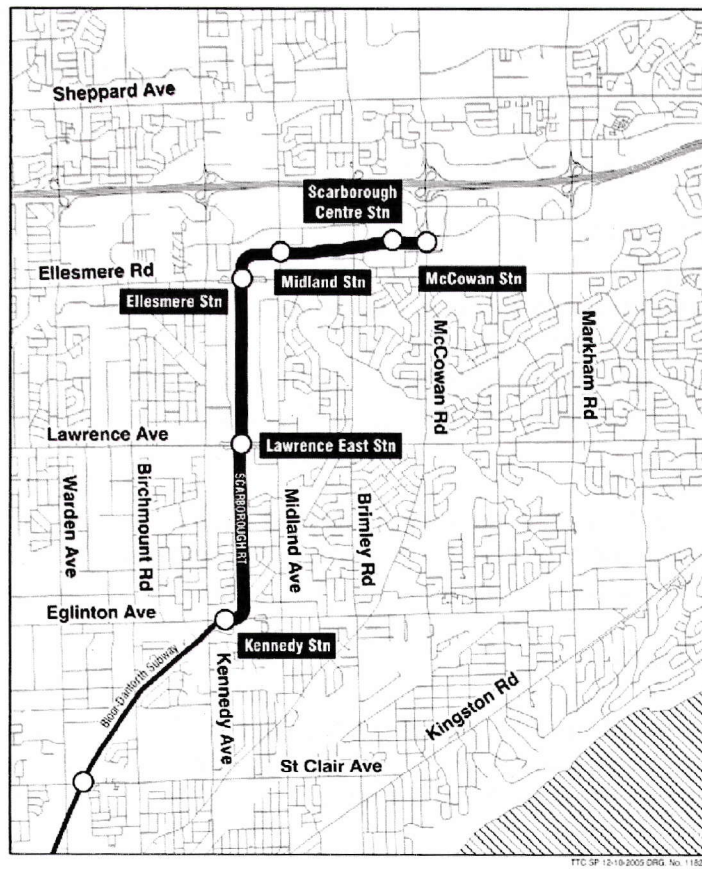
1. Background

1.1 Purpose of the Report

In 1977, the Toronto Transit Commission (TTC) approved construction of a light rail rapid transit (LRT) service between Kennedy Station on the Bloor-Danforth subway and McCowan Road. LRT was selected to take advantage of an existing railway right-of-way in order to stimulate growth and development around the Scarborough City Centre at lower cost than subway construction. At that time, the main thrust for providing rapid transit to the Scarborough City Centre was considered to be a *land use initiative*.

Although LRT construction had already begun, in 1980, the TTC accepted a joint request of the Borough of Scarborough and the Province of Ontario to convert the Scarborough LRT system to a new, high technology, Intermediate Capacity Transit System (ICTS) then being developed by the Province's Urban Transportation Development Corporation (UTDC). This new service, shown in Figure 1.1, named the Scarborough RT (SRT), began revenue service in 1985. Subsequently, a right-of-way was protected for a future extension to Markham Road and Sheppard Avenue.

Figure 1.1 – The Existing Scarborough RT Service



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The fleet of 28 original “Mark I” vehicles is now approaching the end of its economic service life (in terms of maintenance costs and reliability). In addition, the number of these vehicles owned by the TTC limits the capacity of the Scarborough RT, with the result that serious overcrowding is experienced during peak periods. With sufficient vehicles, it has been estimated that the Scarborough RT, today, would attract some 10 to 15 percent more riders during peak periods (some of whom are now using a supplementary bus service).

Replacement vehicles compatible with the Scarborough RT right-of-way and guideway, however, are no longer manufactured. Custom-built cars could be manufactured, but at a very high cost premium. Although lower cost (per seat), longer vehicles are now being manufactured for Vancouver’s SkyTrain, Kuala Lumpur, and other applications, operation of these longer, “Mark II” cars would require some reconstruction of existing facilities and associated suspension of service during construction.

The main purpose of the Scarborough RT Strategic Planning Study is to develop a plan for replacing and expanding capacity of the service before the existing fleet reaches the end of its economic service life. The study is not restricted solely to either the current technology or the existing alignment. A number of alternatives are assessed that differ with respect to:

- choice of technology,
- route alignment,
- station locations,
- integration with other elements of the City and regional transit system, as well as
- proposed scheduling and timing.

Specifically, the study focuses on how best to:

- maintain reliable service,
- expand capacity,
- provide for future network integration (i.e. expansion of higher-order transit),
- minimize service disruption, and
- support the land use and transportation objectives of the City of Toronto *Official Plan*, TTC’s *Ridership Growth Strategy (RGS)*, and the joint City/TTC *Building a Transit City* plan.

It should also be noted that, as has already been indicated in various public arenas, the main intention is to recommend service that provides necessary long term capacity and quality of service comparable to, or better than, the present Scarborough RT.

1.2 The Planning Context

A number of studies, plans, and technical reports help define the context within which a strategic plan for the Scarborough RT should be prepared. Some of the more relevant policies and documents are treated briefly, below.

TTC State of Good Repair

Although expansion of TTC to serve a rapidly growing *GTA* population has dominated most discussion of transit planning for several decades, a great many proposals for new transit facilities have been prepared that do not adequately reflect the financial realities within which transit expansion must be considered.

It is well known that, for quite some time, fares and other revenues derived from transit service have been less than the total costs of operation and maintenance, resulting in a need for operating subsidies. Under these circumstances, all capital investment also requires external funding from municipalities and senior levels of government since there are no operating surpluses that can be used to either establish reserves or fund capital projects. Non-operating maintenance and rehabilitation,¹ the procurement of additional and/or replacement vehicles, as well as the construction of new facilities ranging from bus garages to subway expansion, therefore, depend upon capital funding over and above operating subsidy requirements.

The TTC's capital budget is dictated by funding provided by the City of Toronto, supplemented by additional funding that may be provided by the provincial and federal governments under various transit assistance programs.

The "state of good repair" policy reflects priorities for capital spending. Under this policy, basic capital needs for maintenance and rehabilitation that affect safety and existing service reliability take precedence over other capital projects including system expansion.

Improvements to the existing Scarborough RT, at least with respect to vehicle replacement, certainly fall within the category of state of good repair. What is not quite as clear, however, is how major changes in technology (LRT or subway) and the associated capital works would be treated. Conversion of the existing facility to LRT *might* be treated as state of good repair whereas a new subway would *not*.

Scarborough RT Extension²

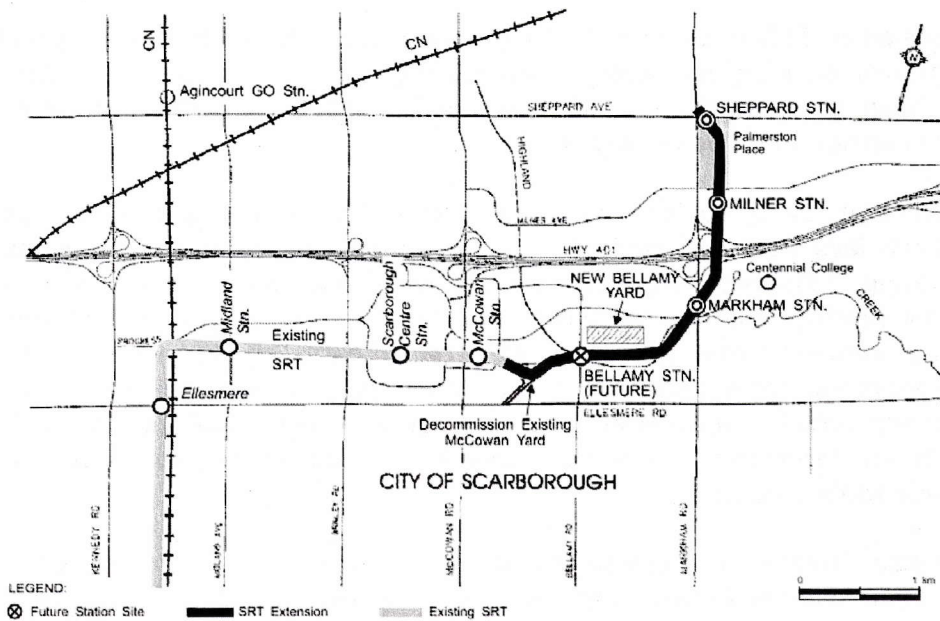
An Environmental Assessment study concluded that extension of the Scarborough RT to Markham Road and Sheppard Avenue (known as the "Malvern Gateway") using the present technology "is the most efficient and environmentally acceptable method to improve transportation services and satisfy the urban development goals in the area Northeast of the Scarborough City Centre". The proposed route is shown in Figure 1.2.

In 1991 dollars, the total capital cost of the extension (including 18 new vehicles, expanded maintenance yards, and property acquisition) ranged from \$390 to \$420 million.

¹ The term 'non-operating maintenance' refers to major expenditures such as streetcar rebuilding, that are included in the capital budget, as opposed to routine operating maintenance such as vehicle repairs and fuel, that are included in the annual operating budget.

² *Scarborough Rapid Transit Extension Environmental Assessment Study*, Toronto: Toronto Transit Commission, May 1992.

Figure 1.2 – Proposed Scarborough RT Extension (1992 Environmental Assessment)



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Rapid Transit Expansion Study³

The main purpose of the 2001 *Rapid Transit Expansion Study* (RTES) was to examine needs and priorities for expansion of the TTC's rapid transit system to the year 2021. That study was based on the previously noted premise that basic capital needs for maintenance, rehabilitation and the "state of good repair" must be met before contemplating funding for rapid transit expansion.

Four aspects of the RTES are particularly relevant to this study of the Scarborough RT.

First, RTES enunciated a number of investment principles, the most important being a commitment to an ongoing program of rapid transit expansion targeted to open one km of new rapid transit every 18 to 24 months at an annual cost of about \$100 million per year.

Second, the study concluded that extension of the Spadina subway to York University and extension of the Sheppard subway beyond the present terminal at Don Mills Road represented the two highest priority elements of rapid transit expansion. Subsequently, in August 2001, the TTC confirmed that:

subject to full funding of its base capital needs, "the highest priority for rapid transit expansion would be *either* a northerly extension of the Spadina subway to York University/Steeles Avenue, *or* an easterly extension of the Sheppard subway".⁴

³ *Rapid Transit Expansion Study*, Toronto: Toronto Transit Commission, August 2001

⁴ Minutes, Toronto Transit Commission, Meeting No. 1826, 9 April 2003.

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At the time, that decision was taken in isolation of the needs to re-equip, expand, or possibly rebuild the Scarborough RT.

Third, the RTES study did not identify the proposed extension of the Scarborough RT from McCowan to Malvern as an immediate priority. Due to lower estimated ridership than competing projects, little impact on system connectivity, and only moderate redevelopment potential, RTES proposed eliminating this project from further consideration.

Finally, two important caveats highlighted in a follow-up report presented to the TTC in June 2002, are first, that not all past subway investments have resulted in redevelopment near stations, thereby resulting in ridership increases that are insufficient to justify investment and second, that it is important to be realistic about what is achievable and/or cost-effective.

*City of Toronto Official Plan*⁵

The Official Plan (OP), approved by the City of Toronto in 2002, contains three elements that relate specifically to the analysis of alternatives for the Scarborough RT.

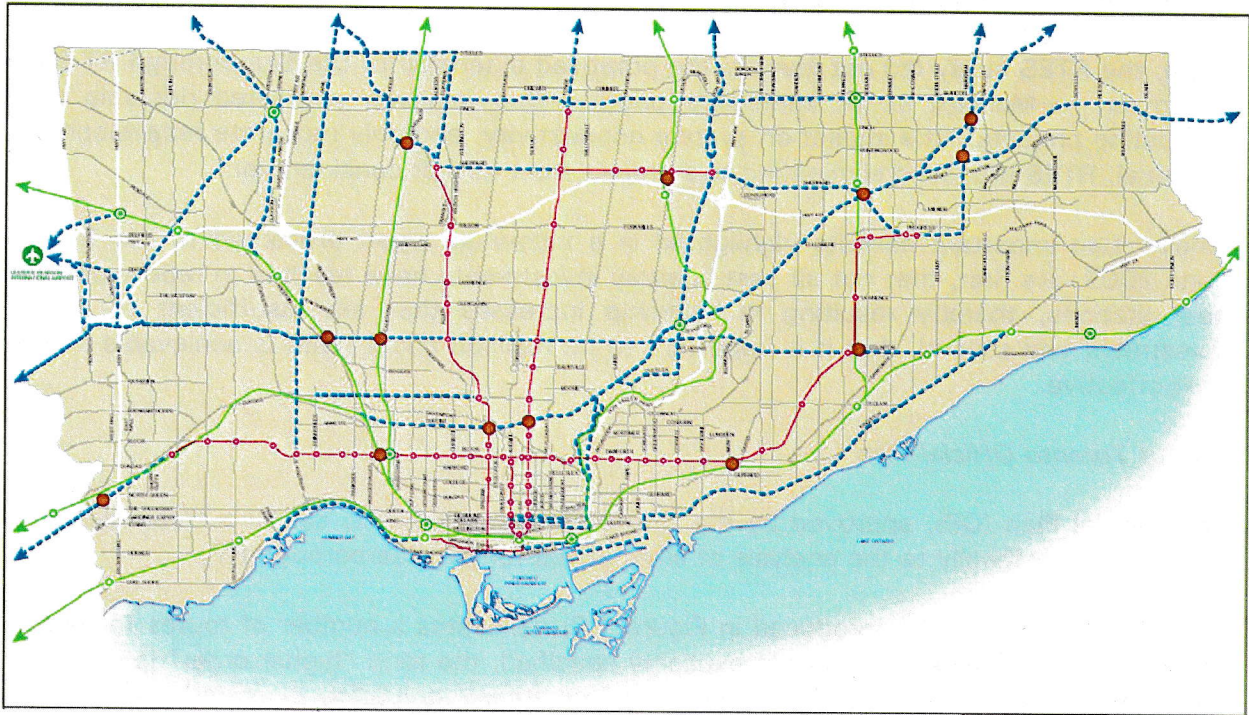
First, Map 4 of the OP (reproduced in Figure 1.3) delineates a number of routes for higher order transit initiatives. Though not explicitly specified, the term “higher order” is generally construed as service that is *better than surface transit operating in mixed traffic*. How much better depends primarily on the degree of protection from other road traffic, which can vary from designated reserved lanes, through partially protected rights-of-way (similar to the Spadina LRT), to fully protected subways or elevated guideways. As indicated in Figure 1.3, a fairly rich network of such unspecified services is shown for transit corridors within northeast Scarborough.

Second, Map 2 of the Official Plan designates the area surrounding the Scarborough City Centre as one of four “vital mixed-use communities” (the others being Bloor-Kipling/Islington in Etobicoke, Yonge-Sheppard/Finch in North York, and Yonge-Eglinton) defined as “places with excellent transit accessibility where, jobs, housing and services will be concentrated in dynamic mixed use settings”. In this regard, the question becomes one of what constitutes excellent transit accessibility. Is transit accessibility maximized by relatively short lengths of very high quality service such as subways, or by larger networks of “lower” quality service such as Scarborough RT technology, BRT, or LRT, serving more origins and destinations? In all likelihood, combinations of both probably best meet the transit needs of Scarborough residents.

Third, the OP stresses the development of the “Avenues”, essentially characterized by moderately-higher densities of mixed land use, as well as pedestrian and bicycle friendly streetscapes served by convenient surface transit (predominantly streetcar). Within the Scarborough RT study area, “avenue” treatment is suggested for relatively short sections of Lawrence Avenue.

⁵ *Toronto Official Plan*, City of Toronto, May 2002

Figure 1.3 – Higher Order Transit Corridors Designated in the Official Plan (Map 4 of OP)



TTC 10 Year Ridership Growth Strategy (RGS)⁶

The *Ridership Growth Strategy* defines practices that “will allow the TTC to contribute significantly to achieving the objectives of the City’s Official Plan” over the period 2003 to 2013. Recognizing financial realities, the proposed strategy, among other initiatives, “features a continuous program of upgrading major surface transit routes” as indicated in Figure 1.4.

TTC/City of Toronto, Building a Transit City Plan⁷

Building a Transit City is a concept put forward by the TTC and the City of Toronto which presents a longer-term, integrated, system of surface right-of-ways based upon those contained in the *TTC Ridership Growth Strategy*, as well as the higher order transit corridors contained in the *City of Toronto Official Plan*.

Elements of the *Ridership Growth Strategy* and *Building a Transit City* plans that bear directly on the Scarborough RT study include:

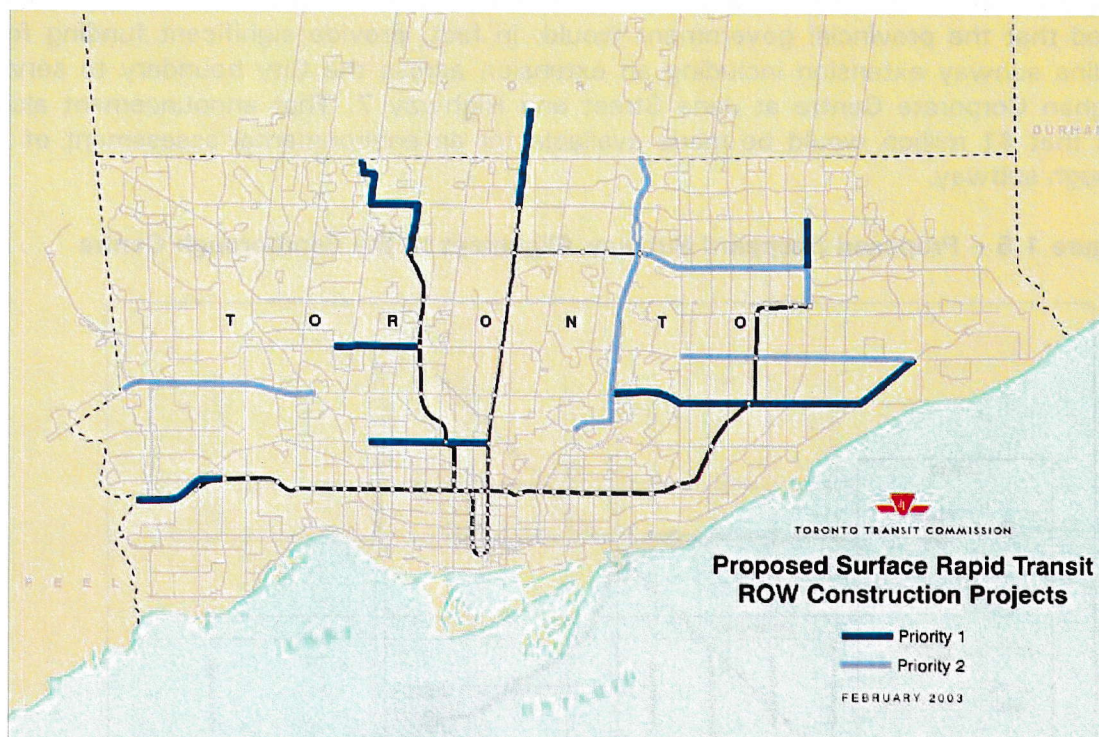
- A program of construction of surface transit rights-of-way within major corridors,
- Increasing the carrying capacity of the Scarborough RT, and
- A program of rapid transit expansion funded at \$175M a year, or about 1km of

⁶ *Ridership Growth Strategy*, Toronto: Toronto Transit Commission, March 2003

⁷ *Building a Transit City*, Toronto: Toronto Transit Commission and the City of Toronto, 2002.

subway, once other elements of the RGS program are funded.

Figure 1.4 – Ridership Growth Strategy Surface Rapid Transit Corridors



*Sheppard Subway Environmental Assessment*⁸

The Sheppard subway was originally intended to connect the North York and Scarborough city centres. The environmental assessment for the entire route concluded that:

the most efficient and environmentally acceptable method to improve transportation services and satisfy urban structure goals...in the Sheppard/Finch corridor is...to construct and operate the Sheppard Subway (underground) on Sheppard Avenue as far as Kennedy Road and then south-easterly into the Scarborough City Centre via the Kennedy-Progress alignment.

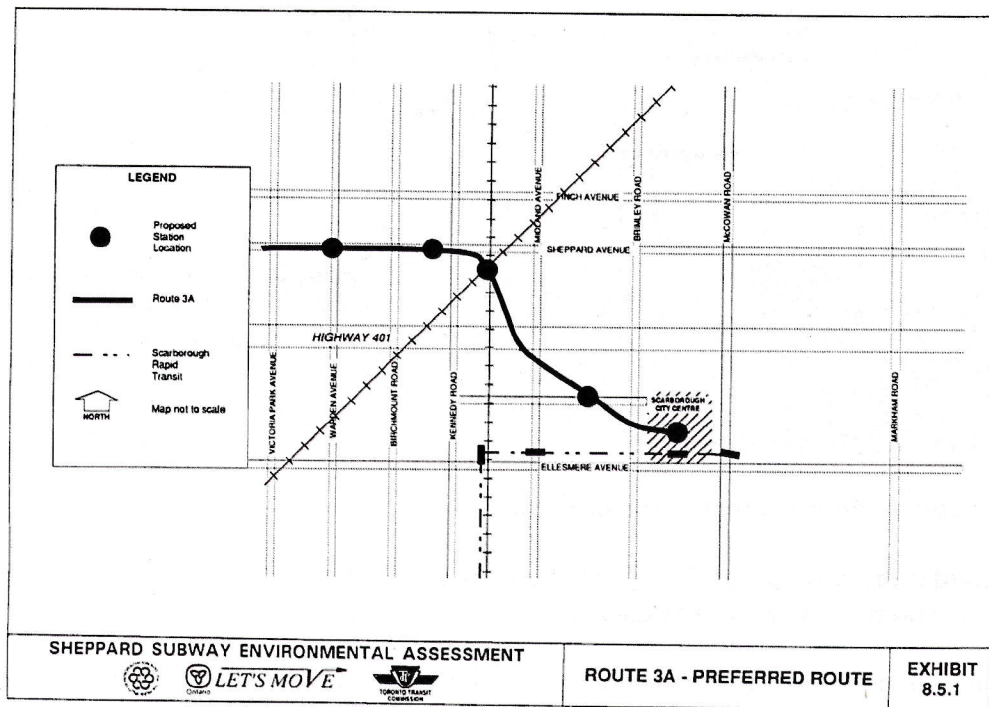
Due to limitations on available funding for this project, only the segment between Yonge Street and Don Mills Road was completed and opened for revenue service. With respect to the Scarborough City Centre, where an extension of the current subway would interface with the Scarborough RT, the recommended alignment is shown in Figure 1.5.

The above studies and reports relate directly to Scarborough RT development. Other studies, not treated here, such as those concerned with bus rapid transit (BRT) on Yonge Street north of the Finch subway terminal, the Spadina Subway extension to York University (including the approved BRT service), improvements to the St. Clair Avenue

⁸ *Sheppard Subway Environmental Assessment*, Toronto: Toronto Transit Commission, undated.

streetcar service, the Don Valley Corridor Transportation Master Plan, and new transit initiatives for Toronto’s waterfront are likely to have indirect impact on the timing of Scarborough RT improvements inasmuch as all are influenced by the availability of funding. In this regard, it should be noted that In April, 2006, the Ontario Minister of Transportation announced that the provincial government would, in fact, provide significant funding for the Spadina subway extension including an extension across the City boundary to serve the Vaughan Corporate Centre at Jane Street and Highway 7. That announcement also indicated that \$1 million would be made available for an environmental assessment of a Scarborough subway.

Figure 1.5 – Proposed Sheppard Subway Alignment to the Scarborough Centre



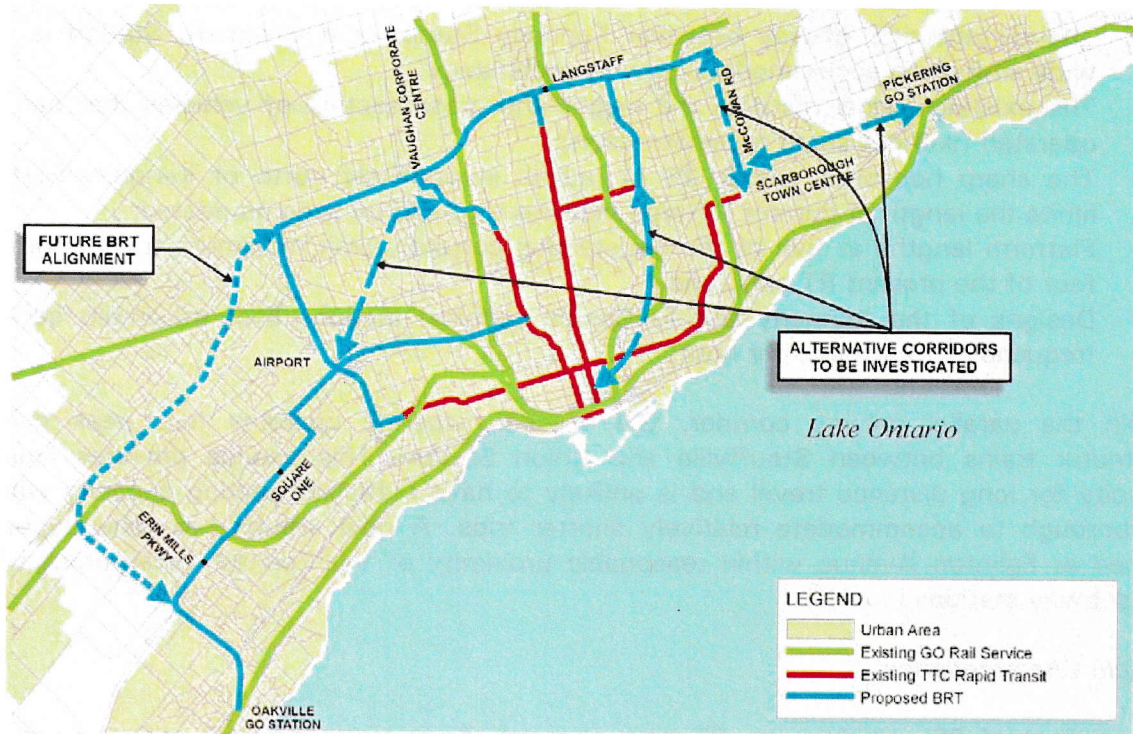
Initiatives proposed by other agencies such as GO Transit and York Region (YRT and VIVA) also have some relevance to the analysis of alternatives for the Scarborough RT. In its major bus rapid transit (BRT) study, for example, GO Transit’s consultant identified a number of BRT routes including a broadly defined north-south corridor between McCowan Road and Morningside Drive, as shown in Figure 1.6.⁹

The York Region Transportation Master Plan¹⁰ also includes a north-south BRT service on Don Mills Road that connects to the present terminal of the Sheppard subway.

⁹ McCormick Rankin, *Inter-Regional Bus Rapid Transit*, Toronto: GO Transit, December, 2002

¹⁰ Region of York, *Transportation Master Plan*, 2002

Figure 1.6 – Proposed GO Transit BRT Plan



2. Current Scarborough RT Service and Operations

2.1 Description

Route Characteristics

The present Scarborough RT service operates over a 7.2 km route (shown schematically in Figure 2.1) between the Kennedy and McCowan stations, with four intermediate stations at Lawrence East, Ellesmere, Midland, and Scarborough Centre. Passengers transferring to and from the Bloor-Danforth subway are required to traverse three levels at Kennedy Station, one of the main criticisms of the existing service.

From Kennedy Station, where the Scarborough RT portion of the station is on an elevated structure, there is a transition to an at-grade alignment adjacent to the railway corridor that continues beyond Ellesmere Station where it turns east and traverses the railway by means of a 160 m tunnel. The remainder of alignment involves elevated structures and stations, except for access to the maintenance and yard facilities east of McCowan station.

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For the existing route:

- The current right-of-way between Kennedy Station and Ellesmere Station is not wide enough to accommodate subway technology,
- The existing tunnel restricts the height and cross section of vehicles that can be operated (without some re-construction),
- The sharp horizontal curve (26 m radius) immediately north of Kennedy Station limits the length of current RT-type vehicles that can be accommodated,
- Platform lengths at five of the six stations currently limit maximum train length to four of the present RT cars, and
- Designs of the Kennedy and McCowan terminal stations limit maximum service frequency to 24 trains per hour.

Within the parallel railway corridor, GO Transit presently operates four peak period commuter trains between Stouffville and Union Station. This service provides limited capacity for long distance travel and is unlikely to have sufficient seating capacity within Scarborough to accommodate relatively shorter trips. A new station has recently been opened at Eglinton Avenue within reasonable proximity of the Kennedy Scarborough RT and subway stations.

Vehicle Characteristics

With a fleet of 28 vehicles, the RT now operates 4-car trains every 3 minutes and 30 seconds (17 trains per hour) during peak periods, providing a *design* capacity of approximately 3,800 passengers per hour per direction (pphpd) between Kennedy Station of the Bloor-Danforth subway and McCowan Station. The fact that peak volumes already exceed 4,000 pphpd indicates that service is already overcrowded. As noted previously, additional capacity is provided by supplementary surface bus service.

Individual vehicles, shown in Figure 2.2, are 12.7 metres in length. Vehicles operate as two-car "married pairs" with a cab at each end in order to retain bi-directional operational capability. The 2-car units can be combined into four- or six-car trains, although, as noted above, maximum train length that can be accommodated is presently limited to four cars.

Service standards are based on 55 passengers per car even though a larger number is often carried.

A single car is roughly the same length and width as a standard transit bus, and a two car train is slightly longer than the Articulated Canadian Light Rail Vehicle (ALRV).

Figure 2.1 – Schematic Alignment of the Scarborough RT Route

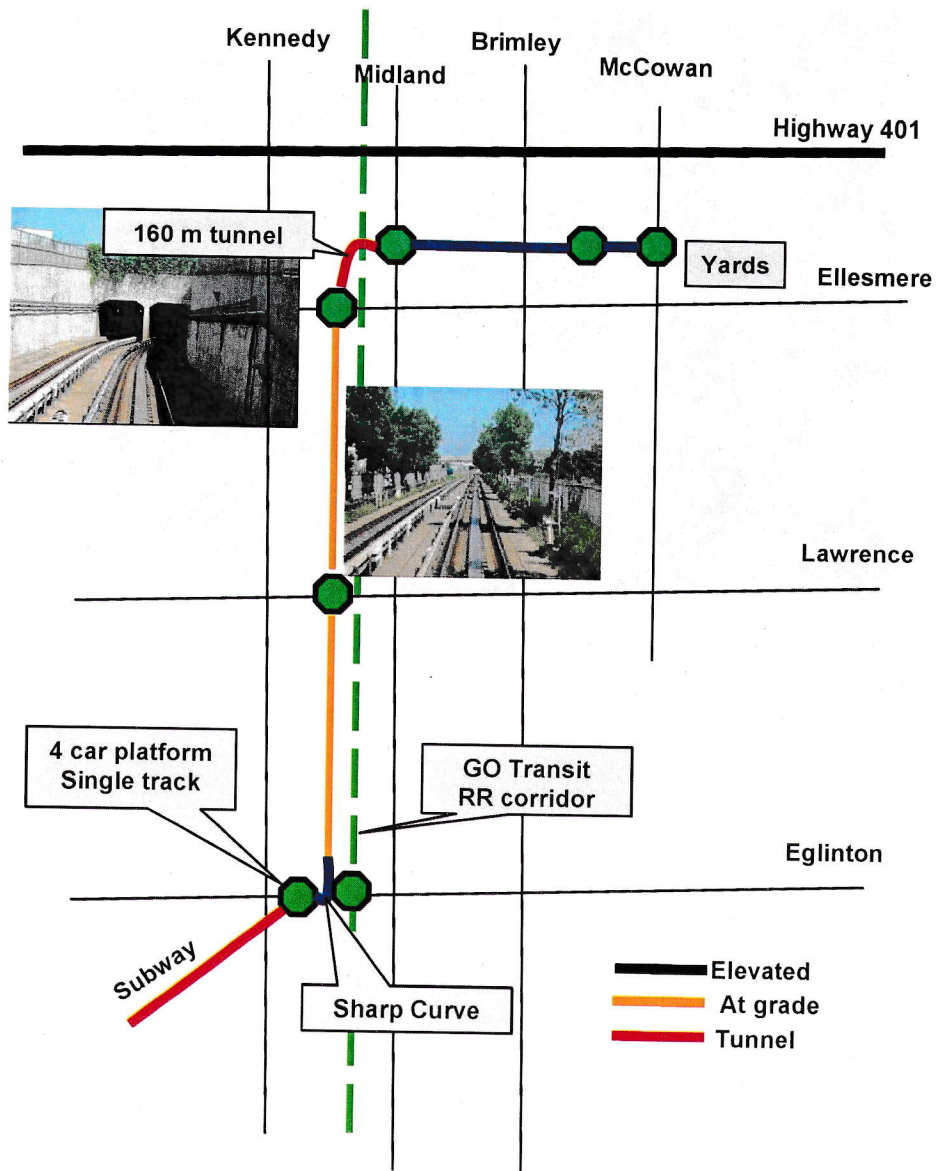


Figure 2.2 – Current RT Vehicles



The vehicle control and signal system (SELTRAC) provides an on-board computer (VOBC) in each car and is capable of completely automated operation (as in Vancouver). On the Scarborough RT, however, a single operator is used on each train.¹¹

¹¹ Similar vehicles operated in Vancouver are also configured somewhat differently to allow for a different means of emergency egress.

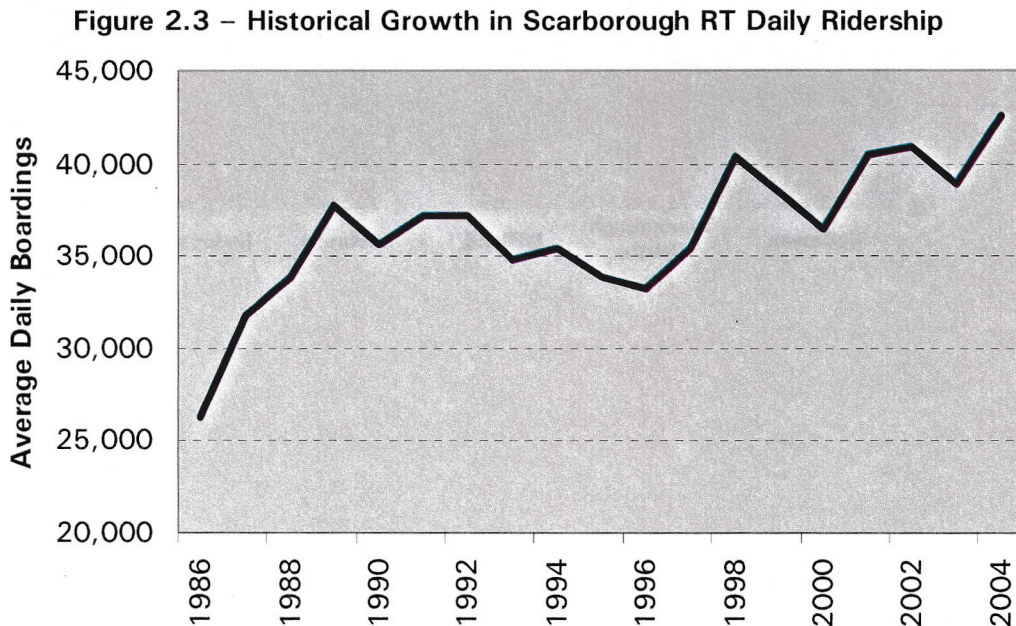
The SELTRAC (“moving block”) advanced train control system permits higher frequency service than in the case of the TTC’s subways where frequencies and “headways” (time between successive trains) are controlled by a traditional “fixed” block signal system wherein the progress of one train is dictated by the location of the previous train.

Unlike streetcars and subways that use conventional DC electric motors, RT cars use an innovative linear induction motor (LIM) whereby power supply can be managed more effectively to meet needs for negotiating steeper grades. The vehicle also features “steerable” (articulated) trucks that reduce both noise and weight.

The RT track is standard railway gauge (the distance between rails) of 1435 mm whereas TTC gauge for subways and streetcars is 1495 mm.

2.2 Present Ridership

The growth in average daily passengers using the Scarborough RT is shown in Figure 2.3. Based on 2004 counts, the Scarborough RT now averages about 42,000 daily passenger boardings, and maximum volumes of about 4,200 pphpd (more than the design capacity referred to previously). Figure 2.4 shows the average daily boardings by station in 2004. Kennedy and Scarborough Centre stations are, by far, the most heavily-used stations. Lawrence East Station also handles reasonable volumes of traffic.



Figures 2.5 and 2.6 display the major origins and destinations of those now using the service during the morning peak period in 2001. For originating trips, these data show that the majority of users live well beyond the present terminal at McCowan Road, a fact that

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results in more than 75 percent of all passengers using one or more buses to transfer to the Scarborough RT, in addition, of course, to the transfer at Kennedy Station.

These transfers reduce the attractiveness of the service from the standpoint of both current and potential users. (Extension of the Scarborough RT to a proposed terminal at Sheppard Avenue and Markham Road would reduce the number of transfers by about 13 percent.) In addition, many riders who use the Scarborough RT to access Kennedy Station, transfer again to reach their final destinations since, as shown also in Figure 2.6, the majority of those destinations are in the downtown and likely involve use of the Yonge subway.

Figure 2.4 – 2004 Scarborough RT Ridership by Station

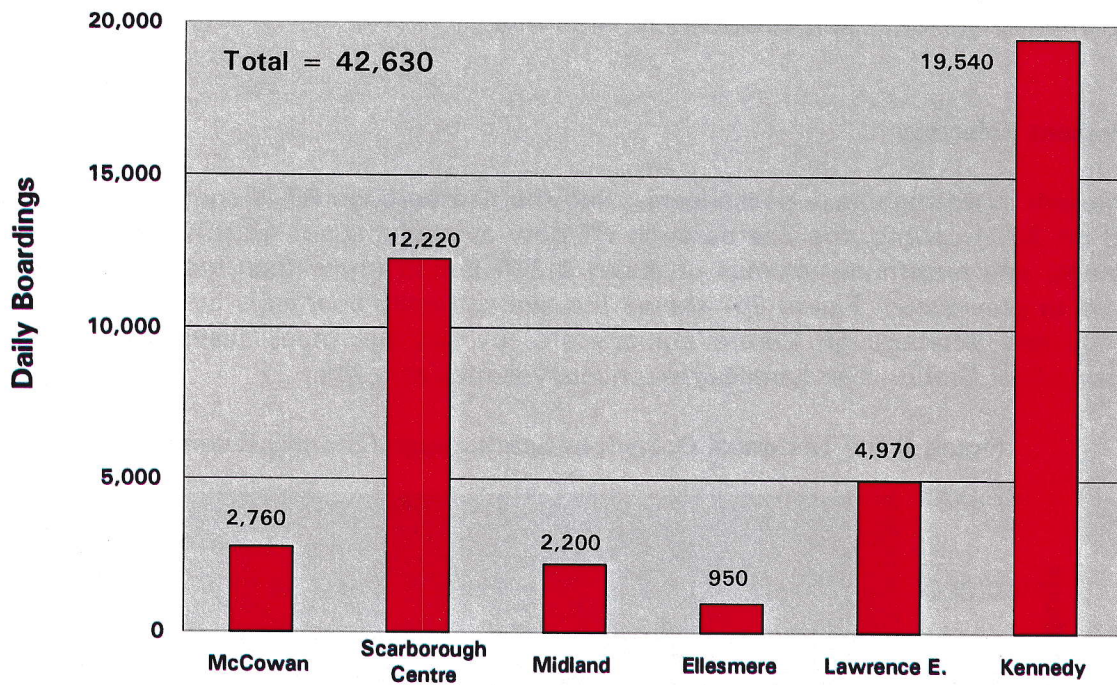


Figure 2.5 – 2001 AM Peak Origins

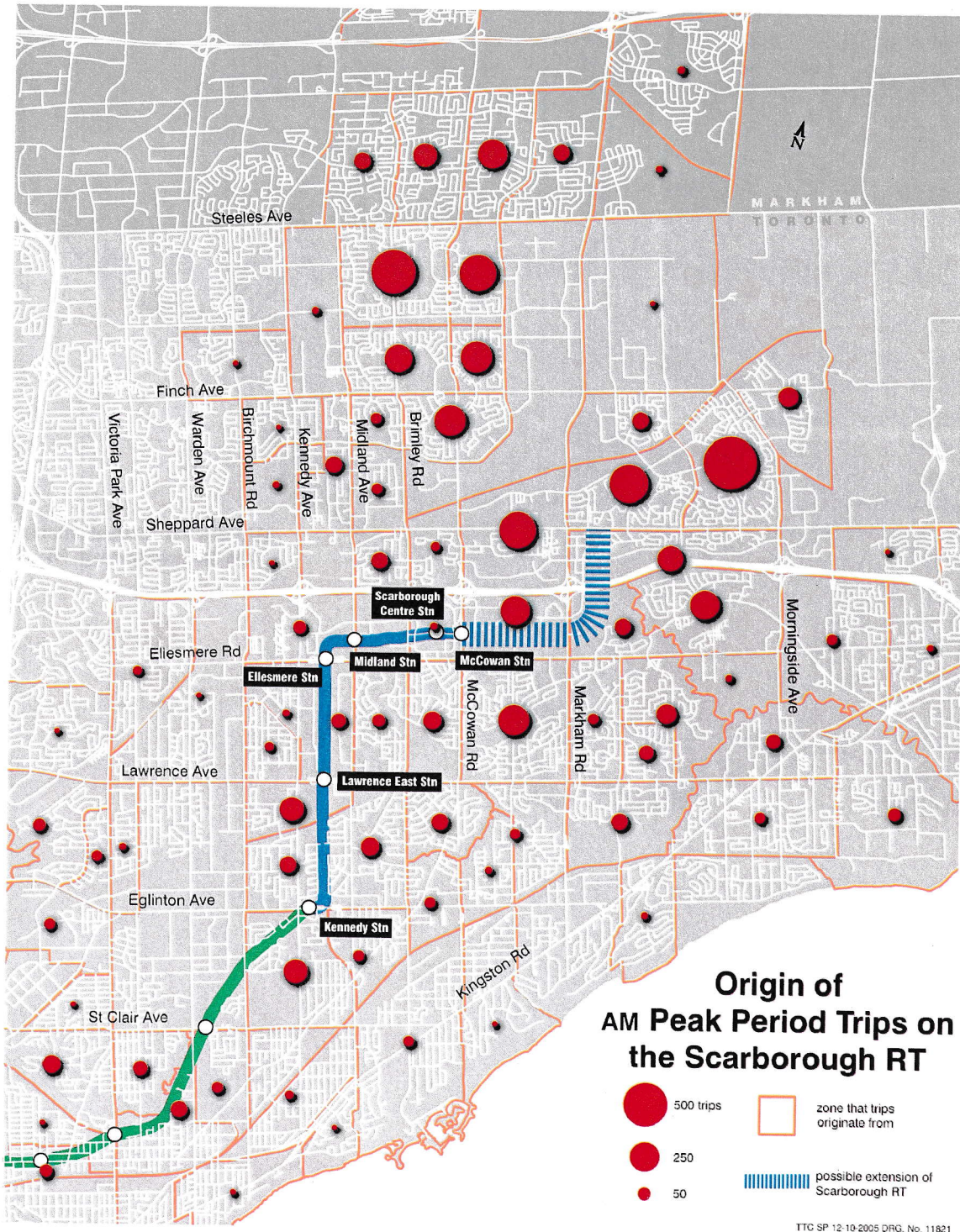


Figure 2.6 – 2001 AM Peak Destinations

