

Document Control Page

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1 Introduction

IBI Group was retained by L & B Canada to complete a traffic impact study (TIS) for a proposed development consisting of 297 apartment units and 38 stacked townhouse units, to be located at 635 Erb Street West (hereinafter referred to as the “subject site”, in Waterloo, Ontario. The nature of the application involves an official plan amendment and zoning by-law amendment.

The purpose of this report is to analyze potential traffic impacts to the study area caused by trips generated by the subject site, and evaluate the subject site’s proposed parking supply.

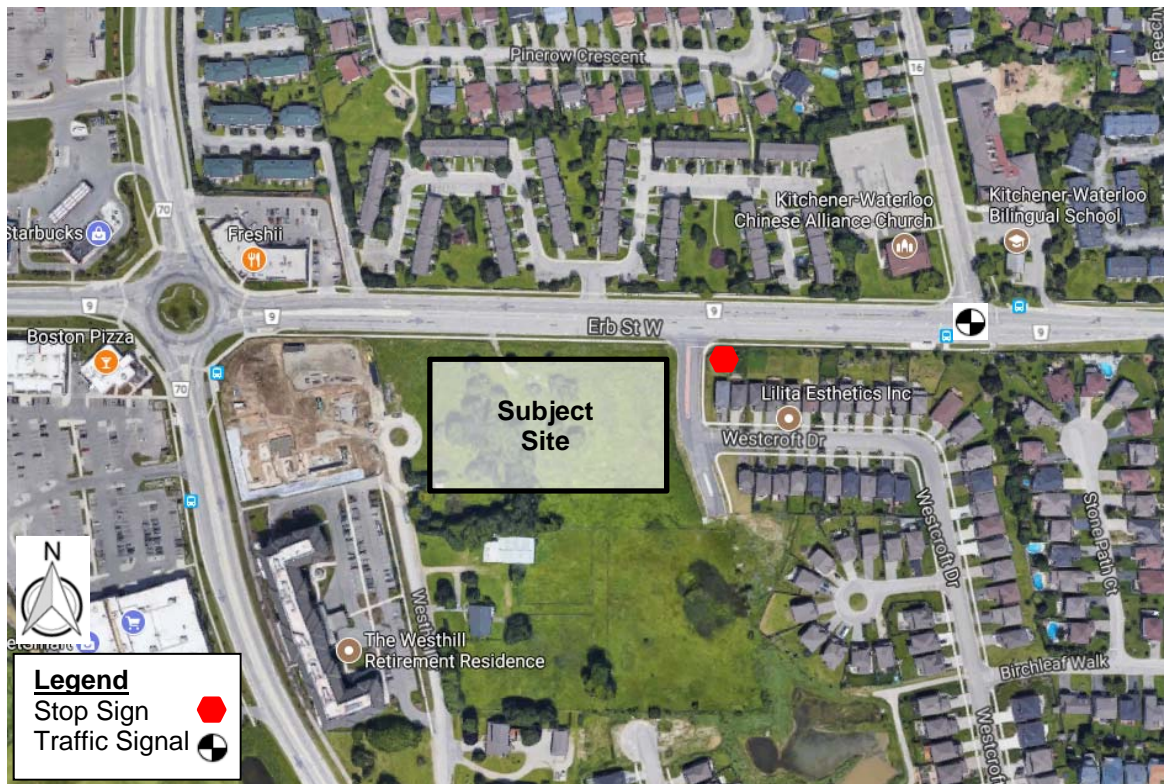
2 Study Area

Upon consultation with the Region of Waterloo and City of Waterloo, the following intersections were selected for analysis in this TIS:

- Erb Street West / Westhaven Street (one-way stop controlled); and
- Erb Street West / Erbsville Crescent (signal controlled).

The proposed development location and the study area intersections are illustrated in **Exhibit 2-1**. The site will have two accesses, one to West Hill Drive and a second to Westhaven Street.

Exhibit 2-1: Study Area



2.1 Road Network

The roadways adjacent to study area are Erb Street West, West Hill Drive, Westhaven Street, and Erbsville Crescent.

Erb Street West is an east-west regional road with two lanes in each direction with a posted 60 km/hr speed limit. There is one signalized intersection within the study area, where Erb Street West and Erbsville Crescent intersects. Sidewalks are provided on both sides of the street, as well as marked curbside bicycle lanes in both directions. Erb Street West is served by Grand River Transit (GRT) iXpress Route 202 bus service.

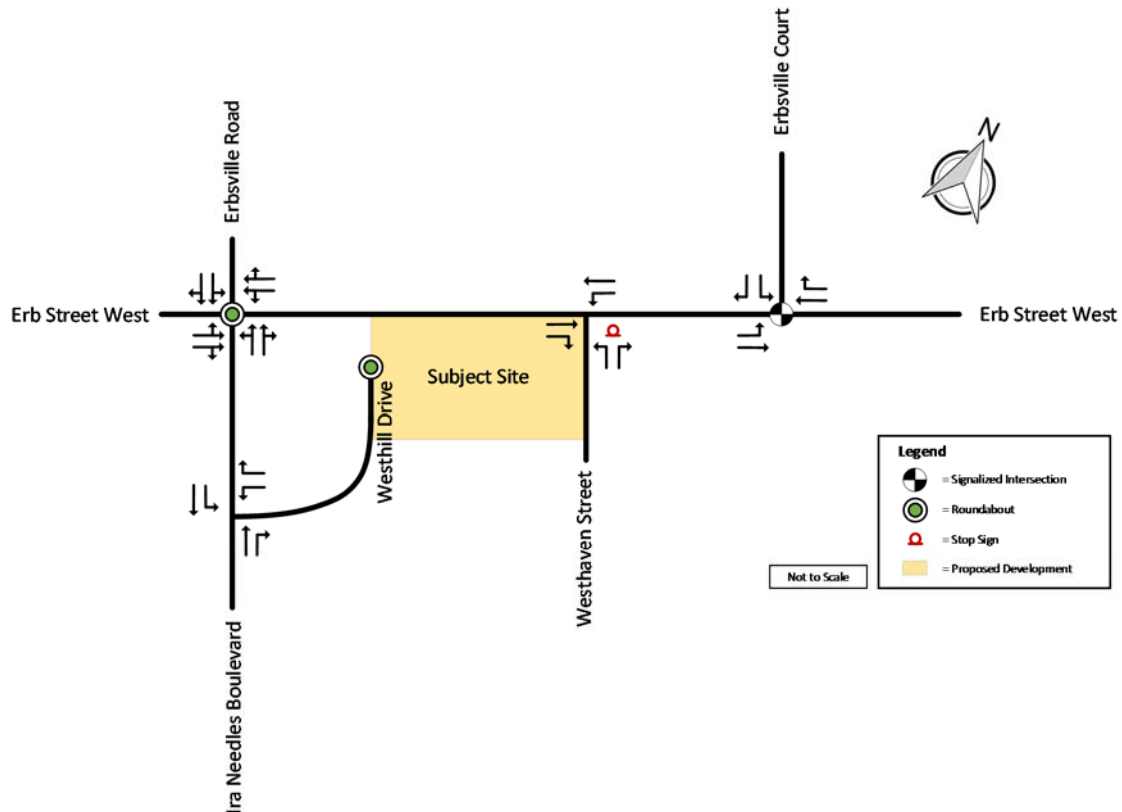
West Hill Drive is a north-south local road with one lane in each direction. The north end of the road terminates south of Erb Street West, and intersects Ira needles Boulevard to the south. There are no sidewalk provisions and speed limits are not posted.

Westhaven Street is a north-south local road with one lane in each direction. The north end intersects with Erb Street West, and the south end terminates south of Westcroft Drive. Speed limits are unposted, and sidewalks are provided on the east side.

Erbsville Crescent is a north-south local road with one lane in each direction. The south end intersects with Erb Street West and is signal controlled with crosswalk markings. The posted speed limit is 50 km/hr, with sidewalks provided on both sides.

The existing lane configuration is shown in **Exhibit 2-2**.

Exhibit 2-2: Existing Lane Configuration



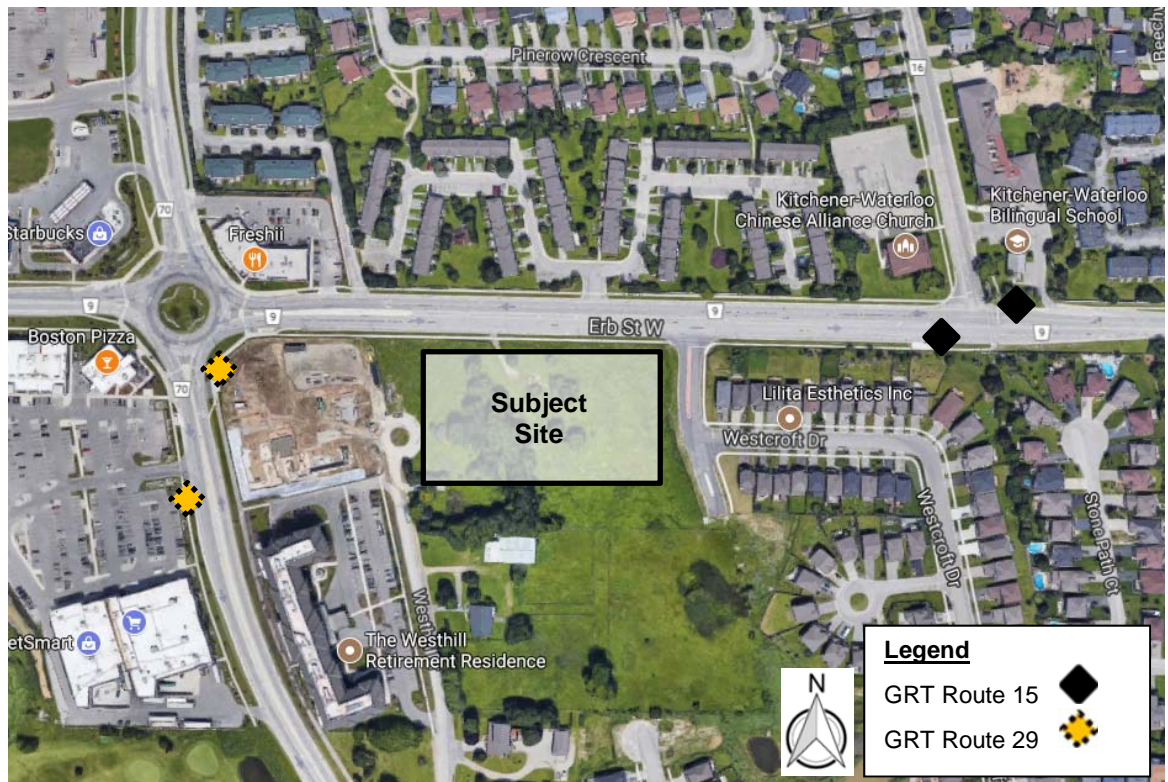
2.2 Transit Facilities

The subject site is located in an area served by Grand River Transit (GRT), with bus stops within walking distance at the Erb Street West / Erbsville Crescent intersection and the Erb Street West / Erbsville Road / Ira Needles Boulevard intersection. **Exhibit 2-3** presents the service frequency obtained from the GRT website, and **Exhibit 2-4** illustrates the GRT bus stop locations within the immediate study area. As noted below, transit service is frequent and accessible during the weekday peak hours.

Exhibit 2-3: Transit Service Frequency

Bus Route	Peak Hour Service Frequency	Off Peak Service Frequency
Grand River Transit (GRT) iXpress – Route 202 (The Boardwalk – Conestoga Mall)	10 minutes	30 minutes
Grand River Transit (GRT) iXpress – Route 29 (Keats Way)	30 minutes	30 minutes

Exhibit 2-4: Study Area Transit Service Coverage



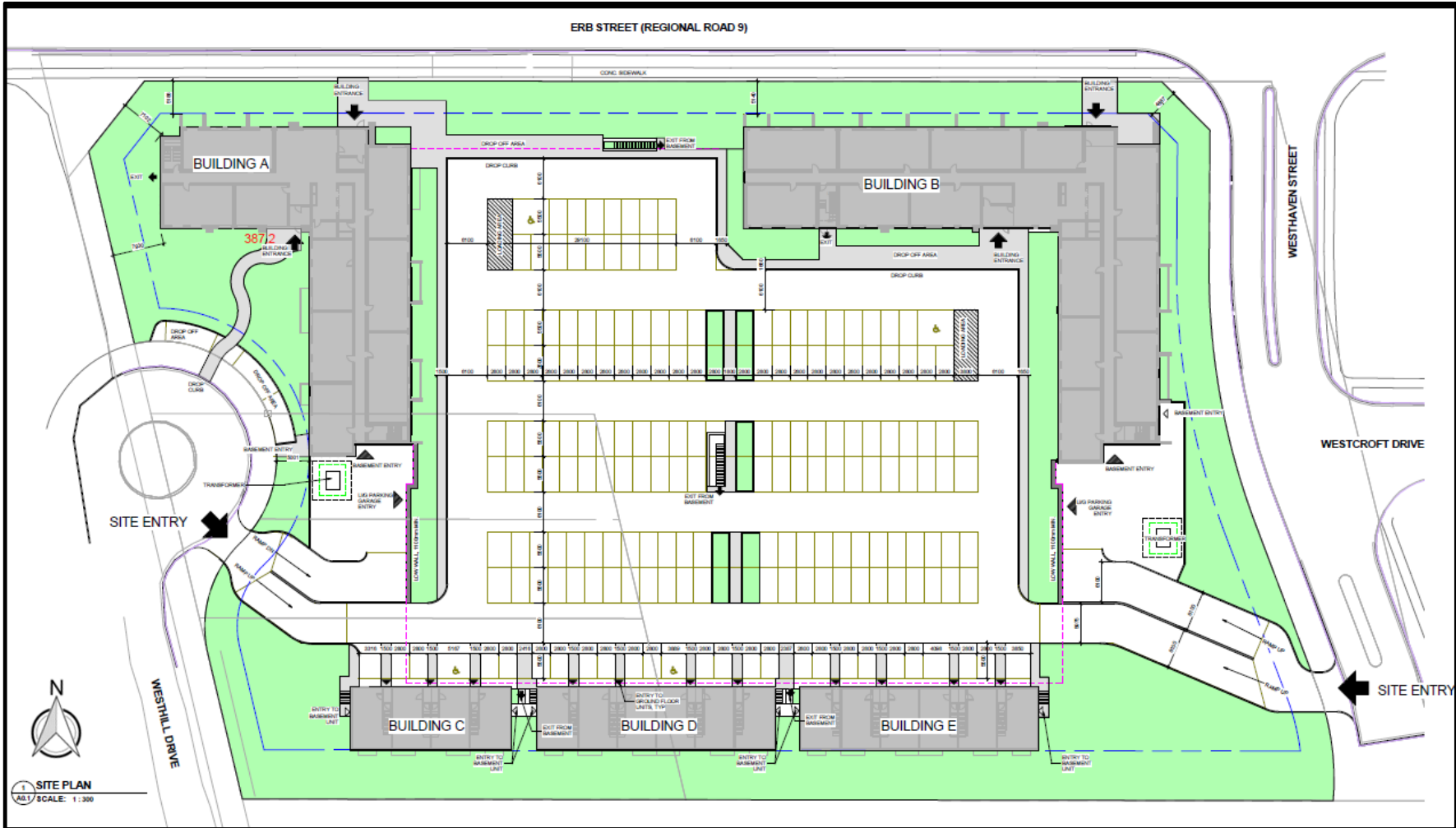
2.3 Proposed Land Use on Site

The subject site currently contains a vacant lot. The proposed layout of the site is for two apartment buildings with a total of 297 units, three stacked townhouse blocks providing 38 units, and 422 parking spaces (237 underground, 185 surface).

Access to the site is proposed via two driveways, located west to connect with the Westhill Drive northern roundabout, and east to connect with Westhaven Street. Both driveways will be configured to permit full movement operations. Surface and underground parking space access / egress will be possible via the two driveways using internal ramps. The current site plan is presented in **Exhibit 2-5**.

The subject site is to be completed and fully occupied under one phase, by the year 2023.

Exhibit 2-5: Site Plan



3 Existing Conditions

3.1 Turning Movement Counts

Turning movement count data was provided by the Region of Waterloo for the study area intersections. This report's studied peak hours were chosen to coincide with weekday AM and PM peak hours of traffic activity on the adjacent road, which is 8:00 AM – 9:00 AM for the AM peak hour, and 4:45 PM – 5:45 PM for the PM peak hour.

Due to the age of the data, a 4.4% growth rate obtained via AADT data provided by the Region of Waterloo (discussed in detail in Section 4.1) was used to determine 2017 current year volumes.

Exhibit 3-1 summarizes the dates of the turning movement counts collected for analysis.

Turning movement count data can be found in **Appendix A**.

Exhibit 3-1: Turning Movement Count Data

Intersection	Date
Erb St W / Ira Needles Blvd / Erbsville Rd	Thursday, March 23, 2017 7:30 AM -10:00 AM 3:00 PM - 6:00 PM
Erb St W / Westhaven St	Thursday, May 15, 2014 7:30 AM -10:30 AM 3:00 PM - 6:00 PM
Erb St W / Erbsville Crt	Thursday, May 15, 2014 7:30 AM -10:30 AM 3:00 PM - 6:00 PM

3.2 Existing Traffic Volumes

IBI Group used the turning movement counts detailed within **Section 3.1** in order to establish a 2017 existing traffic conditions model. **Exhibit 3-2** illustrates the weekday AM and PM peak hour traffic volumes for the study area intersections. **Exhibit 3-3** illustrates the truck specific volumes, while **Exhibit 3-4** illustrates the pedestrian volumes.

Exhibit 3-2: Existing Traffic Volumes

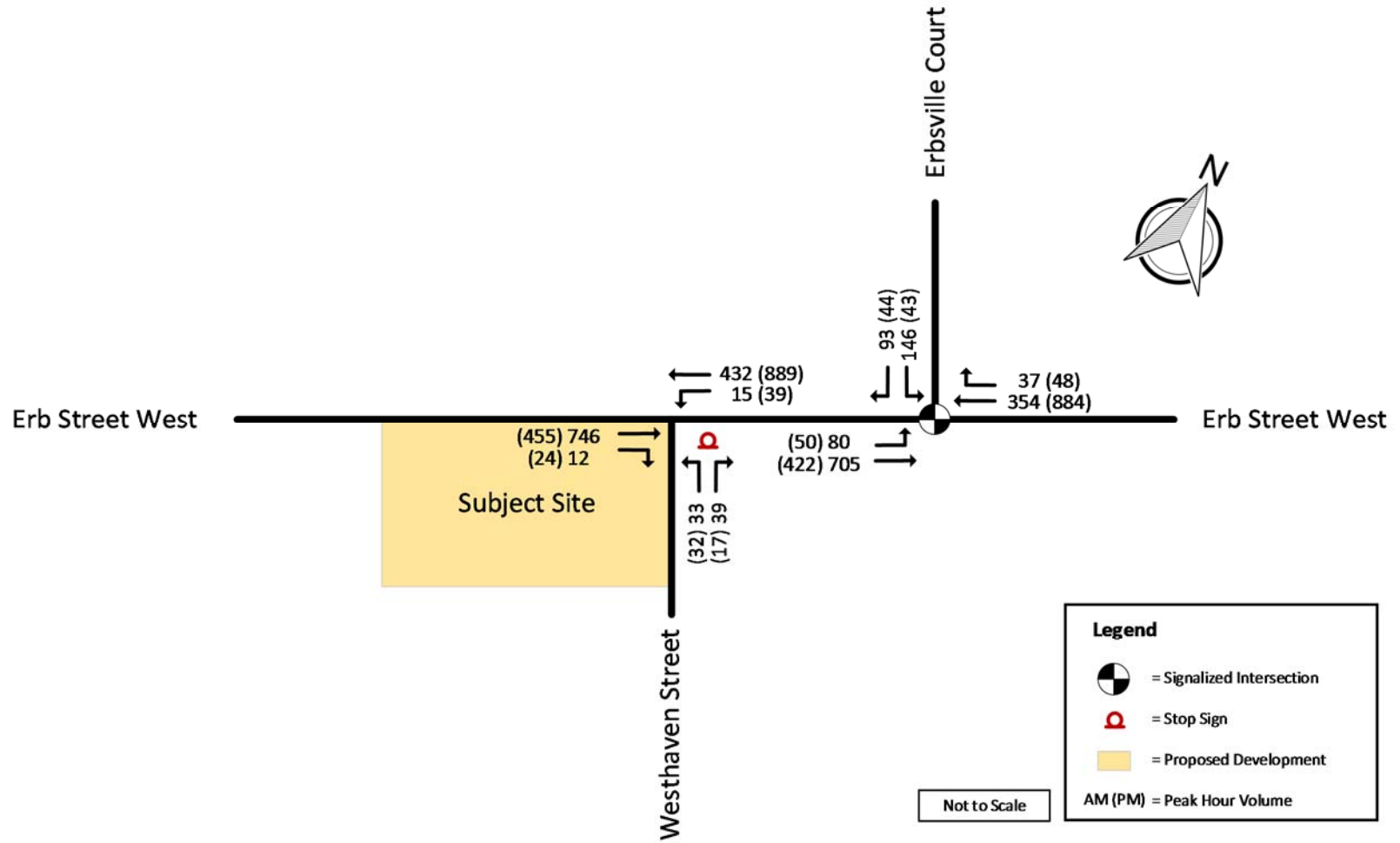


Exhibit 3-3: Existing Truck Volumes

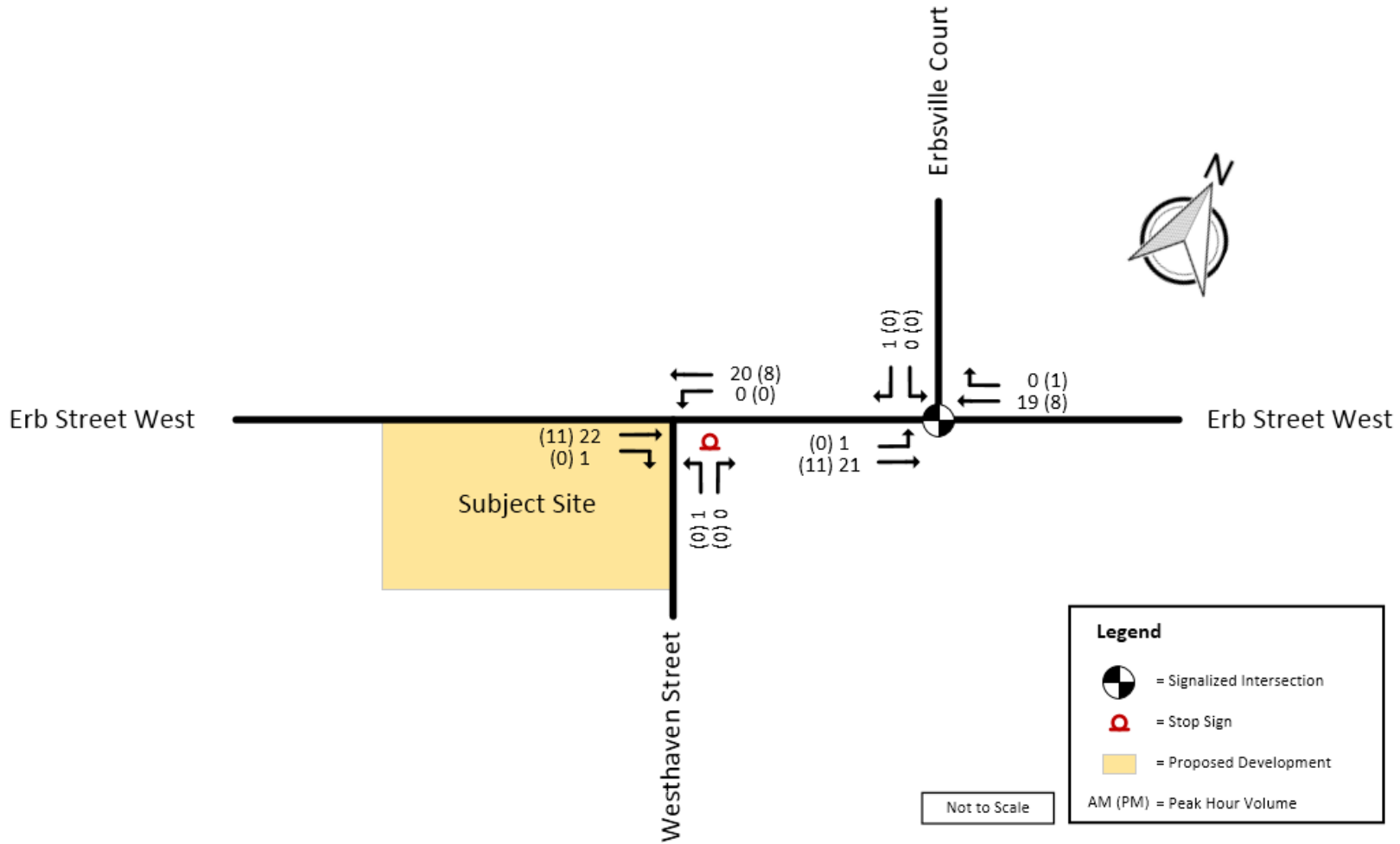
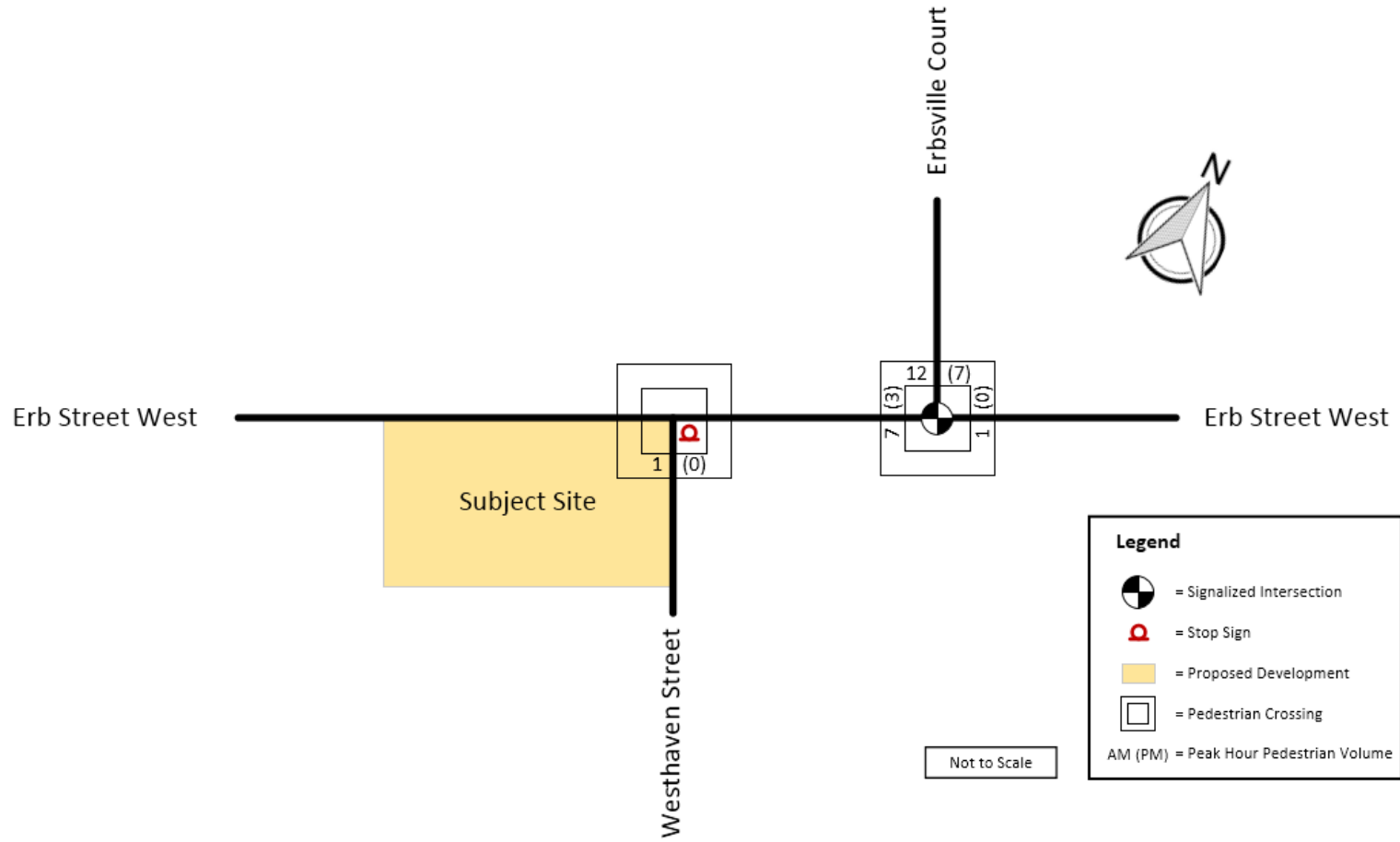


Exhibit 3-4: Existing Pedestrian Volumes



3.3 Existing Traffic Operations

The intersections were analyzed using the Synchro 9.1 analysis package for signalized and unsignalized intersections. Levels of service (LOS) were calculated using the HCM methodology contained in Synchro for the studied intersections. LOS evaluation uses a six-letter grade scale (A to F) to rank vehicle delay at intersections. LOS 'A' indicates excellent traffic operations with minimal delays, while LOS 'F' represents conditions with long delays. Criteria for identifying critical intersections and movements are based on the Region of Waterloo Transportation Impact Study Guidelines (September 2013).

Exhibit 3-5 details existing traffic operations at the signalized Erb Street West / Erbsville Crescent intersection for the AM and PM peak hours. Synchro outputs are found in **Appendix B**. Note that for the analysis of the existing conditions, the peak hour factors (PHF) were calculated for each approach and carried forward to the future background and future total analysis.

Based on the analysis of the AM and PM peak hours, the intersection was observed to have overall acceptable operations during both peak periods. The queues did not exceed the storage length and all movements in the study area operate at an acceptable LOS with no critical movements.

Exhibit 3-5: Existing Traffic Operations – Signalized Intersections

Intersection	Intersection			Movement					
	LOS	Delay	V/C Ratio	Movement	LOS	Delay (s)	V/C Ratio	95th Percentile Queue (m)	Storage Capacity (m)
AM Peak Hour									
Erb St W & Erbsville Ct	B	12.9	0.41	EBL	A	5.9	0.16	13	50
				EBT	A	6.6	0.34	42	-
				WBT	A	5.8	0.21	21	-
				SBL	D	54.0	0.79	42	55
				SBR	C	32.5	0.07	12	-
PM Peak Hour									
Erb St W & Erbsville Ct	A	6.7	0.44	EBL	A	4.3	0.16	7	50
				EBT	A	3.5	0.19	17	-
				WBT	A	4.8	0.43	43	-
				SBL	D	50.0	0.59	18	55
				SBR	D	38.0	0.03	10	-

Exhibit 3-6 displays the existing traffic operations at the Westhaven Street / Erb Street West unsignalized intersection for the AM and PM peak hours. For both peak periods, overall traffic operations are acceptable. No queues exceed the storage length and all movements in the study area operate at an acceptable LOS with no critical movements.

Exhibit 3-6: Existing Traffic Operations – Unsignalized Intersections

Intersection	Delay (s)	Lane	Lane LOS	Control Delay (s)	Approach LOS	V/C Ratio	Queue, 95th (m)	Storage Length (m)
AM Peak Hour								
Westhaven St & Erb St W	1.2	WBL	A	9.6	0.3	0.02	1	45.0
		NBL/R	C	18.7	C	0.18	5	-
PM Peak Hour								
Westhaven St & Erb St W	0.8	WBL	A	8.6	-	0.04	1	45.0
		NBL/R	C	17.8	C	0.14	4	-

4 2023 Future Background Conditions

In accordance with the City of Waterloo TIS Guidelines and after a pre-consultation meeting with the City of Waterloo and the Region of Waterloo, the City of Waterloo has requested a horizon year of five from the date of the TIS (i.e. 2023).

4.1 Other Developments within Study Area

Upon consultation with the Region of Waterloo, existing 2017 and forecasted 2027 AADT values pertaining to Erb Street were provided to IBI Group (**Exhibit 4-1**), with the raw data provided in **Appendix C**. It was determined by the Region that the annual traffic growth rate, 4.4%, calculated using the AADT values, will account for future development traffic and growth in the study area.

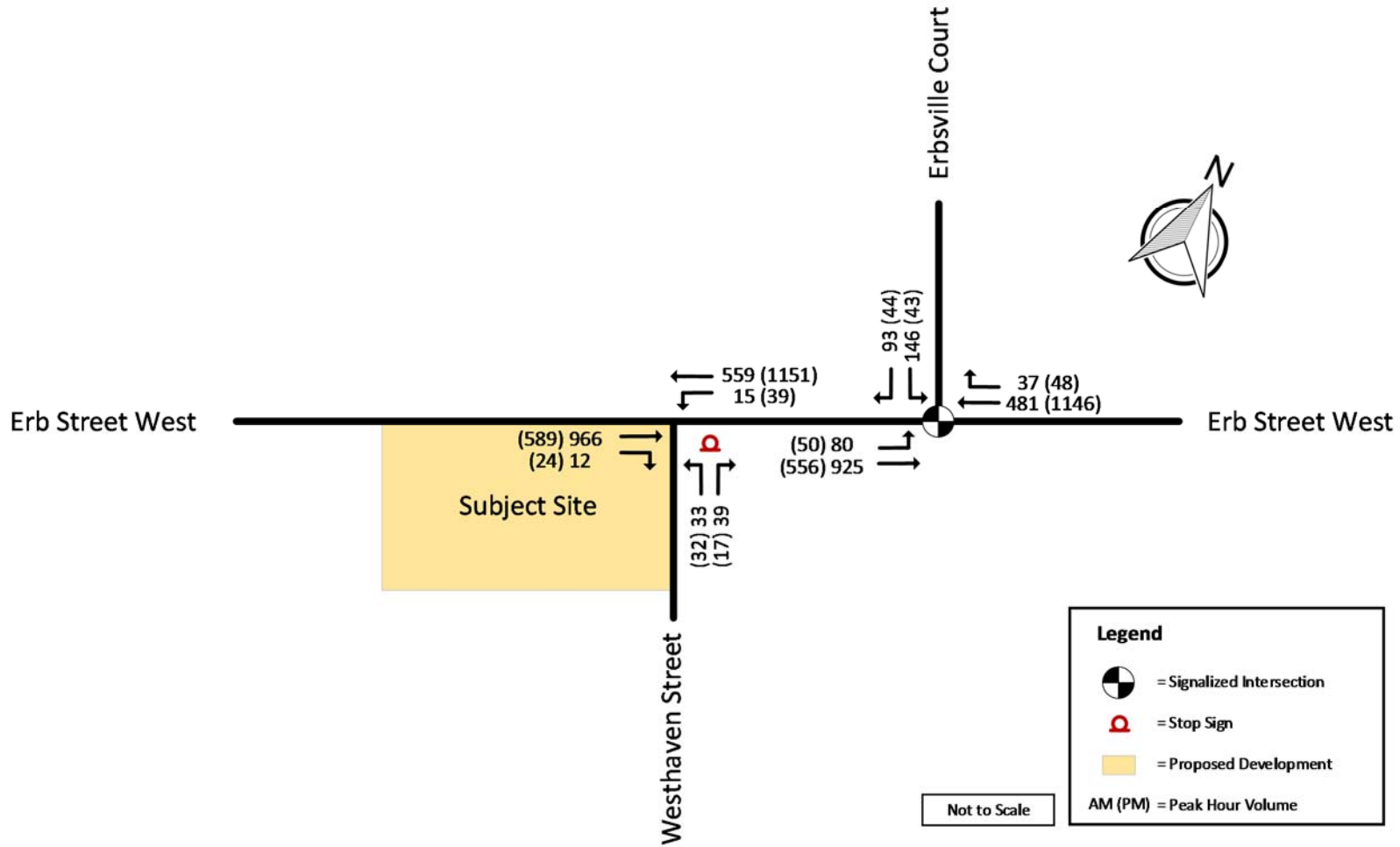
Exhibit 4-1: Erb Street Annual Traffic Growth Rate

On Erb Street (Ira Needles Blvd to Westhaven St)		
Year	AADT	Annual Traffic Growth
2017	13600	4.4%
2027	20900	

4.2 2023 Future Background Traffic Operations

To provide a basis for comparison with existing conditions, the 2023 future background traffic operation analysis will consist of corridor traffic growth discussed in Section 4.1. **Exhibit 4-2** illustrates 2023 future background traffic volumes into the study area during the weekday AM and PM peak hours.

Exhibit 4-2: 2023 Future Background Traffic Volumes



The exhibits below detail 2023 future background traffic operations at the study area intersections. Specifically, **Exhibit 4-3** summarizes signalized intersection operations in the study area during the AM and PM peak hours. Synchro outputs are provided in **Appendix D**.

Similar to the existing conditions, the signalized intersection in the study area will operate well with LOS B or better during both peak hours. Additionally, there are no critical movements anticipated, as all movements operate at LOS D or better.

Exhibit 4-3: 2023 Future Background Traffic Operations – Signalized Intersections

Intersection	Intersection			Movement					
	LOS	Delay	V/C Ratio	Movement	LOS	Delay (s)	V/C Ratio	95th Percentile Queue (m)	Storage Capacity (m)
AM Peak Hour									
Erb St W & Erbsville Ct	B	12.2	0.5	EBL	A	6.2	0.18	13	50
				EBT	A	7.5	0.45	59	-
				WBT	A	6.2	0.28	29	-
				SBL	D	54.0	0.79	42	55
				SBR	C	32.5	0.07	12	-
PM Peak Hour									
Erb St W & Erbsville Ct	A	7	0.55	EBL	A	5.7	0.23	8	50
				EBT	A	3.8	0.24	23	-
				WBT	A	5.8	0.55	63	-
				SBL	D	50.0	0.59	18	55
				SBR	D	38.0	0.03	10	-

Regarding unsignalized operations at the Westhaven Street / Erb Street West intersection under 2023 future background conditions, **Exhibit 4-4** summarizes unsignalized operations. Overall and individual movement LOS is anticipated to be acceptable, with no critical operations observed. All queue lengths are anticipated to be within storage capacity.

Exhibit 4-4: 2023 Future Background Traffic Operations – Unsignalized Intersections

Intersection	Delay (s)	Lane	Lane LOS	Control Delay (s)	Approach LOS	V/C Ratio	Queue, 95th (m)	Storage Length (m)
AM Peak Hour								
Westhaven St & Erb St W	1.3	WBL	B	10.7	-	0.03	1	45.0
		NBL/R	D	27.1	D	0.28	9	-
PM Peak Hour								
Westhaven St & Erb St W	0.8	WBL	A	9.1	-	0.05	1	45.0
		NBL/R	C	23.8	C	0.20	6	-

5 Site-Generated Traffic

The proposed residential development will consist of 297 apartment units and 38 stacked townhouse units. Two full movement site connections are proposed on the west and east sides of the lot.

5.1 Site Access

Access to the site will be via two full movement stop controlled driveways, intersecting with Westhill Drive to the west, and Westhaven Street to the east, illustrated in **Exhibit 2-5**.

Surface and underground parking space access / egress will be possible via the two driveways using internal ramps.

5.2 Trip Generation

The ITE Trip Generation manual was used to estimate vehicle trips generated during the weekday AM and PM peak hours of the adjacent street, summarized below in **Exhibit 5-1**. Trip generation consisted of the proposed apartment (ITE land use code 220) and townhouse (ITE land use code 230) units.

Exhibit 5-1: Trip Generation Summary

Land Use	Unit	Weekday AM Peak Hour			Weekday PM Peak Hour		
		IN	OUT	TOTAL	IN	OUT	TOTAL
Apartment 297 units (Land Use ITE Code 220)	Trips/Unit	0.78	3.14	3.92	3.09	1.67	4.76
	%	20%	80%	100%	65%	35%	100%
	Trips	30	119	149	118	63	181
Townhouse 38 units (Land Use ITE Code 230)	Trips/Unit	0.11	0.52	0.63	0.48	0.23	0.71
	%	17%	83%	100%	67%	33%	100%
	Trips	4	20	24	18	9	27
Total Trips		34	139	173	136	72	208

During the AM peak hour and PM peak hour, a total of 300 and 375 site trips are estimated, respectively.

5.3 Trip Distribution

To distribute the trips forecasted to be generated by the subject site, the existing traffic patterns during the weekday AM and PM peak hours were analyzed using the adjacent road network (i.e. Erb Street West / Ira Needles Boulevard / Erbsville Road four legged roundabout). Using this method, **Exhibit 5-2** summarizes the trip distribution to apply to the new subject site trips.

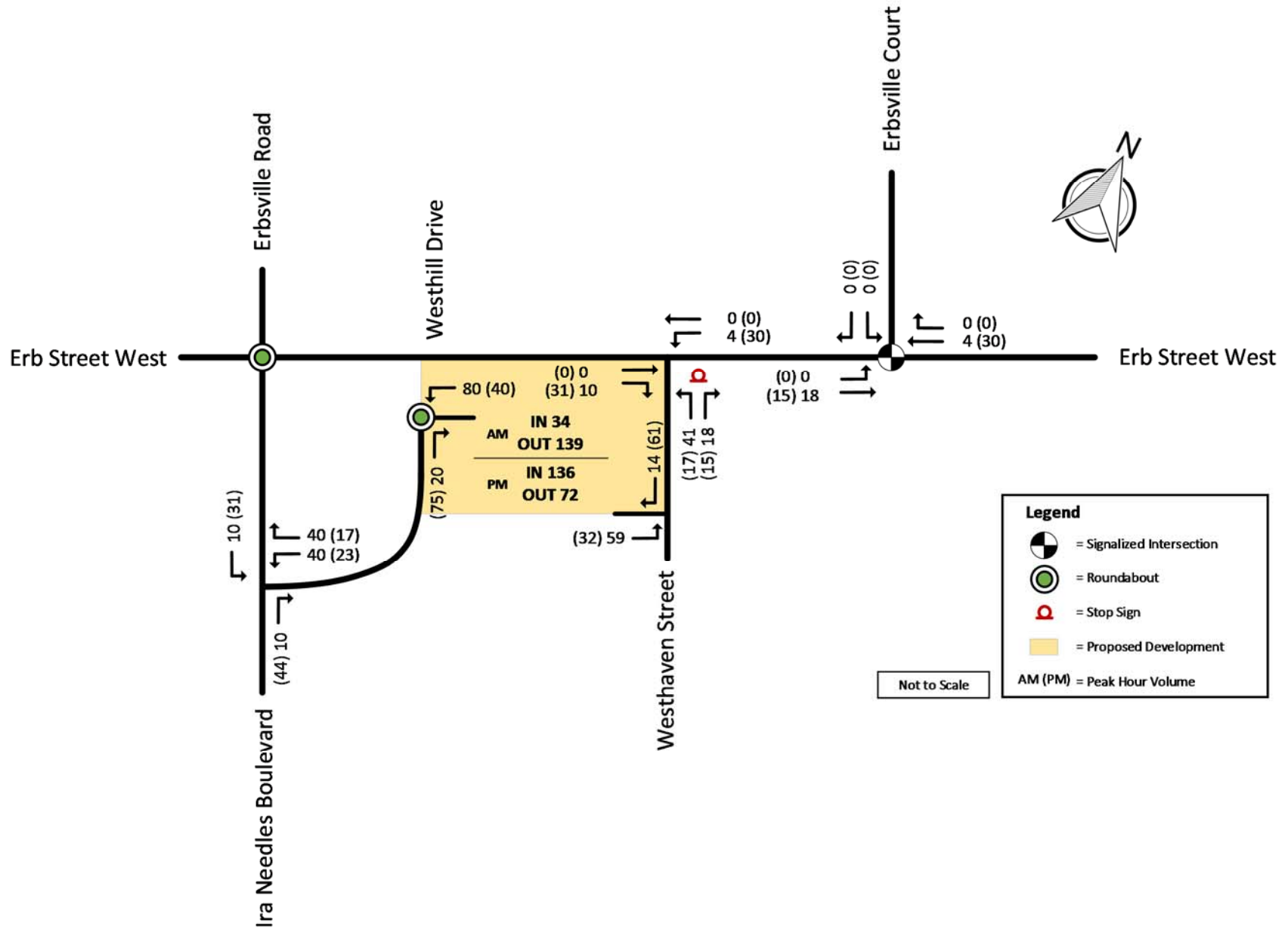
Exhibit 5-2: Trip Distribution

Origin / Destination	% Distribution	
	AM Peak	PM Peak
To / From North: via Erbsville Rd	31%	25%
To / From South: via Ira Needles Blvd	29%	32%
To / From East: via Erb St W	13%	22%
To / From West: via Erb St W	27%	21%
Total	100%	100%

5.4 Site Trip Assignment

Based on the proposed site connectivity and the placement of the resident parking spaces, the assignment of site traffic is provided below in **Exhibit 5-3** .

Exhibit 5-3: Site Traffic Volume Assignment

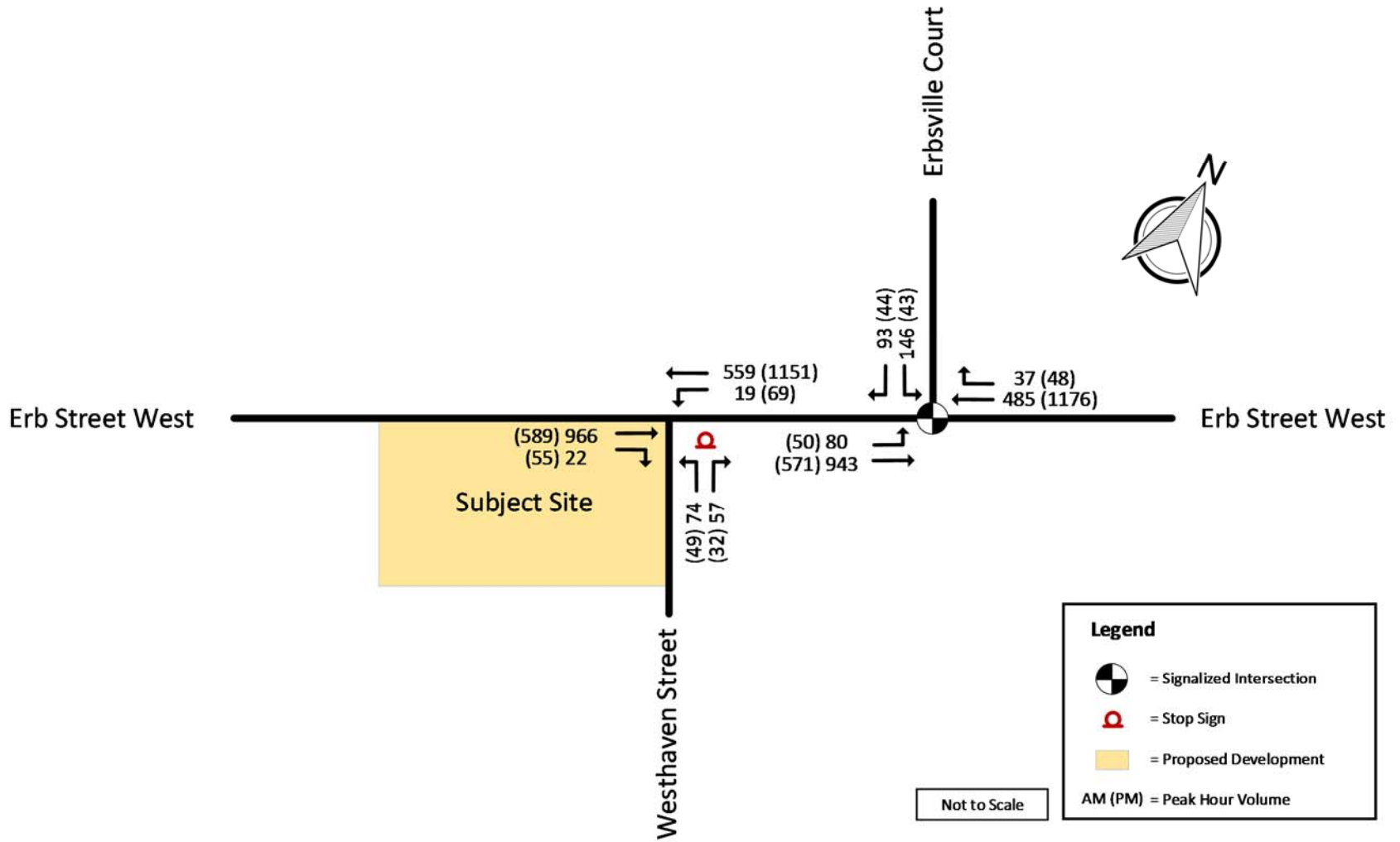


6 2023 Future Total Traffic Conditions

IBI Group added the 2023 future background traffic volumes to the forecasted trips generated by the subject site to establish 2023 future total traffic volumes. This is to correlate with the opening year (assumed to be five years from the date of this report). The 2023 future total volumes shown in **Exhibit 6-1**.

This analysis is based on the assumption that the existing one-way stop control will be maintained at the unsignalized Erb Street West / Westhaven Street intersection, such that no traffic signal will be installed and left turn movements will be occur when there is sufficient gaps in traffic.

Exhibit 6-1: 2023 Future Total Traffic Volumes



The exhibits below summarize 2023 future total traffic operations at the studied intersections. **Exhibit 6-2** summarizes AM and PM peak operations at the signalized Erb Street West / Erbsville Crescent intersection. Synchro outputs are provided in **Appendix E**. Queuing comparisons of existing and future total traffic operations are illustrated in **Appendix F**.

For the weekday AM and PM peak hours, it is anticipated that the intersection will operate well for both peak periods with overall LOS B or better, with no critical operations observed for individual movements. Site related traffic impacts to the intersection operations will be marginal and all queues are anticipated to be comparable to 2023 future background conditions, with a increase of up to four metres for individual movements.

Exhibit 6-2: 2023 Future Total Traffic Operations – Signalized Intersection Results

Intersection	Intersection			Movement					
	LOS	Delay	V/C Ratio	Movement	LOS	Delay (s)	V/C Ratio	95th Percentile Queue (m)	Storage Capacity (m)
AM Peak Hour									
Erb St W & Erbsville Ct	B	12.2	0.51	EBL	A	6.2	0.18	13	50
				EBT	A	7.6	0.46	61	-
				WBT	A	6.2	0.28	30	-
				SBL	D	54.0	0.79	42	55
				SBR	C	32.5	0.07	12	-
PM Peak Hour									
Erb St W & Erbsville Ct	A	7.0	0.56	EBL	A	6.0	0.24	8	50
				EBT	A	3.8	0.25	23	-
				WBT	A	6.0	0.56	66	-
				SBL	D	50.0	0.59	18	55
				SBR	D	38.1	0.05	10	-

Unsignalized operations for the Westhaven Street / Erb Street West intersection are summarized below in **Exhibit 6-3**.

During the AM peak hour, following is noted:

- For the northbound approach is anticipated to operate with up to 71 seconds of delay (LOS F) due to higher outbound site traffic. For a stop controlled intersection, such delays are considered typical at busier roadways. When observing the anticipated residual capacity (V/C ratio of 0.78) and 95th percentile queue length (40 metre), queues are not expected to spill past Westhaven Street, located 45 metres south. Therefore, operations are deemed acceptable in this context.
- In response to potential capacity constraints for the northbound left movement, drivers can choose to exit via the subject site’s western driveway, which would involve making an eastbound right turn onto Ira Needles Boulevard, then west on Erb Street West via the roundabout.

During the PM peak hour, acceptable overall intersection and specific movement operations are anticipated, with no capacity constraints.

As a sensitivity analysis, a signal warrant was conducted for this intersection using the OTM Book 12 Section 4.10 Justification 7 (Projected Volumes) methodology. Via this method, calculations required in Table 19 of the book are summarized in **Appendix G**. Based on the results of the signal warrant, both Justification 1 (98% compliance) and

Justification 2 (84% compliance) do not meet the 120% fulfillment criteria. It is also noted that OTM Book 12 Section 3.7 (Signal spacing) suggests a distance of 215 metres between signalized intersections at a posted speed of 60 km/hr for motorists to recognize and react to each device.

Exhibit 6-3: 2023 Future Total Traffic Operations – Unsignalized Intersection Results

Intersection	Delay (s)	Lane	Lane LOS	Control Delay (s)	Approach LOS	V/C Ratio	Queue, 95th (m)	Storage Length (m)
AM Peak Hour								
Westhaven St & Erb St W	4.8	WBL	B	10.8	-	0.03	1	45.0
		NBL/R	F	60.7	F	0.73	36	-
PM Peak Hour								
Westhaven St & Erb St W	1.6	WBL	A	9.4	-	0.09	2	45.0
		NBL/R	D	30.9	D	0.40	14	-

7 Parking Review

A review of City of Waterloo By-law parking requirements was conducted to determine if the proposed parking provisions are compliant. The following documents were referenced:

- City of Waterloo Existing Zoning By-law Parking Standards;
- City of Waterloo Draft New Zoning By-law (April 18, 2017)¹; and
- City of Waterloo Draft Parking Overlay – Parking Rate Adjustments Schedule A1 (March 20, 2017)².

The subject property is currently zoned Multiple Residential Twelve (MR-12) by the City of Waterloo’s Zoning By-Law (in-effect). The Zoning By-Law requires a minimum parking provision of 1.25 parking spaces per residential unit. Given this standard, a minimum of 419 parking spaces would be required to accommodate the proposed development concept. As the development proposes 422, the parking requirements of the Zoning By-law are met.

It is also noted that the City of Waterloo is currently undertaking a review of its Zoning By-law, and although not yet in effect, it is prudent to consider future changes to the site’s zoning. Specifically, the City has proposed new “Residential Mixed Use 40” zoning for the site. This RMU zoning requires a minimum of 1.25 parking spaces per dwelling unit, which equates to 419 spaces. In addition to this, 0.10 visitor parking spaces per dwelling unit is to be required (34 visitors spaces), leading to an overall total parking requirement of 453 spaces.

Furthermore, the City’s draft Zoning By-law includes a Draft Parking Overlay (Schedule A1), which provides for as-of-right parking reductions. The subject site resides in Parking Area F, where 90% of the existing By-law’s minimum required parking spaces is deemed sufficient.

¹ City of Waterloo, “Draft Zoning Map”, (April 18, 2017), http://www.waterloo.ca/en/contentresources/resources/business/ZBR2_schedule-A.pdf

² City of Waterloo, “Draft Parking Overlay – Parking Rate Adjustments Schedule A1”, (March 20 2017), http://www.waterloo.ca/en/contentresources/resources/business/ZBR2_scheduleA1.pdf.

Therefore, a reduced supply of 377 and 31 residential and visitor parking spaces, totaling 408 spaces, would be required. With a proposed supply of 422 parking spaces proposed, the proposed supply also meets the minimum requirements of the draft new Zoning By-Law.

8 Non-Auto Modes, Transit, Pedestrians, Bicycles

Based on the traffic data obtained, the study area road network and facilities, as well as the proposed site plan, the roadway is anticipated to be able accommodate additional non-auto modes of travel in the study area. The assessment is based on the following:

- Sidewalks facilities: Erb Street West and the surrounding road network has sidewalks that residents of the subject site can utilize to reach transit services and nearby amenities. Traffic data collected indicates minimal pedestrian activity in the study area. Pedestrian connections to the subject site are proposed via two doorways facing Erb Street West, and one pathway facing the Westhill Drive roundabout. Erb Street West crossing opportunities are present via the Erbsville Crescent signalized intersection to the east, and the roundabout to the west.
- Bicycle facilities: Erb Street West has curbside painted bicycle lanes in both directions that residents can utilize. Existing traffic data indicate there is currently no bicycle activity in the study area. The subject site will contain bicycle storage in the basement level on the west side of the property, which residents can access via a basement entry point facing the Westhill Drive roundabout.
- Transit facilities: Residents are within walking distance of GRT Bus Route #15, as mentioned in Section 2.1.

9 Conclusions

This report examined the potential impacts to the study area caused by the proposed development consisting of 297 apartment units and 38 stacked townhouse units, located at 635 Erb Street West.

Background traffic analysis under existing conditions shows that all study area intersections are anticipated to operate with acceptable LOS with no critical movements. This is seen throughout all future background analysis as all intersections operate with overall LOS B or better.

Site traffic for the proposed development was calculated based on the ITE trip generation manual rates. The development generates 173 trips (34 entering, 139 exiting) in the AM peak hour and 208 trips (136 entering, 72 exiting) in the PM peak hour.

In the horizon year of 2023, acceptable traffic operations are expected at the Erb Street West / Erbsville Court signalized intersection during both weekday AM and PM peak hours with no critical movements. During the AM peak hour at the unsignalized intersection of Erb Street West at Westhaven Street, the northbound approach is anticipated to operate with LOS F due to the site generated outbound traffic. However, the movement has sufficient residual capacity, and alternative routes for exiting site traffic, operations here are considered acceptable.

A parking review was also conducted to determine if the proposed parking provisions are compliant with the City's By-law parking requirements. According to the Draft Zoning Map, the subject site resides in an area designated as mixed-use residential (RMU), specifically labelled as "RMU-40". A minimum of 419 residential parking spaces and 34 visitor parking spaces is required, totalling 453 spaces. However, based on the Draft Parking Overlay Schedule A1, the subject site is eligible for a 10% required parking space reduction. Therefore, with a proposed supply of 422 parking spaces, the proposed supply meets the minimum By-law required supply of 408 spaces.

Based on a review of the study area road network, facilities, and the proposed site plan, the roadway is anticipated to be able accommodate additional non-auto modes of travel generated by the subject site within in the study area.

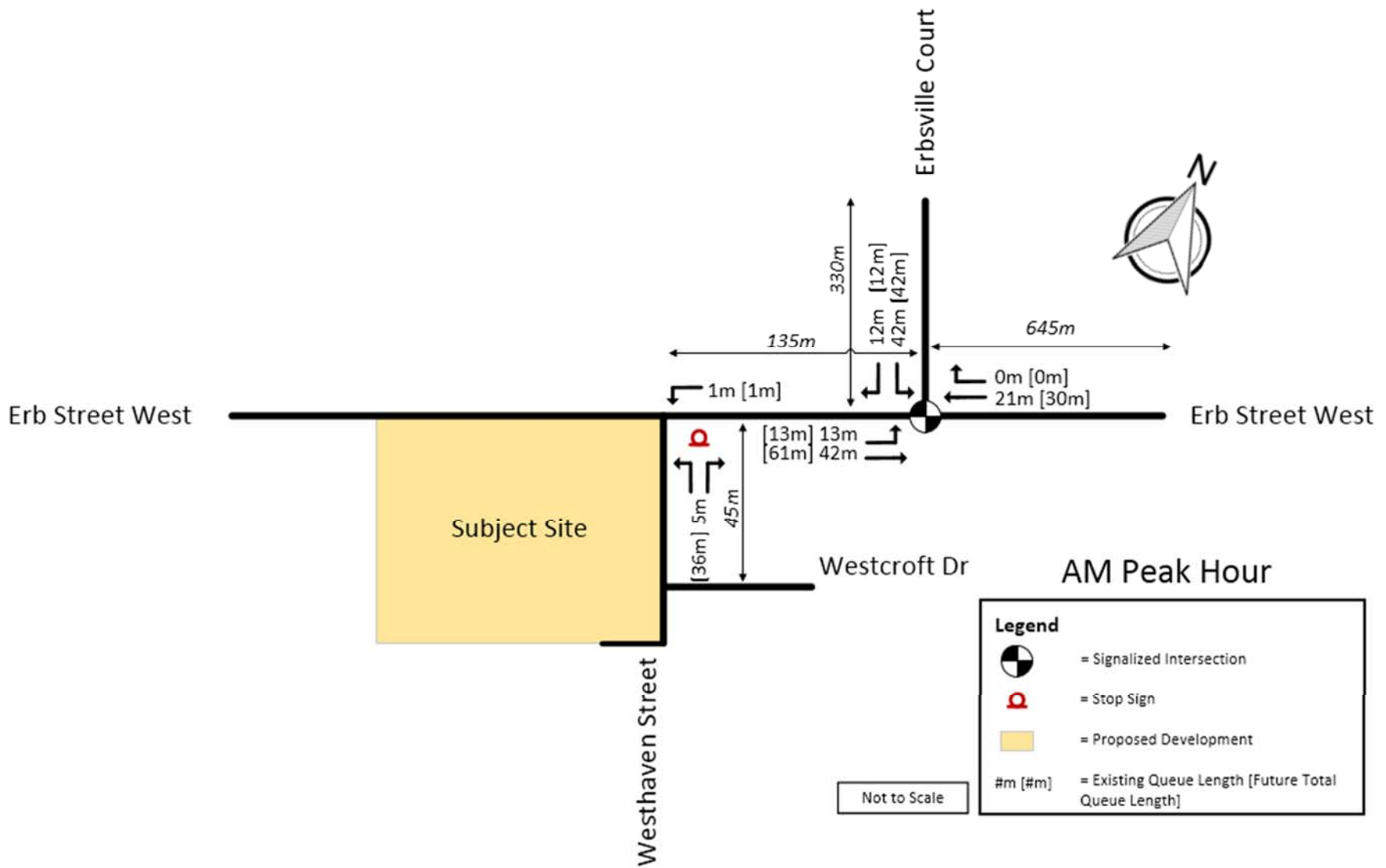
Appendix B – Existing Traffic Conditions: Synchro Outputs

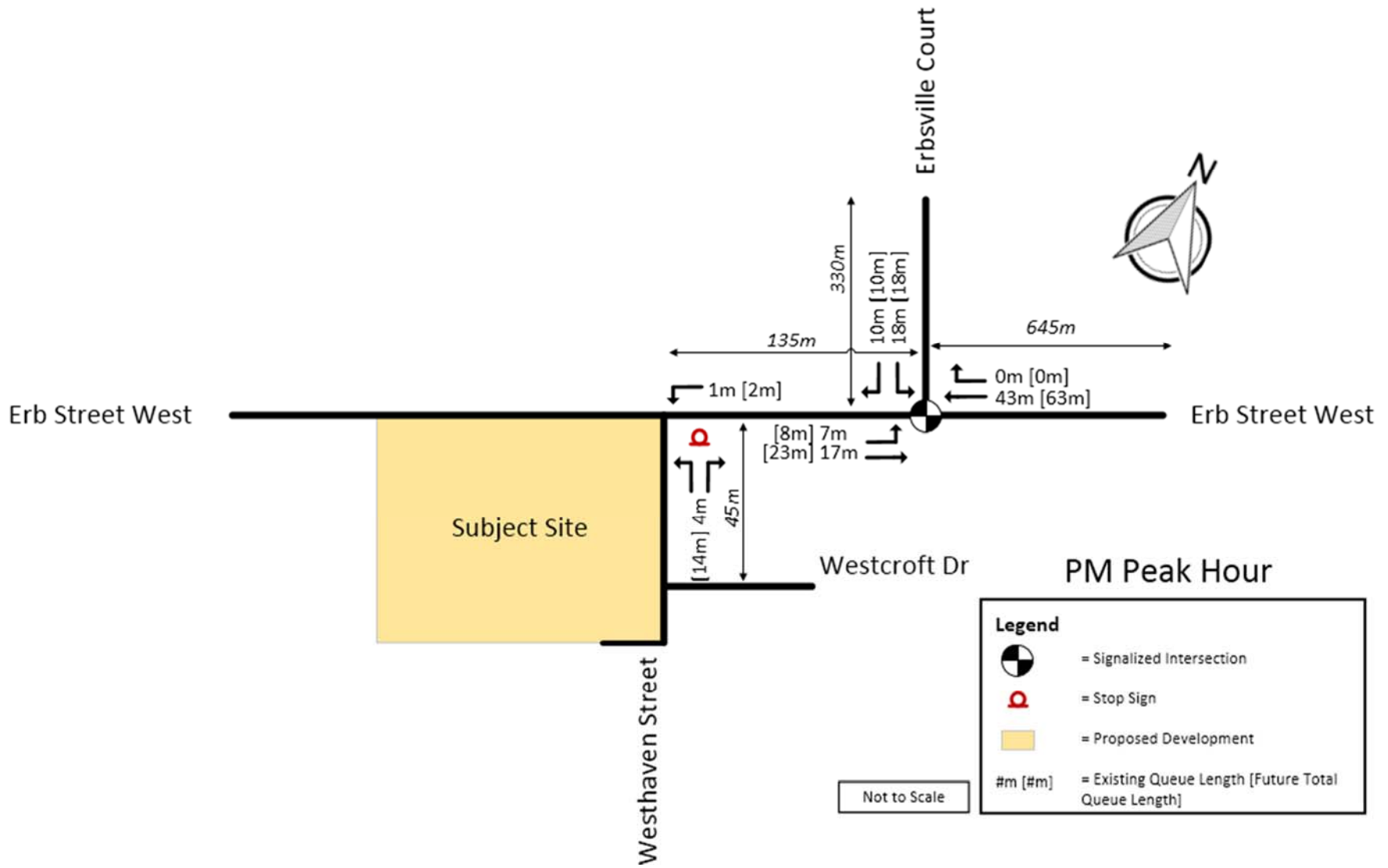
Appendix C – Region of Waterloo Erb Street West AADT Data

Appendix D – 2023 Future Background Traffic Conditions: Synchro Outputs

Appendix E – 2023 Future Total Traffic Conditions: Synchro Outputs

Appendix F – Queuing Analysis Diagrams





Appendix G – Signal Warrant for Erb Street West / Westhaven Street Intersection
