SIGHT LINE ANALYSIS UPDATE

Proposed Townhouse Development
1110 Lorne Park Road
Mississauga, ON

August 2020

Prepared for
LJM Developments

TRANS-PLAN
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August 25, 2020

Mr. AJ Vance, P.Eng.
Land Development Manager
LJM Developments
28-1860 Appleby Line
Burlington, ON L7L 0B7

Re: Proposed Townhouse Development, 1110 Lorne Park Road, Mississauga, ON - Sight Line Analysis Update

Dear Mr. Vance,

TRANS-PLAN is pleased to submit this Sight Line Analysis Update. The study has been conducted to address the City of Mississauga's Transportation and Works updated comments, dated April 6, 2020. The proposed 7-unit townhouse development is located at 1110 Lorne Park Road in the City of Mississauga, Ontario. The site is located on the south side of Lorne Park Road, between the CN railway tracks and Albertson Crescent.

Our review addresses City of Mississauga submission requirements. Both the intersection and site driveways (for the residential units) were reviewed to demonstrate that sight lines would be acceptable / meet the required standards.

The results indicated that there are adequate driver sightlines for vehicles to safely circulate the site through the roadways in the study area, and the proposed building is not expected to reduce driver's visibility.

Sincerely,

Anil Seegobin, P.Eng.
Partner, Engineer

Jing Min, E.I.T.
Traffic Analyst

Trans-Plan Transportation Inc.
Transportation Consultants

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1. INTRODUCTION

Trans-Plan has been retained by LJM Developments to complete a Sight Line Analysis Update in response to the City of Mississauga's Transportation and Works updated comments (dated April 6, 2020) on the previous Sight Line Analysis prepared by Trans-Plan, dated January 2020. The proposed townhouse development is located at 1110 Lorne Park Road in the City of Mississauga.

Our sight Line Analysis Update includes the following study components:

- a review of the development proposal
- a review of sight access spacing requirements and a driver sight distance analysis
- a review of the crash wall with respect to sight-lines

2. RESPONSES TO CITY UPDATED COMMENTS

A Sight Line Analysis was conducted by Trans-Plan on October 25, 2019, and a revised Sight Line Analysis was prepared by Trans-Plan in January 13, 2020, based on the Comments from the Metrolinx. This Sight Line Analysis Update has been conducted to address the City of Mississauga's Transportation and Works updated comments, dated April 6, 2020.

Comment 1: ***The departure sight triangle provided shall be revised to consider sight lines at the centreline of the southbound travel lane and not the dividing yellow line on Lorne Park Road. The proposed noise/crash wall may be affected as a result.***

Based on the crash wall location, our understand of the requirement is to locate the line along Lorne Park Road of sight triangles at the center of the eastbound lane.

As shown in Figure 3 - 4, the departure sight line triangles at Lorne Park Road and Albertson Crescent for both passenger vehicles and Single-unit Truck have been adjusted, and the lines along Lorne Park Road are now located at the centreline of the eastbound travel lane as requested. Table 3 has been updated accordingly.

Comment 2: ***Provide confirmation that there are no sight line conflicts as a result of the proposed building location at Bramblewood Lane / Albertson Crescent.***

A departure sight triangle is provided in Figure 5 to demonstrate the proposed building located at the Bramblewood Lane and Albertson Crescent (unit 7) is not expected to reduce the visibility of vehicles exiting from Bramblewood Lane. Details are provided in 6.4 .

Based on the results in Table 2, the intersection is expected to have sufficient sight distance.

Comment 3: ***The driveway access for Unit 1/2 does not appear to meet the required corner clearance as per TAC. Please revise.***

Table 1 has been updated to include the detailed comparison of required and proposed driveway spacing. The driveway of Unit 1 and 2 is proposed to be 14.7m away from the intersection of Lorne Park Road and Albertson Crescent, including a corner curb radius of 9.1m, a tangent of 4.7m and a driveway curb radius of 0.9m. The tangent separation meets the TAC requirements. The proposed driveway curb radius is less than the minimum requirement of 3m. However, it is expected to serve only 2 vehicles, so the reduced driveway curb radius is considered to be sufficient due to the low volume traffic.

3. SITE LOCATION

The site location, shown in Figure 1, is located within a residential neighbourhood, Lorne Park, in the City of Mississauga. The site is located on the south side of Lorne Park Road, between the CN railway tracks and Albertson Crescent. The lot is currently unoccupied consisting of undeveloped ground and trees.

Located in the vicinity of the site are mainly residential uses mixed with retailers. A commercial plaza with a variety of restaurants and retailers is located on the north side of Lorne Park Road, just north of the site. A CN railway line (that runs north-south) is located just west the site. A one-story building containing M Salon and Spa is located just east of the site. Lakeshore Road is located approximately 500m east of the site.

4. PROPOSED DEVELOPMENT

A site plan of the proposed residential development is provided in Figure 2. The proposed development consists of 7 townhouse units with a total of 7 parking spaces (one driveway parking space each). Individual driveways for units 1 to 6 are proposed off Albertson Crescent and the driveway for unit 7 is proposed off Bramblewood Lane.

5. EXISTING CONDITIONS

5.1 Road Network

The roadways located in the study area under jurisdiction of the City of Pickering are described as follows:

Lorne Park Road is classified as a minor collector in the vicinity of our site, and runs in an east-west direction. It has two travel lanes; one in each direction. There is a posted speed limit of 50 km/h in the vicinity of the development.

Albertson Crescent is classified as a local road and runs in a north-south direction. It has two travel lanes; one in each direction. The assumed speed limit is 40 km/h.

Bramblewood Lane is classified as a local road and generally runs in an east-west direction. It has two travel lanes: one in each direction and terminates in a cul-de-sac. The assumed speed limit is 40 km/h.

Albertson Crescent forms two unsignalized intersections with Lorne Park Road and Bramblewood Lane, respectively.

5.2 Transit Service

The area near the site is served by MiWay, which operates Route 23 within the study area. Route 23, Lakeshore, runs mainly in an east-west direction from Monday to Sunday, between Clarkson Go station and Long Branch Go Station. Route 23 provides stop at Port Credit Go Station, too. The nearest bus stops are located on Lakeshore Road West and Lorne Park Road, approximately 450m east of the proposed site.

6. SITE PLAN REVIEW

6.1 Driveway Spacing

Transportation Association of Canada's (TAC) Geometric Design Guidelines for Canadian Roads defines the minimum tangent separation low volume driveways to be a minimum of 1m apart between driveways

and 2m apart from corner street. The minimum curb radius of 6m and 3m are suggested for street corners and residential driveways, respectively. Table 1 summarized the spacing requirements and proposed design. The source information is provided in Appendix A.

Table 1 – Driveway Spacing

Driveway	Minimum Requirements	Proposed Design
The intersection of Lorne Park Road/ Albertson Crescent	11m (6m minimum corner curb radius + 2m tangent + 3.0m minimal driveway curb radius)	14.7m (9.1m corner curb radius + 4.7m tangent + 0.9m driveway curb radius)
Driveway of Unit 1&2	5m (1m tangent + 3.0m minimal driveway curb radius)	2.8m (1m tangent + 0.9m driveway curb radius)
Driveway of Unit 3&4		5.9m (4.1m tangent + 0.9m driveway curb radius)
Driveway of Unit 5&6	11m (6m minimum corner curb radius + 2m tangent + 3m minimal driveway curb radius)	20.7m (15.7m corner curb radius + 4.1m tangent + 0.9m driveway curb radius)
The intersection of Bramblewood Lane / Albertson Crescent		27.1 m (15.7m corner curb radius + 10.5m tangent + 0.9m driveway curb radius)
Driveway of Unit 7		

Sources: TAC Figure 8.9.2

The driveway of Unit 1 and 2 is proposed to be 14.7m away from the intersection of Lorne Park Road and Albertson Crescent, including a corner curb radius of 9.1m, a tangent of 4.7m and a driveway curb radius of 0.9m. The tangent separation meets the TAC requirements. The proposed driveway curb radius for unit 1&2 and the other three residential driveways are less than the minimum requirement of 3m. However, the proposed individual driveways are expected to serve 1 to 2 vehicles. Therefore, the reduced driveway curb radius is considered to be sufficient due to the low volume traffic.

6.2 Driveway Width

Based on the TAC, design standards for commercial land uses detail maximum driveway widths for a one-way entrance / exit to be 3.0m to 4.3m. For this site, the proposed driveway width is 3.0 m, which generally meets the requirement. Appendix A contains an excerpt from the standard.

6.3 Sight Distance Review

A driver sight distance review was conducted to measure the available site distance for (i) the intersection of Lorne Park Road and Albertson Crescent, (ii) the intersection of Albertson Crescent and Bramblewood Lane and (iii) proposed driveways. A field visit and driver sight distance measurements were conducted by Trans-Plan staff. Survey methodology is summarized as follows:

- The sight distance measurements were conducted on Tuesday, October 22, 2019 with clear weather conditions
- The following locations were measured:
  - Looking west and east along Lorne Park Road at Albertson Crescent (west leg)
  - Looking south and north along Albertson Crescent at Bramblewood Lane
  - Looking south and north along Albertson Crescent from proposed Driveway Locations (Future driveways of unit 3-4 and unit 5-6)
  - Looking west and east along Bramblewood Lane from the proposed Driveway Location (Future driveway of unit 7)
- Two surveyors were present at the site and measured the sight distance using a measuring wheel
- Noted physical obstructions (natural features) and limiting factors, such as horizontal and vertical bends along the roadway

Minimum sight distance requirements were obtained from the Table 9.9.4 & Table 9.9.6, Transportation Association of Canada (TAC) Manual, based on an assumed design speed of 70 km/h for Lorne Park Road (obtained from a posted speed limit of 50km/h) and a design speed of 50 km/h for Albertson Crescent and Bramblewood Lane (based on posted speed limit of 40km/h). Details of the review are summarized in Table 2. Photographs taken from the proposed driveway location are provided in Appendix B.

Table 2 – Sight Distance Review Summary

Location	Direction	Available Sight Distance (m)	Criteria	Required Sight Distance (m)	Requirement Met? (Y / N)
Looking along Lorne Park Road (from Albertson Crescent)	West	~170	SSD	105	Yes
			Calculated	125.1	
			Design	130	
	East	~410	SSD	85	Yes
			Calculated	108.4	
			Design	110	
Looking along Albertson Crescent (from Bramblewood Lane)	North	~70	SSD	65	No (due to end of the road)
			Calculated	104.3	
			Design	105	
	South	~130	SSD	65	Yes
			Calculated	90.4	
			Design	95	
Looking along Albertson Crescent (from accesses of unit 3-6)	North	~20 (unit3&4) ~40 (unit 5&6)	SSD	65	No (due to end of the road)
			Calculated	104.3	
			Design	105	
	South	~70 (unit3&4) ~60 (unit 5&6)	SSD	65	No (however, presence of horizontal bend with lower vehicle travel speeds)
			Calculated	90.4	
			Design	95	
Looking along Bramblewood Lane (from the access of unit 7)	East	~25	SSD	65	No (due to end of the road)
			Calculated	104.3	
			Design	105	
	West	~80	SSD	65	No (however, presence of horizontal bend with lower vehicle travel speeds)
			Calculated	90.4	
			Design	95	

Source: TAC Table 9.9.4 & Table 9.9.6

The available sight distance looking west and east along Lorne Park Road is approximately 170m and 410m, respectively, with no obstructions blocking the view until near the adjacent intersections, which

meet the minimum sight distance required for a turning movement from a full stop at the access point, according to the TAC guidelines.

The available sight distance looking south along Albertson Crescent is approximately 130m, with no obstructions blocking the view until near the adjacent intersections, which meet the minimum sight distance requirements. The site distance of approximately 70m looking north along Albertson Crescent due to the geometry limit.

The available sight distance from the proposed driveways looking right are 70m, 60m and 25m for the accesses of unit 3-4, unit 5-6 and unit 7, respectively. There're no obstructions blocking the view until the end of the roads.

The available sight distance from the proposed driveways looking left are 40m, 60m and 80m for unit 3-4, unit 5-6 and unit 7, respectively. All of the sight distances encounter a reduction in visibility from the intersection to the bend, but is expected to operate acceptably as vehicles would travel around bends at low speeds of around ~20km/h. The area is also expected to generate low traffic volumes which is favourable for the available site distance to the west.

6.4 Departure Sight Triangle Review

A clear sight triangle review has been updated to assess the sight distance for a stopped driver (i)on Albertson Crescent to depart from the intersection and turn right into Lorne Park Road and (ii) on Bramblewood Lane to depart from the intersection and turn right into Albertson Crescent.

<u>The Intersection of Albertson Crescent and Lorne Park Road</u>

Figure 9.9.2 from TAC is referred in our review. Distance a_1 is measured by Trans-Plan during field visit, and distance b is design sight distance for the vehicle turning right from Albertson Crescent. A departure sight triangle of passenger vehicle is shown in Figure 3. A design sight distance of 130m was used to for passenger vehicle. The clear sight triangle is hatched in red, and no obstructions higher than driver's eye height (approximately 1m) should be located within the area.

According to TAC standards, the passenger car is appropriate as a design vehicle at an intersection of two local residential roads, but it is good practice to check the ability of intersection to accommodate the occasional truck. Therefore, to be conservative, a departure sight triangle for single-unit truck is provided in Figure 4. Design sight distance of 170m was used for sing-unit truck (due to the required time for trucks to make a left or right turn from the minor approach). Source information is provided in Appendix A.

Both triangles have been relocated along the centerline of the eastbound travel lane of Lorne Peak Road.

Table 3 summarized the statistics of departure sight triangles. Source information is provided in Appendix A.

Table 3 – Statistics of Departure Sight Triangles

Design Vehicle	Distance a_1 (m)	Distance b (m) (Design Sight Distance)	Maximum length of crash wall along Lorne Park Road (m)
Passenger Car	10	130	13.1
Single-unit truck		170	6.0

A crash wall is requested by Metrolinx to be extended along the north edge of Unit 1 of the development. In order to provide sufficient departure sightline, crash wall is not recommended to be located inside the departure sight triangle.

The results indicate that the crash wall should not be extended more than 13.1m along Lorne Park Road when passenger vehicle is considered as design vehicle. However, when a single-unit truck is considered as the design vehicle, the crash wall could be 6.0m or less in length.

As shown in Figure 2, the proposed 6m crash wall does not encroach within the sight triangle, and driver sightline visibility is maintained. Driver visibility would be impacted if the crash wall were extended any further east on Lorne Park Road other than as shown on the site plan.

The Intersection of Albertson Crescent and Bramblewood Lane

Similarly, a departure sight triangle is provided in Figure 5. Distance a_1 is measured by Trans-Plan during field visit, and distance b is 70.5m due to the end of the road. Figure 5 demonstrates the proposed building located at the Bramblewood Lane and Albertson Crescent (unit 7) is not expected to reduce the visibility of vehicles exiting from Bramblewood Lane.

To provide unobstructed driver sight lines, the owner is to ensure that all vegetation, street furniture, retaining walls, fences, etc. should be maintained fairly low, 0.5m or less, measured from the travelled surface of the roadway.

7. CONCLUSIONS AND RECOMMENDATIONS

This Sight Line Analysis for the proposed townhouse development located at 1110 Lorne Park Road in the City of Mississauga is summarized as follows:

- The proposed townhouse development consists of 7 dwelling units with individual driveways. A total of 7 resident parking spaces is proposed. Individual driveways for units 1 to 6 are proposed off Albertson Crescent and the driveway for unit 7 is proposed off Bramblewood Lane.
- The width of the future driveways design meets the TAC Design Criteria.
- The proposed driveway curb radius for individual driveways are less than the minimum requirement of 3m. but the reduced driveway curb radius is considered to be acceptable due to the low volume traffic.
- A field visit and driver sight distance measurements were conducted by Trans-Plan staff on Tuesday, October 22, 2019 during daytime hours. The sight distance was measured from the two existing intersections and proposed locations of future driveways
- The sight distance review indicates that there are adequate driver sightlines for vehicles to safely enter and exit the site through the roadways in the study area (Lorne Park Road, Albertson Crescent and Bramblewood Lane), with a proper view of oncoming traffic.
- Based on TAC guidelines, our review of the departure triangle at Lorne Park Road and Albertson Crescent (west leg), looking west, a crash wall of approximately 6.0m or less in length along Lorne Park Road is recommended.

- The proposed crash wall is not expected to have any negative impact on visibility. However, driver visibility would be impacted if the crash wall were extended any further east on Lorne Park Road other than as shown on the site plan.
- A departure sight triangle demonstrated the proposed building located at the Bramblewood Lane and Albertson Crescent (unit 7) is not expected to reduce the visibility of vehicles exiting from Bramblewood Lane.
- Additionally, land features (fencing or vegetation) within the above-mentioned departure sight triangle should be kept fairly low (0.5m or less) to maintain driver sight distance at the intersection.

In summary, there are adequate driver sightlines for vehicles to safely circulate the site through the roadways in the study area, and the proposed building is not expected to reduce driver's visibility.

Respectfully submitted,

Anil Seegobin, P.Eng.
Partner, Engineer

Jing Min, E.I.T.
Traffic Analyst

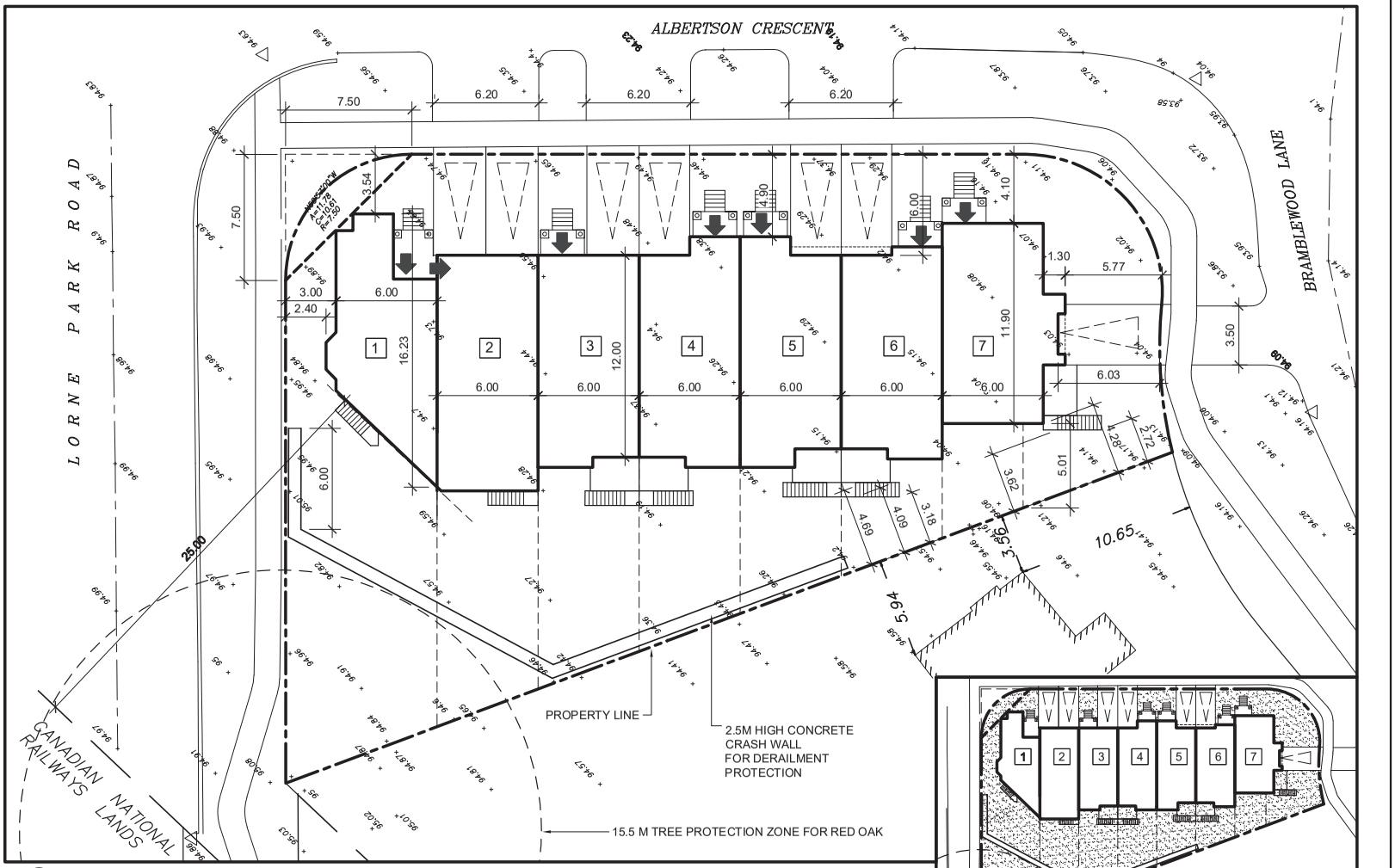
Trans-Plan Transportation Inc.

Transportation Consultants

Figure 1 – Site Location

Source: Google Maps

Figure 2: Site Plan



1 / A1 SITE PLAN
SC. 1:250

DRAWING INDEX

A1	SITE PLAN	A7	FLOOR PLANS
A2	1ST FLOOR LAYOUT	A8	FLOOR PLANS
A3	ROOF PLAN	A9	FLOOR PLANS
A4	FLOOR PLANS	A10	ELEVATIONS
A5	FLOOR PLANS	A11	ELEVATIONS, BUILDING SECTION
A6	FLOOR PLANS	A12	BUILDING SECTION

PROJECT DATA

PROPOSED 7 TOWNHOUSES		
LOT AREA	1413.3 M²	
COVERAGE	527.19 M²	37.30%
LANDSCAPE	634.49 M²	44.89%
TOTAL GFA	1,468 M²	

LOT AREA PER UNIT:

UNIT 1	308.75 M²
UNIT 2	197.32 M²
UNIT 3	183.87 M²
UNIT 4	170.44 M²
UNIT 5	156.99 M²
UNIT 6	143.54 M²
UNIT 7	252.39 M²

NOTE: COVERAGE EXCLUDES FRONT PORCHES & BALCONIES

2 / A1 LANDSCAPING AREA
NTS

NOTES AND REVISIONS

1	ISSUED FOR REVIEW	29/03/2018
2	ISSUED FOR REVIEW	05/06/2018
3	ISSUED FOR PLANNING SUBMISSION	31/10/2018
4	REISSUED AS PER PLANNER'S COMMENTS	28/02/2019
5	REISSUED AS PER PLANNER'S COMMENTS	02/04/2019
6	REISSUED AS PER PLANNER'S COMMENTS	03/04/2019
7	REVISE PER CLIENT'S REQUEST	22/10/2019
8	REVISE PER CLIENT'S REQUEST	09/01/2020

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PROJECT

PROPOSED TOWNHOUSE AT
1110 LORNE PARK ROAD
MISSISSAUGA, ON.

SHEET TITLE

SITE PLAN,
PROJECT DATA

SCALE
AS SHOWN

DRAWN	DATE
MD	MARCH 2017
CHECKED	APPROVED
EK	EK

PROJECT	SHEET NO.
1705	A1

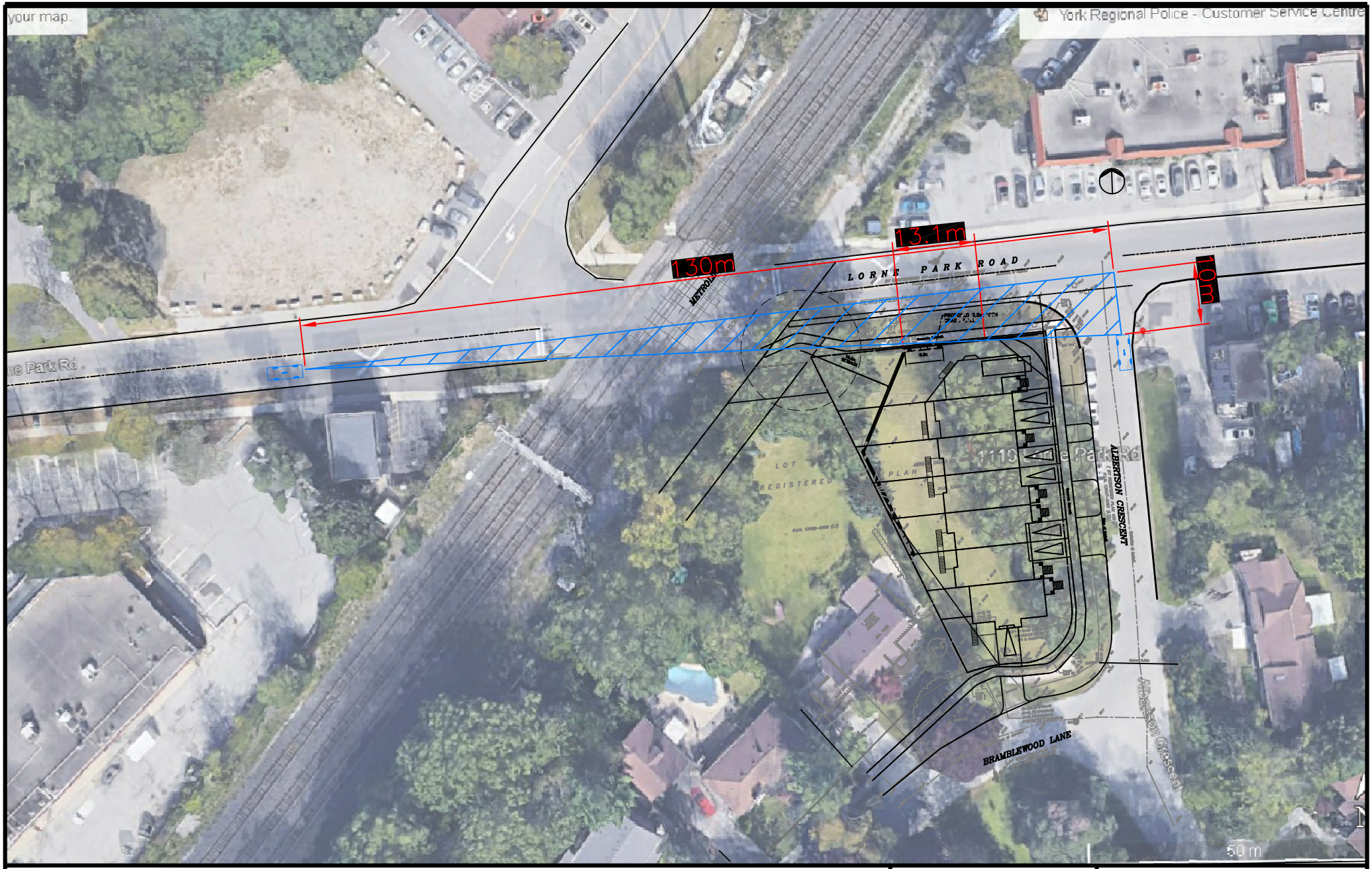

Figure 3 - Departure Sight Triangle at Lorne Park Road and Albertson Crescent, Passenger Car

PROPOSED TOWNHOUSE DEVELOPMENT
1110 LORNE PARK ROAD
MISSISSAUGA, ONTARIO

Source: Site Plan by JSW+ Associates, dated January 7, 2020 & Google Maps

CONSTRUCTION NORTH
TRUE NORTH

SCALE: 1:800 UNITS: m

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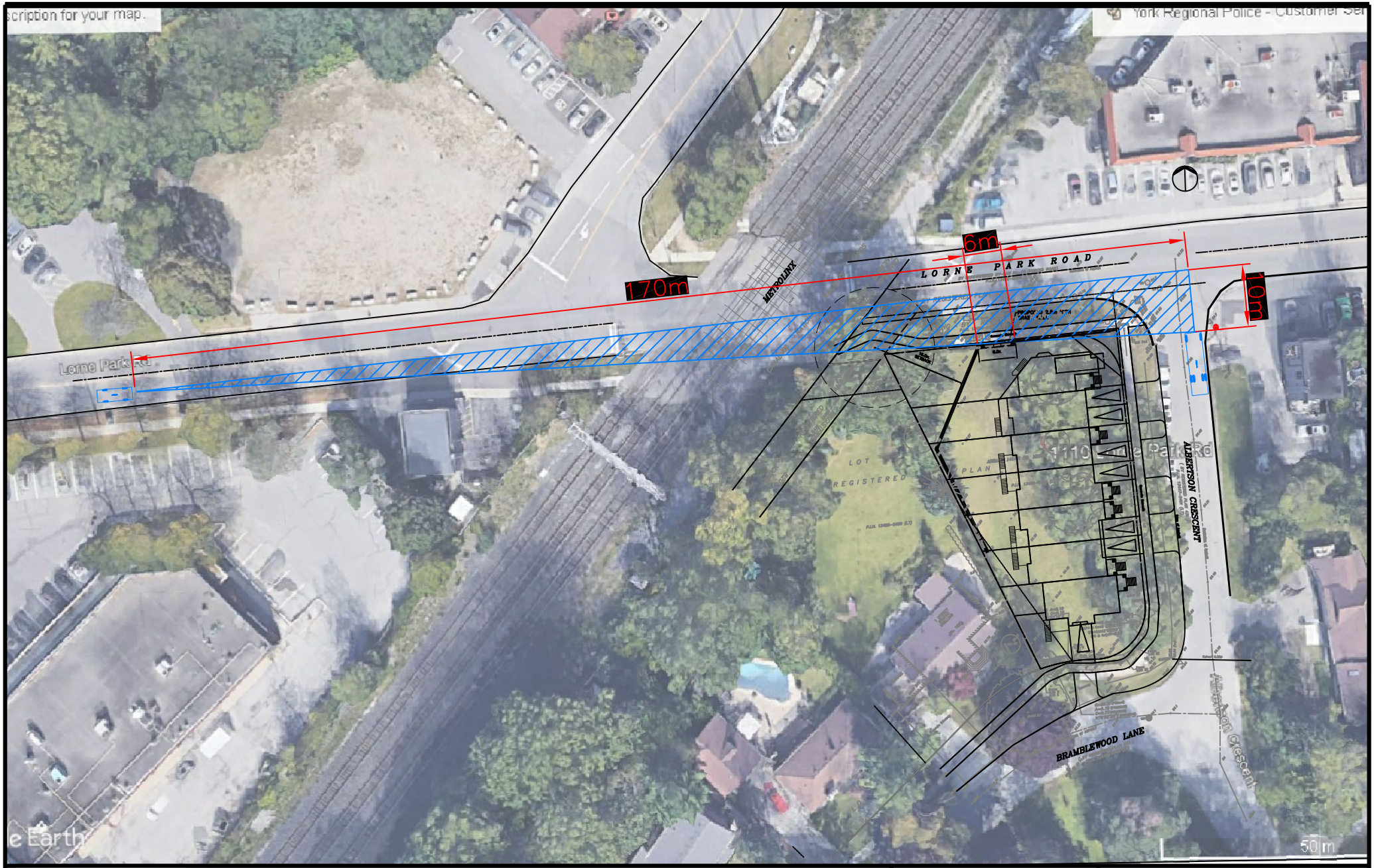

Figure 4 - Departure Sight Triangle at Lorne Park Road and Albertson Crescent, Single-unit Truck

PROPOSED TOWNHOUSE DEVELOPMENT
1110 LORNE PARK ROAD
MISSISSAUGA, ONTARIO

Source: Source: Site Plan by JSW+ Associates, dated January 7, 2020 & Google Maps

CONSTRUCTION NORTH
TRUE NORTH

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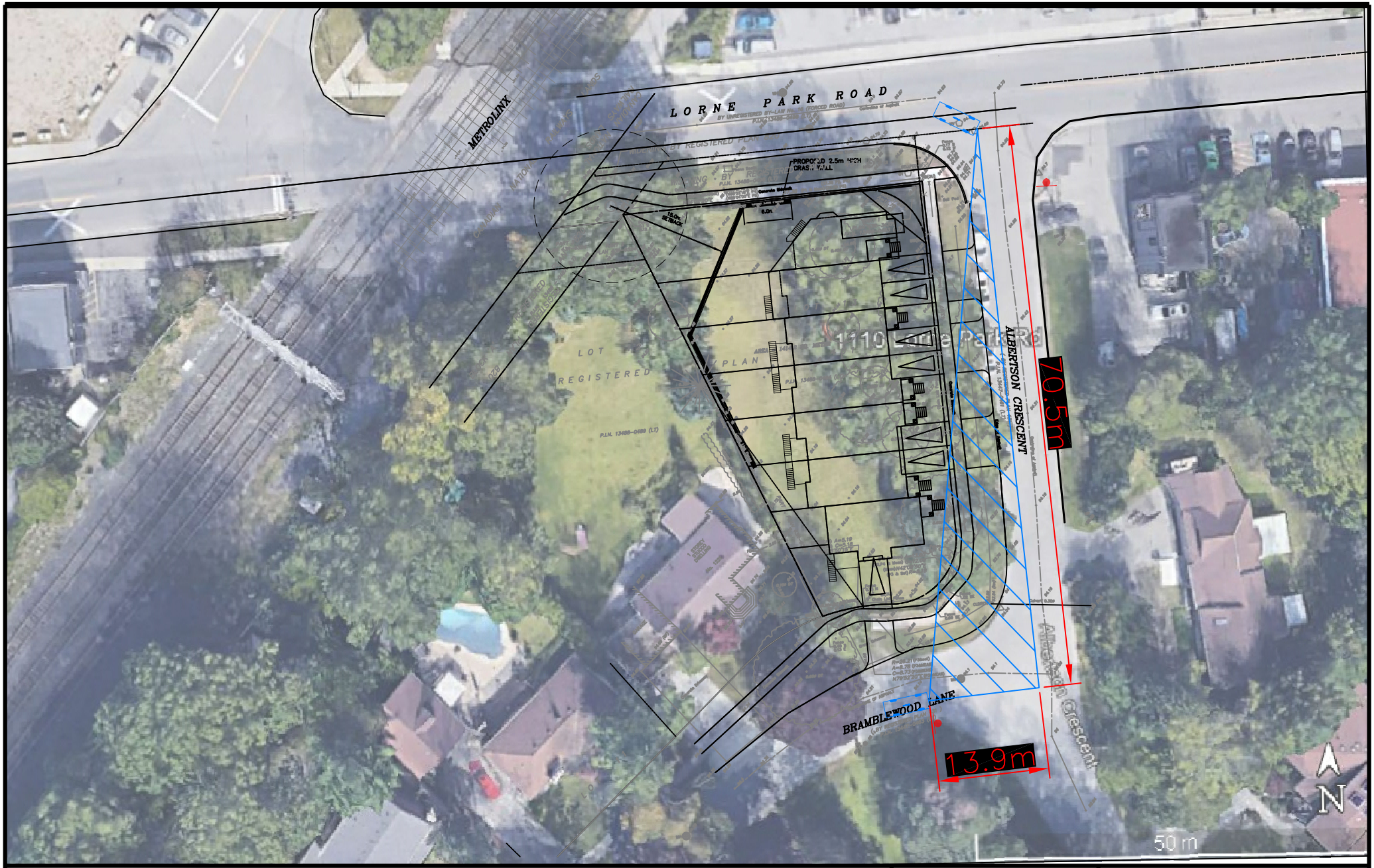

Figure 5 - Departure Sight Triangle at Bramblewood Lane and Albertson Crescent

PROPOSED TOWNHOUSE DEVELOPMENT
1110 LORNE PARK ROAD
MISSISSAUGA, ONTARIO

Source: Site Plan by JSW+ Associates, dated January 7, 2020 & Google Maps

CONSTRUCTION NORTH
TRUE NORTH

SCALE: 1:600 UNITS: m

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APPENDICES

Appendix A – TAC Guidelines, Excerpt

Appendix B – Site Photos

APPENDIX A

TAC Guidelines, Excerpt

8.9.7 CORNER CLEARANCES AT MINOR INTERSECTIONS

Figure 8.9.2 illustrates the corner clearance components at minor intersections. A corner clearance is the distance between the near curb of a roadway intersection and the near edge of a driveway throat. The distance is made up of three components: the intersection corner curb radius, a tangent section (C) and the radius or flare for the driveway. **Section 8.8** provides details of the desired corner clearances for major intersections. It is good design practice to provide a tangent separation (C), between the curb return of the public roadway intersection and the first driveway. Even a short separation assists in reducing the impact of overlapping conflict zones and in promoting collision free operation.

Short tangent separations (C) are acceptable for residential land uses where driveway and roadway traffic volumes are normally low. A minimum distance (C) of 2.0 m is suggested for residential driveways. The resulting minimum corner clearance is then about 11.0 m: 6.0 m for the minimum corner curb radius, the 2.0 m distance (C), and a 3.0 m minimum driveway curb radius.

For commercial and industrial land uses, the increased driveway volumes and the larger turning path requirements warrant a greater corner clearance. A minimum dimension (C) of 5.0 m is suggested to separate the conflict zones and to provide for a greater maneuvering area for turning trucks. For an industrial area, this then results in a minimum corner clearance of about 25.0 m (11.0 m for the minimum corner curb radius, the 5.0 m dimension (C), and a 9.0 m minimum driveway curb radius).

A high volume driveway on the near side of an intersection may warrant a left-turn storage area on the roadway to accommodate left turning traffic into the driveway. If this is the case, the driveway is located in consideration of the total distance needed for the back-to-back left-turn bays created on the roadway. The combined left-turn storage and taper requirements significantly increases the corner clearance requirements.

8.9.8 SPACING OF ADJACENT DRIVEWAYS

In addition to the corner clearance considerations described in **Section 8.9.7**, driveways are normally located in consideration of their physical relationships to existing or possible future driveways. The following three criteria need to be considered:

- minimum spacing between driveways
- minimum offset to property line
- maximum number of driveways based on property frontage.

The application of these design criteria assists in meeting the following objectives:

- Clearly identify to the user which property each driveway serves.
- Ensure that sufficient space is available between driveways for the positioning of traffic signs, lighting poles and other surface utility fixtures, and road hardware.
- Separate the conflict areas for each driveway.
- Provide appropriate space between driveways for on-street parallel parking, where permitted and in consideration of sight line requirements.
- Increase the length of potentially collision free pedestrian areas by minimizing the number and width of driveways.

Roadway retrofit projects often provide the opportunity to improve existing driveway spacing.

The minimum spacing between driveways is measured between the end and start of the curb returns on the adjacent driveways, shown as dimension (E) on **Figure 8.9.2**. A 1.0 m minimum spacing is recommended between adjacent low volume driveways for residential properties, along local and

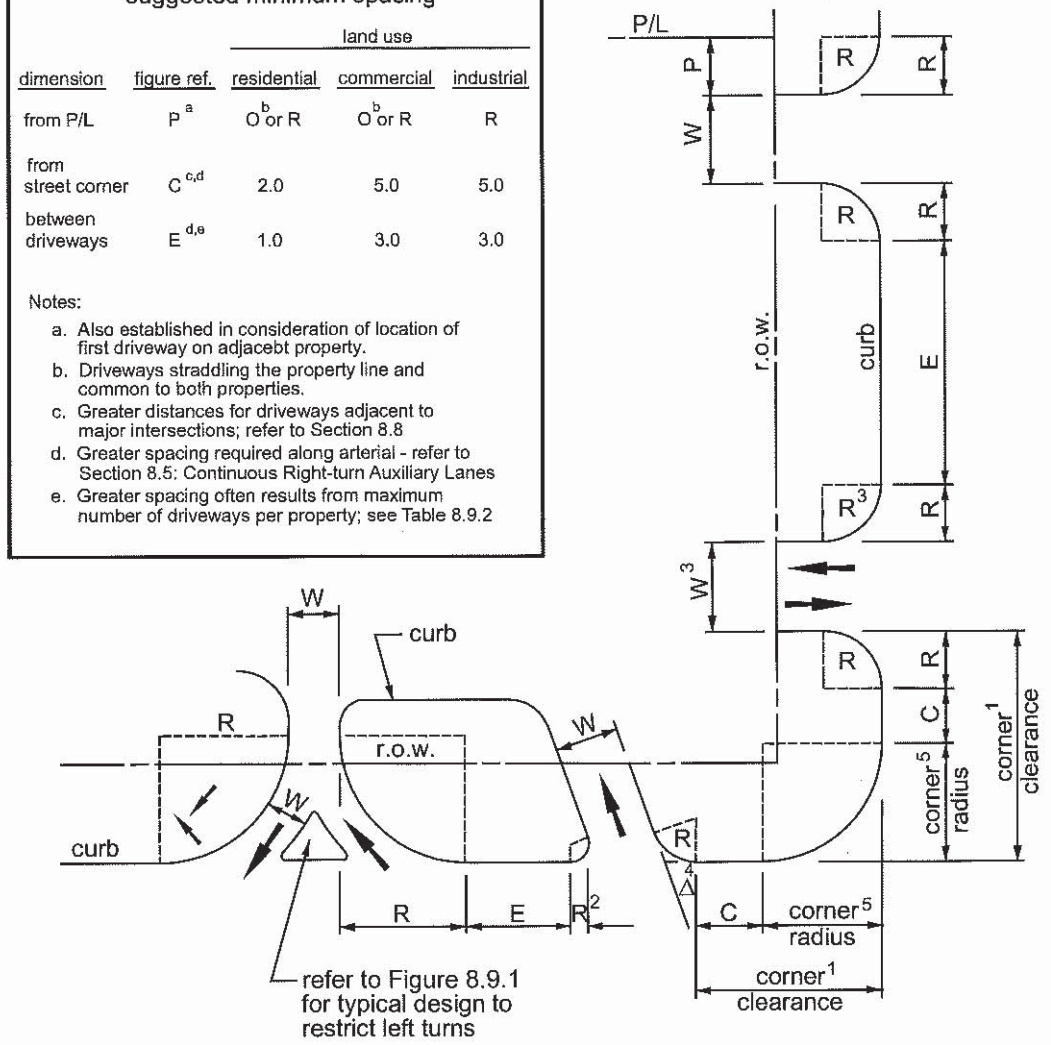
collector roadways, while a 3.0 m minimum is the suggested dimension for both commercial and industrial land uses. If there is a need to provide parallel parking between driveways along the roadway, a spacing of 6.0 to 7.5 m is suitable. If the spacing provided is in the range of 3.0 to 5.0 m, the space may appear inviting to a driver wishing to park, but if used, severely hampers the operation of the driveways by reducing sight lines and interfering with the turning paths of the vehicles.

suggested minimum spacing

dimension	figure ref.	land use: residential	land use: commercial	land use: industrial
from P/L	P [a]	O [b] or R	O [b] or R	R
from street corner	C [c,d]	2.0	5.0	5.0
between driveways	E [d,e]	1.0	3.0	3.0

Notes:

a. Also established in consideration of location of first driveway on adjacebt property.
b. Driveways straddling the property line and common to both properties.
c. Greater distances for driveways adjacent to major intersections; refer to Section 8.8
d. Greater spacing required along arterial - refer to Section 8.5: Continuous Right-turn Auxiliary Lanes
e. Greater spacing often results from maximum number of driveways per property; see Table 8.9.2



Notes:
1. For suggested minimum corner clearance at major intersections, see Figure 8.8.2
2. Where turns are not permitted, R=1.5 m assists in discouraging wrong-way movements.
3. For typical R and W dimensions, refer to Table 8.9.1
4. Minimum angle of 70° desirable where pedestrians routinely cross driveway, 45° minimum otherwise.

Figure 8.9.2: Driveway Spacing Guidelines – Locals and Collectors

contrasting construction materials across the driveway assists in defining a pedestrian crossing zone to the driver.

The radius of the curb return style or the flare required to accommodate an equivalent turning radius is meaningful only when considered in combination with the width of the driveway throat.

8.9.5 WIDTH

The width of a two-way driveway is measured parallel to the road since turns are generally oriented at right angles. The dimension is typically measured beyond any entrance flare. The width of one-way driveways, which are normally skewed, is measured perpendicular to the driveway.

It is desirable to state suitable driveway widths as a design domain. Dimensions at the lower end of the domain are intended to define the minimum spatial and operational requirements. The maximum dimensions assist in preventing driveways from becoming unwieldy with large paved areas and poorly defined travel paths. The most appropriate width of a driveway is determined in combination with the radius of the curb return (or the design vehicle turning radius and flare dimensions, if a straight flared design is adopted), the desired operating characteristics such as turning speed, and physical limitations which may exist at the site.

Table 8.9.1 provides a typical design domain for driveway throat widths and radii for both two-way and one-way operation. In locations where special vehicles such as long combination vehicles or similar vehicles are present, wider driveway throat dimensions or larger radii may be required.

Table 8.9.1: Typical Driveway[c] Dimensions

Dimension (m)	Land Use		
	Residential	Commercial	Industrial
Width (W)			
- One way	3.0[a] – 4.3	4.5[a] – 7.5	5.0 – 9.0
- Two way	2.0[a] – 7.3	7.2[a] – 12.0[b]	9.0[a] – 15.0[b]
Right turn radius (R)	3.0 – 4.5	4.5 – 12.0	9.0 – 15.0

Notes:

a. Minimum widths are normally used with radii at or near the upper end of the specified range
b. Increased widths may be considered for capacity purposes; where up to 3 exit lanes and 2 entry lanes are employed, 17.0 m is the maximum width exclusive of any median
c. Applicable to driveways only, not road intersections

8.9.6 ANGLE OF DRIVEWAY

Two-way driveways normally intersect the roadway curb at or near 90°. However, a minimum acute angle of 70°, as measured from the roadway curb line, normally operates in an acceptable manner.

For one-way driveways, where a skewed intersection assists in efficient traffic operation, skews in the range of 45° to 60° are appropriate in industrial areas where pedestrians are infrequent. For commercial and residential land uses, where pedestrian volumes are normally moderate to high, minimum skew angles in the range of 60° to 70° are preferred to improve the driver's visibility of the pedestrian, and vice versa, and to encourage lower turning speeds.

Table 9.9.4: Design Intersection Sight Distance – Case B1, Left Turn From Stop

Design Speed (km/h)	Stopping Sight Distance (m)	Intersection Sight Distance for Passenger Cars	
		Calculated (m)	Design (m)
20	20	41.7	45
30	35	62.6	65
40	50	83.4	85
50	65	104.3	105
60	85	125.1	130
70	105	146.0	150
80	130	166.8	170
90	160	187.7	190
100	185	208.5	210
110	220	229.4	230
120	250	250.2	255
130	285	271.1	275

Note: Intersection sight distance shown is for a stopped passenger car to turn left onto a two-lane highway with no median and grades 3% or less. For other conditions, the time gap should be adjusted and the sight distance recalculated.

Sight distance design for left turns at divided-highway intersections should consider multiple design vehicles and median width. If the design vehicle used to determine sight distance for a divided-highway intersection is larger than a passenger car, then sight distance for left turns will need to be checked for that selected design vehicle and for smaller design vehicles as well. If the divided-highway median is wide enough to store the design vehicle with a clearance to the through lanes of approximately 1 m at both ends of the vehicle, no separate analysis for the departure sight triangle for left turns is needed on the minor-road approach for the near roadway to the left. In most cases, the departure sight triangle for right turns (case B2) will provide sufficient sight distance for a passenger car to cross the near roadway to reach the median. Possible exceptions are addressed in the discussion of case B3.

Table 9.9.6: Design Intersection Sight Distance – Case B2, Right Turn from Stop, and Case B3, Crossing Maneuver

Design Speed (km/h)	Stopping Sight Distance (m)	Intersection Sight Distance for Passenger Cars	
		Calculated (m)	Design (m)
20	20	36.1	40
30	35	54.2	55
40	50	72.3	75
50	65	90.4	95
60	85	108.4	110
70	105	126.5	130
80	130	144.6	145
90	160	162.6	165
100	185	180.7	185
110	220	198.8	200
120	250	216.8	220
130	285	234.9	235

Note: Intersection sight distance shown is for a stopped passenger car to turn right onto or to cross a two-lane highway with no median and with grades of 3% or less. For other conditions, the time gap should be adjusted and the sight distance recalculated.

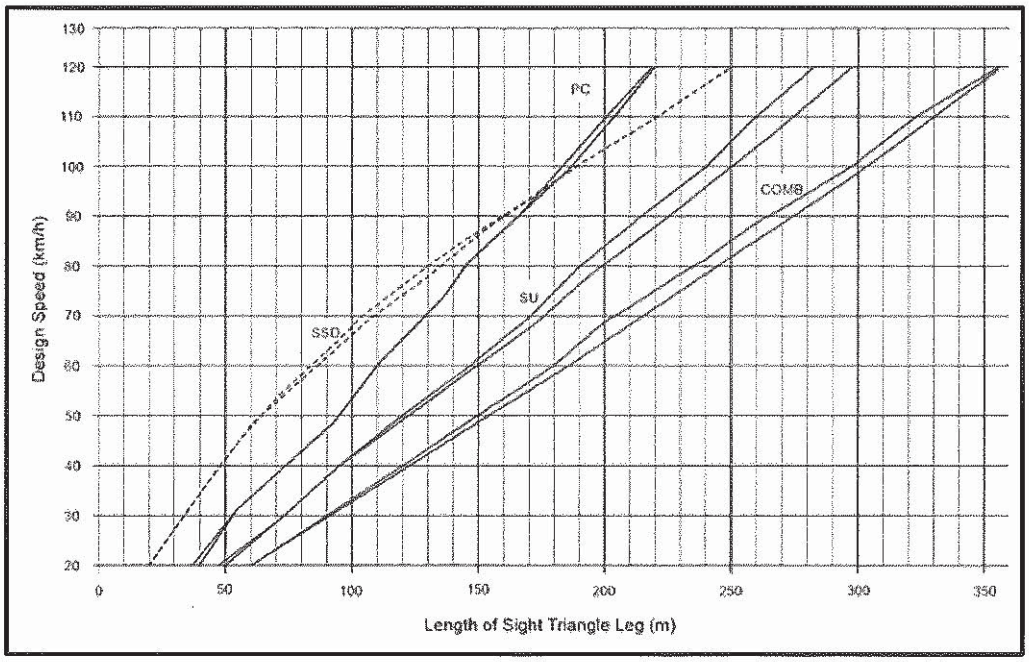


Figure 9.9.5: Intersection Sight Distance – Case B2, Right Turn from Stop, and Case B3, Crossing Maneuver (Calculated and Design Values Plotted)

9.9.2.2 Departure Sight Triangles

A second type of clear sight triangle provides sight distance sufficient for a stopped driver on a minor-road approach to depart from the intersection and enter or cross the major road. **Figure 9.9.2** shows typical departure sight triangles to the left and to the right of the location of a stopped vehicle on the minor road.

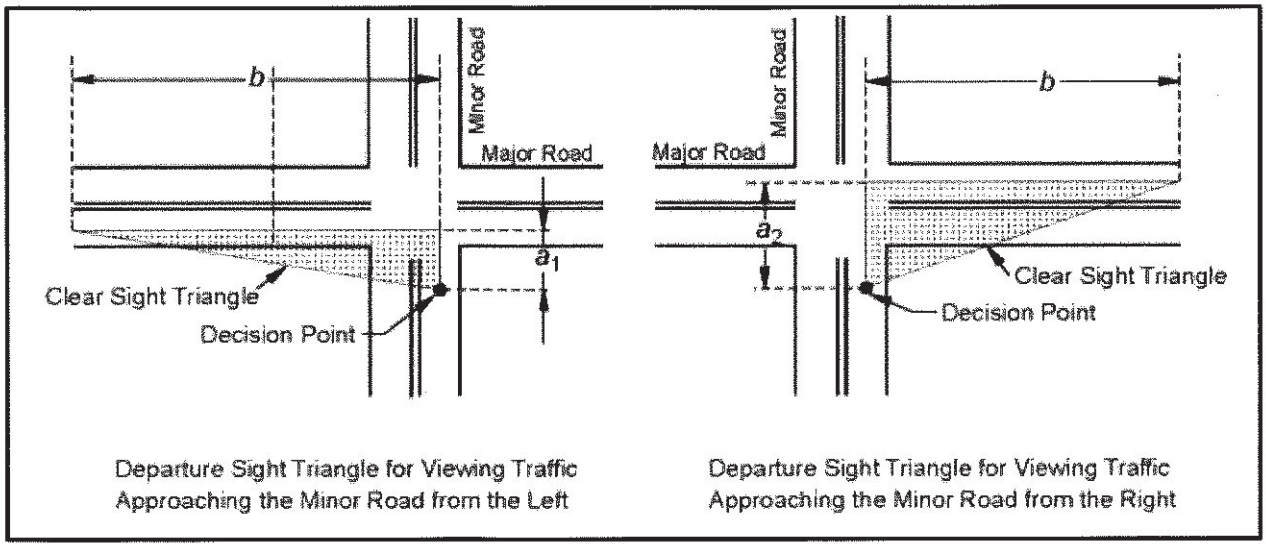


Figure 9.9.2: Departure Sight Triangles (Stop-Controlled)

Departure sight triangles should be provided in each quadrant of each intersection approach controlled by stop or yield signs. Departure sight triangles should also be provided for some signalized intersection approaches. Distance a_2 in **Figure 9.9.2** is equal to distance a_1 plus the width of the lane(s) departing from the intersection on the major road to the right. Distance a_2 should also include the width of any median present on the major road, unless the median is wide enough to permit a vehicle to stop before entering or crossing the roadway beyond the median. The appropriate measurement of distances a_1 and a_2 for departure sight triangles depends on the placement of any marked stop line that may be present and may therefore vary with site-specific conditions.

The recommended dimensions of the clear sight triangle for desirable traffic operations where stopped vehicles enter or cross a major road are based on assumptions derived from field observations of driver gap-acceptance behaviour.[66] Providing clear sight triangles like those shown in **Figure 9.9.2** also allows the drivers of vehicles on the major road to see any vehicles stopped on the minor-road approach and to be prepared to slow or stop, if needed.

9.9.2.3 Intersection Control

The recommended dimensions of the sight triangles vary with the type of traffic control used at an intersection because different types of control impose different legal constraints on drivers and, therefore, result in different driver behaviour. Procedures to determine sight distances at intersections are presented below, according to different types of traffic control, as follows:

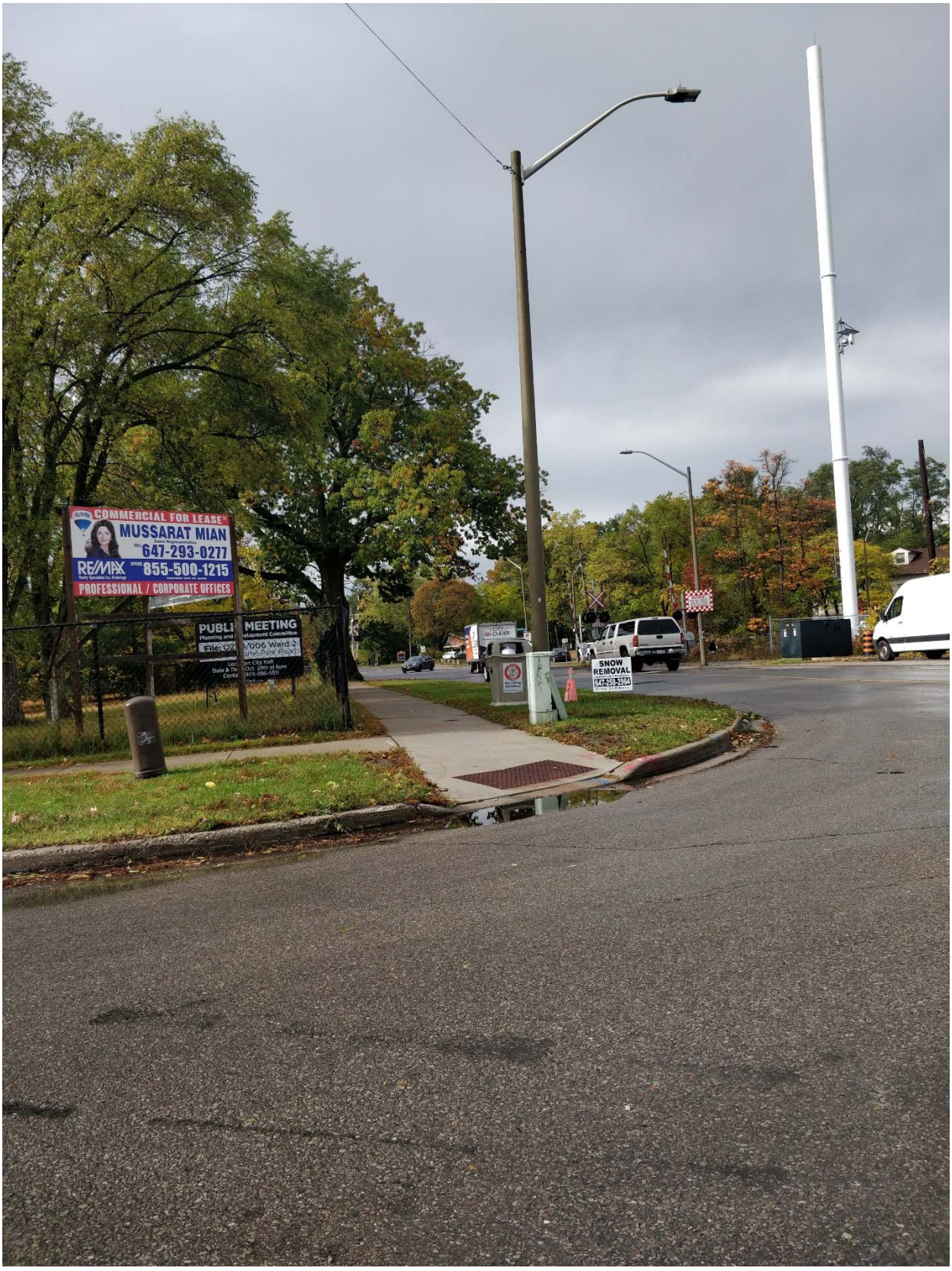
- Case A – Intersections with no control
- Case B – Intersections with stop control on the minor road

APPENDIX B

Site Photos

Albertson Crescent looking east on Lorne Park Road

Albertson Crescent looking west on Lorne Park Road



Bramblewood Lane looking north on Albertson Crescent

Bramblewood Lane looking south on Albertson Crescent

Future driveways (unit 3-6) looking north on Albertson Crescent

Future driveways (unit 3-6) looking south on Albertson Crescent

Future driveway (unit 7) location looking east on Bramblewood Lane

Future driveway (unit 7) looking west on Bramblewood Lane