# Yonge North Subway Extension: Neighbourhood Stations Analysis



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## Contents

Executive Summary	6
Assumptions and Methodology	13
Strategic Case	14
YNSE Ridership	14
Four Stations Analysis	15
Core Station with Clark Station	16
Core Station with Cummer Station	20
Core Station with Royal Orchard Station	23
Five Stations Analysis	27
Economic Case	28
Four Stations Analysis	29
Five Station Analysis	29
Financial Case	31
Four Stations Analysis (\$2021 PV)	31
Five Station Analysis (\$2021 PV)	31
Deliverability and Operations Case	32
Clark Station	32
Construction of Clark Station	32

	YNSE Land Requirements without Clark Station	32
	Impact on Bus Network	32
	Impact on Train Speed and Travel Time	33
Cun	nmer Station	34
	Construction of Cummer Station	34
	YNSE Land Requirements without Cummer Station	34
	Impact on Bus Network	35
	Impact on Train Speed and Travel Time	35
Roy	al Orchard Station	35
	Construction of Royal Orchard Station	35
	Land Requirements without Royal Orchard Station	36
	Impact on Bus Network	36
	Impact on Train Speed and Runtimes	37

## **Executive Summary**

The Yonge North Subway Extension (YNSE) will transform the transportation options in York Region, North York and beyond by extending Line 1 subway service by approximately 8 kilometres north from Finch Station to Vaughan, Markham, and Richmond Hill.

An Initial Business Case (IBC) and further supplementary analysis were developed for the extension to evaluate alignment and station options. The YNSE reference alignment (Figure 1) was selected through this business case process, for further evaluation through the Preliminary Design Business Case (PDBC) phase.

A total of six stations were evaluated in the IBC - Steeles, Bridge, High Tech, Cummer, Clark and Royal Orchard. These stations were grouped in three categories in order to facilitate investigation and a more appropriate evaluation of options:

- 1. A **Primary station** is determined to deliver the most significant benefits to the project because they are expected to attract the highest ridership. These stations also tend to be located along existing east-west transportation corridors. In the IBC, Primary stations are defined to have high level of ridership particularly resulting from transfers from buses (over 5,000 average ridership in AM peak hour) The primary stations are Steeles and Bridge Stations.
- 2. A **Complementary Urban Core station** is included in future plans because it is located in an area that is poised for significant urban growth and development and enhances the benefits of at least one Primary station. High Tech Station is a Complementary Urban Core station.
- 3. A **Neighbourhood station** is located in residential areas that are not expected to grow at the pace of areas surrounding other stations. In the IBC, these stations are assumed to be less busy and have average ridership of less than 3,000 in AM peak hour. Cummer, Clark and Royal Orchard are Neighbourhood stations.

Through the IBC analysis, it was determined that four stations could be accommodated within the announced project funding envelope of \$5.6 billion. Three stations were confirmed within the YNSE project scope through the IBC stage – Steeles, Bridge, and High Tech stations – with further analysis to be conducted to inform Neighbourhood station selection.

A preliminary analysis of the Neighbourhood stations was conducted at the IBC stage, where pre-Benefits Cost Ratio (Pre-BCR) and Pre-Net Present Value (Pre-NPV) were provided as an early opportunity to compare forecasted lifecycle of the project and its components (in this case a station) benefits against cost, in advance of the more detailed cost-benefit analysis. This evaluation (Appendix 1 of the IBC) examined how each Neighbourhood station would perform if implemented within the network, relative to the Business as Usual scenario if the station did not exist. A preliminary evaluation of the Benefit-Cost Ratio of each station identified Clark Station as the best performing, followed by Cummer and Royal Orchard stations, respectively. It should be noted that this preliminary analysis used methodology and assumptions (e.g. base case, assumed alignment and stations) that have since been refined and updated.

Following the completion of the IBC and initiation of the PDBC phase of the project, the Neighbourhood station analysis was advanced and further refined with updated assumptions and models in order to further investigate the relative performance of each Neighbourhood station. This was completed under the four cases of the Metrolinx Business Case framework, for a comprehensive analysis under four chapters of the Metrolinx business case:

- Strategic Case
- Economic Case
- Financial Case
- Deliverability and Operations Case

The purpose of this study is to investigate the benefits and trade-offs of each Neighbourhood station to inform decisions on Neighbourhood station scope for the extension. This analysis explores the performance of each station as the potential *fourth* station which can be accommodated within the project's announced \$5.6 billion funding envelope. In addition, station performance is evaluated to inform decisions on a possible *fifth* station, should additional funding become available to include within the YNSE project scope.





Table 1 summarizes the findings of the evaluation. Steeles, Bridge and High Tech Stations are grouped as "Core" stations as they have been confirmed within the project's scope.

Clark Station offers more benefits at lower costs with less complexity of construction, compared to other scenarios; of note are 1,250 new daily riders, and \$124.4 M worth of economic benefits in a *four-station* scenario (Core stations and Clark Station). The expected Benefit-Cost Ratio in this scenario is 0.6.

Clark Station is strategically superior, compared to other scenarios, as it supports broader intensification objectives by connecting the future branch of York Region Viva Orange service to the extension and access to key residential and employment growth areas at Promenade Centre and the Bathurst/Centre corridor. Clark Station will also be able to leverage new separated cycle tracks on Clark Avenue from west of Dufferin Street to Yonge Street.

While Clark Station would have the highest individual station ridership as a fourth station on the extension, it should be noted that all Neighbourhood stations would result in comparable total ridership for the extension as a whole. However, there are significant aggregate time savings benefits out of a fourth station at Clark.

Since Clark Station has the greatest ridership and overall performance as a potential fourth station, this study then assumed Clark Station in both five-station scenarios that were analyzed. These two scenarios offer similar benefits and expected Benefit-Cost Ratio.

Cummer Station as a potential *fifth station* is located in an area with higher potential for future development, but the ridership model shows this station does not attract as many riders as expected to the extension because it is in closer proximity to other nearby major subway stations (Finch and Steeles stations).

Royal Orchard Station as a potential *fifth station* would provide a more balanced station spacing along the extension. Although this station would mainly serve the adjacent community, it has greater user benefits compared to Cummer Station. Without Royal Orchard Station the distance from this location and other nearby subway stations (Clark and Bridge) requires bus riders and walk-in users to transfer/access a bus route on Yonge Street and travel to Clark station to access the subway.

Table 1 - Summary c	of YNSE Neighbourhood Static	ons Analysis - Reference Alignme	nt <sup>1</sup>			
		4 Stations		5 Stations		
	Core + Cummer	Core + Clark	Core + Royal Orchard	Core + Clark + Cummer	Core + Clark + Royal Orchard	
Strategic Case						
Improve access to transit	<ul> <li>700 new daily riders compared to Base Case<sup>1</sup></li> <li>Catchment overlap with Finch and Steeles Stations; 5,700 people within a 10-minute walk of Cummer Station with no overlap</li> <li>2,100 AM peak hour riders at Cummer</li> <li>27,400 AM peak hour riders along the extension in this scenario</li> <li>800 Alightings, 1,300 Boardings</li> <li>Sensitivity test based on City of Toronto's Land Use projection: 200 additional daily riders</li> </ul>	<ul> <li>1,250 new daily riders compared to Base Case</li> <li>Catchment overlap with Steeles Station; 8,100 people within a 10-minute walk with no overlap</li> <li>2,500 AM peak hour riders at Clark</li> <li>27,300 AM peak hour riders along the extension in this scenario</li> <li>700 Alightings, 1,800 Boardings</li> <li>Sensitivity test based on York Region's Land Use projection: 800 additional daily riders</li> </ul>	<ul> <li>1,075 new daily riders compared to Base Case</li> <li>No catchment overlaps with other stations; 7,300 people within a 10-minute walk</li> <li>1,400 AM peak hour riders at Royal Orchard</li> <li>27,700 AM peak hour riders along the extension in this scenario</li> <li>200 Alightings, 1,200 Boardings</li> <li>Sensitivity test based on York Region's Land Use projection: 100 additional daily riders</li> </ul>	<ul> <li>1,850 new daily riders compared to Base Case</li> <li>2,100 AM peak hour riders at Cummer</li> <li>28,100 AM peak hour riders along the extension in this scenario</li> <li>800 Alightings, 1,300 Boardings at Cummer</li> <li>Less balanced station spacing: Finch and Cummer: 0.6km Cummer and Steeles: 1.4km Steeles and Clark: 1km Clark and Bridge: 3.5km</li> <li>Cummer has catchment overlap with Finch Station</li> <li>13,800 people within a 10- minute walk of the two Neighbourhood stations with no overlap</li> </ul>	<ul> <li>1,900 new daily riders compared to Base Case</li> <li>1,100 AM peak hour riders at Royal Orchard</li> <li>27,700 AM peak hour riders along the extension in this scenario</li> <li>200 Alightings, 900 Boardings at Royal Orchard</li> <li>More balanced station spacing: Finch and Steeles: 2km Steeles and Clark: 1km Clark and Royal Orchard:1.5km Royal Orchard and Bridge: 2km</li> <li>Royal Orchard has no catchment overlap with other stations</li> <li>15,400 people within a 10- minute walk of the two Neighbourhood stations with no overlap</li> <li>If Cummer was pursued over Royal Orchard as a fifth station, the distance from Royal Orchard and other nearby subway stations (Clark and Bridge) requires bus riders and walk-in users to transfer/access a bus route on Yonge St and travel to Clark to access the subway - This results in higher travel time and so user impacts compared to Cummer</li> </ul>	

<sup>&</sup>lt;sup>1</sup> Base Case: YNSE has been implemented with only the core stations

#### YONGE NORTH SUBWAY EXTENSION NEIGHBOURHOOD STATIONS ANALYIS

		4 Stations	5 Stations			
	Core + Cummer	Core + Clark	Core + Royal Orchard	Core + Clark + Cummer	Core + Clark + Royal Orchard	
Increase access to economic opportunities Support Planned	<ul> <li>2,200 jobs within a 10- minute walk of with no overlap</li> <li>The lands adjacent to</li> </ul>	<ul> <li><b>1,900 jobs</b> within a 10- minute walk with no overlap</li> <li>YNSE corridor will likely</li> </ul>	<ul> <li><b>1,300 jobs</b> within a 10- minute walk</li> <li>There are limited</li> </ul>	<ul> <li>4,100 jobs within a 10- minute walk of the two Neighbourhood stations with no overlap</li> <li>See Core + Cummer</li> </ul>	<ul> <li>3,200 jobs within a 10- minute walk of the two Neighbourhood stations with no overlap</li> <li>See Core + Royal Orchard</li> </ul>	
Development along the YNSE	<ul> <li>Cummer Station are part of the Yonge Street North Secondary Plan, currently in draft. Draft policies would allow greater heights and densities on than what is in the current policy, accounting for Cummer Station in the extension.</li> <li>Developments in the pipeline, and future developments that have not had density approvals settled would be supported for higher-range densities with inclusion of Cummer</li> </ul>	experience some redevelopment, but higher-range densities would be supported with inclusion of Clark in the extension	<ul> <li>development</li> <li>opportunities compared to</li> <li>other Neighbourhood</li> <li>stations, given the absence</li> <li>of continuous east-west</li> <li>routes, as well as the</li> <li>constraints of the heritage</li> <li>and environmental</li> <li>features on the west side</li> <li>of Yonge</li> <li>Overall, the extension</li> <li>corridor will likely</li> <li>experience some</li> <li>redevelopment, but</li> <li>higher-range densities</li> <li>would be supported with</li> <li>inclusion of Royal Orchard</li> <li>in the extension, specially</li> <li>factoring the distance</li> <li>between Royal Orchard</li> <li>and other subway stations.</li> </ul>	analysis	analysis	
Economic Case (\$202	21, PV)					
Iotal Economic Impacts (Benefits)	\$48.0 M	\$124.4 M	\$88.8 M	\$162.3 M	\$183.7 M	
Total Station Costs	\$214.6 M	\$232.2 M	\$283.6 M	\$446.9 M	\$517.6 M	
Net Present Value	\$-158.4 M	\$-90.6 M	\$-180.0 M	\$-258.9M	\$-307.6 M	
Benefit-Cost Ratio	0.26	0.60	0.36	0.41	0.40	
Financial Case (\$202	21, PV)					
Total Incremental Costs <sup>2</sup>	\$256.4 M	\$250.6 M	\$319.9 M	\$507.1 M	\$572.3 M	

<sup>&</sup>lt;sup>2</sup> As indicated in the IBC, the total estimated cost for each Neighbourhood Station is between \$400 and \$500 million, which includes direct cost (e.g. stations infrastructure), property costs as well as indirect costs (e.g. design and engineering, risk and contingency, tax). However, in this study, only the incremental capital costs and property costs of building each Neighbourhood station has been captured under the Financial Case.

#### YONGE NORTH SUBWAY EXTENSION NEIGHBOURHOOD STATIONS ANALYIS

		4 Stations		5 Stations				
	Core + Cummer	Core + Clark	Core + Royal Orchard	Core + Clark + Cummer	Core + Clark + Royal Orchard			
Deliverability and Operations								
Constructability	<ul> <li>Tunnel interface with the Finch Station tail track</li> <li>Utilities relocations at this station are complex</li> <li>Traffic staging would be complex and extended along a longer distance</li> </ul>	<ul> <li>Typical cut and cover construction</li> <li>No major utility relocations</li> <li>Site remediation may be required based on station location.</li> </ul>	<ul> <li>Royal Orchard is a deep station (30-45m) requiring more complex construction methods resulting in increased costs as well as travel time for passengers accessing the station through vertical circulation</li> </ul>	<ul> <li>Tunnel interface with the Finch Station tail track</li> <li>Utilities relocations at this station are complex</li> <li>Traffic staging would be complicated and extended along a longer distance</li> </ul>	<ul> <li>Royal Orchard is a deep station (40-45m) requiring more complex construction methods resulting in increased costs as well as travel time for passengers accessing the station through vertical circulation</li> </ul>			
Bus Network	<ul> <li>Opportunity for reduction in bus operating and capital costs if the station was implemented (TTC routes 42 and 125)</li> </ul>	<ul> <li>Opportunity for reduction in bus operating and capital costs if the station was implemented (YRT routes 2, 5, and 77 and Viva Orange BRT)</li> </ul>	<ul> <li>YRT routes would likely be unaffected given the long distance between this station and other stations but may result in reduction in service levels with implementation of this station</li> </ul>	<ul> <li>See Core + Cummer analysis</li> </ul>	<ul> <li>See Core + Royal Orchard analysis</li> </ul>			
Runtime	<ul> <li>As a result of inclusion of Cummer Station, up to 50 seconds additional runtime could be assumed for the extension in a single trip</li> </ul>	<ul> <li>As a result of inclusion of Clark Station, up to 60 seconds additional runtime could be assumed for the extension in a single trip</li> </ul>	<ul> <li>As a result of inclusion of Royal Orchard Station, up to 45 seconds additional runtime could be assumed for the extension in a single trip.</li> </ul>	<ul> <li>As a result of inclusion of Cummer Station, up to 50 seconds added runtime could be assumed for the extension in a single trip</li> </ul>	<ul> <li>As a result of inclusion of Royal Orchard Station, up to 45 seconds additional runtime could be assumed for the extension in a single trip.</li> </ul>			

## **Assumptions and Methodology**

In this study, Metrolinx refined the methodology used in the IBC and updated the assumptions, to review the performance of Neighbourhood stations in detail. For the purpose of this study, eight scenarios were modeled using the Reference Alignment and the updated assumptions listed below (note the updates since the IBC, have been marked as "NEW"):

- Metrolinx Market 2041 Land Use
- GGHMv4 (Greater Golden Horseshoe Model version 4) to generate ridership for the stations
- Existing fare structure
- **NEW**: Changed alignment from the approved EA alignment (Option 1) to the Reference Alignment
- **NEW**: Turn back at Finch Station in AM Peak Hour
- **NEW**: Updated frequencies on YRT surface transit routes
- **NEW**: Updated subway speeds, runtime, station spacing
- **NEW**: Consideration of the entire alignment + the study station(s)
- **NEW**: Dedicated model runs (five scenarios) to assess each of the Neighbourhood stations with the Core Stations (to assess fourth station performance)
- *NEW*: Dedicated model runs (additional three scenarios) combining the best performing Neighbourhood stations with the Core Stations (to assess fifth station performance)
- **NEW**: Base Case assumed Core stations only (whereas in the previous study, the Base Case assumed to include all six stations)
- **NEW**: Modifications to Bus Operating Impacts
- **NEW**: Updated Stations' Costs
- **NEW**: Updated S-Curve
- **NEW**: Extract and monetize all the external benefits from the model instead of using External Benefits Multiplier



## **YNSE** Ridership

The analysis revealed that overall ridership along the extension is similar across all options. This is because the ridership demand at specific Neighbourhood stations gets mostly redistributed to other stations if the Neighbourhood station is not implemented on the network. In other words, there will be minimal ridership impacts outside of the extension as a result of these stations. However, the users will experience travel time benefits as a result of adding the Neighbourhood station(s), which has been captured in the Economic analysis.

The diagram below shows static morning peak hour passenger volume (passengers per peak hourpeak direction, pphd) at Finch Station in all scenarios regardless of which Neighbourhood Station is added. By adding Neighbourhood stations, the demand at nearby stations gets redistributed accordingly. For example, when Clark Station is added, 1,100 fewer riders board at Steeles Station, but the total morning peak hour passenger volume departing Steeles Station remains consistent.



Figure 2 - Southbound Ridership in AM Peak Hour in Example Scenarios

Volume (pphpd) Boarding () Alighting

## Four Stations Analysis

Table 2 shows the AM peak hour demand at each station, in different scenarios. Alighting in the morning generally suggests transit users accessing employment or educational destinations in the areas surrounding Cummer and Clark stations. Royal Orchard Station is not expected to have significant alightings in the morning peak period, suggesting that access to employment is not a key function of the station.

Clark Station, not only has the highest demand in AM peak hour, it also attracts more daily riders to the transit network (1,250 riders), as it connects other key residential and employment growth areas in York Region, specifically at Promenade Centre and Bathurst/Centre corridor to the extension through the planned branch of Viva Orange.

Given the close proximity of Cummer Station to nearby Finch Station, and the higher service frequency offered at Finch Station in the morning peak hour, the models show that the majority of walk-ins and bus riders would access the subway at Finch Station instead of Cummer Station. This also results in the least incremental new daily riders compared to other scenarios (700 riders). If Cummer Station is not implemented, the bus routes serving that area (TTC routes 42 and 125) would continue to connect to the subway at their current terminus at Finch Station.

Royal Orchard Station does not have the same demand as the other two stations in the morning peak hour but it does attract more riders to the transit network compared to Cummer Station in terms of daily ridership due to the subway station spacing.

Stations	Base (Core Sta	Case tions Only)	Full So (All 6 St	cope ations)	Core +Cummer		Core + Clark		Core + Royal Orchard	
	Board	Alight	Board	Alight	Board	Alight	Board	Alight	Board	Alight
Finch	5,900	3,800	5,100	3,500	5,100	3,400	5,700	3,700	5,900	3,800
Cummer	N/A	N/A	1,200	800	1,300	800	N/A	N/A	N/A	N/A
Steeles	4,000	2,900	2,700	2,400	3,800	2,800	2,900	2,500	3,700	2,900
Clark	N/A	N/A	1,500	600	N/A	N/A	1,800	700	N/A	N/A
Royal Orchard	N/A	N/A	1,000	200	N/A	N/A	N/A	N/A	1,200	200
Bridge	7,200	1,900	6,500	1,800	7,000	1,900	6,900	1,900	6,900	1,900
High Tech	1,200	100	1,000	100	1,200	100	1,100	100	1,100	100
Total	18,300	8,700	19,000	9,400	18,400	9,000	18,400	8,900	18,800	8,900
Incremental New Daily Riders	Ν	I/A	2,5	50	7	00	1,2	50	1,	075

Table 2 - Station's Ridership in 4-Station Scenarios - AM Peak Hour

## Core Station with Clark Station

#### **Station Spacing**

Clark Station would be located at the intersection of Clark Avenue and Yonge Street, approximately one kilometre north of Steeles Station and 3.5 kilometres south of Bridge Station.

#### **Ridership and Access Mode Share**

The Reference Alignment with Clark Station in the scope would bring approximately 27,300 riders to the extension (including at Finch Station) in the weekday AM peak hour (for reference, the full scope with inclusion of all six stations would bring 28,400 riders in weekly AM peak hour).

Should the extension include Clark Station in the scope as the fourth station, approximately 1,250 new daily riders would be served by the rapid transit system compared to the Base Case scenario, in which none of the Neighbourhood stations exists.

The analysis suggests that out of 2,500 total users of Clark Station in the weekday AM peak hour (2041), about 700 alight and 1,800 board at Clark Station.

More than half of the transit users are expected to connect to Clark Station by bus (54%). This station also serves residents walking to and from the subway (36%).

Through our consultations with our municipal partners we recognize that there are other forecasts for the corridor based on potential future development scenarios. In particular, the Region of York has forecasted additional employment growth in the Richmond Hill Centre and Langstaff areas. Additional growth in these areas would be well served by the subway project and result in additional northbound trips in the AM peak hour.

It is recognized that the growth assumptions applied in the modelling for this analysis may be conservative along the YNSE corridor, as the corridor specific growth forecasts noted above are not captured. Land Use sensitivity analysis was undertaken in the IBC to understand the impact of said alternative growth scenarios along the YNSE station areas. Additionally, results will continue to be refined based on sensitivity analyses and additional work going into the PDBC.

The York Region forecasts estimate significant additional population growth in the Clark and Steeles Station areas, as well as higher anticipated employment than assumed in the 2041 Market forecasts. The estimated ridership impacts for Clark Station under the York Region projections are:

- 200 additional AM peak hour boardings
- 60 additional AM peak hour alightings
- 800 additional daily riders

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CLARK AVE

->>> METROLINX

1

These estimates can be found in the Land Use Sensitivity Analysis section of the IBC.

#### Catchment Area

Travel time savings associated with riders accessing Clark Station is much higher than the other two Neighbourhood stations driven by high station demand Clark.

Alighting in the mornings generally suggests transit users accessing employment or educational destinations in the Clark Station area or in the surrounding area. About 20% of the walk-in catchment area of this station is within 800m of Steeles Station. Approximately 8,100 people and 1,900 jobs would be within 800 metres or a 10-minute walk of Clark Station with no overlap with Steeles Station.



Figure 3 -Walk Time to Clark Station

Street Map data. Metrolinx does not guarantee that the pedestrian network is complete or error-free Base imagery from Bing Maps.

200

400 m



STEELES AVE

0

#### Land use Characteristics

The York Region Official Plan (2010) set minimum density of 2.5 floor space index for key development areas at and adjacent to Clark and Royal Orchard stations on Yonge Subway Extension (for reference, the minimum FSI for areas around future Steeles Station is 3.5 FSI). York Region is currently in the process of a review to update its Official Plan.

Vaughan's Yonge-Steeles secondary plan also anticipates significant ultimate property development along Yonge Street, especially in the South Area (between Steeles and Clark stations).

On September 7, 2010, Council adopted the Yonge-Steeles Corridor Secondary Plan that proposes the land use policies and urban design guidelines for future development in the area along Yonge Street and Steeles Avenue. The secondary plan was subsequently forwarded to York Region for approval but has since been the subject of appeals. A Local Planning Appeal Tribunal (LPAT) hearing on the Yonge-Steeles Corridor Secondary Plan has been organized into phases. The first phase of the hearing is intended to deal solely with the population permitted prior to and after construction of the extension. A hearing is scheduled for mid-2022 as indicated by the City of Vaughan.

It should be noted that the Yonge-Steeles Area Regional Transportation Study (2015), which was prepared by York Region and resulted in modifications to Vaughan's secondary plan, indicated that the Yonge Subway Extension to Richmond Hill/Langstaff Gateway Centre would have significant impact on the transportation capacity in the Secondary Plan area. As a result, this study proposed residential development phasing for the pre-subway and post-subway scenarios.

The secondary plan allows for maximum height of 35 storeys (FSI: 6) for lands in the South Area. These lands are mainly designated as High-Rise Mixed-Use, transitioning down to the existing residential area. Site-specific applications submitted in the South Area (at LPAT) request significant increases in height and density with little office uses. Current applications represent approximately three times more density, which would result in a 30,000 population or more versus the planned 10,000 population. Appellants are now preparing a Transportation Study to justify an increase in population as indicated by the City of Vaughan.

Moreover, not all the projected riders in this area are from the pedestrian catchment area of the stations. The analysis shows that the Promenade Centre, located two kilometres away from the project corridor, will also have considerable impact on the ridership of the extension, especially at Clark Station.

The Promenade Centre study area is situated within the boundaries of Centre Street, Bathurst Street, Clark Avenue West and Pierre Elliott Trudeau Park. Based on the latest draft land use estimates, it is

anticipated that this area would accommodate between 6,520 - 11,470 residents and 4,580 - 5,850 jobs by 2041.

The lands east side of Yonge Street East side of Yonge Street contains a mix of commercial and residential uses with low density residential fronting onto local roads. The City of Markham's vision for the Yonge Steeles Corridor between Yonge Street and Dudley Avenue is a mix of commercial, residential and employment uses and the highest densities near transit stations (refer to York Region Municipalities and Metrolinx meeting on February 1, 2021).

There are two active development applications in the Clark Station area:

- 1- 7089 Yonge Street, Markham:
  - **Proposal**: A 27-storey mixed-use condominium with retail at grade, office on the second floor, and 212 residential units (420 persons) on floors 3-27
  - Status: Under construction
  - Clark Station Impact: No influence of station inclusion, under construction
- 2- 7080 Yonge Street, Vaughan
  - **Proposal**: Two 20 and 40-storey mixed-use buildings with 665 residential units
  - Status: Official Plan Amendment and Zoning By-law Amendment Under Appeal
  - Clark Station Impact: No influence of station inclusion, within Steeles MTSA

## Core Station with Cummer Station

#### **Station Spacing**

Cummer Station would be located in the City of Toronto at the intersection of Cummer Avenue/Drewry Avenue and Yonge Street. It would be the first station north of the existing terminus, approximately 600 metres north of Finch Station and 1.4 kilometres south of Steeles Station.

#### **Ridership and Access Mode Share**

The Reference Alignment with Cummer Station would serve about 27,400 riders (including Finch) in the AM peak hour. For comparison, the full scope with inclusion of all six stations would bring 28,400 riders in weekly AM peak hour.

If Cummer Station is included in the scope as the fourth station, approximately 700 new daily riders would be added to the rapid transit system compared to Base Case scenario in which none of the Neighbourhood stations exist.

Cummer Station is expected to experience usage for both residents accessing the subway, as well as subway users alighting at the station to access the employment, educational and retail destinations in the area. Out of 2,100 total station users of Cummer station in the weekday AM peak hour (2041), about 800 alight and 1,300 board at Cummer Station.

The majority of transit users connect to Cummer Station by bus (66%) and about 24% walk to/from the station. It is important to note that Cummer Station has walking catchment overlap (800 metres) with Finch and Steeles stations.

It is recognized that the growth assumptions applied in the modelling for this analysis may be conservative along the YNSE corridor, as the corridor specific growth forecasts noted previously are not captured. Land Use sensitivity analysis was undertaken in the IBC to understand the impact of the municipalities alternative growth scenarios along the YNSE station areas. Additionally, results will continue to be refined based on sensitivity analyses and additional work going into the PDBC.

Based on Metrolinx' land use sensitivity analysis, the estimated ridership impacts for Cummer Station under the City of Toronto projections are as indicated below:

- 35 additional AM peak hour boardings
- 10 additional AM peak hour alightings
- 200 additional daily riders

These estimates can be found in the Land Use Sensitivity Analysis section of the IBC.

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#### Catchment Area

The catchment area for potential users of Cummer Station has significant overlap with the catchment areas for Finch and Steeles Stations. In looking at the issue of overlap, it is important to note that Finch Station's entrance is located north of Finch Avenue. There are currently underground connections to Finch Station in buildings north of the hydro corridor on the east side of Yonge St.

In the diagram below, the impact of this station location is highlighted. The 800m buffer, when taken from the station entrances north of Bishop Avenue, mean that the proposed Cummer Station entrance is within 800m of a Finch Station entrance.



While the inclusion of Cummer Station would create an overlap, there are transit user benefits associated with the additional station. An individual that was very close to a Cummer Station entrance would save up to 10 minutes by walking to that station compared to the walk to get on the subway at Finch Station. However, the model shows that some of these walk-in users and bus riders access the

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station from the north would continue to board at Finch Station, where more frequent subway service is provided in the morning peak hour.

#### Land use Characteristics

The Cummer Station area is a continuation of the North York Centre area which has attracted significant residential growth, largely in the form of condominium towers. While some of the development application approvals are already in place, regardless of a subway station, approvals for some development sites may be impacted by the presence or absence of Cummer Station.

The lands adjacent to Cummer Station are part of the Yonge Street North Secondary Plan, currently in draft. This planning study was initiated in 2011 and is expected to set the stage for managing growth in the Yonge Street corridor between Finch and Steeles avenues in the light of the planned extension of the Yonge subway line and associated stations at Drewry/Cummer and Steeles Avenue. While alternatives for land use were examined in 2013, progress on the plan has been delayed and was only recently reactivated. The City is targeting Q3 2021 to have the Secondary Plan before Council. Despite the incomplete status of the Secondary Plan, landowners and developers have been advancing their proposals and applications for lands near the proposed Cummer Station.

There are five active applications in Cummer Station area in addition to other development interests in the area at preliminary stages:

- 1- 5799-515 Yonge Street, Toronto (the former Newtonbrook Plaza, now known as M2M)
  - **Proposal**: Four 28, 36, 36, and 44 storeys mixed-use buildings with 1,674 residential units, at-grade retail uses, office uses, townhouses, a new public park, and street
  - Status: Under construction
  - Cummer Station Impact: No Influence of station inclusion, under construction
- 2- 51 Drewry Avenue, Toronto
  - **Proposal**: 551 residential units in two towers of 10 and 32 storeys
  - Status: Site Plan Application under review
  - **Cummer Station Impact**: No influence of station inclusion, Official Plan Amendment and Zoning By-law Amendment approved
- 3- 5840 and 5870 Yonge Street, Toronto
  - **Proposal**: a 32-storey residential building containing 408 dwelling units
  - Status: Pre-Construction
  - **Cummer Station Impact**: No influence of station inclusion, Official Plan Amendment and Zoning By-law Amendment approved

- 4- 5800 Yonge Street, Toronto
  - **Proposal**: four mixed use towers of 34, 37, 38 and 44 storeys containing 1,496 residential units
  - Status: Official Plan Amendment and Zoning By-law Amendment under review
  - **Cummer Station Impact**: No influence of station inclusion, located within 800 meters (10 minute walk) of the Finch Subway Station, density largely settled
- 5- 5925-5997 Yonge Street, 11-25 Wedgewood Drive, 1-8 Doverwood Court, 42-54 Cummer Avenue, and 5959 Yonge Street, Toronto
  - **Proposal**: Five mixed-use buildings with heights of 14, 32, 32, 46 and 46 storeys (1,941 residential units).
  - **Status**: Official Plan Amendment and Zoning By-law Amendment under appeal with Local Planning Appeal Tribunal
  - Cummer Station Impact: Potential influence of station inclusion, density to be confirmed

#### Core Station with Royal Orchard Station

#### **Station Spacing**

Royal Orchard Station would be located at the intersection of Royal Orchard Boulevard and Yonge Street, approximately 2.5 kilometres north of Steeles Station and two kilometres south of Bridge Station.

#### **Ridership and Access Mode Share**

The Reference Alignment with Royal Orchard Station in the scope would bring approximately 27,700 riders to the extension (including at Finch Station) in the weekly AM peak hour (for reference the full scope with inclusion of all six stations would bring 28,400 riders in weekly AM peak hour).

Should the extension reference alignment include the Royal Orchard Station in the scope as the Neighbourhood station, approximately 1,075 new daily riders would be added to the rapid transit system compared to Base Case scenario in which none of the Neighbourhood stations exist.

Out of 1,400 total station users of Royal Orchard Station in the weekday AM peak hour (2041), about 200 alight and 1,200 board at Royal Orchard Station. The low level of alighting in the morning peak period, suggest that access to employment is not a key function of the station.

There are limited surface transit connections at Royal Orchard Station given the absence of a continuous east-west routes, as well as the constraints of the heritage and environmental features on the west side of Yonge Street. This station would only serve one east-west bus route (YRT route 3)

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which extends from the Pioneer Village Station at York University in the west to Don Mills and Sheppard in the east. Therefore, the bus transfers at this station is fewer than bus transfers in other Neighbourhood stations but it holds 44% of mode share at this station. Royal Orchard Station does not have catchment overlap with any of the adjacent stations (Steeles and Bridge stations). With removal of this station, walk-in passengers as well as those on YRT route 3, would need to access the subway by transferring to a bus service on Yonge Street.

The Region of York's land use projection (from the IBC stage) generally aligns with the market-trendbased land use projections by Metrolinx. The estimated ridership impacts for Royal Orchard Station under the York Region projections are as following:

- 30 additional AM peak hour boardings
- 10 additional AM peak hour alightings
- 100 additional daily riders

These estimates can be found in the Land Use Sensitivity Analysis section of the IBC.

#### **Catchment Area**

The 800m catchment area of Royal Orchard Station does not have any overlaps with the catchment areas of other nearby stations (Steeles and Bridge). Royal Orchard Station would provide walkingdistance access (800 metres or a 10-minute walk) for approximately 7,300 people in 2041.

The Royal Orchard community has a primarily residential character with some retail-focused employment. Royal Orchard Station would provide walking-distance access for approximately 1,300 jobs in 2041.

Calculations are based on population projections for Traffic Analysis Zones (TAZ), as a result, it may underestimate the population in proximity to the station in a case like that of the area around Royal Orchard Station, where growth is planned to have higher density in proximity to the station.

#### Figure 5- Walk Time to Royal Orchard Station



#### Land use Characteristics

Development activity in the area is also limited given the urban context, and the heritage constraints. Part of the catchment area of Royal Orchard Station is in the Thornhill Vaughan Heritage Conservation District.

York Region Official Plan (2010) set minimum density of 2.5 floor space index for key development areas at and adjacent to Clark and Royal Orchard stations on the Yonge Subway Extension (for reference, the minimum FSI for areas around future Steeles Station in the Official Plan is 3.5 FSI). York Region is currently in the process of a review to update its Official Plan.

The lands to the west side of Yonge Street would be subject to the Yonge Steeles Corridor Secondary Plan (North Area). The scale of development between South and North areas is different. In North Area, maximum height that has been approved by LPAT is 12 storeys (FSI: 3.8). These lands are mostly designated as Mid-Rise Mixed Use, recognizing limitations of shallow lots adjacent to stable detached home areas.

There are two active applications in Royal Orchard Station area:

- 1- 8136 8188 Yonge Street and 5 Uplands Avenue, Vaughan
  - **Proposal**: two 2 and 10 storeys mixed-use building with 282 residential units and atgrade retail
  - Status: Approved Official Plan Amendment
  - **Royal Orchard Station Impact**: No influence of station inclusion, density largely settled (approved Official Plan Amendment)
- 2- 10 Royal Orchard Boulevard, Markham
  - **Proposal**: Four mixed-use 25 and 59 storeys buildings with 1,560 residential units and retail and office uses
  - **Status**: Official Plan Amendment and Zoning By-law Amendment applications under review
  - **Royal Orchard Station Impact**: Potential influence of station inclusion, density to be confirmed

## **Five Stations Analysis**

Since Clark Station demonstrated the greatest ridership and performance as the potential fourth station, in evaluation of a potential fifth station, this study assumed Clark Station in the scenarios where two Neighbourhood stations are included. Table 3 below shows the station's ridership in the AM peak hour, in two scenarios.

There are interdependencies in ridership at Clark and Royal Orchard Stations given their sequential locations along the YNSE alignment. By adding a station at the Royal Orchard location, the ridership of Clark Station would drop by 12% as it would be redistributed to the new station. The projected ridership of Royal Orchard Station would also drop by 21% as a result of including Clark Station, when compared to a four-station scenario with Royal Orchard Station only.

Including Clark Station does not impact the projected ridership of Cummer Station. Cummer Station would still have 1,800 riders boarding and 700 alighting in the AM peak hour in a five station scenario.

Compared to Cummer Station, Royal Orchard Station does not have the level of demand in the AM peak hour. However, looking at the daily ridership, inclusion of Royal Orchard Station would attract almost as many new riders to the transit network, as the inclusion of Cummer Station would, and this embodies in Cummer Statin's close proximity to Finch Station.

Overall, either five-station scenario would attract a minimum of 600 additional new daily riders to the extension compared to the best performing four-station scenario (Core with Clark stations).

Stations	Base (Core Sta	e Case itions Only)	Full So (All 6 St	cope ations)	Core+ Clark + Cummer Core + Clark + Orchard		ark + Royal hard	
	Board	Alight	Board	Alight	Board	Alight	Board	Alight
Finch	5,900	3,800	5,100	3,500	5,100	3,400	5,700	3,800
Cummer	N/A	N/A	1,200	800	1,300	800	N/A	N/A
Steeles	4,000	2,900	2,700	2,400	2,800	2,400	2,900	2,400
Clark	N/A	N/A	1,500	600	1,800	700	1,500	700
Royal Orchard	N/A	N/A	1,000	200	N/A	N/A	900	200
Bridge	7,200	1,900	6,500	1,800	6,800	1,800	6,600	1,800
High Tech	1,200	100	1,000	100	1,100	100	1,100	100
Total	18,300	8,700	19,000	9,400	18,900	9,200	18,700	9,000
Incremental New Daily Riders N/A 2		2,5	50	1,8	850	1,9	00	

Table 3 - Station's Ridership in 5-Station Scenarios - AM Peak Hour



The IBC included a station-specific analysis of the benefits associated with the Neighbourhood stations. Specifically, it looked at the travel time savings associated with each station. In that study, Metrolinx considered how much time transit users would save by having the ability to access that particular station by bus or on foot. The benefits were totalled and monetized for the life of the project.

To modify and study the Neighbourhood stations in more depth, we have modified the methodology and updated the assumptions as explained above. For instance, and as mentioned in the Assumptions and Methodology section, the Base Case in this study was assumed to be Core stations only, whereas in the preliminary station-specific analysis of the IBC, all potential six stations were included.

For this analysis, significant benefits were identified around travel time, however other benefits were also captured, such as crowding benefit, decongestion, reliability, collision reduction, etc. There were also operating cost savings identified for reduction in bus route length.

## Four Stations Analysis

Clark Station is expected to serve both residents walking to the subway as well as transit users alighting at this station. This station performs the best relative to Cummer and Royal Orchard stations, as the travel time savings associated with riders accessing Clark Station is much higher than the other two stations, with the total costs being close to Cummer Station and are higher than Royal Orchard Station. This results in a BCR of 0.6 for a project that includes a combination of Core stations and Clark and is incremental to the Base Case (Core stations only scenario).

	Core + Cummer	Core + Clark	Core + Royal Orchard
Total Benefits (\$2021, PV)	\$48.0 M	\$124.4 M	\$88.8 M
User Benefits	\$44.4 M	\$118.0 M	\$83.3 M
External Benefits	\$3.6 M	\$6.4 M	\$5.6 M
Benefit Adjustments (\$2021, PV)	\$8.2 M	\$14.9 M	\$12.8 M
Total Station Costs (\$2021, PV)	\$214.6 M	\$232.2 M	\$283.6 M
Capital Costs	\$177.4 M	\$186.9 M	\$222.5 M
Operating Costs	\$37.2 M	\$45.3 M	\$61.1 M
Net Present Value (\$2021, NPV)	\$-158.4 M	\$-90.6 M	\$-180.0 M
Expected Benefit-Cost Ratio (BCR)	0.26	0.60	0.36

Table 4 - Economic Case Summary - 4-Stations Analysis

## **Five Station Analysis**

Analysis of five-station scenarios showed that both scenarios offer comparable overall Benefit to Cost Ratios. While Cummer Station is located in an area with higher potential for future developments, the ridership model showed that this station does not attract as many riders as expected to the extension in the AM peak hour, since it is in closer proximity to other nearby subway stations.

Higher user benefits in a scenario including Royal Orchard Station is a result of the location of this station and the distance to other adjacent stations. Without Royal Orchard station the distance from this location and other nearby subway stations (Clark and Bridge) requires bus riders and walk-in users to transfer/access a bus route on Yonge Street and travel to Clark station to access the subway and therefore this would result in higher travel time benefits when Royal Orchard Station is added.

The lower benefits of Cummer Station is explained by the users being able to access Finch Station (proximity of the two stations), making the travel time savings minimal from implementing Cummer

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## YONGE NORTH SUBWAY EXTENSION NEIGHBOURHOOD STATIONS ANALYIS

Station, although more riders are attracted to the station compared to Royal Orchard Station. While there are less riders attracted to Royal Orchard Station, the model suggests that the travel time impact is much higher - at Cummer Station, the travel time savings for the users is approximately 1.5 minutes per user, whereas it is about 4.5 minutes per user at Royal Orchard Station.

On the contrary, the costs of building Royal Orchard Station are higher than those of Cummer Station, as Royal Orchard Station would have to be built deeper underground.

	Core + Clark + Cummer	Core + Clark + Royal Orchard
Total Benefits (\$2021, PV)	\$162.3 M	\$183.7 M
User Benefits	\$152.6 M	\$174.1 M
External Benefits	\$9.7 M	\$9.6 M
Benefit Adjustments (\$2021, PV)	\$22.1 M	\$22.8 M
Total Station Costs (\$2021, PV)	\$446.9 M	\$517.6 M
Capital Costs	\$364.3 M	\$409.4 M
Operating Costs	\$82.6 M	\$108.2 M
Net Present Value (\$2021, NPV)	\$-258.9M	\$-307.6 M
Expected Benefit-Cost Ratio (BCR)	0.41	0.40

Table 5 - Economic Case Summary - 5-Stations Analysis



As indicated in the IBC, the total estimated cost for each Neighbourhood Station is between \$400 and \$500 million, which includes direct cost (e.g. stations infrastructure), property costs as well as indirect costs (e.g. design and engineering, risk and contingency, tax). However, in this study, only the incremental capital costs and property costs of building each Neighbourhood station has been captured under the Financial Case.

The incremental costs of each Neighbourhood station in each scenario (compared against the Base Case with Core station) has been captured in the 2021 financial Present Values below:

## Four Stations Analysis (\$2021 PV)

- Core + Cummer: **\$256.4 M**
- Core + Clark: **\$250.6 M**
- Core + Royal Orchard: **\$319.9 M**

## Five Station Analysis (\$2021 PV)

- Core + Clark + Cummer: **\$507.1 M**
- Core + Clark + Royal Orchard: **\$572.3 M**

# Deliverability and Operations Case

## **Clark Station**

## Construction of Clark Station

The construction method for Clark would include cut and cover construction between two headwalls. The headwalls are constructed prior to tunnel boring.

- Depth of station: less than 20m
- Construction complexity: Typical cut and cover construction
- Utility Impact: No major utility relocations
- Environmental Mitigation: Site remediation may be required based on station location.

## YNSE Land Requirements without Clark Station

Even without a station, some land would be still required for the extension between Steeles and Royal Orchard or Bridge. The station will be required to be replaced with at least one Emergency Exit Building (EEB). Two EEBs may be required if the distance to the nearest station platform exceeds 762m, as per NFPA-130.<sup>3</sup>

Each station includes a traction power substation (TPSS) for providing direct current (DC) power to the subway. If the station was removed from the scope, the TPSS programme at grade and underground including Systems, Mechanical and Electrical rooms would remain, however the exact location may change. The TPSS would be combined with an EEB.

While the precise requirements have not been developed, it can be expected such facilities would have a much smaller footprint than station entrances.

### Impact on Bus Network

The bus routes serving the bus facilities at each station were designed by TTC and YRT to serve each local transit network, overall public transit objectives and transit master plans. Below is a list of Metrolinx assumed impacts to local transit network based on travel patterns and available information

<sup>3</sup> Section 3.4 and 3.5- TTC DM-0102-03 and NFPA 130, Section A.7.1.2.2 require that the distance from any underground location to EEB is not greater than 381m, i.e. the spacing between EEBs or between an EEB and the closest station platform (or portal entrance) not to exceed 762m

at the time, should Clark Station not be included in the final project. These assumptions are subject to further refinements and confirmation with transit agencies, as the project's scope is solidified:

- YRT route 98/99 would likely be unaffected, as its routing likely would not change to serve Clark Station. However, the routes may require increased service levels to meet the demand.
  - YRT currently operates high-frequency service on Viva Blue along Yonge Street that will terminate at Bridge Station once the extension is in place. It is Metrolinx assumption that a similar service would potentially be needed if neither Clark nor Royal Orchard are built; as YRT route 99 by itself would not be sufficient.
- YRT routes 2, 5, and 77 would be affected and could:
  - Return to their current terminus at Finch; or
  - o Terminate at Steeles, requiring additional bays/space at that facility; or
  - Terminate at Bridge, requiring additional bays/space at that facility.
  - Either of these options could result in higher operating and capital costs for YRT/York
     Region
- Viva Orange BRT (future planned south branch) would be affected and could:
  - Eliminate the south branch, sending all service to Bridge (north branch planned to terminate at Bridge); or
  - Terminate the south branch at Steeles, requiring additional bays/space at that facility.
  - Either of these options could result in higher operating costs for YRT/York Region and capital costs for the extension

## Impact on Train Speed and Travel Time<sup>4</sup>

- The maximum operating speed of the subway is 80 km/h.
- The train speed without Clark Station is 80 km/h.
- The train speed with Clark Station is 80 km/h between Steeles and Clark stations and 80 km/h between Clark and Royal Orchard/Bridge stations.
- As a result of inclusion of the Clark Station, up to 60 seconds additional travel time could be assumed for the overall extension in a single trip.

<sup>&</sup>lt;sup>4</sup> Assumptions for train speed and runtimes impact:

<sup>•</sup> Trains are TR trains standard acceleration, -1.1 m/s/s deceleration, ATC- Automatic Train Operation

 <sup>20</sup> seconds dwelling time at station stops (wheel stop and door movement time)

<sup>•</sup> Terminal stops 30 secs. Departure terminal NOT included

Performance Factor 100%

## **Cummer Station**

## Construction of Cummer Station

The construction method for Cummer Station includes cut and cover excavation between two headwalls. The headwalls are constructed prior to tunnel boring.

- Depth of station: less than 20m
- Construction complexity: Relatively close to the Finch Station box structure (tunnel interface with the Finch Station tail track).
- Utility Impact: Utilities relocations required if this station is implemented are complex and would require prolonged construction staging.
- Traffic Staging: Relatively close to the Finch Station box structure (tunnel interface with the Finch Station tail track). Traffic staging would be complex and extended along a longer distance due to the proximity of the cut and cover boxes.
- Environmental Mitigation: Currently no adverse environmental conditions known at this location.

## YNSE Land Requirements without Cummer Station

Even without a station, some land would be still required for the extension between Finch and Steeles stations. The station will be required to be replaced with at least one Emergency Exit Building (EEB). Two EEBs may be required if the distance to the nearest station platform exceeds 762m, as per NFPA-130.

Each station includes a traction power substation (TPSS) for providing direct current (DC) power to the subway. If the station was removed from the scope, the TPSS programme at grade and underground including Systems, Mechanical and Electrical rooms would remain, however the exact location may change. The need for an Emergency Service Building (ESB) with the emergency exit at one end of the station will require confirmation through Subway Environment Simulation (SES) analysis; however, it is anticipated that a single ESB with two SVS fans is likely to be required. The TPSS would be combined with the ESB.<sup>5</sup>

While the precise requirements have not been developed, it can be expected such facilities would have a much smaller footprint than the two contemplated entrance buildings. Given their smaller size, there might be more flexibility on the location, which could have less impact on future development and the existing urban form.

<sup>5</sup> Section 3.4 and 3.5- TTC DM-0102-03 and NFPA 130, Section A.7.1.2.2 require that the distance from any underground location to EEB is not greater than 381m, i.e. the spacing between EEBs or between an EEB and the closest station platform (or portal entrance) not to exceed 762m

## Impact on Bus Network

The bus routes serving the bus facilities at each station were implemented by TTC and YRT to serve each local transit network, overall public transit objectives and transit master plans. Below is a list of Metrolinx assumed impacts to local transit network based on travel patterns and available information at the time, should Cummer Station not be included in the final project. These assumptions are subject to further refinements and confirmation with transit agencies, as the project's scope is solidified:

- TTC route 97F would likely be unaffected, as its routing would remain consistent regardless if Cummer Station was implemented. However, Cummer Station would provide an opportunity to decrease bus operating and capital costs since the service levels (frequency) could be decreased. Without Cummer Station, it is Metrolinx' assumption that potentially additional service would need to be provided by TTC on the 97 route to provide capacity between Finch and Steeles station; this would require a high frequency service due to the emerging higher-range densities of commercial/residential in this corridor.
- TTC routes 42 and 125 would return to their current terminus at Finch, however, Cummer Station, if implemented, could provide an opportunity for reduction in bus operations and capital costs.

Impact on Train Speed and Travel Time<sup>6</sup>

- The maximum operating speed of the subway is 80 km/h.
- The train speed without Cummer Station is 80 km/h (maximum operating speed).
- The train speed with Cummer Station is less 80 km/h between Finch and Cummer stations,
   80 km/h between Cummer and Steeles stations.
- As a result of inclusion of the Cummer Station in the scope, up to 50 seconds additional travel time could be assumed for the overall extension in a single trip.

## **Royal Orchard Station**

## Construction of Royal Orchard Station

The construction method for Royal Orchard Station includes mined excavation (Sequential Excavation Method (SEM).

<sup>&</sup>lt;sup>6</sup> Assumptions for train speed and runtimes impact:

<sup>•</sup> Trains are TR trains standard acceleration, -1.1 m/s/s deceleration, ATC- Automatic Train Operation

 <sup>20</sup> seconds dwelling time at station stops (wheel stop and door movement time)

<sup>•</sup> Terminal stops 30 secs. Departure terminal NOT included

Performance Factor 100%

- Depth of station: approx. 40-45m requiring more complicated construction methods resulting in increased costs as well as travel time for passengers accessing the station through vertical circulation
- Construction complexity: Due to the depth, the cost is higher than the typical cut and cover stations which are less than 20m in depth.
- Environmental Mitigation: No major impacts.

## Land Requirements without Royal Orchard Station

Even without a station, some land would be still required for the extension between Clark/Steeles and Bridge. The station will be required to be replaced with at least one Emergency Exit Building (EEB). Two EEBs may be required if the distance to the nearest station platform exceeds 762m, as per NFPA-130.<sup>7</sup>

Each station includes a traction power substation (TPSS) for providing direct current (DC) power to the subway. If the station was removed from the scope, the TPSS programme at grade and underground including Systems, Mechanical and Electrical rooms would remain, however the exact location may change. Given the length of tunnel, it is anticipated that two SVS fans will be required in an Emergency Service Building (ESB) with the emergency exit at one end of Royal Orchard Station, or in the proximity of this future station site, to split the tunnel ventilation zones and meet train operation requirements. The TPSS would be combined with the ESB.

Assuming the extension's alignment does not change with exclusion of Royal Orchard Station, the TPSS for providing DC power to the subway would remain at the current proposed location.

### Impact on Bus Network

The bus routes serving the bus facilities at each station were designed by TTC and YRT to serve each local transit network, overall public transit objectives and transit master plans. Below is a list of Metrolinx assumed impacts to local transit network based on travel patterns and available information at the time, should Royal Orchard Station not be included in the final project. These assumptions are subject to further refinements and confirmation with transit agencies, as the project's scope is solidified:

• YRT routes 98/99 and 3 would likely be unaffected, as their routings would not have been changed to serve Royal Orchard. However, by adding Royal Orchard Station, reduction in the routes service levels could result in savings in the bus operating and capital costs.

<sup>7</sup> Section 3.4 and 3.5- TTC DM-0102-03 and NFPA 130, Section A.7.1.2.2 require that the distance from any underground location to EEB is not greater than 381m, i.e. the spacing between EEBs or between an EEB and the closest station platform (or portal entrance) not to exceed 762m

 YRT currently operates high-frequency service on Viva Blue along Yonge Street that will terminate at Bridge Station once the extension is in place. It is Metrolinx assumption that a similar service would potentially be needed if neither Clark nor Royal Orchard are built; as YRT route 99 by itself would not be sufficient.

## Impact on Train Speed and Travel Time<sup>8</sup>

- The maximum operating speed of the subway is 80 km/h.
- The train speed without Royal Orchard Station is 80 km/h.
- The train speed with Royal Orchard Station is 60 km/h between Clark/Steeles and Royal Orchard stations and 60 km/h between Royal Orchard and Bridge stations.
- As a result of inclusion of the Royal Orchard Station, up to 45 seconds additional travel time could be assumed for the overall extension in a single trip.

<sup>&</sup>lt;sup>8</sup> Assumptions for train speed and runtimes impact:

<sup>•</sup> Trains are TR trains standard acceleration, -1.1 m/s/s deceleration, ATC- Automatic Train Operation

<sup>• 20</sup> seconds dwelling time at station stops (wheel stop and door movement time)

<sup>•</sup> Terminal stops 30 secs. Departure terminal NOT included

Performance Factor 100%