TRANSPORTATION IMPACT STUDY

375 KINGSTON ROAD
PROPOSED RESIDENTIAL AND RETAIL DEVELOPMENT
CITY OF PICKERING, REGIONAL MUNICIPALITY OF DURHAM

PREPARED FOR:
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1.0 Executive Summary

CF Crozier & Associates Inc. (Crozier) was retained by 375 Kingston Road Corporation to undertake a Transportation Impact Study in support of an Official Plan Amendment (OPA), Zoning By-Law Amendment (ZBA) and Site Plan Application (SPA) for a proposed mixed-use residential and retail development located at 375 Kingston Road, in the City of Pickering, Regional Municipality of Durham.

The purpose of the study is to assess the impacts of the proposed development on the boundary road network and to recommend any required mitigation measures, if warranted.

The Transportation Impact Study was completed in accordance with the agreed upon Terms of Reference with the City of Pickering and Regional Municipality of Durham's (Durham Region) staff.

The subject property covers an area of approximately 0.84 ha and currently consists of a one to two-storey commercial retail plaza, along with associated surface parking. The development proposes to the replace the retail plaza with 25-storey and 31-storey towers with 580 residential units total, and 1,532 m^2 of ground floor retail space. A total of 551 parking spaces are proposed at-grade and underground to facilitate the mixed-use development.

Existing Conditions

The Subject Property is located along the Kingston Road Corridor with a wide range of mixed-use developments, accessible by walking or transit.

The existing Study Area provides sidewalks on all roadways but there are no dedicated cycling facilities provided within the study area. Cyclists are expected to share the right-of-way with motor vehicles.

The study area is served by multiple local Durham Region Transit bus services with connections to Pickering GO station, which provides passengers with local and regional bus connections as well as Regional Rail services to other parts of Durham Region, Toronto and the greater Toronto and Hamilton area.

Due to the ongoing Covid-19 pandemic, new traffic volume counts were not conducted at this time. Instead, previously conducted 2016 and 2019 traffic volumes were used and projected to 2021 volumes for 'existing traffic condition' analysis.

Based on estimated 2021 volumes, the boundary road network is currently operating at a level of service (LOS) "C" or better with an acceptable control delay of 32.8 seconds or less. The signalized intersections of Kingston Road at Rougemount Drive and Kingston Road at Altona Road are currently operating over the theoretical volume-to-capacity ratio (v/c), with maximum theoretical v/c ratios of 1.53 and 1.13 during the weekday p.m. peak period, respectively. The existing site accesses are also operating acceptably with moderate v/c ratios.

While the signalized intersections are operating above capacity, the intersection delays are still acceptable and are typical for major arterial roadways during commuter peak periods. Additionally, these results are considered conservative as a default peak hour factor (PHF) of 0.92 was used to model existing conditions while the observed PHFs at the signalized intersection are higher, signifying a more uniform distribution of traffic throughout the peak hour (as opposed to a sudden larger wave of traffic).

Future Background Conditions

A shift in transportation modes can be expected as there are major transit improvements proposed by the City, Region, and by the province for the study area in the medium to long term future.

The Durham-Scarborough BRT (herein referred to as Kingston BRT) is proposed. The Kingston BRT will be implemented along the site frontage on Kingston Road in Pickering, with a stop at Altona Road (6-minute walk), just west of the Subject Property, and Rosebank Road (8-minute walk) just east of the Subject Property. With the dedicated right-of-way and proposed 5 minutes headways during the peak hours, the Kingston BRT will improve transit travel times, increase transit frequencies and capacities, and provide additional transit options within the neighbourhood and the rest of the Durham Region. As such, a material shift in vehicle travel mode to transit mode is expected in the near future.

The all-day, electrified, and frequent GO-Train improvements by Metrolinx as part of the Regional Express Rail (RER) project will also significantly improve regional transit services between Durham Region, downtown Toronto and the Greater Toronto and Hamilton Area. Improvements to the rest of the GO rail network are also proposed as part of Metrolinx RER. Thus, the RER project is expected to significantly improve residents' and visitors' reach to/from Toronto, and the GTHA region with greater flexibility, accessibility, and shorter travel times.

Furthermore, aside from the transit improvements, bike lanes are also proposed along Kingston Road as part of the Kingston BRT, providing residents and visitors of the development convenient and safe access to the cycling network.

Per correspondence with Region of Durham and City of Pickering staff, future background traffic volumes at the study intersections were determined using a 1% growth rate, consistent with rates used in background Traffic Impact Studies. It is noted that a one-time post-BRT volume reduction was not applied. In addition to the annual compounded growth rate, background site generated traffic from 603-643 and 645-699 Kingston Road, 770 Kingston Road and 346-364 Kingston Road were also separately applied to estimate future background traffic volumes.

Due to the proposed centre median for the future Kingston BRT, existing site accesses along the Kingston Road Corridor will be converted to right-in-right-out (RIRO) accesses. As such, left-turn movements into and out of the site accesses were redistributed downstream as a U-turn movement.

Left-turn auxiliary lane warrants were also undertaken for the southbound left-turn at the Rougemount site access during weekday a.m. and p.m. hours under future background conditions. Per the Ontario Ministry of Transportation (MTO) Geometric Design Standards for Ontario Highways, a left-turn lane of 15 metres is warranted by 2026 at Rougemount site access. However, for a conservative analysis, all future analyses were conducted assuming no left-turn lane is provided.

Intersection analyses of the 2036 future background traffic volumes indicate the signalized intersection of Kingston Road and Rougemount Drive is expected to operate at a LOS "F" or better with a maximum control delay of 131.0 seconds or less during the weekday a.m. and p.m. peak periods. The intersection is expected to operate at a maximum theoretical v/c of 1.35, indicating the intersection is expected to operate above capacity. Selected 95th percentile queue lengths are also expected to exceed provided storage lengths.

The signalized intersection of Kingston Road and Altona Road is expected to operate at a LOS "D" or better during the weekday a.m. and p.m. peak periods, with a maximum control delay of 45.7 seconds or less and a maximum theoretical volume-to-capacity ratio of 1.13.

The site accesses are expected to continue to operate acceptably at a LOS "C" with moderate

control delays and v/c ratios.

The future background operations can be considered conservative due to the following:

- Peak Hour Factor (PHF) calibrations: A default PHF of 0.92 was used, as required by Region guidelines, despite higher observed PHFs
- Mode Shift Changes: As a result of the BRT and RER transit improvements, vehicle volumes are expected to reduce materially within the study area.
- Travel Pattern Changes: As a result of the expected congestion, and RIRO restrictions, redistribution of traffic is expected as frequent drivers will optimize their route and avoid unnecessary delays (i.e., U-turns)
- Lost Time Adjustments: No lost time adjustments were applied, however, consistent with urban congested traffic, a more aggressive driving behavior can be expected (i.e., higher saturation rates, left turns during intergreen, reduced time gap for left turns etc.).
- Growth Rate: Assumed a 1% annual compounded growth rate for all horizons, despite the observed traffic volume decline between 2017 and 2019, and in addition to several background developments.
- No Dedicated Southbound Left-turn Lane at Rougemount Site Access: All analyses were conducted assuming no southbound left-turn lane is provided for conservative analysis.

Additionally, longer delays and congestions are also expected and typical for post-BRT and post-Light Rail Transit (LRT) conditions due to the increased U-turns, and implementation of Protected U-turn and left turn signal phases. Increased travel delays and congestion are expected to deter commuters from driving and further encourage transit usage. Per the Durham Region Transportation Master Plan (Region of Durham, 2017), the Region acknowledged that congestion and queueing issues have been previously identified along Kingston Road and are expected to continue between Sheppard Avenue and Brock Road.

Therefore, the observed conditions herein, are generally consistent with operations identified for the area in previous studies. The proposed Kingston BRT is expected to mitigate traffic congestion in the area, with a material shift in transportation mode in the study area.

Future Total Conditions

The proposed development is expected to generate 128 and 106 net two-way primary vehicle trips during the weekday a.m. and p.m. peak hours, respectively.

Left-turn auxiliary lane warrants were once again undertaken for the southbound left-turn at the Rougemount site access during weekday a.m. and p.m. hours under future total conditions. Per the Ontario Ministry of Transportation (MTO) Geometric Design Standards for Ontario Highways, a left-turn lane of 25 metres is warranted by 2026 at the Rougemount site access. However, for conservative analysis, all future analyses were conducted without a left-turn lane provided.

Intersection analyses of the 2036 future total traffic conditions indicate that the signalized intersection of Kingston Road and Rougemount Drive is anticipated to operate at an unchanged LOS "F" or better with a maximum control delay of 144.2 seconds or less and maximum theoretical v/c ratio of 1.39 or less during the weekday a.m. and p.m. peak hours. When compared to 2036 future background conditions, the intersection is expected to experience a minor increase in maximum control delay of 13.2 seconds and a minimal increase in the maximum theoretical v/c ratio of 0.07 and 0.04 in the weekday a.m. and p.m. peak periods, respectively. 95th percentile queue lengths for select movements are expected to continue to exceed available storage lengths, as is consistent with future background operations.

The signalized intersection of Kingston Road and Altona Road is anticipated to operate at an

unchanged LOS "D" or better with a maximum control delay of 47.4 seconds or less and maximum theoretical v/c ratio of 1.13 or less during the weekday a.m. and p.m. peak hours.

The proposed site accesses are expected to operate efficiently at a LOS "C" or better during weekday a.m. and p.m. peak periods, with moderate control delays and maximum v/c ratios. The southbound left-turn queue length at the Rougemount Drive site access is not expected to impact the downstream intersection of Kingston Road and Rougemount Drive. However, a "Do Not Block Intersection" sign is required along Rougemount Drive to avoid northbound queued vehicles from blocking southbound left-turning vehicles entering the site.

Once again, the future total operations are considered conservative due to the following:

- Peak Hour Factor (PHF) calibrations
- Mode Shift Changes
- Travel Pattern Changes
- Lost Time Adjustments
- Growth Rate
- No Dedicated Southbound Left-turn Lane at Rougemount Site Access

As mentioned above, longer delays and congestions are expected and typical for post-BRT and post-LRT conditions due to the increased U-turn volumes and the implementation of Protected U-turn and left turn signal phasing. Increased travel delays and congestion is expected to deter commuters from driving and further encourage transit usage. Regardless, it is noted that the future total traffic conditions are consistent with future background conditions and that the site generated traffic does not materially affect traffic operations.

Sensitivity Analysis

A sensitivity analysis was conducted to calibrate future total traffic conditions using the observed peak hour factors, lost-time adjustments and a 10% reduction in through volumes along Kingston Road (to account for BRT mode shift).

The sensitivity analysis confirms that, the optimized signalized intersections of Kingston Road at Rougemount Drive, and Kingston Road at Altona Road are expected to operate with improved maximum control delays and theoretical volume-to-capacity ratios, with no queueing impacts to the downstream intersections.

The intersection of Kingston Road at Rougemount Drive is expected to operate with an improved maximum control delay of 92.4 seconds or less, and at a theoretical maximum v/c ratio of 1.20 or less. The intersection of Kingston Road at Altona Road is expected to operate with an improved maximum control delay of 34.7 seconds and theoretical maximum v/c ratio of 1.02. The optimized sensitivity analysis results are comparable to existing and future background conditions.

In addition, the sensitivity analysis confirms the addition of a 12 to 15-metre southbound left-turn lane at Rougemount site access will significantly reduce the southbound left-turn queue. Nevertheless, with or without a southbound left-turn lane, Rougemount site access is expected to operate acceptably, and is not expected to impact the downstream intersection of Kingston Road and Rougemount Drive. On that basis, it is recommended that the requirement for an auxiliary lane at this location be monitored upon the build out of the BRT and intensification of the Kingston Road corridor.

Finally, regardless of the improvements, future total conditions are comparable to future background conditions. The traffic generated by the development does not materially change the traffic operations of the boundary road network. Thus, the proposed development is supportable from a traffic operations perspective.

Traffic Safety

Assessment of sight distance at the proposed site accesses indicate that there is sufficient sight distance for vehicles entering and exiting the Subject Property. Accordingly, the proposed development is not expected to create a safety hazard due to vehicle ingress or egress at the site access on Kingston Road or on Rougemount Drive. The accesses can be supported from a sight distance perspective.

The development proposes two loading spaces. The loading operations analysis indicates that the proposed site layout accommodates standard Durham Region waste collection vehicles, standard pumper, and aerial fire trucks, as well as delivery vehicles, also known as Medium Single Unit Trucks (MSU). Thus, the proposed loading supply is supportable from an operations and safety perspective.

Transportation Demand Management (TDM)

There are several opportunities for the development to promote TDM measures in support of reduced automobile use.

The residential parking spaces are proposed to be unbundled from the condominium unit and controlled by parking pricing. Prospective residents will be made aware of the parking availability and parking space pricing, prior to the purchase of the condominium unit. Those who require a parking space or multiple parking spaces will make other arrangements or consider residency elsewhere. Accordingly, the residential parking demand can be controlled and managed.

Additional Transportation Demand Management (TDM) strategies proposed in support of reduced automobile use include:

- TDM Information Packages for New Residents
- Secure Bicycle Parking
- Excess Bicycle Parking
- Bicycle Repair Station
- Provision of Carshare Spaces
- Priority Rideshare Pickup/Drop-off Area
- Short-term visitor parking spaces
- Real-Time Transit Information

The analysis contained within this report was prepared using the most recent Site Plan. Any minor revisions to the site plan are not expected to affect the conclusions contained with this report.

In conclusion, the proposed mixed-use development at 375 Kingston Road can be supported from a transportation operations and safety perspective with the noted recommendations.

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2.1 Background

CF Crozier & Associates Inc. (Crozier) was retained by 375 Kingston Road Corporation to undertake a Transportation Impact Study in support of an Official Plan Amendment (OPA), Zoning By-Law Amendment (ZBA) and Site Plan Application (SPA) for a proposed mixed-use residential and retail development located at 375 Kingston Road, in the City of Pickering, Regional Municipality of Durham.

The purpose of the study is to assess the impacts of the proposed development on the boundary road network and to recommend any required mitigation measures, if warranted.

The study has been completed in accordance with the agreed upon Terms of Reference with the City of Pickering's and Regional Municipality of Durham's (Durham Region) staff, as well as general conformance with Durham Region's Transportation Impact Study Guidelines, with the associated analyses and findings outlined herein.

It is noted that an attempt was made to confirm the scope of the Transportation Impact Study with the Ontario Ministry of Transportation (MTO), but no response was received. Nevertheless, the TIS has been prepared based on the agreed upon Terms of Reference with the City and Region, with traffic analysis, synchro modelling, and horizon years examined per MTO TIS guidelines.

The agreed upon Terms of Reference correspondence can be found in **Appendix A**.

2.2 Development Proposal

According to the most recent Site Plan, the residential development will consist of a 25-storey tower and a 31-storey tower with 580 residential units total, and 1,532 m^2 of ground floor retail space. A total of 551 parking spaces are proposed at-grade and underground to facilitate the overall residential subdivision. Two site accesses are also proposed; one full-moves access at Rougemount Drive and one right-in-right-out access at Kingston Road. The full buildout is estimated to occur within five years (2026).

Table 1 summarizes the proposed development statistics. The most recent Site Plan and the site location are illustrated in **Figure 1** and **Figure 2,** respectively.

Table 1
Development Statistics

Proposed Development	Number of Units/GFA
1 Bedroom Suites	416
2 Bedroom Suites	103
3 Bedroom Suites	61
Ground Floor Retail	1,532 m^2
Total	**580 Units** **1,532 m^2 Retail**
Parking & Loading Supply	
Residential	464 spaces (including 4 carshare)
Residential and Retail Visitors	87 spaces
Total Vehicle Parking	**551 spaces**
Loading Space	2 Provided (12 m x 3.5 m x 4.2 m)
Bicycle Parking	292 spaces

3.0 Existing Conditions

3.1 Development Lands

The subject property covers an area of approximately 0.84 ha and currently consists of a one to two-storey retail plaza, along with associated surface parking. The site lies on the southeast corner of the Kingston Road and Rougemount Drive intersection, within a mixed-use residential and commercial neighbourhood in Pickering. The site is bound by Kingston Road to the north, Rougemount Drive to the west, Highway 401 to the south and residential and commercial properties to the east.

3.2 Study Area

The study area encompasses the boundary road network surrounding the Subject Property as described in **Section 3.3**. The Transportation Impact Study analyzes the following intersections as agreed upon in the Terms of Reference with the City of Pickering and Durham Region, attached in **Appendix A**.

- Kingston Road at Rougemount Drive
- Kingston Road at Altona Road
- Kingston Site Access
- Rougemount Site Access

3.3 Boundary Road Network

The boundary road network is described in **Table 2** and illustrated in **Figure 3**.

Table 2
Boundary Road Network

Feature	Roadway		
	Kingston Road/Regional Highway 2	**Rougemount Drive**	**Altona Road/Regional Road 27**
Direction	Two-Way (East-West)	Two-Way (North-South)	Two-Way (North-South)
Classification	Type B Arterial	Local	Type B Arterial
Jurisdiction	Region of Durham	City of Pickering	Region of Durham
Speed Limit	60 km/h	40 km/h	50 km/h
Span	Rouge River to Notion Road (Pickering Boundaries)	Altona Road to Rosebank Road	Whitevale Road (Regional Road 27) to Kingston Road (Highway 2)
Number of lanes total	Four travel lanes	Two travel lanes	Four travel lanes
Pedestrian Facilities	Yes	Yes	Yes
Cycling Facilities	No	No	No
On-Street Parking	No	Yes (where posted)	No

3.4 Existing Pedestrian and Cycling Movements

The Subject Property is located in a residential-commercial neighbourhood within walking and cycling distance to many destinations. Sidewalks are provided on majority of the roadways within the subject area while no cycling facilities are currently provided. Cyclists are expected to share right-of-way with motor vehicles.

3.5 Existing Transit

Durham Region Transit (DRT) operates local and regional transit services for Durham Region. Specifically, DRT provides transit services to the City of Pickering, City of Oshawa, Municipality of Clarington, Town of Whitby, Town of Ajax, Townships of Brock, Scugog and Uxbridge. GO Transit is a regional transit service offered by Metrolinx (Province of Ontario) connecting passengers across the Golden Horseshoe region of Ontario.

Table 3 below outlines the existing transit routes, direction, days of operation, peak hour headways, and the location of bus stops in the study area.

Table 3
Existing Transit Services

Route	Direction	Span[1]	Days of Operation[1]	Peak Hour Headways (min)[1]	Bus Stops in Study Area[2]
103 Glenanna	East-West	Pine Grove Avenue and Altona Road to Pickering GO	Monday-Friday	30	Kingston Road at Altona Road (300 metres; 4 min walk)
120 Whites	North-South	Whites Road and Sunbird Trail to Pickering GO Station	Monday-Sunday	30	Whites Road at Kingston Road (1.5 km; 7 min bus ride)
900 PULSE Highway 2	East-West	Centennial Circle to King Street/Bond Street at Ritson Road	Monday-Sunday	10-20	Kingston Road and Rougemount Drive (Fronting Subject Property) Kingston Road at Altona Road (300 metres; 4 min walk)
920 McCowan Station	East-West	McCowan Station to Ontario Tech/Durham College North Campus	Monday-Sunday	30	
N1 Blue Night – Simcoe-Highway 2 (Overnight Service)	East-West	Centennial Circle to Harmony Terminal	Monday-Sunday	n/a	
Go Transit 41 Hamilton/ Pickering	East-West	Hamilton GO Centre to Pickering GO	Monday-Friday	25-70	Pickering GO (5-km west, 10-15 min bus ride)
GO Transit 92 Oshawa/ Yorkdale	East-West	Yorkdale Bus Terminal to Oshawa Bus Terminal	Monday-Sunday	30	Kingston Road and Rougemount Drive (Fronting Subject Property)
Lakeshore East GO Rail	East-West	Oshawa GO to Union Station	Monday-Sunday	15	Pickering GO (5-km east, 15-20 min bus ride)

Note 1: Transit routes and schedules are based on available information at the time of this report. Due to the ongoing pandemic and change in travel demands, routes and headways may change.
Note 2: Travel times along Kingston Road and to Pickering GO are expected to improve materially upon the buildout of Kingston Road BRT.

The transit services described above, provide residents and visitors in the City of Pickering frequent, easily accessible, and direct transit services throughout the City and Region. In addition, major employment, commercial and tourist attractions such as Downtown Toronto, Oshawa, or greater Toronto areas can be accessed using GO Transit, via direct bus connection at Pickering GO station. As such, transit is a convenient mode of transport for both residents and visitors of the proposed development.

Appendix B contains relevant transit information.

3.6 Existing Site Volumes

As mentioned, the site currently consists of a one to two-storey commercial plaza with a Gross Floor Area (GFA) of approximately 27,500 ft^2.

Due to the Covid-19 pandemic, new counts were not undertaken at the existing site accesses. Instead, volumes at the site accesses were estimated based on ITE Trip Generation, assumed trip distribution and trip assignment.

3.6.1. Existing Trip Generation

The trip generation of the existing retail space was forecasted using Institute of Transportation Engineers (ITE) Trip Generation Manual, 11th Edition, under the Land Use Category 822 "Strip Retail Plaza (<40k)."

Fitted curves and average rate forecasts were provided by ITE. The trip generation forecast is based on fitted curve estimates (if available and deemed accurate with R^2 over 0.80) established by ITE data for the gross floor area (GFA) provided, in a general urban and suburban setting.

The forecasted unadjusted trips are tabulated in **Table 4**.

Table 4
Existing Trip Generation

Use	GFA	Roadway Peak Hour	Number of Trips		
			Inbound	Outbound	Total
LUC 822 Strip Retail Plaza (<40k)	27,500 sq. ft	Weekday A.M.	39	26	65
		Weekday P.M.	91	90	181

According to the ITE Trip Generation Manual, the existing commercial site is forecasted to generate an upper bound of 65 and 181 two-way unadjusted trips in the weekday a.m. and p.m. peak hours, respectively.

3.6.2. Pass-by Trips

As defined by the ITE Trip Generation Handbook, 3rd Edition, primary trips are external trips made for the specific purpose of visiting the site generator and pass-by trips are intermediate stops on the way from an origin to a primary trip destination without a route diversion. Accordingly, pass-by trips are existing trips that access the site on the way to the ultimate destination, and thus, have already been accounted for in the external road network and do not further increase the external volume of vehicles on the roadway.

While there is no available pass-by rate for the Land Use Category 822 "Strip Retail Plaza (<40k), a 34% pass-by trip rate during the weekday p.m. peak period was applied; typical for commercial developments (i.e., Land Use Category 820). No pass-by rate was applied to the weekday a.m. peak period trips.

The forecasted primary and pass-by trips for the existing site are tabulated in **Table 5.**

Table 5
Existing Primary and Pass-By Trips

Use	Trip Type	Roadway Peak Hour	Number of Trips		
			Inbound	Outbound	Total
Retail	Primary	Weekday A.M.	39	26	65
		Weekday P.M.	60	59	119
	Pass-By	Weekday A.M.	0	0	0
		Weekday P.M.	31	31	62

Accordingly, accounting for pass-by trips, the existing retail site is estimated to generate an upper bound of 65 and 119 two-way primary trips in the weekday a.m. and p.m. peak hours, respectively.

3.6.3. Existing Trip Distributions

The existing commercial plaza is not expected to attract a large number of visitors from outside of the neighbourhood or region. The primary customers of a local "strip retail plaza" of this size are expected to be residents from within the neighbourhood, from the nearby neighbourhoods and those who are already visiting the area (pass-by trips).

As such, the assumed commercial trip distributions for the existing site are based on density of the nearby residential neighbourhoods and their proximity to existing nearby commercial properties. As there are more residential neighbourhoods to the south and north-west of the subject lands with limited commercial uses, more trips are expected from these areas.

Trips from the east are expected to be lower as these zones contain their own local commercial plazas and their own institutional properties, with more convenient access.

Lastly, shoppers from outside of the neighbourhood and region, are expected to visit larger stores located at Pickering Town Centre, Scarborough Town Centre and/or larger commercial plazas further east of the Subject Lands. The assumed trip distributions are outlined in **Table 6** below.

Table 6
Existing Trip Distributions (Assumed)

Departing To/Arriving From	Percentage
East: Kingston Road	20%
West: Kingston Road	5%
North: Altona Road	20%
North: Rougemount Drive	5%
South: Rougemount Drive	50%
Total	**100%**
	100%

The existing site trip distributions and assignments are illustrated in **Figures 4** through **7.**

As the existing traffic movement counts already accounted for trips to and from the Subject Property, these distributions were only used to determine volumes at the existing site accesses.

3.7 Traffic Data

Due to ongoing Covid-19 pandemic, new traffic volume counts were not conducted at this time. Instead, previously conducted traffic volumes were used and projected to 2021 volumes for analysis, as agreed upon in the Terms of Reference with Region and City staff.

Older traffic data from the Region of Durham Traffic Volume Counts Map was reviewed. 2016 data for the intersection of Kingston Road at Rougemount Drive and 2019 data for the intersection of Kingston Road at Altona Road were available.

These turning movement counts were conducted between 6:00 a.m. to 9:00 a.m., and 3:00 p.m. to 6:30 p.m. on Thursday, June 9th, 2016, for the intersection of Kingston Road and Rougemount Drive

and Tuesday, September 24th, 2019, for the intersection of Kingston Road and Altona Road. These volumes were projected to 2021 traffic volumes using a 1% growth rate (See **Section 4.2**).

Table 7 below outlines the observed peak hour factors (PHF) at each intersection.

Table 7
Peak Hour Factors

Intersection	Peak Hour	Intersection Peak Hour Factor
Kingston Road at Rougemount Drive	Weekday A.M. 8:00 a.m. – 9:00 a.m.	0.97
	Weekday P.M. 4:45 p.m. – 5:45 p.m.	0.98
Kingston Road at Altona Road	Weekday A.M. 7:45 a.m. – 8:45 a.m.	0.95
	Weekday P.M. 4:45 p.m. – 5:45 p.m.	0.96

The PHFs outlined above represent uniform pattern of traffic flow on the boundary road network and are reflective of typical urban commuter travel patterns.

Nevertheless, per Region of Durham guidelines, all existing and future analyses were conducted using a PHF of 0.92 for all intersections for comparison purposes. As such, the analysis can be considered conservative as the observed PHFs listed above are higher than the default PHF of 0.92, signifying a more uniform distribution of traffic throughout the peak hour (as opposed to a sudden large wave of traffic).

The traffic count data is provided in **Appendix C**. **Figure 8** illustrates the 2021 existing traffic volumes.

3.8 Intersection Modelling

The intersection operations are modelled based on default parameters provided by Synchro 11 and Sim Traffic 11, as well as in general conformance with Durham Region's and MTO's Transportation Impact Study Guidelines. Analysis of all intersections were based on existing signal timings as provided by Durham Region. Signal timing plans have been included in **Appendix C**.

3.9 Intersection Operations

The operations of the critical intersections were analyzed based on the 2021 existing traffic volumes illustrated in **Figure 8.** Level of Service definitions are included in **Appendix D.**

Table 8 outlines 2021 existing traffic level of service for the study intersections under existing conditions and geometric configurations. It is noted that a default PHF of 0.92 is assumed for weekday a.m. and p.m. peak hours for all intersections for comparison purposes. Detailed capacity analyses are included in **Appendix E.**

Table 8
2021 Existing Level of Service

Intersection	Control	Peak Hour	Level of Service[1]	Control Delay	Maximum V/C Ratios[2]	95th Percentile Queue > Storage Length
Kingston Road at Rougemount Drive	Signalized	A.M.	B	18.2 s	0.94 (NBL)	60.6 m > 35.0 m (NBL) 20.9 m > 19.0 m (SBL)
		P.M.	C	30.8 s	1.53 (WBL) 0.96 (NBL)	166.2 m > 80 m (WBL) 64.3 m > 35.0 m (NBL) 22.8 m > 19.0 m (SBL)
Kingston Road at Altona Road	Signalized	A.M.	B	18.5 s	0.83 (SBLT)	63.2 m > 16.0 m (EBL)
		P.M.	C	32.8 s	1.13 (EBL)	65.3 m > 16.0 m (EBL)
Kingston Site Access	One-Way Stop Controlled (Full-moves)	A.M.	C	15.4 s	0.29 (WBT)	None
		P.M.	C	21.0 s	0.46 (EBT)	40.6 m > 15.0 m (WBL)
Rougemount Site Access	One-Way Stop Controlled (Full-moves)	A.M.	C	15.4 s	0.29 (NBTR)	None
		P.M.	C	18.5 s	0.26 (NBTR)	None

Note 1: The Level of Service of a signalized intersection is based on the average control delay per vehicle. The level of Service of a stop-controlled intersection is based on the minor (stopped) approach control delay per vehicle.

Note 2: The critical v/c ratio is considered to be the maximum v/c ratio at the intersection. All v/c ratios greater than 0.90 are outlined and highlighted.

The signalized intersection of Kingston Road at Rougemount Drive is currently operating at a level of service (LOS) "C" or better during the weekday a.m. and p.m. peak periods. The intersection's maximum control delay is 30.8 seconds or less, and the theoretical maximum volume-to-capacity ratio is 1.53. The 95th percentile queue lengths for all left-turn movement exceed the available storage lengths during the weekday p.m. peak period, however there is additional taper length to accommodate queued vehicles.

The signalized intersection of Kingston Road at Altona Road is currently operating at a LOS "C" or better during the weekday a.m. and p.m. peak periods. The intersection is operating at a moderate control delay of 32.8 seconds or less and a theoretical maximum volume-to-capacity ratio of 1.13 or less. The 95th percentile queue length for the eastbound left-turn movement is expected to exceed the available storage length. However, there is additional taper length available to accommodate queued vehicles and queues are not expected to impact any downstream intersections.

The existing site accesses are both currently operating at a LOS "C" during the weekday a.m. and p.m. peak periods with a maximum control delay of 21.0 seconds and maximum volume-to-capacity ratio of 0.46. These metrics indicate that the accesses are operating efficiently with acceptable delays and reserve capacity to accommodate future increases in traffic volume.

While the signalized intersections are operating at or above theoretical volume-to-capacity ratios, the intersection delays are still acceptable and are typical for major arterial roadways in an urban environment during commuter peak periods. Additionally, the above results are considered conservative as the default PHF of 0.92 was used to model existing traffic conditions (as requested by the Region), while the observed PHFs at the signalized intersection are actually higher as outlined in **Table 7**. Additionally, no lost-time adjustments were applied, as per Region guidelines. Thus, the results above may be considered conservative.

4.0 Future Background Conditions

4.1 Horizon Years

The Subject Development is anticipated to be fully built out and operational by 2026; therefore, horizon years of 2026 and 2031 are assumed, as agreed upon in the Terms of Reference with the City of Pickering and Durham Region.

In addition, the horizon year of 2036 has been analyzed per the Ministry of Transportation (MTO) General Guidelines for the Preparation of Traffic Impact Studies, as the Subject Property falls with the MTO Permit Control Area.

4.2 Growth Rate

A review of Durham Region AADT data for Kingston Road, east and west of Altona Road, resulted in a minor traffic decrease between 2017 and 2019. Nevertheless, per discussion with Region staff, a conservative 1% annual compounded growth rate is assumed for all traffic movements in the future traffic analysis. This is consistent with background development Traffic Impact Studies in the area.

4.3 Proposed Infrastructure Improvements

Metrolinx has proposed the Durham-Scarborough BRT project as a part of the 2041 Regional Transportation Plan for the Greater Toronto and Hamilton Area.

The Durham-Scarborough BRT, also referred to as Kingston BRT herein, is planned to span 36-kilometres from Grangeway Avenue and Ellesmere Road near the Scarborough Town Centre in the west through Durham Region to Simcoe Street and King Street in downtown Oshawa to the east. The Kingston BRT is proposed to include 49 stops and provide two-way service every five minutes during peak periods. The BRT will be implemented along Kingston Road in Pickering, with a stop proposed at Kingston Road and Altona Road (450 metres, 6-minute walk), just west of the Subject Property, and at Kingston Road and Rosebank Road (650 metres, 8-minute walk) just east of the Subject Property.

Furthermore, due to the proposed centre median for the future BRT, all existing site accesses along Kingston Road will be restricted to a right-in-right-out access.

Per the Metrolinx Draft Implementation Strategy, construction of the Pickering segment of the BRT is currently forecasted to occur between 2022 and 2027. As such, it is assumed that construction along

Kingston Road will be underway by the 2026 horizon year and the Kingston Road site access will be restricted to right-in-right-out (RIRO) access for all horizon years in the future background and future total analyses.

Accordingly, the existing retail trips were redistributed at the site accesses based on the most convenient route, to account for the Kingston Site Access becoming a right-in-right-out access. The redistributions are as follows:

- It was assumed that trips that currently turn left into the Kingston Site Access (i.e., Westbound Kingston Road) would instead utilize the signalized intersection of Kingston Road and Rougemount Drive, and then Rougemount site access.
- Similarly, it was assumed that trips that currently exit left onto Kingston Road would instead exit via Rougemount site access and make a left turn at the signalized intersection of Kingston Road and Rougemount Drive.

Information on the Durham-Scarborough BRT is included in **Appendix B**.

4.4 Future U-Turn Movements

As described above, due to the future centre median BRT, existing site accesses along the Kingston Road Corridor will be converted to right-in-right-out accesses. As such, left-turn movements into and out of the site accesses along Kingston Road were redistributed downstream as a U-turn movement.

As there is currently no available data on the assumed number of U-turns generated by the introduction of the BRT, a U-Turn estimate was made based on first principles as described below:

- Trip generation for all sites between Altona Road and Rosebank Road that only have access via Kingston Road, were forecasted using the Institute of Transportation Engineers (ITE) Trip Generation Manual, 11th Edition.
- Trips were distributed based on existing travel patterns.

Details on each property included, land use assumed, and trip generation are included in **Appendix F. Table 9** below outlines the assumed redistributions for each movement.

Table 9
Assumed U-turn Redistributions

Zone	Existing Movement	Future Movement	
		Direction	Intersection
Rougemount Drive to Rosebank Road (North)	EBL IN	EB U-turn	Kingston Road and Rosebank Road
	SBL OUT	WB U-turn	Kingston Road and Rougemount Drive
Rougemount Drive to Rosebank Road (South)	WBL IN	WB U-turn	Kingston Road and Rougemount Drive
	NBL OUT	EB U-turn	Kingston Road and Rosebank Drive
Altona Road to Rougemount Drive (North)	EBL IN	EB U-turn	Kingston Road and Rougemount Drive
	SBL OUT	WB U-turn	Kingston Road and Altona Road
Altona Road to Rougemount Drive (South)	WBL IN	WB U-turn	Kingston Road and Altona Road
	NBL OUT	EB U-turn	Kingston Road and Rougemount Drive

Per discussion with the Region, it is understood that the Durham-Scarborough BRT Environmental Assessment (EA) is currently underway and is expected to be completed by March 2022.

As part of the EA process, a Transportation Assessment has been prepared and is currently under review. The Transportation Assessment is expected to provide U-turn volume estimates, mode shift projections, traffic volume forecasts and any traffic reduction as a result of the proposed Kingston BRT. As such, it is expected that upon review of the Transportation Assessment, updates to the future traffic volumes, post-BRT trip distribution assumptions, and traffic modelling parameters will be undertaken in order to incorporate the Region's assumptions in regard to the operation of the BRT and future vehicle travel trends.

Consequently, the analysis herein, has been conducted with the information available at the time of the study and is intended to offer a high-level overview of the traffic impacts of the proposed development in comparison to future background operations. The future traffic growth may be considered conservative as a 1% annual compounded growth rate was applied to all future horizons; contrary to the observed traffic volume decline from 2017 and 2019, as well as contrary to the expected mode shift due to Kingston BRT.

4.5 Background Developments

In addition to the annual compounded growth rate, background site generated traffic from 603-643 and 645-699 Kingston Road, 770 Kingston Road and 346-364 Kingston Road was also separately applied to the future background traffic volumes, as discussed in the Terms of Reference with City and Region staff.

- 603-643 and 645-699 Kingston Road: Located east of the subject property, proposes a mixed-use community including six high-rise residential towers, two mid-rise residential tower, and four blocks of townhouses. A total of 2,884 residential units, 2,232 m^2 of ground floor retail, 4,448 m^2 of office space, and 3,997 m^2 of parklands is proposed. It is expected to generate a total of 800 and 705 two-way trips during the a.m. and p.m. peak periods, respectively.

- 770 Kingston Road: Located east of the subject property, proposes a residential development with 82 three-storey stacked townhouse units. It is expected to generate a total of 30 and 37 two-way trips during the a.m. and p.m. peak periods, respectively.

- 346-364 Kingston Road: Located directly across from the subject property on the northwest corner of Kingston Road and Rougemount Drive, Metropolitan Towns by Grand Communities is currently in the preconstruction phase for 28 townhouse units. It is expected to generate a total of 32 and 33 two-way trips during the a.m. and p.m. peak periods, respectively.

The background site generated traffic and trip assignments for 603—643 and 645-699 Kingston Road and 770 Kingston were applied to the future background volumes based on the respective Traffic Impact Studies.

As a Traffic Impact Study is not provided for 346-364 Kingston Road, the trip generation of the site was forecasted using Institute of Transportation Engineers (ITE) Trip Generation Manual, 11th Edition, under the Land Use Category 220 "Multifamily Housing (Low-Rise)," based on the proposed 28 townhouse units. It was assumed that the development will have a site access on Rougemount Drive and no site access on Kingston Road, based on the Metropolitan Towns promotional images available. The trip distribution of the site was assumed to be consistent with the trip distribution for the residential portion of the Subject Property (see **Section 5.5**).

Relevant excerpts of the background Traffic Impact Study and trip generation calculations for 346-364 Kingston Road are included in **Appendix G**. **Figures 9**, **10** and **11** illustrate the trip assignments of the background site generated traffic.

4.6 Auxiliary Lane Analysis

Left-turn auxiliary lane warrants were undertaken for the southbound left-turn at the Rougemount site access during weekday a.m. and p.m. hours under **future background conditions**.

The requirements were reviewed based on the Ontario Ministry of Transportation (MTO) Geometric Design Standards for Ontario Highways, which covers unsignalized intersections with a design speed of 50 km/h respectively. Relevant MTO auxiliary lane analysis excerpts are included in **Appendix H**.

Table 10
Future Background Auxiliary Lane Analysis (Rougemount Drive and Site Access)

Year	Peak Hour	VA	% Left Turns in VA	VO	Warranted	Minimum Storage (metres)	MTO GDSOH Figure
50 km/h Design Speed (Future Background)							
2026	A.M.	377	2.7%	476	✘	-	Ex 9A-3
	P.M.	637	3.3%	430	✓	15 m	Ex 9A-3
2036	A.M.	415	2.4%	524	✘	-	Ex 9A-3
	P.M.	701	3.0%	470	✓	**15 m**	Ex 9A-3

Per **Table 10**, given a design speed of 50 km/h, a minimum left-turn storage of 15 metres is warranted by 2026 at Rougemount site access.

It is noted that the analysis has been prepared using pre-Covid traffic volumes projected to future volumes, as well as using the estimated site access turning movements, as new counts were not conducted due to the ongoing pandemic. As such, the analysis above may be considered conservative and the need for a southbound left-turn auxiliary lane should be monitored by the City upon build out of the Kingston BRT and corridor intensification.

4.7 Intersection Modelling

For all future analyses, Kingston Road configurations have been modelled based on the Conceptual Design drawings of the Durham-Scarborough BRT (Metrolinx, October 2020). The BRT Lane has been excluded from modelling and is only included as a dedicated westbound-right turn lane at the signalized intersections.

Due to the proposed BRT centre median, the westbound and eastbound left-turn and U-turns have been modelled as protected left-turn movements along Kingston Road. In addition, the following optimized signal timings have been applied to both signalized intersections for all future background and future total scenarios:

- Weekday A.M. Peak Period
  - Optimized Splits
  - Optimized Offsets

- Weekday P.M. Peak Period
  - Increased cycle length of 120 seconds
  - Optimized Splits
  - Optimized Offsets

It is noted that a default PHF of 0.92 is assumed for weekday a.m. and p.m. peak hours for all future traffic analysis. Additionally, it was conservatively assumed no auxiliary southbound left-turn lane at Rougemount Site Access is implemented. Information on the Durham-Scarborough BRT and Kingston Road Conceptual Design drawings are included in **Appendix B**.

4.8 Intersection Operations

Tables 11, **12** and **13** outline 2026, 2031 and 2036 future background operations associated with the boundary road network based on the future background traffic volumes illustrated in **Figures 12** through **Figure 14**, with detailed capacity analyses included in **Appendix E**.

Table 11
2026 Future Background Level of Service

Intersection	Control	Peak Hour	Level of Service[1]	Control Delay	Maximum V/C Ratios[2]	95th Percentile Queue > Storage Length
Kingston Road at Rougemount Drive	Optimized Signal	A.M.	C	26.5 s	0.86 (NBL)	67.9 m > 35.0 m (NBL) 27.7 m > 19.0 m (SBL)
		P.M.	F	97.2 s	1.23 (EBT) 1.07 (WBL) 1.03 (NBL)	213.0 m > 93.0 m (EBUL) 281.0 m > 263.8 m (EBT)[3] 294.0 > 263.8 m (EBTR)[3] 76.0 m > 35.0 m (NBL) 32.5 m > 19.0 m (SBL)
Kingston Road at Altona Road	Optimized Signal	A.M.	C	22.1 s	0.94 (EBL)	69.3 m > 16.0 m (EBL)
		P.M.	C	33.1 s	1.00 (EBL) 0.92 (SBLT) 0.91 (WBT)	62.3 m > 16.0 m (EBL)
Kingston Site Access	One-Way Stop Controlled (RIRO)	A.M.	A	8.9 s	0.35 (WBT)	None
		P.M.	B	12.1 s	0.70 (EBT)	None
Rougemount Site Access	One-Way Stop Controlled (Full-moves)	A.M.	C	15.6 s	0.30 (NBTR)	None
		P.M.	C	19.8 s	0.28 (NBTR)	None

Note 1: The Level of Service of a signalized intersection is based on the average control delay per vehicle. The level of Service of a stop-controlled intersection is based on the minor (stopped) approach control delay per vehicle.

Note 2: The critical v/c ratio is considered to be the maximum v/c ratio at the intersection. All v/c ratios greater than 0.90 are outlined and highlighted.

Note 3: 263.8 m length refers to intersection spacing between the signalized intersections of Kingston Road at Altona Road and Kinston Road at Rougemount Drive, rather than available storage length. As such, queued eastbound vehicles at the intersection of Kingston Road at Altona Road may have to wait for more than one cycle to advance.

Table 12
2031 Future Background Level of Service

Intersection	Control	Peak Hour	Level of Service[1]	Control Delay	Maximum V/C Ratios[2]	95th Percentile Queue > Storage Length
Kingston Road at Rougemount Drive	Optimized Signal	A.M.	C	27.8 s	0.88 (NBL)	70.6 m > 35.0 m (NBL) 26.9 m > 19.0 m (SBL)
		P.M.	F	113.6 s	1.29 (EBT) 1.13 (WBL) 1.10 (NBL)	213.0 m > 93.0 m (EBUL) 280.7 m > 263.8 m (EBT)[3] 286.5 > 263.8 m (EBTR)[3] 71.3 m > 35.0 m (NBL) 38.6 m > 19.0 m (SBL)
Kingston Road at Altona Road	Optimized Signal	A.M.	C	23.5 s	0.95 (EBL) 0.91 (SBLT)	73.0 m > 16.0 m (EBL)
		P.M.	D	38.8 s	1.06 (EBL) 0.96 (WBT) 0.94 (SBLT)	61.3 m > 16.0 m (EBL)
Kingston Site Access	One-Way Stop Controlled (RIRO)	A.M.	A	9.1 s	0.38 (WBT)	None
		P.M.	B	12.1 s	0.74 (EBT)	None
Rougemount Site Access	One-Way Stop Controlled (Full-moves)	A.M.	C	16.2 s	0.32 (NBTR)	None
		P.M.	C	21.0 s	0.29 (NBTR)	None

Note 1: The Level of Service of a signalized intersection is based on the average control delay per vehicle. The level of Service of a stop-controlled intersection is based on the minor (stopped) approach control delay per vehicle.

Note 2: The critical v/c ratio is considered to be the maximum v/c ratio at the intersection. All v/c ratios greater than 0.90 are outlined and highlighted.

Note 3: 263.8 m length refers to intersection spacing between the signalized intersections of Kingston Road at Altona Road and Kinston Road at Rougemount Drive, rather than available storage length. As such, queued eastbound vehicles at the intersection of Kingston Road at Altona Road may have to wait for more than one cycle to advance.

Table 13
2036 Future Background Level of Service

Intersection	Control	Peak Hour	Level of Service[1]	Control Delay	Maximum V/C Ratios[2]	95th Percentile Queue > Storage Length
Kingston Road at Rougemount Drive	Optimized Signal	A.M.	C	29.4 s	0.90 (NBL)	73.0 m > 35.0 m (NBL) 28.8 m > 19.0 m (SBL)
		P.M.	F	131.0 s	1.35 (EBT) 1.18 (NBL) 1.17 (WBL)	198.9 m > 93.0 m (EBUL) 280.4 m > 263.8 m (EBT)[3] 289.9 > 263.8 m (EBTR)[3] 156.0 m > 140.0 m (WBUL) 71.3 m > 35.0 m (NBL) 33.6 m > 19.0 m (SBL)
Kingston Road at Altona Road	Optimized Signal	A.M.	C	25.4 s	0.96 (EBL) 0.94 (SBLT)	71.6 m > 16.0 m (EBL)
		P.M.	D	45.7 s	1.13 (EBL) 1.00 (WBT) 0.98 (SBLT)	61.3 m > 16.0 m (EBL)
Kingston Site Access	One-Way Stop Controlled (RIRO)	A.M.	A	9.2 s	0.40 (WBT)	None
		P.M.	B	12.1 s	0.78 (EBT)	None
Rougemount Site Access	One-Way Stop Controlled (Full-moves)	A.M.	C	17.0 s	0.34 (NBTR)	None
		P.M.	C	22.5 s	0.30 (NBTR)	None

Note 1: The Level of Service of a signalized intersection is based on the average control delay per vehicle. The level of Service of a stop-controlled intersection is based on the minor (stopped) approach control delay per vehicle.
Note 2: The critical v/c ratio is considered to be the maximum v/c ratio at the intersection. All v/c ratios greater than 0.90 are outlined and highlighted.
Note 3: 263.8 m length refers to intersection spacing between the signalized intersections of Kingston Road at Altona Road and Kinston Road at Rougemount Drive, rather than available storage length. As such, queued eastbound vehicles at the intersection of Kingston Road at Altona Road may have to wait for more than one cycle to advance.

The signalized intersection of Kingston Road at Rougemount Drive is expected to operate at a LOS "C" during the weekday a.m. peak hour and a LOS "F" during the weekday p.m. peak hour under 2036 future background conditions. The intersection is expected to operate at a maximum control delay of 131.0 seconds and a maximum theoretical volume-to-capacity ratio of 1.35. The 95th percentile queue lengths for all U-turn and left-turn movements and for the eastbound through

movement are expected to exceed available storage length. The queue lengths for the eastbound through movement are forecasted to impact the downstream intersection of Kingston Road and Altona Road. However, these operations are considered conservative as the effects of the future BRT have not been considered (and will be revised upon the Kingston BRT EA study). It is also expected that there will be a significant reduction in automobile use along the Kingston Road corridor with the introduction of the BRT. As such the operations outlined above are considered conservative and the queue lengths are considered to be overstated.

The signalized intersection of Kingston Road at Altona Road is expected to operate at a LOS "D" or better during the weekday a.m. and p.m. peak periods under 2036 future background conditions. The intersection is expected to operate at a maximum control delay of 45.7 seconds and a maximum theoretical volume-to-capacity ratio of 1.13. The 95th percentile queue length for the eastbound left-turn movement is expected to exceed the available storage length.

The existing site accesses are expected to continue operating acceptably at a level of service "C" or better during the weekday a.m. and p.m. peak periods with a maximum control delay of 22.5 seconds and maximum volume-to-capacity ratio of 0.78. These metrics indicate that the accesses are expected to operate efficiently with acceptable delays and with reserve capacity to accommodate future increases in traffic volume.

Once again, these results are considered conservative as the default PHF of 0.92 was used to model the boundary road network while higher PHFs were observed at the signalized intersections as outlined in **Table 7.** These results are also considered conservative as the modal shift due to the future Durham-Scarborough BRT has not been considered.

4.9 Kingston Road Corridor Intensification & Congestions Expected

While the future background operations outlined above indicate that the boundary road network is expected to operate at capacity, it is important to note that congestion has been anticipated along this segment of the Kingston Road corridor.

For instance, per Exhibit 5.2 "2031 Proposed Network – Congested Links" of the Durham Region Transportation Master Plan (Region of Durham, 2017), the Region acknowledged that congested and over capacity conditions are expected to continue. The Region of Durham acknowledges that even with the proposed roadway and transit improvements expected (i.e., Kingston BRT) in the mid-to-long-term future, congestion will remain, and it is not sustainable to continue to provide additional automobile capacity. Despite the current and expected congestion, further intensification within the area has been proposed within the City and Region along this transit priority corridor.

Specifically, per the City of Pickering Integrated Transportation Master Plan (ITMP) (IBI, August 2021):

- The City has identified Kingston Road as one of the major east-west corridors that currently experiences congestion and vehicle volumes exceeding capacity.
- However, the Kingston Road corridor is planned to be one of the four main growth areas in Pickering with "growth targets of 22,000 people and 7,500 jobs".

It is recognized that road widening is not expected to sufficiently mitigate the future traffic congestion problems along the Kingston Road corridor and as such, a pedestrian, cyclist and transit-oriented corridor and related infrastructure improvements have been proposed. Mixed-use and well-integrated community developments are envisioned along the Kingston Road corridor in order to

promote localized travel, to encourage alternative transportation modes and to reduce automobile usage. Per the Kingston Road Corridor and Specialty Retailing Node Intensification Plan (City of Pickering, November 2019), "Kingston Road Corridor and Specialty Retailing Node will be":

- A walkable place in all four precincts, with safe, comfortable and green sidewalks, and pedestrian connections on both sides of Kingston Road

- An urban, livable, transit-supportive community with a higher density mix of uses, located in buildings that are pedestrian oriented

- A regional and local multi-modal connector, with Regional gateways at Altona Road and Brock Road, and with gateways to the neighbourhoods north and south of the corridor at Rougemount Drive, Whites Road and Fairport Road.

In addition, the Kingston BRT has been proposed within the Study Area. Although the Kingston BRT EA is ongoing, in consistent with median-running BRT/LRT corridors across the GTHA where left turns are signalized with protected only phases, vehicle congestion is expected but may also act as a deterrent to reduce vehicle usage as discussed in the MTO Transit Supportive Guidelines (MTO, 2012). The proposed Kingston BRT is consequently expected to prioritize transit level of service along the corridor, reduce transit delays, improve transit capacity, and thus facilitate a mode shift to transit along the Kingston Road corridor. This shift to transit has also been identified in the Durham Region Transportation Master Plan (Region of Durham, 2017), which expects an increase in transit mode share of 9% by 2031 for rapid transit corridors. As such, given the population growth and intensification envisioned for the Kingston Road corridor, it is reasonably expected that traffic congestion will continue, and the operations outlined above are not unexpected, albeit conservative.

Finally, as mentioned, the above operations are conservative based on the following:

- Peak Hour Factor (PHF) calibrations: A default PHF of 0.92 was used, as required by Region guidelines, despite higher observed PHFs.
- Mode Shift Changes: As a result of the BRT and RER transit improvements, vehicle volumes are expected to reduce materially within the study area.
- Travel Pattern Changes: As a result of the expected congestion, and RIRO restrictions, redistribution of traffic is expected as frequent drivers will optimize their route and avoid unnecessary delays (i.e., U-turns)
- Lost Time Adjustments: No lost time adjustments were applied, however, consistent with urban congested traffic, a more aggressive driving behavior can be expected (i.e., higher saturation rates, left turns during intergreen, reduced time gap for left turns etc.).
- Growth Rate: Assumed a 1% annual compounded growth rate for all horizons, despite the observed traffic volume decline between 2017 and 2019.
- No Dedicated Southbound Left-turn Lane at Rougemount Site Access: All analyses were conducted assuming no southbound left-turn lane is provided for conservative analysis.

As mentioned, the Durham-Scarborough BRT EA is currently underway. When the EA is completed, the Transportation Assessment is expected to provide BRT modelling assumptions, revised signal timing plans, long term traffic projections, and revised mode split percentages incorporating the effects of the Kingston BRT. As such, it is expected that upon review of the Transportation Assessment, updates to the traffic modelling herein will be undertaken in order to incorporate the Region's assumptions, operation of the BRT and future vehicle travel trends.

Relevant excerpts of the City of Pickering Integrated Transportation Master Plan, Durham Region Transportation Master Plan and the Kingston Road Corridor and Specialty Retailing Node Intensification Plan are included in **Appendix I, Appendix J** and **Appendix K**, respectively.

5.0 Site Generated Traffic

5.1 Trip Generation

The proposed mixed-use development will result in additional vehicles on the boundary road network that previously did not exist. The proposed development will also create additional turning movements at the study intersections.

The trip generation of the high-rise residential tower and retail space was forecasted using Institute of Transportation Engineers (ITE) Trip Generation Manual, 11th Edition, under the Land Use Category 222 "Multi-family Housing (High-Rise)" and Land Use Category 822 "Strip Retail Plaza (<40k)".

Fitted curves and average rate forecasts were provided by ITE. The trip generation forecast is based on fitted curve estimates (if available and deemed accurate with R^2 over 0.80) established by ITE data for the number of dwelling units or gross floor area (GFA) provided, in a general urban and suburban setting. The forecasted unadjusted trips are tabulated in **Table 14**.

Table 14
Trip Generation

Use	Units/GFA	Roadway Peak Hour	Number of Trips		
			Inbound	Outbound	Total
LUC 222 Multifamily Housing (High-Rise)	580 units	Weekday A.M.	53	104	157
		Weekday P.M.	104	82	186
LUC 822 Strip Retail Plaza (<40k)	1,577[1] m^2	Weekday A.M.	24	16	40
		Weekday P.M.	56	56	112
Total		**Weekday A.M.**	**77**	**120**	**197**
		Weekday P.M.	**160**	**138**	**298**

Note 1: Trip generation was forecasted under a previous site plan with a retail GFA of 1,577 m^2. With the updated retail GFA of 1,532 m^2, -1 and -3 fewer two-way trips are generated in the weekday a.m. and p.m. peak hours, respectively. As such, the analysis and conclusions herein are valid and considered conservative.

According to the ITE Trip Generation Manual, the mixed-use development is forecasted to generate an upper bound of 197 and 298 two-way unadjusted trips in the weekday a.m. and p.m. peak hours, respectively.

5.2 Internal Trip Capture

As with many multi-use integrated sites, internal interaction between uses is expected to occur. In this regard, internal trips are expected to occur between the residential and retail land uses on the subject property without using the external boundary road network. Internal trips which circulate between the residential and commercial land uses on the subject site were calculated per ITE data.

Table 6.1 of the ITE Trip Generation Handbook (3rd Edition) outlines the trip capture rates for trip origins within a mixed-use development, while Table 6.2 outlines the trip capture rates for destinations within a mixed-use development.

Table 15 below outlines the forecasted internal and external trips for the proposed development.

Table 15
Internal and External Trips

Use	Trip Type	Roadway Peak Hour	Number of Trips		
			Inbound	Outbound	Total
Residential	Internal	Weekday A.M.	1	1	2
		Weekday P.M.	15	6	21
	External	**Weekday A.M.**	**52**	**103**	**155**
		Weekday P.M.	**89**	**76**	**165**
Retail	Internal	Weekday A.M.	1	1	2
		Weekday P.M.	6	15	21
	External	**Weekday A.M.**	**23**	**15**	**38**
		Weekday P.M.	**50**	**41**	**91**
Total	Internal	Weekday A.M.	2	2	4
		Weekday P.M.	21	21	42
	External	**Weekday A.M.**	**75**	**118**	**193**
		Weekday P.M.	**139**	**117**	**256**

With internal trip captures accounted for, the proposed development is forecasted to generate an upper bound of 193 and 256 two-way external trips in the weekday a.m. and p.m. peak hours, respectively.

5.3 Pass-By Trips

Similarly, as defined by the ITE Trip Generation Handbook, 3rd Edition, primary trips are external trips made for the specific purpose of visiting the site generator and pass-by trips are intermediate stops on the way from an origin to a primary trip destination without a route diversion. Accordingly, pass-by trips are existing background trips that access the site on the way to the ultimate destination, and thus, have already been accounted for in the external road network and do not further increase the vehicle volumes on the external roadway.

While there is no available pass-by rate for the Land Use Category 822 "Strip Retail Plaza (<40k), a 34% pass-by trip rate during the weekday p.m. peak period was applied; typical for commercial developments (i.e., Land Use Category 820). No pass-by rate was applied to the weekday a.m. peak period trips.

The forecasted primary and pass-by trips for the site are tabulated in **Table 16.**

Table 16
Primary and Pass-By Trips

Use	Trip Type	Roadway Peak Hour	Number of Trips		
			Inbound	Outbound	Total
Residential	Primary	Weekday A.M.	52	103	155
		Weekday P.M.	89	76	165
	Pass-By	Weekday A.M.	0	0	0
		Weekday P.M.	0	0	0
Retail	Primary	Weekday A.M.	23	15	38
		Weekday P.M.	33	27	60
	Pass-By	Weekday A.M.	0	0	0
		Weekday P.M.	17	14	31
Total	**Primary**	**Weekday A.M.**	**75**	**118**	**193**
		Weekday P.M.	**122**	**103**	**225**
	Pass-By	Weekday A.M.	0	0	0
		Weekday P.M.	17	14	31

Accordingly, accounting for internal and pass-by trip captures, the proposed development is forecasted to generate an upper bound of 193 and 225 two-way primary trips in the weekday a.m. and p.m. peak hours, respectively.

5.4 Net Site Trip Generation

As the existing commercial plaza will no longer be in operation, the existing trips were removed from the boundary road network. The net forecasted two-way site generated trips are tabulated in **Table 17**.

Table 17
Net Site Trip Generation

Mode	Use	Roadway Peak Hour (Weekday)	Number of Trips		
			Inbound	Outbound	Total
Vehicle (Primary Trips)	Existing Commercial	A.M.	-39	-26	-65
		P.M.	-60	-59	-119
	Proposed Development	A.M.	75	118	193
		P.M.	122	103	225
	Net	**A.M.**	**36**	**92**	**128**
		P.M.	**62**	**44**	**106**

As shown, the proposed development is expected to generate a net 128 and 106 two-way primary vehicle trips during the weekday a.m. and p.m. peak hours, respectively.

5.5 Trip Distribution

Residential Trip Distribution

The residential trips generated by the proposed development were assigned to the boundary road network based on Transportation Tomorrow Survey (TTS) data. TTS is a comprehensive survey of transportation characteristics of households in the Golden Horseshoe, Simcoe County and surrounding areas.

For the proposed development, TTS results were filtered to auto trips exiting 2006 GTA Zone 1046, the zone in which the subject property is located in. Trips were filtered to the weekday a.m. peak period. From this query, trip destinations were determined, and percentage of trips assigned to each destination was accounted for. Trips were assumed to travel to and from their destination based on the most convenient route possible. Based on the existing traffic volumes, the assumed trip distribution per TTS results is in general conformance with commuter travel patterns.

The trip distribution that was applied for the weekday a.m. peak period was inversely applied to the weekday p.m. peak period. **Table 18** below outlines the assumed trip distribution for the proposed development. The residential trip distribution is illustrated in **Figure 15**. **Appendix C** outlines the TTS 2016 results.

Table 18
Trip Distributions

Departing To/Arriving From	Peak Period	Percentage	
		IN	OUT
East: Kingston Road	A.M.	55%	30%
	P.M.	30%	55%
West: Kingston Road	A.M.	25%	50%
	P.M.	50%	25%
North: Altona Road	A.M.	15%	15%
	P.M.	15%	15%
South: Rougemount Drive	A.M.	5%	5%
	P.M.	5%	5%
Total	**A.M.**	**100%**	**100%**
	P.M.	**100%**	**100%**

Commercial Trip Distribution

The proposed retail use is located on the ground floor of the residential building and is not expected to generate a large number of external trips, nor attract a large number of visitors from outside of the neighbourhood or region. The primary customers of the ground floor retail of this size, are expected to be residents from the proposed residential towers, residents from within the neighbourhood, from the nearby neighbourhoods, and those who are already visiting the area (pass-by trips).

The trips generated by the retail portion of the proposed development were distributed to the boundary road network using the same distributions applied to the existing site trips outlined in **Section 3.6.3.** The primary and pass-by retail trip distributions are illustrated in **Figure 16** and **Figure 17**, respectively.

The residential, primary retail and pass-by retail trip assignments are illustrated in **Figures 18, 19** and **20,** respectively**.**

6.0 Future Total Conditions

6.1 Auxiliary Lane Analysis

Once again, left-turn lane warrants were undertaken for the southbound left-turn lane at the Rougemount site access using MTO Geometric Design Standards for Ontario Highways during weekday a.m. and p.m. hours under future total conditions. It is noted that the analysis has been prepared using pre-Covid traffic volumes projected to future volumes. As such, the analysis is considered an estimate and the need for a southbound left-turn auxiliary lane should be monitored by the City upon build out of the Kingston BRT and corridor intensification. **Table 19** below summarizes the auxiliary lane analysis.

Table 19
Future Total Auxiliary Lane Analysis (Rougemount Site Access)

Year	Peak Hour	VA	% Left Turns in VA	VO	Warranted	Minimum Storage (metres)	MTO GDSOH Figure
50 km/h Design Speed (Future Background)							
2026	A.M.	377	2.7%	476	✘	-	Ex 9A-3
	P.M.	637	3.3%	430	✓	15 m	Ex 9A-3
2036	A.M.	415	2.4%	524	✘	-	Ex 9A-3
	P.M.	701	3.0%	470	✓	**15 m**	Ex 9A-3
Year	**Peak Hour**	**V_A**	**% Left Turns in V_A**	**V_O**	**Warranted**	**Minimum Storage (metres)**	**MTO GDSOH Figure**
50 km/h Design Speed (Future Total)							
2026	A.M.	399	8.0%	471	✘	-	Ex 9A-3
	P.M.	658	6.2%	421	✓	25 m	Ex 9A-3
2036	A.M.	437	7.3%	519	✓	15 m	Ex 9A-3
	P.M.	722	5.7%	461	✓	**25 m**	Ex 9A-3

Per **Table 19**, given a design speed of 50 km/h, a left-turn lane of 25 metres is warranted by 2026 at Rougemount site access.

Although a southbound left-turn lane is warranted by 2026, the traffic operations at the Rougemount site access remain acceptable through all study horizon years (as outlined below in **Section 6.3**)**.**

Additionally, while a 25-metre southbound left-turn lane is warranted per **Table 19** above, the sensitivity analysis outlined in **Section 7** below, results in a forecasted 95th percentile southbound left turn queue length of 11.1 m. As such, a reduced 12 m auxiliary lane is expected to be adequate.

Once again, it is recommended that the City continue to monitor operations at the site access upon the build out of the BRT and intensification of the Kingston Road corridor as future traffic volumes estimated may be considered conservative due to the number of transit and active transportation initiatives, as well as the pre-Covid traffic volume projections.

If required, a southbound left-turn auxiliary lane can be accommodated within the existing Rougemount right-of-way (ROW). The existing ROW is approximately 20 m, the following can be accommodated within the cross section:

- 2x – 3.75 m through lanes
- 2x – 3.0 m to 3.25 left-turn lanes
- 2x – 1.8 m sidewalk
- 1x – 2.4 m boulevard space

Furthermore, due to the existing light pole on the east side of Rougemount Drive, as well as the proximity to Kingston Road intersection to the north, further discussions with the City and Region staff are required to determine the supportability of the southbound left-turn lane. Nevertheless, the site access is expected to operate acceptably without the southbound left-turn lane (see **Table 22**), and it is recommended that the need for a southbound left-turn auxiliary lane be monitored by the City upon the buildout of the Kingston BRT and future intensification.

6.2 Basis of Assessment

The traffic impacts arising from the proposed development were assessed on the basis of the site generated traffic illustrated in **Figures 17, 18** and **19**, superimposed on the future background traffic volumes in **Figures 12, 13** and **14** using the same optimized signal timing plans as mentioned in future background conditions. The resulting future total traffic volumes for the weekday a.m. and p.m. peak hours are illustrated in **Figure 21, 22,** and **23** for the 2026, 2031 and 2036 horizon years, respectively. Similar to the future background analysis, it was conservatively assumed no auxiliary southbound left-turn lane at Rougemount Site Access is implemented.

6.3 Intersection Operations

Tables 20, 21 and **22** outline the 2026, 2031 and 2036 future total traffic conditions associated with the boundary road network, respectively. Detailed capacity analyses are included in **Appendix E**.

Table 20
2026 Future Total Level of Service

Intersection	Control	Peak Hour	Level of Service[1]	Control Delay	Maximum V/C Ratios[2]	95th Percentile Queue > Storage Length
Kingston Road at Rougemount Drive	Optimized Signal	A.M.	C	31.4 s	0.94 (NBL)	74.6 m > 35.0 m (NBL) 24.5 m > 19.0 m (SBL)
		P.M.	F	109.3 s	1.27 (EBT) 1.24 (WBL) 1.10 (NBL)	218.7 m > 93.0 m (EBUL) 285.8 m > 263.8 m (EBT)[3] 299.3 > 263.8 m (EBTR)[3] 77.9 m > 35.0 m (NBL) 37.2 m > 19.0 m (SBL)
Kingston Road at Altona Road	Optimized Signal	A.M.	C	22.4 s	0.94 (EBL)	70.5 m > 16.0 m (EBL)
		P.M.	C	34.9 s	1.01 (EBL) 0.94 (WBT, SBLT)	61.1 m > 16.0 m (EBL)
Kingston Site Access	One-Way Stop Controlled (RIRO)	A.M.	A	9.2 s	0.36 (WBT)	None
		P.M.	B	12.6 s	0.71 (EBT)	None
Rougemount Site Access	One-Way Stop Controlled (Full-moves)	A.M.	B	14.1 s	0.30 (NBTR)	SBL: 15.3 m
		P.M.	C	16.8 s	0.27 (WBLR)	SBL: 29.8 m

Note 1: The Level of Service of a signalized intersection is based on the average control delay per vehicle. The level of Service of a stop-controlled intersection is based on the minor (stopped)approach control delay per vehicle.
Note 2: The critical v/c ratio is considered to be the maximum v/c ratio at the intersection. All v/c ratios greater than 0.90 are outlined and highlighted.
Note 3: 263.8 m length refers to intersection spacing between the signalized intersections of Kingston Road at Altona Road and Kinston Road at Rougemount Drive, rather than available storage length. As such, queued eastbound vehicles at the intersection of Kingston Road at Altona Road may have to wait for more than one cycle to advance.

Table 21
2031 Future Total Level of Service

Intersection	Control	Peak Hour	Level of Service[1]	Control Delay	Maximum V/C Ratios[2]	95th Percentile Queue > Storage Length
Kingston Road at Rougemount Drive	Optimized Signal	A.M.	C	33.3 s	0.96 (NBL)	76.2 m > 35.0 m (NBL) 26.0 m > 19.0 m (SBL)
		P.M.	F	126.1 s	1.32 (EBT) 1.30 (WBL) 1.17 (NBL)	211.8 m > 93.0 m (EBUL) 280.9 m > 263.8 m (EBT)[3] 291.7 > 263.8 m (EBTR)[3] 155.1 m > 140.0 m (WBUL) 76.5 m > 35.0 m (NBL) 33.7 m > 19.0 m (SBL)
Kingston Road at Altona Road	Optimized Signal	A.M.	C	24.1 s	0.95 (EBL) 0.92 (SBLT)	70.6 m > 16.0 m (EBL)
		P.M.	D	40.5 s	1.07 (EBL) 0.98 (WBT) 0.96 (SBLT)	61.2 m > 16.0 m (EBL)
Kingston Site Access	One-Way Stop Controlled (RIRO)	A.M.	A	9.4 s	0.39 (WBT)	None
		P.M.	B	12.6 s	0.74 (EBT)	None
Rougemount Site Access	One-Way Stop Controlled (Full-moves)	A.M.	B	14.6 s	0.32 (NBTR)	SBL: 18.9 m
		P.M.	C	17.7 s	0.28 (WBLR)	SBL: 44.9 m

Note 1: The Level of Service of a signalized intersection is based on the average control delay per vehicle. The level of Service of a stop-controlled intersection is based on the minor (stopped)approach control delay per vehicle.
Note 2: The critical v/c ratio is considered to be the maximum v/c ratio at the intersection. All v/c ratios greater than 0.90 are outlined and highlighted.
Note 3: 263.8 m length refers to intersection spacing between the signalized intersections of Kingston Road at Altona Road and Kinston Road at Rougemount Drive, rather than available storage length. As such, queued eastbound vehicles at the intersection of Kingston Road at Altona Road may have to wait for more than one cycle to advance.

Table 22
2036 Future Total Level of Service

Intersection	Control	Peak Hour	Level of Service[1]	Control Delay	Maximum V/C Ratios[2]	95th Percentile Queue > Storage Length
Kingston Road at Rougemount Drive	Optimized Signal	A.M.	D	36.1 s	0.97 (NBL) 0.92 (WBL) 0.90 (EBT)	76.7 m > 35.0 m (NBL) 26.4 m > 19.0 m (SBL)
		P.M.	F	144.2 s	1.39 (EBT) 1.34 (WBL) 1.25 (NBL)	183.8 m > 93.0 m (EBUL) 288.7 m > 263.8 m (EBT)[3] 297.4 > 263.8 m (EBTR)[3] 179.7 m > 140.0 m (WBUL) 70.6 m > 35.0 m (NBL) 31.8 m > 19.0 m (SBL)
Kingston Road at Altona Road	Optimized Signal	A.M.	C	26.3 s	0.96 (EBL) 0.95 (SBLT) 0.91 (WBT)	69.3 m > 16.0 m (EBL)
		P.M.	D	47.4 s	1.13 (EBL) 1.02 (WBT) 1.01 (SBLT)	62.5 m > 16.0 m (EBL)
Kingston Site Access	One-Way Stop Controlled (RIRO)	A.M.	A	9.5 s	0.41 (WBT)	None
		P.M.	B	12.6 s	0.78 (EBT)	None
Rougemount Site Access	One-Way Stop Controlled (Full-moves)	A.M.	C	15.1 s	0.33 (NBTR)	SBL: 31.8 m
		P.M.	C	18.7 s	0.29 (NBTR)	SBL: 51.7 m

Note 1: The Level of Service of a signalized intersection is based on the average control delay per vehicle. The level of Service of a stop-controlled intersection is based on the minor (stopped)approach control delay per vehicle.
Note 2: The critical v/c ratio is considered to be the maximum v/c ratio at the intersection. All v/c ratios greater than 0.90 are outlined and highlighted.
Note 3: 263.8 m length refers to intersection spacing between the signalized intersections of Kingston Road at Altona Road and Kinston Road at Rougemount Drive, rather than available storage length. As such, queued eastbound vehicles at the intersection of Kingston Road at Altona Road may have to wait for more than one cycle to advance.

The signalized intersection of Kingston Road at Rougemount Drive is expected to operate at a LOS "D" during the weekday a.m. peak hour and a LOS "F" during the weekday p.m. peak hour under 2036 future total conditions. The intersection is expected to experience an increase in maximum control delay of 13.2 seconds or less, and a minor increase in the maximum theoretical volume-to-capacity ratio of 0.07 and 0.04 in the weekday a.m. and p.m. peak periods, respectively, when

compared to 2036 future background conditions.

The 95th percentile queue lengths for all U-turn and left-turn movements and for the eastbound through movement are expected to exceed the available storage length. The queue lengths for the eastbound through movement are forecasted to impact the downstream intersection of Kingston Road and Altona Road. However, these operations are considered conservative as the mode shift effects of the future BRT have not been considered. It is expected that there will be a significant reduction in automobile use along the Kingston Road corridor with the introduction of the BRT. As such the operations outlined above are conservative and the queue lengths are considered to be overstated. **Furthermore, these queue lengths are consistent with future background operations and the addition of the site generated traffic does not materially change the expected queue lengths.**

The signalized intersection of Kingston Road at Altona Road is expected to continue to operate at an unchanged LOS "C" and "D" during the weekday a.m. and p.m. peak periods, respectively, under 2036 future total conditions. The intersection is expected to experience an increase in maximum control delay of 1.7 seconds or less, and the maximum theoretical volume-to-capacity ratio is expected to remain unchanged at 1.13. The 95th percentile queue lengths for the eastbound left-turn movement are expected to continue to exceed the available storage length. However, there is additional taper available for queued vehicles and these conditions are consistent with future background and existing conditions.

The one-way stop-controlled site accesses are expected to continue operating acceptably at a level of service "C" or better during the weekday a.m. and p.m. peak periods with a maximum control delay of 18.7 seconds and maximum volume-to-capacity ratio of 0.78. Accordingly, the proposed site accesses are supportable from a transportation operations perspective.

Under future total conditions the maximum 95th percentile queue length for the southbound-left turn movement at the Rougemount site access is 51.7 m. As there is approximately 66 metres[1] between the intersection of Kingston Road and Rougemount Drive and the proposed site access, the southbound left-turn queue is not expected to impact the downstream intersection. However, it is required that "Do Not Block Intersection" signage be installed along Rougemount Drive, in order to avoid northbound queues from blocking southbound left-turns into the site access.

It is noted that the site access operations above assumed a single shared southbound left-through movement at the Rougemount site access. The queue length is expected to improve should a dedicated left-turn lane be provided. This scenario is reviewed in the sensitivity analysis provided in **Section 7.** Nonetheless, the site access is supportable from a traffic operations perspective with or without a dedicated left-turn lane.

Once again, the results above are considered conservative as the default PHF of 0.92 was used. In addition, the analysis is considered conservative as the effects of the future BRT were not accounted for. It is expected that the BRT will result in significantly reduced automobile usage along the Kingston Road corridor. Regardless of the effects of the BRT, the results above indicate that the site generated traffic does not materially impact traffic operations. The future total operations remain comparable to future background conditions without the redevelopment.

Finally, as previously mentioned, this is a high-level analysis as the Kingston BRT Transportation Assessment report is not yet made available. As such, it is expected that updates to the above traffic

[1] Measured from northbound stop bar to the north end of the proposed Rougemount site access

analysis will be undertaken in the future in order to incorporate the Region's assumptions in regard to the operation of the BRT. Again, regardless of the BRT assumptions, the results in **Table 22** indicate that the site generated traffic does not materially impact traffic operations.

6.4 Kingston Road Corridor Intensification & Congestions Expected

While the future total operations outlined above indicate that the boundary road network is expected to operate at capacity, it is important to note that this congestion has been recognized in City and Regional transportation studies, and that further intensification and infrastructure improvements have been proposed along Kingston Road corridor as mentioned in **Section 4.9**.

As such, given the population growth and intensification envisioned for the Kingston Road corridor, it is reasonably expected that traffic congestions will continue, and the operations outlined above are not unexpected. However, as mentioned, the operations above, did not account for the following:

- Peak Hour Factor (PHF) calibrations
- Mode Shift Changes
- Travel Pattern Changes
- Lost Time Adjustments
- Growth Rate
- No Dedicated Southbound Left-turn Lane at Rougemount Site Access

Furthermore, although the Environmental Assessment of the Kingston BRT is ongoing, it is noted that these traffic conditions outlined in **Table 13** and **Table 22** are typical to post-BRT and post-LRT conditions observed elsewhere within the GTHA (i.e., Mississauga Hurontario LRT EA study, Vaughan post BRT conditions, Markham post BRT conditions, Toronto Eglinton Crosstown LRT EA Study, Toronto Eglinton East LRT EA Study).

The proposed BRT is intended to improve transit operations, transit rider's travel times, and relieve traffic congestions by encouraging transit usage. The traffic congestion is also further expected to deter unnecessary vehicle trips. Furthermore, the proposed ground floor retail along Kingston Road will promote localized pedestrian and cycling trips within the neighbourhood. As such, the proposed development is supportable, given the minor incremental traffic operations effects, as well as the expected traffic operations in the area (post BRT) per City and Regional studies.

7.0 Sensitivity Analysis

As shown above, the signalized intersections of Kingston Road and Rougemount Drive, and Kingston Road and Altona Road are anticipated to operate beyond the theoretical volume-to-capacity ratios. However, it is noted that the introduction of the Durham-Scarborough BRT, pedestrian oriented streetscape, and dedicated cycling lanes along Kingston Road would reasonably result in reduced automobile use and therefore reduced vehicle volumes on the boundary road network.

Additionally, per the Region of Durham TIS Guidelines, the default peak hour factor (PHF) of 0.92 and a lost time adjustment of zero seconds was used in all above analyses. As higher PHFs were observed in the weekday a.m. and p.m. peak hours as outlined in **Table 7**, the above analysis can be considered conservative as existing traffic conditions replicate a more uniform distribution of traffic throughout the peak hour. Similarly, as expected in congested areas, a more aggressive driving behavior with reduced lost time is expected. This includes more vehicles proceeding through the intersection at intergreen, higher saturation rates and lower time gap acceptance. As such, the above analysis can once again be considered conservative.

As a result, a sensitivity analysis has been conducted for the ultimate 2036 future total horizon to analyze the operations using expected travel conditions and calibrations. The sensitivity analysis assumptions and calibrations are outlined below. It is noted that the assumptions and modelling calibrations herein, may be updated once the Kingston BRT Environmental Assessment is complete. Per discussion with Durham Region staff, the report is expected to be released in early 2022.

Sensitivity Analysis Assumptions:

- A 10% vehicle volume reduction was applied to all through traffic along Kingston Road to account for the future Kingston BRT.
    - This assumption is consistent with other BRT and LRT transportation studies in the GTHA and is consistent with the targeted mode shift as previously outlined in Metrolinx's Durham-Scarborough Bus Rapid Transit Benefits Case (Metrolinx, June 2010).
- Furthermore, existing PHFs were applied for calibration purposes (see **Table 7**).
- A lost time adjustment of -1.0 second was applied to calibrate peak hour volume distributions observed, as well as to account for left turns during intergreen along Kingston Road, typical for major arterial roadways during commuter peak periods.
- Lastly, the sensitivity analysis also accounts for a dedicated southbound left-turn lane at the Rougemount site access to review incremental improvement of the site access operations. The southbound left-turn lane was modelled with a storage length of 15 metres and a taper length of 30 metres.

Table 23 below outlines the improved 2036 future total operations of the boundary road network in the weekday a.m. and p.m. peak hours with the above calibrations applied, as well as with the dedicated southbound left-turn lane modelled at the Rougemount site access. **Figure 24** illustrates the 2036 future total traffic volumes analyzed in the sensitivity analysis with the 10% through volume reduction applied.

Table 23
2036 Future Total Level of Service (Sensitivity Analysis)

Intersection	Control	Peak Hour	Level of Service[1]	Control Delay	Maximum V/C Ratios[2]	95th Percentile Queue > Storage Length
Kingston Road at Rougemount Drive	Optimized Signal	A.M.	C	31.3 s	0.94 (NBL)	79.8 m > 35.0 m (NBL) 31.2 m > 19.0 m (SBL)
		P.M.	F	92.4 s	1.20 (EBT) 1.15 (NBL) 1.14 (WBL)	136.2 m > 93.0 m (EBUL) 180.3 m > 140.0 m (WBUL) 70.5 m > 35.0 m (NBL) 34.2 m > 19.0 m (SBL)
Kingston Road at Altona Road	Optimized Signal	A.M.	C	22.1 s	0.92 (EBL)	67.5 m > 16.0 m (EBL)
		P.M.	C	34.7 s	1.02 (EBL) 0.97 (SBLT)	61.0 m > 16.0 m (EBL)
Rougemount Site Access	One-Way Stop Controlled (Full-moves)	A.M.	C	15.1 s	0.33 (NBTR)	SBL: 11.1 m
		P.M.	C	18.7 s	0.44 (SBT)	SBL: 6.4 m

The intersection of Kingston Road at Rougemount Drive is expected continue to operate at a level of service (LOS) "C" and "F" during the weekday a.m. and p.m. peak hours, respectively, under 2036 future total conditions. The intersection is expected to operate with an improved maximum control delay of 92.4 seconds or less, and at a theoretical maximum volume-to-capacity ratio of 1.20 or less. In comparison to the unadjusted operations (see **Table 22**), the maximum control delay and maximum theoretical volume-to-capacity ratio are reduced by 51.8 seconds and 0.19, respectively. Additionally, the 95th percentile queue lengths for the eastbound through movements are reduced and are no longer expected to impact the downstream intersection of Kingston Road and Altona Road.

The intersection of Kingston Road at Altona Road is expected to operate at an improved LOS "C" during the weekday a.m. and p.m. peak hours under 2036 future total conditions. The intersection is expected to operate with an improved maximum control delay of 34.7 seconds and theoretical maximum volume-to-capacity ratio of 1.02. In comparison to the unadjusted operations (see **Table 22**), the maximum control delay and maximum theoretical volume-to-capacity ratio are reduced by 12.7 seconds and 0.11, respectively.

The one-way stop-controlled Rougemount site access is expected to operate with a maximum 95th percentile queue length for the southbound left-turn movement of 11.1 metres and 6.4 metres during the weekday a.m. and p.m. peak hours, respectively. In comparison to the unadjusted operations (see **Table 22**), the 95th percentile queue length of the south-bound left-turn lane has been reduced

by 20.7 metres and 45.3 metres in the weekday a.m. and p.m. peak hours, respectively.

As such, a 12 to 15 -meter dedicated left-turn lane would significantly reduce the southbound queue length at the Rougemount site access. Nevertheless, the Rougemount site access is expected to operate acceptably without impacting the downstream intersection (with or without a dedicated southbound left-turn lane through 2036 future total traffic conditions). Consequently, it is recommended that the requirement for an auxiliary lane at this location be monitored upon the build out of the BRT and intensification of the Kingston Road corridor.

On that basis, the boundary road network is expected to operate significantly better than outlined in **Table 22** as a result of the expected reduction in through vehicle traffic along Kingston Road, the observed PHFs and lost-time adjustments. Despite the calibrations applied in **Table 23**, the above operations may still be considered conservative as traffic redistribution as a result of the future Kingston BRT was not accounted for. As residents and visitors of the area become familiar with left-turn restrictions post-BRT, and the expected congestion, traffic redistributions are expected to occur (i.e., driver are expected to optimize their routes and use alternative routes to avoid U-turn maneuvers). Additionally, some existing and future background left turns may be considered conservative as those trips may also be conducted via transit in the future.

8.0 Summary of Required Improvements

Based on the boundary road network analysis and intersection operations reviewed above, **Table 24** below summarizes the required and recommended improvements.

Table 24
Summary of Required and Recommended Improvements

Improvements	Intersection	Horizon	Required/Recommended/Monitor
Optimized Signal Timing Weekday A.M. Peak Period • Optimized Splits • Optimized Offsets Weekday P.M. Peak Period • Increased cycle length of 120 seconds • Optimized Splits • Optimized Offsets	Kingston Road at Rougemount Drive Kingston Road at Altona Road	2026 Future Background	Required
"Do not block intersection" sign for northbound traffic	Rougemount site access	2026 Future Background	Required
Southbound Left-Turn Auxiliary Lane (12-15 m storage, 30 m taper)	Rougemount Site Access	2026 Future Background	Monitor upon the build out of the BRT and intensification of the Kingston Road corridor.

9.0 Sight Distance Assessment

The available sightlines at the proposed site accesses on Kingston Road and Rougemount Drive were measured and compared to the standards set out in the Transportation Association of Canada (TAC) Geometric Design Guide for Canadian Roads (GDGCR). Sight distances were measured from the proposed site access using the following assumptions:

- A standard drive eye height of 1.08 metres for a passenger car
- A 4.4 metre setback from the approximate extension of the outer curb to represent a vehicle waiting to exit the site

Intersection sight distance is calculated using equation 9.9.1 from the GDGCR as outlined below:

$$ISD = 0.278 * V_{major} * tg$$

Where:

ISD = Intersection Sight Distance
V major = design speed of roadway (km/h)
tg = assumed time gap for vehicles to turn from stop onto roadway (s)

The design speed of a roadway in an urban environment is typically 10 km/h greater for roadways with posted speed limits of 50 km/h or lower, and 20 km/h greater for roadways with posted speed limits above 50 km/h. As 40 km/h is the posted speed limit along Rougemount Drive, a design speed of 50 km/h was assumed for the purposes of sight distance analysis. Similarly, as Kingston Road has a posted speed limit of 60 km/h. a design speed of 80 km/h was assumed for the sight distance assessment.

Table 25 below outlines the sight distance analysis for the proposed site accesses.

Table 25
Sight Distance Analysis

Parameter	Rougemount Site Access	Kingston Site Access
Access Type	Full Moves	Right-In-Right-Out
Posted Speed Limit of Roadway	40 km/h	60 km/h
Assumed Design Speed	50 km/h	80 km/h
Base Time Gap (Passenger Cars)	Left Turn: 7.5 s Right Turn: 6.5 s	Right Turn: 6.5 s
Additional Time Gap	n/a	n/a
Grade of Roadway	Less than 3%	Less than 3%
Sight Stopping Distance (TAC GDGCR Table 2.5.2)	65 m	130 m
Sight Distance Required (TAC GDGCR Eqn. 9.9.1)	Left Turn: 105 m Right Turn: 95 m	Right Turn: 145 m
Measured Sight Distance	North: 250 m + South: 100 m	West: 170 m +
Minimum Sight Distance Satisfied	Yes	Yes

As outlined in **Table 25,** the available sight distance exceeds the required sight distances for each of the site accesses.

Although Rougemount Drive has a slight incline and bend south of the site access, adequate sight distance is achieved as the roadway is entirely visible up until the highest point of the bridge spanning Highway 401. This represents approximately 100 metres of sight distance, exceeding the required sight distance of 95m for right turn egressing vehicles.

Appendix L contains sight distance analysis excerpts, including sight distance drawings.

10.0 Vehicle Turning Assessment

The vehicle turning diagrams has been included in **Appendix N** of the Parking Justification Study (Crozier, December 2021). The Vehicle Turning Assessment indicates that the proposed site layout can accommodate standard Durham Region waste collection vehicles, standard pumper, and aerial fire trucks, as well as delivery vehicles, also known as Medium Single Unit Trucks (MSU).

11.0 Transportation Demand Management (TDM)

A number of TDM opportunities currently exist for the proposed development. The existing TDM opportunities, as well as future TDM opportunities proposed by the City of Pickering, Durham Region and Metrolinx are summarized below.

11.1 Existing Transit Network

The Subject Development is located in close proximity to multiple Durham Region Transit and GO transit routes as outlined in **Section 3.5.**

The wide variety of transit services previously outlined provide residents and visitors in the City of Pickering with quick, easily accessible and direct transit services throughout the City and Region.

As Steeple Hill Shopping Centre is approximately 1.5 km east (7 minutes with transit) of the subject site along Kingston Road, transit is a convenient option to access essential services. Similarly, as Pickering Town Centre is approximately 13 minutes away by transit, residents and visitors of the subject property may easily access these commercial attractions by transit.

In addition, major employment, commercial and tourist attractions outside of the Region, such as Downtown Toronto, Oshawa, or greater Toronto areas can be accessed using GO transit, via direct 10–15-minute bus connection at Pickering GO. As such, transit is a convenient mode of transport for both residents and visitors of this proposed development.

11.2 Transit Incentives

Inter-Transit Connections

Durham Region, Metrolinx and other municipalities currently offer numerous transit discounted fares, promotions, and incentives to encourage transit use.

For instance, riders to and from GO Transit will receive a discounted fare of $0.80 per trip when connecting to and from GO transit. Similar transit transfer discounts are also offered for York Regional Transit, Brampton Transit (including Züm Express), Mississauga Transit (MiWay), Oakville Transit, Burlington Transit and Hamilton Street Railway (HSR) as long as the maximum transfer period have not expired.

Discounted fares are also offered for transit users under the age of 12 (Child fare), youth between the ages of 13 to 19, or those over the age of 65. Alternatively, children at age 12 or under can ride for free with a fare paying passenger.

Frequent Transit Users Discount

Durham Region Transit also offers discounted monthly passes between September and June to students in Durham Region. The monthly discount can be uploaded directly onto a Presto card, a smart contactless payment system used throughout GTHA, and provides savings of up to $200 in 10 months.

GO Transit and other transit agencies also offer regular monthly and GTA weekly discounted passes for frequent transit users and commuters working within or outside of Durham Region.

Lastly, Durham Region also offers Universal Transit Pass (U-Pass) for eligible students at participating colleges and universities with unlimited travel on DRT and OneFare DRT-GO Transit routes.

It is recommended that landowners of the proposed development educate individual residents (i.e., via TDM information packages, newsletters etc.), to explore the various transportation incentives offered by the Region and or employers.

11.3 Active Transportation Network

Sidewalks are currently provided in all streets within the boundary road network. The Subject Development also proposes pedestrian connections to the existing sidewalk along Kingston Road.

Although cycling is currently an under-utilized mode of transportation in the City of Pickering, the City and Region have cycling initiatives in place for the near- and medium-term future to improve safety and to promote active transportation within the City and Region.

Per Durham Region's Regional Cycling Plan (2021), approximately 217 km of new cycling facilities are proposed for Durham Region between 2021 to 2031. Of the 217 km of recommended cycling network, 92.3 km of multi-use boulevard path, 24 km of cycle tracks, 14.4 km of road cycling lanes and 12.4 km of buffered cycling lanes are proposed. These improvements are all proposed for implementation between 2021 to 2031.

Within the study area, a cycle track is proposed along Kingston Road from Altona Road to Bainbridge Drive, where a multi-use path will begin. With direct access to the cycle track fronting the Subject Property, residents may access large commercial attractions to the east, the City Centre area, as well as employment areas safely via walking or cycling.

To encourage and facilitate potential cycling improvements of the study area in the mid- to long-term future, the most recent Site Plan also proposes short-term and long-term bicycle parking spaces in excess of the Zoning By-Law requirements in anticipation of the Kingston Road BRT and related cycling infrastructure improvements. In addition, the following TDM measures are also proposed to encourage active transportation:

- Short-term bicycle parking spaces; accessible by visitors
- Secure Long-term bicycle parking spaces
- TDM info and Trail maps in the lobby
- Bike repair station; accessible by visitors

As such, a reduction in automobile use is expected due to the proposed cycling infrastructure improvements within the City and Region.

Appendix M contains relevant Regional Cycling Plan excerpts.

11.4 Future Transit Opportunities

There are many significant transit expansion and transit improvement projects proposed by the Government of Ontario (Metrolinx/GO-transit) that will improve transit services within the study area, the City of Pickering, as well as in the Greater Toronto Hamilton Area (GTHA).

Specifically, the following projects have been proposed:

Durham-Scarborough Bus Rapid Transit (BRT)

As mentioned above, the Subject Property is located along the future Durham-Scarborough Bus Rapid Transit (BRT) corridor, providing residents and visitors of the proposed development direct, rapid and frequent transit access.

The Durham-Scarborough BRT project is part of Metrolinx's 2041 Regional Transportation Plan for the Greater Toronto and Hamilton Area. The BRT is planned to span 36-kilometres from Grangeway Avenue and Ellesmere Road near the Scarborough Town Centre in the west through Durham Region to Simcoe Street and King Street in downtown Oshawa to the east. The BRT is proposed to include 49 stops and be operational by 2031 with expectations that the system will attract 1,000 to 1,500 new transit riders during the peak hour (IBI Group, 2018).

Per Metrolinx Initial Business Case Report prepared by IBI in 2018, the plan proposes more frequent buses, at 5 minutes or less during peak hours, and reliable transit services to and from Durham Region. To ensure reliability and faster travel times, the BRT will utilize existing and new bus dedicated lanes, queue jumping at intersections, Intelligent Transportation System (ITS) technologies (i.e., green light progression, and transit priority) and more.

The BRT will be implemented along Kingston Road in Pickering, with a stop proposed at Kingston Road and Altona Road (450 metres, 6-minute walk), just west of the Subject Property, and at Kingston Road and Rosebank Road (650 metres, 8-minute walk) just east of the Subject Property. The BRT will operate in addition to the existing transit routes, and will materially improve transit reliability, increase transit capacity, provide additional transit options within the neighbourhood and the City, provide faster travel times, increased coverage, and more convenient transit service for those travelling within the City and beyond.

In conjunction to the BRT construction, separated bike lanes and pedestrian friendly urban streetscapes are also proposed along the site frontage of Kingston Road, providing residents and visitors of the development convenient and safe access to the pedestrian, cycling and transit network. As such, the Kingston Road BRT is expected to materially decrease vehicle usage within the City and Durham Region, and increase transit, pedestrian, and cyclist usage.

Metrolinx: Regional Express Rail

Metrolinx proposes a Regional Express Rail service (RER) throughout the City of Toronto and Greater Toronto Hamilton Area by 2025.

Specifically, within the Study Area, Metrolinx has already completed several improvements to the Pickering GO station with upgraded staircases, upgraded rail platforms and a secure bike storage room.

Concurrently, as part of RER and GO Expansion program for Lakeshore East train services, Metrolinx proposes daily, all day two-way frequent electrified train services for the route with headways of 15 minutes or less, significantly improving transit connections between Durham Region, Downtown Toronto and the Greater Toronto and Hamilton Area. Metrolinx expects a 20% faster travel time along the Lakeshore East line. Similar improvements are also proposed for other GO lines such as Lakeshore West, Kitchener GO, Milton GO and more. These Metrolinx projects will significantly improve transit connections, transit accessibility, and travel time as commuters and visitors have greater flexibility and transit options to and from downtown, and the Greater Toronto Hamilton Areas.

Accordingly, transit services in the short term, within the study area are not expected to change materially. However, based on the Durham-Scarborough BRT and Metrolinx's RER and GO Expansion programs, regional transit services are expected to improve materially in the medium to long term future.

Residents and visitors are expected to benefit significantly by the Durham-Scarborough BRT, RER, electrification of the GO Train lines and the 15 minutes or better two-way services. These service improvements will reduce commute time, and improve transit capacity and reliability, while considerably increasing commuter accessibility within the GTHA. Accordingly, reduced vehicle ownership, and reduced auto-vehicle trips are expected.

Appendix B contains relevant transit information.

11.5 Site Specific TDM Recommendations

There are several opportunities for the development to promote TDM measures in support of reduced automobile use.

Table 26
Site Specific TDM Recommendations

Recommended/Provided TDM Measure	Implementation Summary
TDM Information Package for New Residents	Upon and prior to occupancy, a TDM information package should be provided to new and prospective residents and owners. Promotional materials should also be readily available (and continuously updated) in the building lobby to increase awareness of available alternate travel modes and reduce the barriers to adopting more sustainable travel behaviour. Such marketing allows prospective residents to be aware of sustainable travel options, as well as updates in the transit and cycling infrastructures improvements of the area. TDM Information Packages can comprise of: • Active transportation network maps • Transit maps and schedules • Car rental and carshare locations Neighbourhood commercial, retail, and institutional facilities should also be included in the marketing package to promote local businesses and to promote a walkable mixed-use community. Information on the future transit projects could be provided to prospective buyers to make them aware of pending mass transit opportunities, which can encourage measures such as reduced vehicle ownership. Periodic Transit and TDM information updates, can also be provided to residents via mailbox.
Secure Bike Storage Facilities, Excess Bicycle Parking Spaces	Safe and secure bicycle parking is proposed for the development. Although the City's Zoning By-Law requires no minimum bicycle parking spaces for the development, the development proposes 292 bicycle parking spaces in consistent with the City Centre Zoning By-Law. Access to safe and secure bicycle parking will increase confidence and reliability for prospective cyclists to cycle as their primary mode of transportation. The provision of cycling maps, short term bicycle parking spaces, and secure long-term spaces encourages bicycle use and provides residents and visitors convenient and safe storage for frequent bicycle use.

Recommended/Provided TDM Measure	Implementation Summary
Bicycle Repair Station	A small, compact bicycle repair station with a toolkit and pump are also recommended. These stations can be provided near the bicycle parking spaces to promote cycling use. These stations also increase confidence and reliability for prospective cyclists to cycle as a viable mode of transportation.
Provision of Carshare Spaces	Four carshare spaces are proposed to be provided on the Subject Property. Residents who do not require a vehicle frequently, may utilize the carshare on an as needed basis, thus reducing the overall parking demand of the site. Carshare marketing material should be included in TDM information package for new and existing residents.
Priority Rideshare Pickup/Drop-off Area	A designated pick-up and drop-off area near the entrance to the residential tower is proposed. This area will provide a convenient space for pick-up and drop-off of 5 minutes or less, to facilitate taxi, rideshare (Uber, Lyft), and carpool near the building entrance and is expected to contribute to reduced SOV trips. Additional short-term visitor parking spaces (30 minutes or less) are also available for pick-up and drop-off and food or package deliveries that may need additional time.
Real-Time Transit Information	The provision of Real-time transit information screens is recommended and would ideally be displayed in the lobby or elevators via wall mounted screens or kiosks. This provides residents information on transit schedules and real time service delays, increasing reliability for residents to use transit as their primary mode of transportation. Residents should also be encouraged to download the Rocketman App through landlord-tenant communications. The Rocketman App provides users with real-time transit information including real time passenger volume counts on buses to assist with trip planning. The app allows buses to be tracked along its route and allows for live arrival countdowns that help minimize wait times and notify users if an approaching bus is not-busy (0%-30% of capacity) to very busy (>80% of capacity). Additionally, this transit information will educate residents and visitors on the range of routes available by Durham Region Transit and connecting GO Transit services. This increased consciousness of convenient transit options has been historically shown to increase transit mode share in similar developments and may provide similar benefit to the subject development.

Recommended/Provided TDM Measure	Implementation Summary
	Overall, this measure is expected to increase transit reliability and perception for residents to use transit as their primary mode of transportation.
Unbundled and Paid Parking	Parking is to be leased or purchased separately from the condominium sale. The parking spaces will be purchased or leased on a first come, first-serve basis. Additionally, it is recommended that parking be variably priced according to demand and supply available. Prospective residents should be advised in advance of the parking availability and cost of buying or leasing a parking space, if available. Potential residents will also be warned of the limited on-street parking in the area. As such, the residential parking demand can be significantly reduced, managed, and controlled. By advising the parking availability to potential residents prior to the condominium sale, the ambiguity of the parking demand and parking availability can be managed. This strategy allows for prospective residents to choose whether they wish to incur the added cost of leasing a parking space, particularly if parking is not desired due to vehicle ownership choices. Additionally, this strategy ensures that once resident spaces are no longer available (due to first come first-serve basis), prospective residents requiring the use of a parking space would seek alternate modes of transit or make alternate arrangements to secure monthly parking in a proximal lot.
Short-term Visitor Parking Spaces	Short-term at-grade visitor vehicle parking spaces are proposed. These at-grade spaces will be limited to short-term parking of 30 minute or less for retail customers, food deliveries, as well as an additional pick-up and drop-off area.

The above site-specific TDM measures are expected to increase sustainable mode share and reduce single occupancy vehicle trips.

11.6 Responsibilities of Stakeholders

For the TDM measures to function effectively, the implementation must be supported by local and regional governments, existing neighbouring property owners, as well as future developers. Continuous monitoring efforts must be made by all stakeholders to ensure the TDM strategies are operating as planned, and to advise should improvements or repairs be required.

11.7 Projected Trip Generation Reductions

The proposed active transportation and TDM measures are expected to reduce single occupant vehicle (SOV) trips during the peak hour. **Table 27** below summarizes the proposed TDM measures and

their expected impacts on reducing vehicle trips based on previous research conducted by Victoria Transport Policy Institute.

Table 27
Estimated Trip Reductions for TDM Measures

TDM Measure	Expected Reductions	Reference
Unbundled Parking	10% - 30%	"Parking Management Comprehensive Implementation Guide" by Victoria Transport Policy Institute
Promotions, Marketing	5% - 15%	
Secure Bicycle Parking	5% - 15%	
Carshare Spaces	10-20%	
Proximity to future BRT	10-25%	

11.8 Performance Monitoring

Performance of the TDM measures can be monitored via questionnaire surveys as well as periodic field observations (i.e., parking utilization surveys, traffic movement counts to and from the proposed site access).

Surveys are an effective performance measurement tool as it provides direct feedback from residents living in the proposed development. Their feedback may indicate challenges and constraints that are specific to the property, experienced only by the residents in the area.

Durham Regional Transit can also monitor transit ridership in the area over the years to determine the effectiveness of the TDM strategies. Periodic traffic movement counts can indicate traffic volume changes over the years, as well as bicycle and pedestrian volumes and usage along the corridor.

It is important to note that TDM performance can vary significantly due to a variety of factors (i.e., gas price, cost of vehicle ownership, etc.). It is equally important to note that external changes may influence the internal TDM performance.

12.0 Conclusions & Recommendations

375 Kingston Road Corporation proposes a new mixed-use development at 375 Kingston Road in the City of Pickering, Durham Region. The analysis contained within this report has resulted in the following key findings:

Existing Conditions

- The Subject Property is located along the Kingston Road Corridor with a wide range of mixed-use developments, accessible by walking or transit.

- The existing Study Area provides sidewalks on all roadways but there are no dedicated cycling facilities provided within the study area. Cyclists are expected to share the right-of-way with motor vehicles.

- The study area is served by multiple local Durham Region Transit bus services with connections to Pickering GO station, which provides passengers with local and regional bus connections as well as Regional Rail services to other parts of Durham Region, Toronto and the greater Toronto and Hamilton area.

- Due to the ongoing Covid-19 pandemic, new traffic volume counts were not conducted at this time. Instead, previously conducted 2016 and 2019 traffic volumes were used and projected to 2021 volumes for 'existing traffic condition' analysis.

- Based on estimated 2021 volumes, the boundary road network is currently operating at a level of service (LOS) "C" or better and is currently operating at an acceptable control delay of 32.8 seconds or less. The signalized intersections of Kingston Road at Rougemount Drive and Kingston Road at Altona Road are currently operating over the theoretical volume-to-capacity ratio (v/c), with maximum theoretical v/c ratios of 1.53 and 1.13 during the weekday p.m. peak period, respectively. The existing site accesses are also operating acceptably with moderate v/c ratios.

- While the signalized intersections are operating above capacity, the intersection delays are still acceptable and are typical for major arterial roadways during commuter peak periods. Additionally, these results are considered conservative as a default peak hour factor (PHF) of 0.92 was used to model existing conditions while the observed PHFs at the signalized intersection are higher, signifying a more uniform distribution of traffic throughout the peak hour (as opposed to a sudden larger wave of traffic).

Future Background Conditions

- A shift in transportation modes can be expected as there are major transit improvements proposed by the City, Region, and by the province for the study area in the medium to long term future.

- The Durham-Scarborough BRT (herein referred to as Kingston BRT) is proposed from Grangeway Avenue and Ellesmere Road near the Scarborough Town Centre in the west through Durham Region to Simcoe Street and King Street in downtown Oshawa to the east. The Kingston BRT will be implemented along the site frontage on Kingston Road in Pickering, with a stop at Altona Road (6-minute walk), just west of the Subject Property, and Rosebank Road (8-minute

walk) just east of the Subject Property. With the dedicated right-of-way and proposed 5 minutes headways during the peak hours, the Kingston BRT will improve transit travel times, increase transit frequencies and capacities, and provide additional transit options within the neighbourhood and the rest of the Durham Region. As such, a material shift in vehicle travel mode to transit mode are expected in the near future.

- The all-day, electrified, and frequent GO-Train improvements by Metrolinx as part of the Regional Express Rail (RER) project will also significantly improve regional transit services between Durham Region, downtown Toronto and Greater Toronto and Hamilton Area. Specifically, Metrolinx RER plan includes all-day 15 minutes or less electrified services for the existing Lakeshore East GO Line.

- Improvements to the rest of the GO rail network are also proposed as part of Metrolinx RER. Thus, the RER project is expected to significantly improve residents' and visitors' reach to/from Toronto, and the GTHA region with greater flexibility, accessibility, and shorter travel times.

- Furthermore, aside from the transit improvements, bike lanes are also proposed along Kingston Road as part of the Kingston BRT, providing residents and visitors of the development a convenient and safe access to the cycling network. Additionally, Durham Region proposed a total of 217 km of new cycling facilities within the region to be constructed between 2021 and 2031.

- Per correspondence with Region of Durham and City of Pickering staff, future background traffic volumes at the study intersections were determined using a 1% growth rate, consistent with rates used in background Traffic Impact Studies. A one-time post-BRT volume reduction was not applied. In addition to the annual compounded growth rate, background site generated traffic from 603-643 and 645-699 Kingston Road, 770 Kingston Road and 346-364 Kingston Road was also separately applied to estimate future background traffic volumes.

- Due to the proposed centre median for the future Kingston BRT, existing site accesses along the Kingston Road Corridor will be converted to right-in-right-out (RIRO) accesses. As such, left-turn movements into and out of the site accesses were redistributed downstream as a U-turn movement.

- Left-turn auxiliary lane warrants were also undertaken for the southbound left-turn at the Rougemount site access during weekday a.m. and p.m. hours under future background conditions. Per the Ontario Ministry of Transportation (MTO) Geometric Design Standards for Ontario Highways, a left-turn lane of 15 metres is warranted by 2026 at Rougemount site access. However, for a conservative analysis, all future analyses were conducted assuming no left-turn lane is provided.

- Intersection analyses of the 2036 future background traffic volumes indicate the signalized intersection of Kingston Road and Rougemount Drive is expected to operate at a LOS "F" or better with a maximum control delay of 131.0 seconds or less during the weekday a.m. and p.m. peak period. The intersection is expected to operate at a maximum theoretical v/c of 1.35, indicating the intersection is expected to operate above capacity. Selected 95th percentile queue lengths are also expected to exceed provided storage lengths.

- The signalized intersection of Kingston Road and Altona Road is expected to operate at a LOS "D" or better during the weekday a.m. and p.m. peak periods, with a maximum control delay

of 45.7 seconds or less and a maximum theoretical v/c ratio of 1.13.

- The site accesses are expected to continue to operate acceptably at a LOS "C" with moderate control delays and v/c ratios.

- The future background operations can be considered conservative as the analysis does not account for:

    - Peak Hour Factor (PHF) calibrations
    - Mode Shift Changes
    - Travel Pattern Changes
    - Lost Time Adjustments
    - Conservative Growth Rates applied
    - No Dedicated Southbound Left-turn Lane at Rougemount Site Access

- Additionally, longer delays and congestions are also expected and typical for post-BRT and post-Light Rail Transit (LRT) conditions due to the increased U-turns, and implementation of Protected U-turn and left turn signal phases. Increased travel delays and congestion are expected to deter commuters from driving and further encourage transit usage. Per the Durham Region Transportation Master Plan (Region of Durham, 2017), the Region acknowledged that congestion and queueing issues have been previously identified along Kingston Road and are expected to continue between Sheppard Avenue and Brock Road.

- Therefore, the observed conditions herein, are generally consistent with operations identified for the area in previous studies. The proposed Kingston BRT is expected to mitigate traffic congestion in the area, with a material shift in transportation mode in the study area.

Future Total Conditions

- The proposed development is expected to generate 128 and 106 net two-way primary vehicle trips during the weekday a.m. and p.m. peak hours, respectively.

- Left-turn auxiliary lane warrants were once again undertaken for the southbound left-turn at the Rougemount site access during weekday a.m. and p.m. hours under future total conditions. Per the Ontario Ministry of Transportation (MTO) Geometric Design Standards for Ontario Highways, a left-turn lane of 25 metres is warranted by 2026 at the Rougemount site access. However, for a conservative analysis, all future analyses were conducted without a left-turn lane provided.

- Intersection analyses of the 2036 future total traffic conditions indicate that the signalized intersection of Kingston Road and Rougemount Drive is anticipated to operate at an unchanged LOS "F" or better with a maximum control delay of 144.2 seconds or less and maximum theoretical v/c ratio of 1.39 or less during the weekday a.m. and p.m. peak hours. When compared to 2036 future background conditions, the intersection is expected to experience a minor increase in maximum control delay of 13.2 seconds and a minimal increase in the maximum theoretical v/c ratio of 0.07 and 0.04 in the weekday a.m. and p.m. peak periods, respectively. 95th percentile queue lengths for select movement are expected to continue to exceed available storage lengths, as is consistent with future background operations.

- The signalized intersection of Kingston Road and Altona Road is anticipated to operate at an unchanged LOS "D" or better with a maximum control delay of 47.4 seconds or less and maximum theoretical v/c ratio of 1.13 or less during the weekday a.m. and p.m. peak hours.

- The proposed site accesses are expected to operate efficiently at a LOS "C" or better during weekday a.m. and p.m. peak periods, with moderate control delays and maximum v/c ratios. The southbound left-turn queue length at the Rougemount Drive site access is not expected to impact the downstream intersection of Kingston Road and Rougemount Drive. However, a "Do Not Block Intersection" sign is required along Rougemount Drive to avoid northbound queued vehicles from blocking southbound left-turning vehicles entering the site.

- Once again, the future total operations are considered conservative due to the following:

    - Peak Hour Factor (PHF) calibrations
    - Mode Shift Changes
    - Travel Pattern Changes
    - Lost Time Adjustments
    - Conservative Growth Rates applied
    - No Dedicated Southbound Left-turn Lane at Rougemount Site Access

- As mentioned above, longer delays and congestions are expected and typical for post-BRT and post-LRT conditions due to the increased U-turn volumes and the implementation of Protected U-turn and left turn signal phasing. Increased travel delays and congestion are expected to deter commuters from driving and further encourage transit usage. Regardless, it is noted that the future total traffic conditions are consistent with future background conditions and that the site generated traffic does not materially affect traffic operations.

Sensitivity Analysis

- A sensitivity analysis was conducted to calibrate future total traffic conditions using the observed peak hour factors, lost-time adjustments and a 10% reduction in through volumes along Kingston Road (to account for BRT mode shift).

- The sensitivity analysis confirms that, the optimized signalized intersections of Kingston Road at Rougemount Drive, and Kingston Road at Altona Road are expected to operate with improved maximum control delays and theoretical v/c ratios, with no queueing impacts to the downstream intersections.

- The intersection of Kingston Road at Rougemount Drive is expected to operate with an improved maximum control delay of 92.4 seconds or less, and at a theoretical maximum v/c ratio of 1.20 or less. The intersection of Kingston Road at Altona Road is expected to operate with an improved maximum control delay of 34.7 seconds and theoretical maximum v/c ratio of 1.02. The optimized sensitivity analysis results are comparable to existing and future background conditions.

- In addition, the sensitivity analysis confirms the addition of a 12 to 15-metre southbound left-turn lane at the Rougemount site access will significantly reduce the southbound left-turn queue. Nevertheless, with or without a southbound left-turn lane, Rougemount site access is expected to operate acceptably, and is not expected to impact the downstream intersection of Kingston Road and Rougemount Drive. On that basis, it is recommended that the

requirement for an auxiliary lane at this location be monitored upon the build out of the BRT and intensification of the Kingston Road corridor.

- Finally, regardless of the improvements, future total conditions are comparable to future background conditions. The traffic generated by the development does not materially change the traffic operations of the boundary road network. Thus, the proposed development is supportable from a traffic operations perspective.

Traffic Safety

- Assessment of sight distance at the proposed site accesses indicate that there is sufficient sight distance for vehicles entering and exiting the Subject Property. Accordingly, the proposed development is not expected to create a safety hazard due to vehicle ingress or egress at the site access on Kingston Road or on Rougemount Drive. The accesses can be supported from a sight distance perspective.

- The development proposes two loading spaces. The loading operations analysis indicates that the proposed site layout accommodates standard Durham Region's waste collection vehicles, standard pumper and aerial fire trucks, as well as delivery vehicle, also known as Medium Single Unit Truck (MSU). Thus, the proposed loading supply is supportable from an operations and safety perspectives.

Transportation Demand Management (TDM)

- There are several opportunities for the development to promote TDM measures in support of reduced automobile use.

- The residential parking spaces are proposed to be unbundled from the condominium unit and controlled by parking pricing. Prospective residents will be made aware of the parking availability and parking space pricing, prior to the purchase of the condominium unit. Those who require a parking space or multiple parking spaces will make other arrangements or consider residency elsewhere. Accordingly, the residential parking demand can be controlled and managed.

- Additional Transportation Demand Management (TDM) strategies proposed in support of reduced automobile use includes:

    - TDM Information Packages for New Residents
    - Secure Bicycle Parking
    - Excess Bicycle Parking
    - Bicycle Repair Station
    - Provision of Carshare Spaces
    - Priority Rideshare Pickup/Drop-off Area
    - Short-term visitor parking spaces
    - Real-Time Transit Information

The analysis contained within this report was prepared using the most recent Site Plan. Any minor revisions to the site plan are not expected to affect the conclusions contained with this report.

In conclusion, the proposed mixed-use development at 375 Kingston Road can be supported from a

transportation operations and safety perspective with the noted recommendations.

Respectfully submitted by,

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