5000 Robert Grant Ave

TIA Final Report

Final

March 2024

TIA Plan Reports

On 14 June 2017, the Council of the City of Ottawa adopted new Transportation Impact Assessment (TIA) Guidelines. In adopting the guidelines, Council established a requirement for those preparing and delivering transportation impact assessments and reports to sign a letter of certification.

Individuals submitting TIA reports will be responsible for all aspects of development-related transportation assessment and reporting, and undertaking such work, in accordance and compliance with the City of Ottawa's Official Plan, the Transportation Master Plan and the Transportation Impact Assessment (2017) Guidelines.

By submitting the attached TIA report (and any associated documents) and signing this document, the individual acknowledges that s/he meets the four criteria listed below.

CERTIFICATION

1. I have reviewed and have a sound understanding of the objectives, needs and requirements of the City of Ottawa's Official Plan, Transportation Master Plan and the Transportation Impact Assessment (2017) Guidelines;
2. I have a sound knowledge of industry standard practice with respect to the preparation of transportation impact assessment reports, including multi modal level of service review;
3. I have substantial experience (more than 5 years) in undertaking and delivering transportation impact studies (analysis, reporting and geometric design) with strong background knowledge in transportation planning, engineering or traffic operations; and
4. I am either a licensed[1] or registered[2] professional in good standing, whose field of expertise [check √ appropriate field(s)] is either transportation engineering ☑ or transportation planning ☐.

[1,2] **License of registration body that oversees the profession is required to have a code of conduct and ethics guidelines that will ensure appropriate conduct and representation for transportation planning and/or transportation engineering works.**

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Dated at Ottawa this 05 day of March, 2024 .
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5000 Robert Grant Ave

TIA Final Report

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March 5, 2024

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TIA FINAL REPORT

Parsons has been retained by Fernbank Apartments Inc. to prepare a TIA in support of a Site Plan Control Application for a proposed residential development located at the municipal address of 5000 Robert Grant Ave. This document follows the TIA process as outlined in the City of Ottawa Transportation Impact Assessment (TIA) Guidelines (2017). The following report represents Step 5 – TIA Final Report. The Screening Form has been provided in **Appendix A**.

1.0 SCREENING FORM

The Screening Form confirmed the need for a TIA Report based on the Trip Generation trigger. The Trip Generation Trigger was met as the development is anticipated to generate more than 60 person trips during peak hours and the Location Trigger was met as the development is located adjacent to Robert Grant cycle-tracks with crosstown bikeway classification along with adjacent to a future proposed BRT corridor on Robert Grant Ave. The proposed development did not satisfy the Safety Triggers.

2.0 SCOPING REPORT

2.1. Existing and Planned Conditions

2.1.1. Proposed Development

The proposed development is located at the municipal address of 5000 Robert Grant Ave, bounded by Robert Grant Ave to the west and Livery St to the east. The site is currently zoned as Arterial Mainstreet, AM[2152] F(3.5) S437-h. The site context is illustrated in **Figure 1**.

The development is proposed as three (3) residential towers referred to as pavilions totaling 504 new residential units and 203 m^2 of commercial ground floor retail, with building breakdowns provided in **Table 1**.

The development will provide a total of 651 parking spaces located in an underground parking garage. A central courtyard is surrounded by three pavilions as shown in **Figure 2**. The courtyard is a notable amenity for residents.

The development will provide two vehicular accesses; a primary all movement access to Robert Grant Ave that connects to underground parking garage, the courtyard area, moving areas and limited visitor parking; the secondar access is proposed via Livery St, which will provide another access to the underground parking garage, garbage pick-up and moving area for Pavilion A. The proposed development is anticipated to be constructed in two-phases, with Pavilion A and B plus the courtyard and both accesses constructed in the first phase and Pavilion C ensuing the construction of the first phase with an assumed full-buildout year of 2025.

Table 1: Proposed Site Statistics

Pavillion	Number of Storeys	Number of Units	Proposed Commercial Space (ft^2)
A	6	122	0
B	9	163	0
C	18	219	2,185 ft^2
	Combined Totals	504	2,185 ft^2

Figure 1: Local Context

Figure 2: Proposed Site Plan

2.1.2. Existing Conditions

Area Road Network

A description for each road within the study area included in the TIA has been provided below.

Robert Grant Ave is a north-south arterial road that is currently fragmented with plans to be extended abd connected in the future. Within the study area, the road extends from Fernbank Road in the south to Abbot St E in the north. Outside of the study area, the road extends from Huntmar Rd to Palladium Dr. The roadway consists of a two-way two-lane undivided urban cross-section with a posted speed limit of 60 km/h.

Abbott Street E is an east-west major collector roadway that extends from Terry Fox Dr in the east to West Ridge Dr in the west. Within the study area, the roadway typically operates as a two-way two-lane undivided urban cross-section with a posted speed limit of 50km/h.

Fernbank Road is an east-west arterial road that extends from Eagleson Rd in the east to Dwyer Hill Rd in the west. Within the study area, the roadway typically operates as a two-way two-lane undivided urban cross-section with a posted speed limit of 60 km/h.

Bobolink Ridge is an east-west local road that extends from Asturcon St in the east to Angel Heights in the west. The roadway operates as a two-way two-lane undivided urban cross-section with a posted speed limit of 40km/h.

Cope Drive is an east-west collector road that extends from Eagleson Rd in the east to Goldhawk Dr in the west. The roadway operates as a two-way two-lane undivided urban cross-section with a posted speed limit of 50km/h.

Haliburton Heights is an east-west local road that extends from Continental Ave in the east to Robert Grant Ave in the west. The roadway operates as a two-way two-lane undivided urban cross-section with an assumed speed limit of 50km/h.

Livery Street is an east-west local road that extends from Asturcon St in the east to Robert Grant Ave in the west. The roadway operates as a two-way two-lane undivided urban cross-section with an assumed speed limit of 50km/h.

Existing Study Area Intersections

Abbott St E/Robert Grant Av

The Abbott/Robert Grant intersection is currently a three-legged single lane roundabout, where the southbound approach is expected to be constructed within the next 3 years. All approaches consist of a single shared all-movement lane. Pedestrian crossing facilities are provided on the south and west legs while the crossings on the north and east legs have not been completed yet.

Bobolink Rdg/Robert Grant Ave

The Bobolink/Robert Grant intersection is a four-legged single lane roundabout. All approaches consist of a single shared all-movement lane. Pedestrian crossing facilities are provided on all approaches.

Cope Dr/Robert Grant Ave

The Cope/Robert Grant intersection is a four-legged single lane roundabout. All approaches consist of a single shared all-movement lane. Pedestrian crossing facilities are provided on all approaches.

Haliburton Hts/Robert Grant Ave

The Haliburton/Robert Grant intersection is a three-legged "T" intersection with STOP control on the westbound approach. The eastbound approach has been partially built and will be finished in the upcoming years. The westbound approach consists of a single shared-movement lane. The northbound and southbound approaches consist of a shared through-right lane and a left-turn lane.

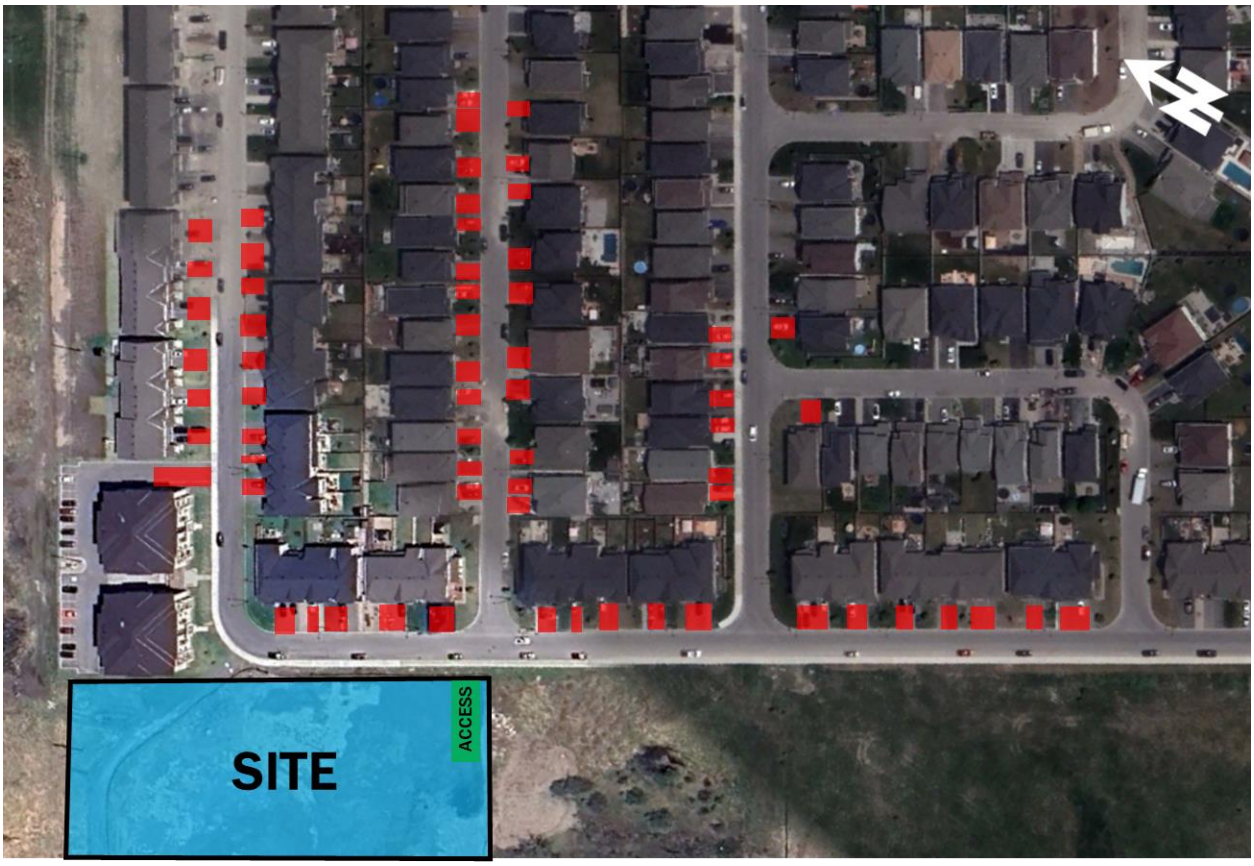
Fernbank Rd/Robert Grant Ave

The Fernbank/Robert Grant intersection is a three-legged signalized intersection. The eastbound approach consists of one auxiliary left-turn lane and one through lane. The westbound approach consists of one through lane and one auxiliary right-turn lane. The southbound approach consists of one auxiliary left turn lane and one right-turn lane. Pedestrian crossings are provided on all legs of the intersection.

Existing Driveways to Adjacent Developments

There are approximately 64 adjacent driveways within 200m of the proposed development access along Livery St, where 63 lead to detached homes and 1 driveway along Livery serves two three-storey condo buildings as shown in **Figure 3**.There are no adjacent driveways within 200m to the Robert Grant Ave access.

Figure 3: Adjacent Driveways within 200m of Site Access



Existing Area Traffic Management Measures

Existing area traffic management measures within the study area include “stop for pedestrian” signs at various crosswalks and 40km/h reduced speed areas.

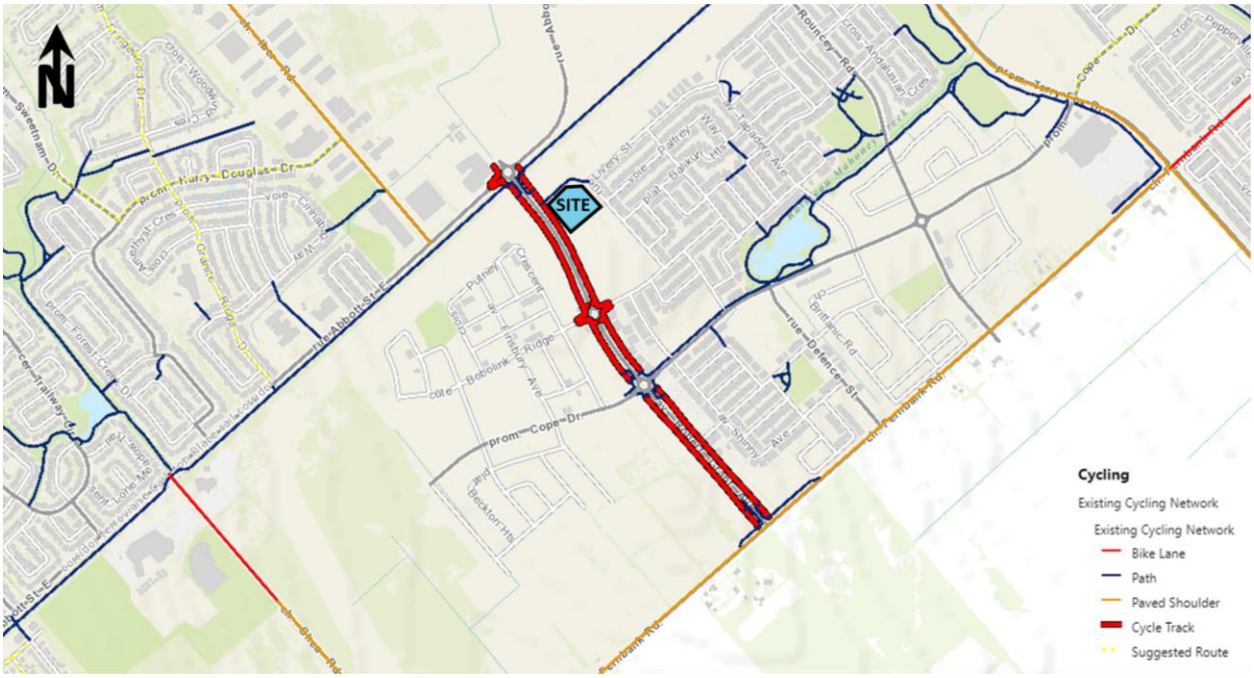
Existing Pedestrian/Cycling Network

Sidewalks are provided on both sides of Robert Grant Ave, on the north side of Abbott St E, the north side of Bobolink Dr, the south side of Cope Dr, south side of Haliburton Hts and the west side of Livery St. There are no existing sidewalks on Fernbank Rd, however, a multi-use pathway (MUP) exists on the north side of Fernbank Rd extending approximately 100m east and 200m west of Robert Grant Ave which then drops to a paved shoulder facility. A sidewalk landing pad is provided on the south side of Fernbank Rd but does not extend beyond the Fernbank/Robert Grant intersection. A MUP is also provided on the south side of Abbott St E and on the north side of Cope Dr. The Ottawa Pedestrian Plan (2013) does not identify any future projects within the study area.

The City of Ottawa's 2013 Cycling Plan Identifies Robert Grant Ave and Fernbank Rd as Spine Routes, and Abbott St E as a major pathway. The Crosstown Bikeway Network (March 1, 2023)[1] from the New Transportation Master Plan classifies Robert Grant Ave and Abbott St E as crosstown bikeways. The Official Plan and New TMP Policies states that all arterial, major collector and collector roads are to be upgraded to include dedicated cycling facilities in both directions at time of reconstruction and redevelopment, while all new ones will provide them when they are first built. All arterial, major collector and collector roads should be treated as spine bike routes. Cycling facilities include cycle tracks on Robert Grant Ave on both sides and a pathway on the south side of Abbott St E. There are no existing cycling facilities extending on Fernbank Rd, however a bi-directional cross-ride with short receiving MUPs that recede into a paved shoulder currently exists on the north approach.

The cycling facilities have been illustrated in **Figure 4**.

Figure 4: Existing Study Area Cycling Facilities



Transit Network

The following description of OC Transpo routes within the study area reflect the current bus operations:

- **Route #62 (Tunney's Pasture <-> Terry Fox, Stittsville):** identified by OC Transpo as a "Rapid Route", this route operates all day, 7 days a week in all time periods. This route provides connectivity to the Confederation LRT Line at Tunney's Pasture, connectivity to Bayshore Shopping Center, Canadian Tire Center and other destinations within Kanata and Stittsville.

[1] Crosstown Bikeway Network, March 1, 2023

The nearest bus stop to the site is located along Abbott St E and Iber Rd, located approximately 600m from the site.

- **Route #67 (Tunney's Pasture, Terry Fox<-> Cope):** identified by OC Transpo as a "Local Route", this route operates with a custom routing to local destinations. This route provides connectivity to Terry Fox Station, Bayshore Shopping Center, Lincoln Fields and Confederation LRT Line at Tunney's Pasture. The nearest bus stop to the site is located on Cope Dr, approximately 600m from the site.

The transit network for the study area is illustrated in **Figure 5** and the transit route maps are provided in **Appendix B**. **Figure 6** illustrates the bus stop locations.

Figure 5: Area Transit Network

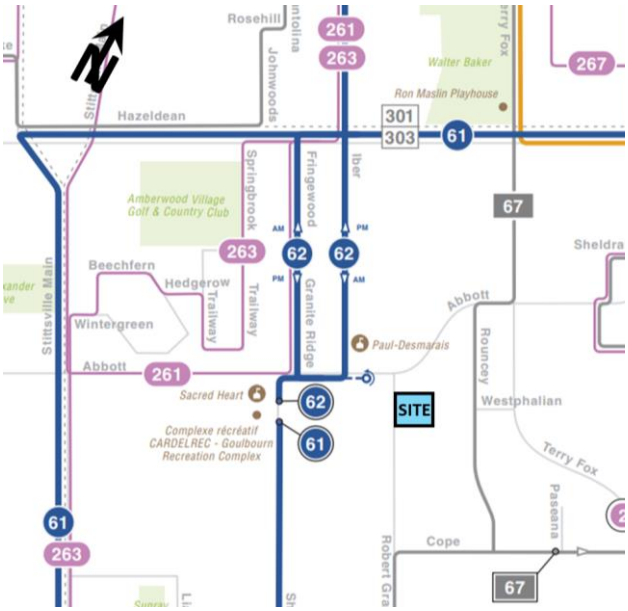
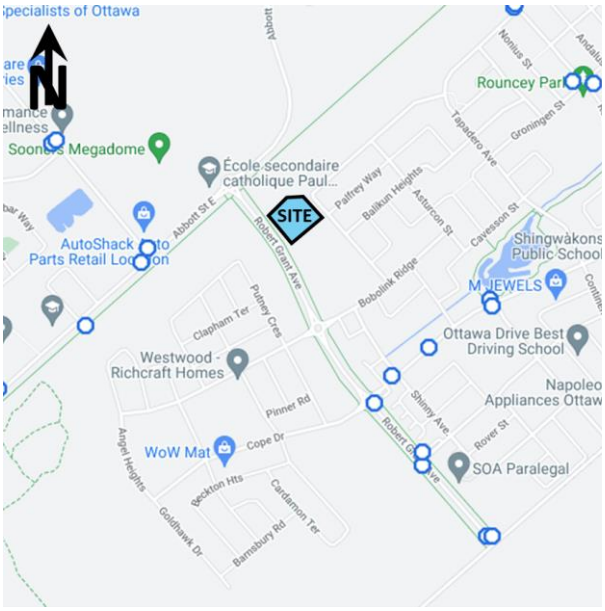


Figure 6: Bus Stop Locations

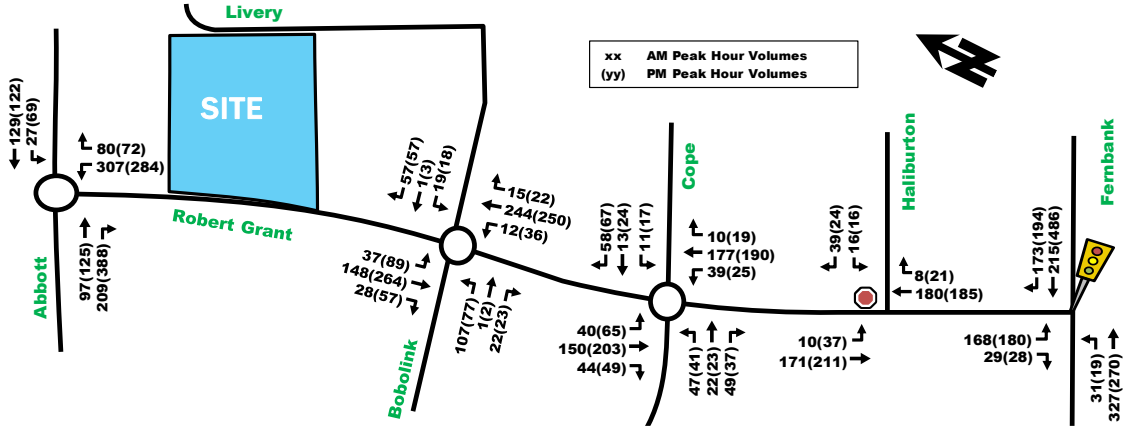


Peak Hour Travel Demands

Traffic count data was performed by Parsons at study area intersections in August 2023 and obtained from the City of Ottawa for Fernbank/Robert Grant (2018 count).

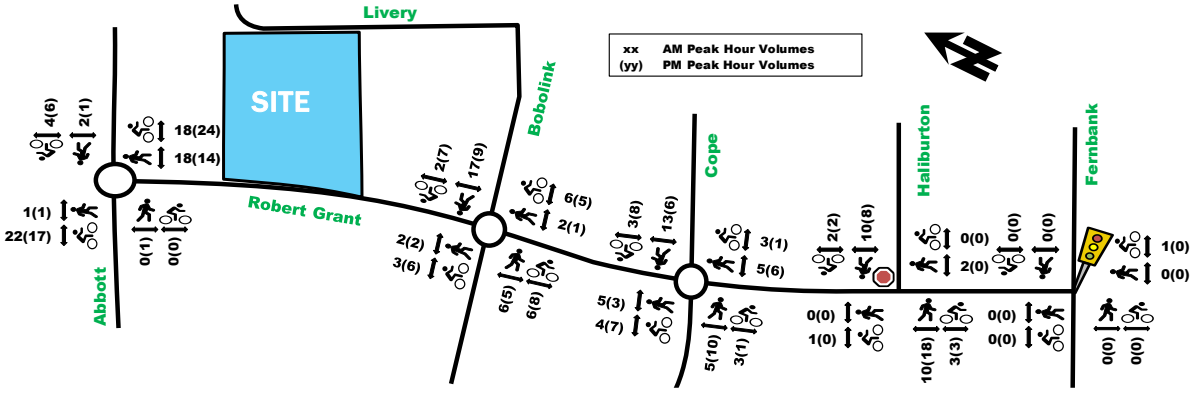
The traffic volumes at study area intersections are illustrated in **Figure 7**, with raw traffic count data provided in **Appendix C**. Existing active transportations volumes have been provided in **Figure 8**.

Figure 7: Existing Peak Hour Vehicle Traffic Volumes



Note: Fernbank/Robert Grant was grown 2% annually to achieve 2023 volumes

Figure 8: Existing Pedestrian and Cyclists Peak Hour Volumes



Existing Road Safety Conditions

A five-year collision history data (2017-2021, inclusive) was obtained from the City of Ottawa's Open Data webpage for all intersections and road segments within the study area. Robert Grant Ave only became operational around 2017 and has mainly functioned to serve the recently built developments. Since 2017, the adjacent neighbourhoods have slowly become occupied and the surrounding population and traffic volumes on study area intersections have gradually increased.

Given the low traffic volumes during the first few data years, low frequency of collisions has occurred. Within the 5 study area intersections, only 9 total collisions have been recorded within the 5 years, with at least one but less than 4 collisions on each intersection except for Haliburton/Robert Grant which had zero.

No collision patterns could be determined based on the low number of collisions. It is noteworthy however that of the 9 collisions, one involved a cyclist at Cope/Robert Grant causing non-fatal injury and one involved a pedestrian at Abbott/Robert Grant, also causing a non-fatal injury. No collisions were recorded within road segments between intersections. Collision data has been provided in **Appendix D.**

2.1.3. Planned Conditions

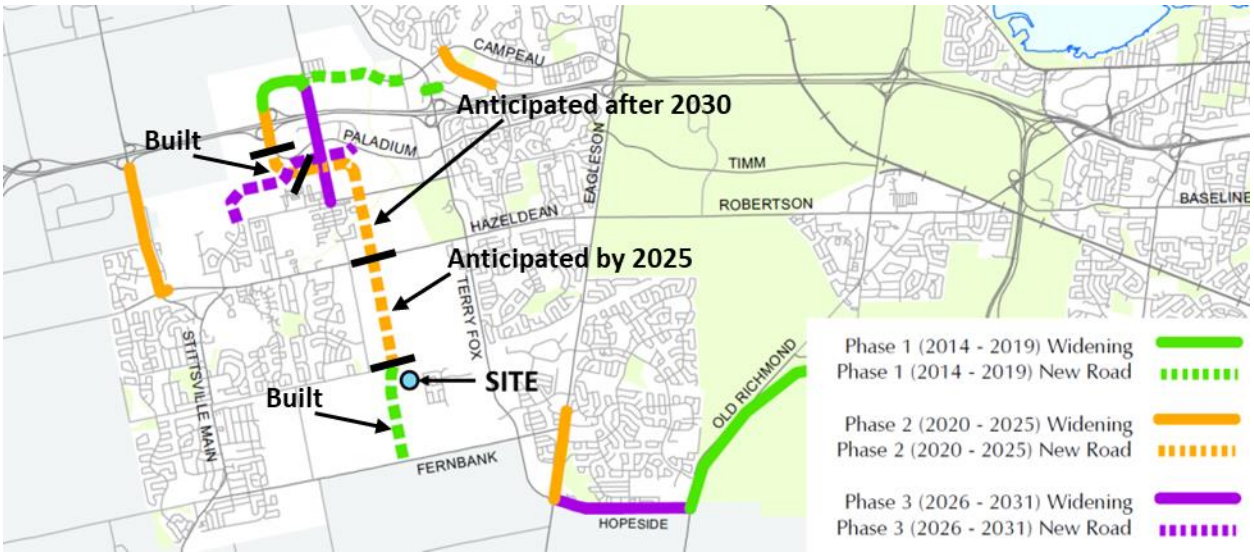
Future Transportation Network Changes

Transportation Master Plan (2013 & On-Going)

An update to the 2013 Transportation Master Plan (TMP) is currently ongoing. Details such as policy and active transportation project list have been released, but a detailed network map such as the "affordable network" has not been released yet. The complete TMP update is forecasted for 2025. It is generally understood however that the previous goals and horizon year estimates for future transportation project construction within the affordable network (forecasted by 2031 within the 2013 TMP) have fallen behind schedule due to funding constraints. The new TMP should provide updated timelines for future transportation related projects.

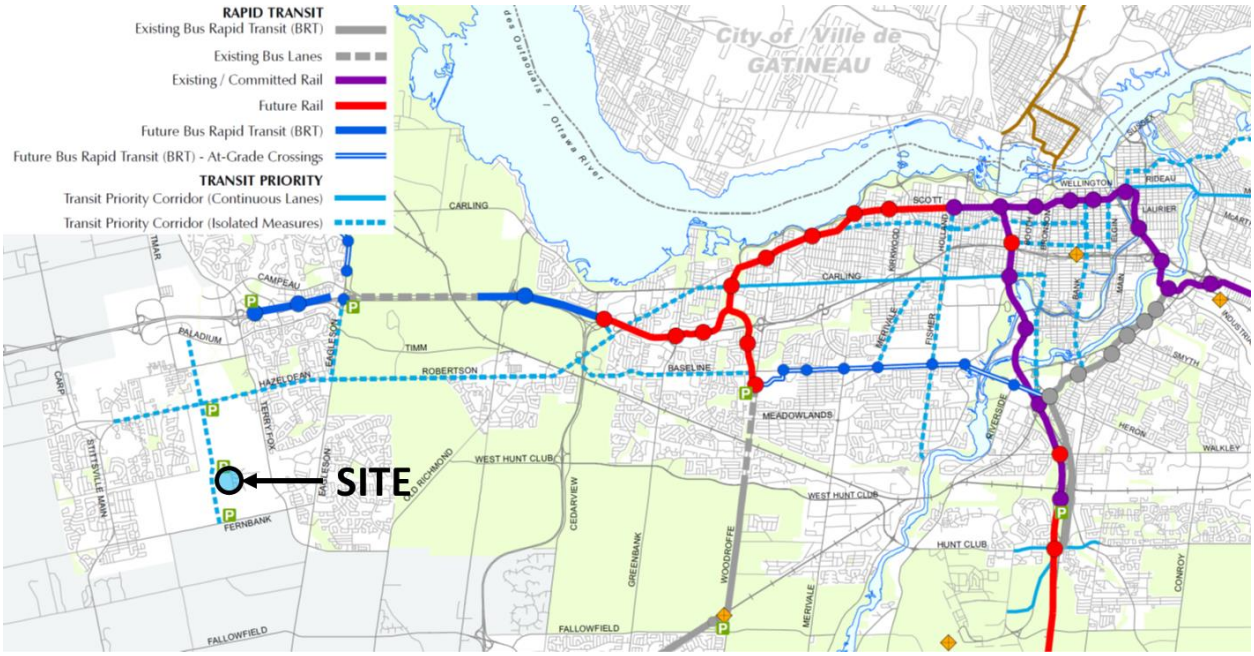
According to the 2013 TMP, Map 11 highlights horizon years for the extensions of Robert Grant Ave. Today, Robert Grant Ave is fragmented, with a short segment of road extending from Palladium Dr to Huntmar Dr and another segment from Abbott St E to Fernbank Rd. It was confirmed by City of Ottawa Staff that the segment of Robert Grant Ave from Abbott St E to Hazeldean Rd is anticipated to be built by the 2025 horizon, however the remaining extension from Hazeldean Rd to Huntmar Dr and Palladium Dr is not anticipated within the 2030 horizon year. **Figure 9** illustrates Map 11 from the TMP with markups of new horizon timelines based on conversation with City of Ottawa Staff.

Figure 9: Map 11 TMP – Future 2031 Affordable Road Network



The Affordable Network within the TMP highlights Robert Grant Ave as a transit priority corridor with isolated measures from Palladium Dr to Fernbank Rd as shown in **Figure 10**. This transit priority corridor would be built by the 2031 horizon in ideal conditions; however, City of Ottawa Staff have confirmed that this transit priority corridor is not anticipated by that date due to lack of funding availability.

Figure 10: TMP Transit Affordable Network for 2031 Horizon

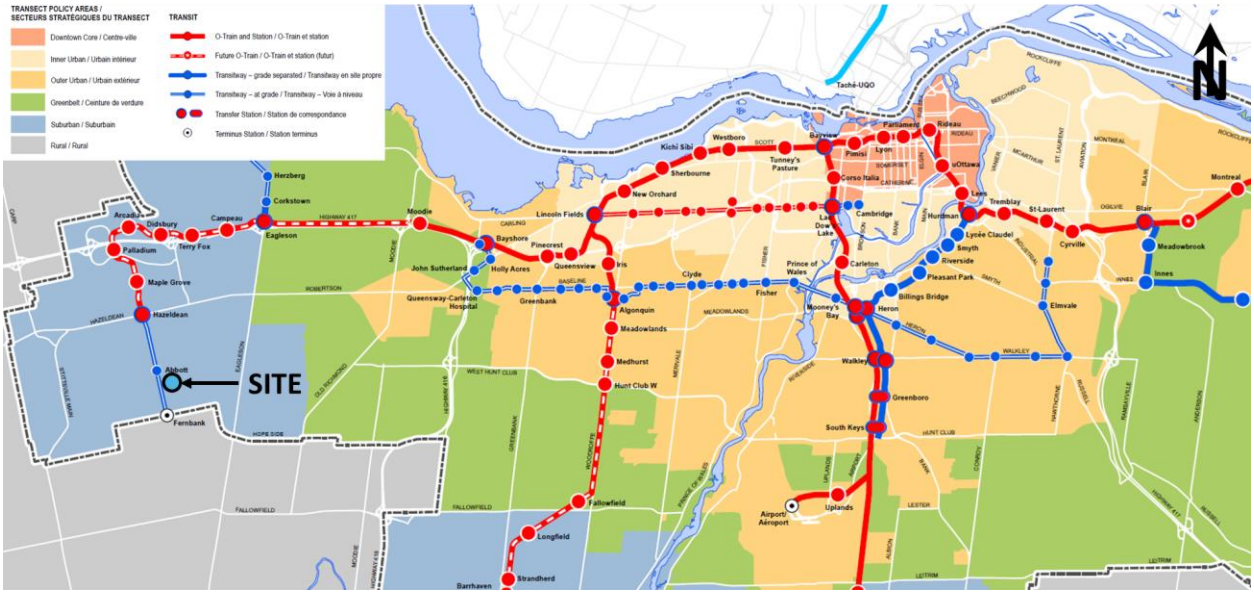


Ottawa Light Rail Transit (LRT) Stage 2 and 3 Expansion & New Official Plan (2021)

The City of Ottawa is currently in the process of expanding its two LRT Lines as part of Stage 2 Expansion. Stage 2 is a package of three extensions – south, east and west – totaling 44 km of new rail and 24 new LRT stations. Within the New Official Plan for the City of Ottawa, further LRT extensions and bus rapid transit (BRT) corridors are proposed. Based on city direction, it is anticipated that Stage 3 extension of the LRT will include an expansion into Kanata and Stittsville, along other destinations as shown in **Figure 11** and in full detail in **Appendix E.** According to the New Official Plan, the furthest southwest extension of LRT would reach Hazeldean

Station, where a BRT at grade transitway route would continue south on Robert Grant Ave, fronting the site. However, this expansion is not included within the 2031 Affordable Network within the TMP, and further updates from City Town Hall meetings suggests that the City is not in a position to fund the Stage 3 LRT Expansion unless it is paid for by the Federal and Provincial Governments.

Figure 11: New Official Plan – Ultimate Rapid Transit Network

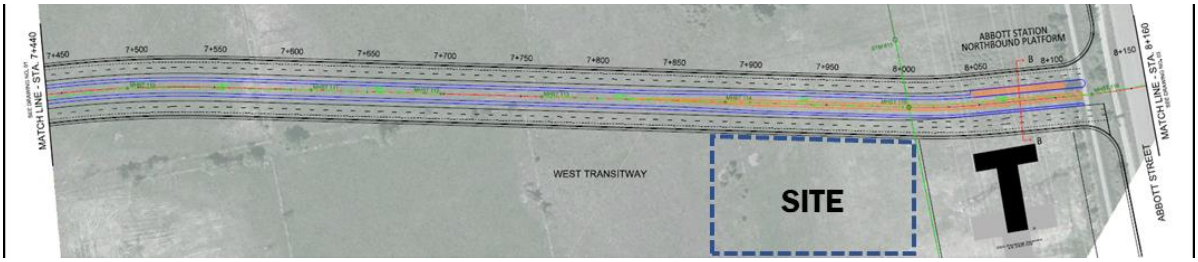


Robert Grant Ave Transit Services

Robert Grant Avenue is identified as a transit priority corridor with isolated measures in the Affordable Network Plan within the Transportation Master Plan (TMP) north of Fernbank Rd and a future Bus Rapid Transit (BRT) corridor with an at-grade transitway in the Network Concept Plan for the New Official Plan. Additionally, Park and Rides have been proposed at the Abbot E/Robert Grant and Fernbank/Robert Grant intersections in the Affordable Network Plan, the Network Concept Plan and the Fernbank Community Design Plan.

To accommodate the future transit priority, Robert Grant would need to be redesigned. A high-level design for Robert Grant Ave was completed as part of the West Transit Way Connections (Terry Fox Dr. to Fernbank Rd) EA study, which recommended exclusive bus lanes along the roadway median and widening of Robert Grant Ave from a 2-lane general traffic cross-section to a 4-lane general traffic cross-section. The design also featured the possible location for future Abbott BRT station, and park and ride location as shown in **Figure 12**. If built, the future Abbott rapid transit station would be located along the north property edge of the site. City of Ottawa Staff confirmed that widening and a median transitway along Robert Grant will not be completed within the TIA horizon years and there is no assurance this project will be included in the future TMP. OC Transpo was contacted to inquire about future routes on Robert Grant Ave but no information has been provided yet. It is assumed that transit routes will operate on Robert Grant Ave in the near future to service the newly built developments. Transit routes will likely begin as a local route and upgraded in frequency as ridership demand increases.

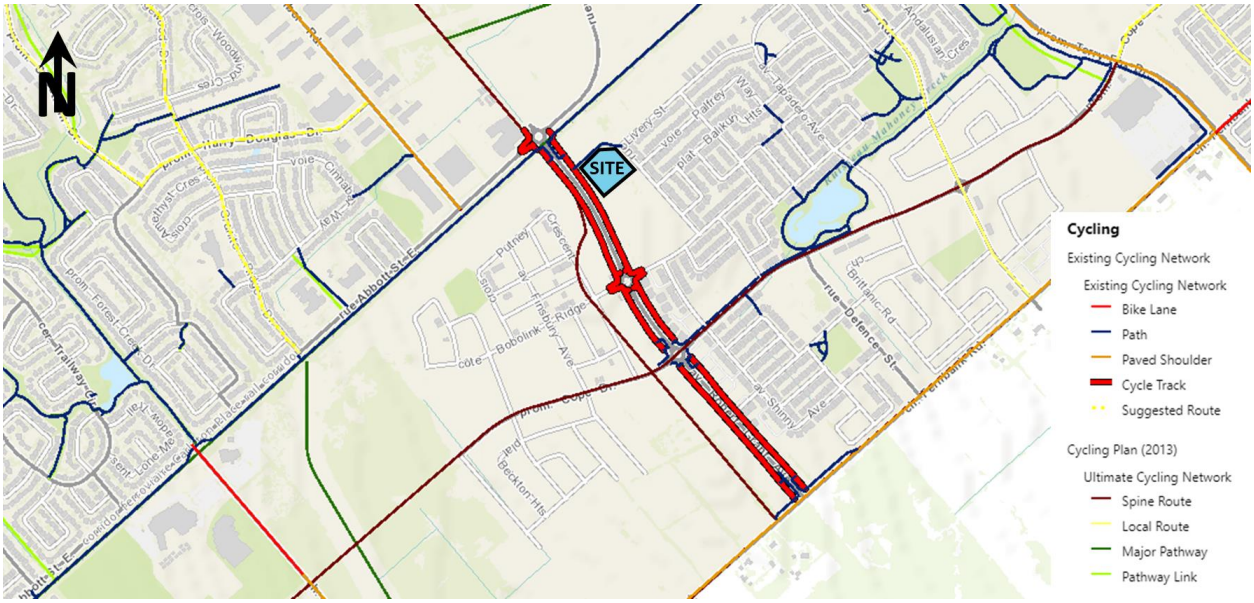
Figure 12: Future Robert Grant Ave Concept with Median BRT



Ultimate Cycling Network Plan

Within the cycling plan, Robert Grant Ave and Cope Dr are identified as a future spine routes. Abbott St E is classified as a major pathway and Fernbank Rd will have paved shoulders. Various local streets have a proposed future local route classification. The future cycling network is illustrated in **Figure 13**. As mentioned earlier, in the 2023 TMP update, Robert Grant Ave and Abbott St E are classified as crosstown bikeways.

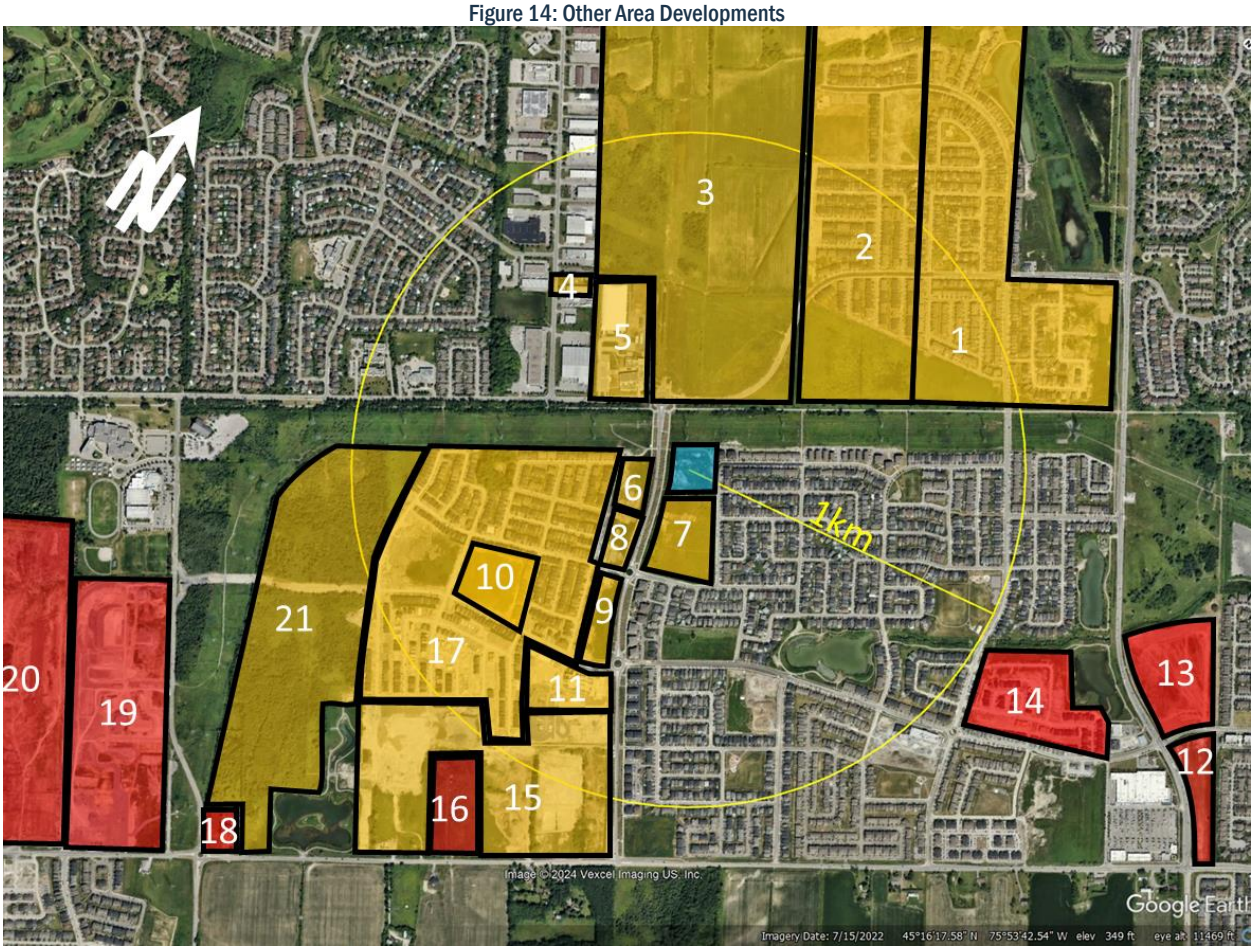
Figure 13: Ultimate Cycling Network Map



Other Area Developments

The developments summarized in **Table 2** are planned near the subject site based on the latest information from the City of Ottawa development application wizard. The location of the site and the adjacent future developments are shown below in **Figure 14**.

Figure 14: Other Area Developments



Note: Areas in orange will be considered for background volumes, while areas in red have been described below but exceed the 1km radius for other area developments. The teal square is the proposed site.

Table 2: Other Area Developments

Map Ref.	Development	Land Use	Est. Buildout Year	% Built	Projected Vehicle Trips Generated			
					AM		PM	
					In	Out	In	Out
1	570 Hazeldean Rd	600 Residential Units	2021	95%	70	238	309	173
2	590 Hazeldean Rd	227 Single Detached, 518 Townhomes	2020	100%	Was featured in previous TIA. It has been fully built since then.			
3	5618 Hazeldean Rd	288 Single Detached, 469 Townhouses, 878 Multi-Family Housing (Low Rise), 360 Apartments (High Density), 760 Apartments and 351,334 ft² of Retail, 580 Student Elementary School, 375 Space Park and Ride	2030	0%	455	814	1036	803
4	155 Iber Rd	10,000 ft² Warehouse	–	0%	No TIA found.			
5	5315 Abbott St	16 Classrooms	2024	0%	Negligible new trips.			
6	723 Putney Rdg	112 Townhomes	–	0%	Project on hold			
7	360 Bobolink Rdg	360 Multi-Family Mid-Rise	2024	0%	23	51	42	31
8	585 Bobolink Rdg	76 Townhomes	–	0%	No TIA found.			
9	620 Bobolink Rdg	84 Multi-Family High Rise	–	0%	5	11	9	7
10	700 Cope Dr	High school	2024	70%	205	107	133	206
11	755 Cope Dr	Elementary School 4,781 m² GFA, 751 students, 49 children (daycare), 51 staff	2023	0%	126	94	52	72
					Captured in CRT Lands P1 and P2			
12	5331 Fernbank Rd	195 Condominiums	2023	0%	10	21	24	18
					Too far from development			
13	1039 Terry Fox Dr	55 Single Detached Homes, 129 townhouses	2022	0%	36	98	118	50
					Too far from development			
14	5505 Fernbank Rd (Cardel Homes Section)	112 Single Detached Homes, 92 Townhouses	2021	50%	23	85	86	49
15	5725 Fernbank Rd (CRT Phase 3)	206 Single Detached Homes, 391 Townhomes	2025	0%	129	253	247	193
16	5769 Fernbank Rd	70 Single Detached Homes	2025	0%	14	35	38	25
17	5786 Fernbank Rd (CRT Phase 1 & 2)	510 Single Detached Homes, 364 Townhomes, elementary school (755 Cope Dr), high school (700 Cope Dr)	2025	80%	295	479	429	265
18	5897 Fernbank Rd	Clinic 2,287 ft², Shopping Centre 59,740 ft²	2024	0%	39	19	106	120
19	5969 Fernbank Rd	119 Single Detached Homes, 238 Townhomes	2020	0%	69	170	191	120
20	6015 Fernbank Rd	234 Single Detached Homes, 140 Semi Detached Homes, 262 Townhomes	–	–	No TIA found.			
21	1555 Shea (CRT Phase 4)	286 Single Detached Homes, 270 Multi-Family Low Rise, 54 Multi-Family High Rise	2025	0%	76	177	165	111

2.2. Study Area and Time Periods

For the purposes of this report, the proposed development is assumed to be fully constructed by 2025. Although two phases of construction are proposed, no significant change in transportation network are proposed between each phase. For this reason, only the full buildout scenario and five-years after development buildout will be analyzed, 2025 and 2030. As per City Staff guidance, the widening and implementation of the median transit lanes on Robert Grant Ave will not be in place by 2030. Only the extension of Robert Grant Ave from Abbott St to Hazeldean Rd is anticipated to be built by the 2025 horizon.

The future horizon years analyzed will use the weekday morning and afternoon peak hour traffic volumes. Proposed study area intersections are listed below and illustrated in **Figure 15**.

- Abbott/Robert Grant
- Bobolink/Robert Grant
- Cope/Robert Grant
- Haliburton/Robert Grant
- Fernbank/Robert Grant
- Site Accesses

Figure 15: Study Area and Intersections to be Analyzed

2.3. Exemption Review

The following modules/elements of the TIA process provided in **Table 3** are recommended to be exempt in the subsequent steps of the TIA process, based on the City's TIA guidelines and the subject site:

Table 3: Exemptions Review Summary

Module	Element	Exemption Consideration
4.1 Development Design	4.1.3 New Street Network	Only required for plans of subdivision
4.8 Network Concept	All	Only required for ZBLA applications.

3.0 FORECASTING

3.1. Development Generated Travel Demand

3.1.1. Trip Generation and Mode Shares

Trip Generation Rates

The proposed development will consist of 504 apartment units and approximately 2,185 ft^2 of ground floor retail space located within three pavilions. The retail space is small and will likely provide ancillary uses for the high-density residential units and is expected to be intended for local residents and local community only. As such, it is not expected to be a regional attraction and is not anticipated to generate new trips. The appropriate trip generation rates for high-rise apartment units were obtained from the 2020 TRANS Trip Generation Manual. The Manual provides person-trip rates during the peak AM and PM periods (i.e. 7am-9:30am and 3:30pm-6pm). The trip rates are summarized in **Table 4** below.

Table 4: Proposed Development Trip Rates

Land Use	ITE/TRANS Designation	Data Source	Trip Rates	
			AM Peak	PM Peak
Residential	"High-Rise Apartments"	TRANS	T = 0.80(du);	T = 0.90(du);
Note: T = Average Vehicle Trip Ends; du = Dwelling unit				

Using the TRANS Trip Generation rates from **Table 4**, the total amount of person trips generated by the proposed 504 residential units was calculated by multiplying the rate by the number of units, for the morning and afternoon peak periods, as shown in **Table 5**.

Table 5: Residential Units Peak Period Person Trip Generation

Land Use	Dwelling Units	AM Peak Period Person Trips	PM Peak Period Person Trips
High-Rise Apartments	504	403	454

The proposed residential units are anticipated to generate approximately 405 and 455 total person trips during the morning and afternoon peak hours respectively. The total peak period person trips in **Table 5** are then divided into different travel modes using mode share percentages obtained from the 2020 TRANS Manual for the "Kanata - Stittsville" district. **Table 6** provides the travel mode breakdown for the proposed high-rise apartments.

Table 6: High-Rise Apartments Peak Period Trips Mode Shares Breakdown

Travel Mode	Mode Share	AM Peak Period Person Trip	Mode Share	PM Peak Period Person Trips
Auto Driver	43%	172	55%	249
Auto Passenger	26%	103	19%	87
Transit	28%	111	21%	97
Cycling	0%	0	0%	0
Walking	4%	17	5%	20
Total Person Trips	**100%**	**403**	**100%**	**454**

Standard traffic analysis is usually conducted using the morning and afternoon peak hour trips as they represent a worst-case scenario. In the 2020 TRANS Manual, Table 4 provides conversions rates from peak period to peak hours for different mode shares. The conversion rates are provided in **Table 7** below.

Table 7: Peak Period to Peak Hour Conversion Factors (2020 TRANS Manual)

Travel Mode	Peak Period to Peak Hour Conversion Factors	
	AM	PM
Auto Driver and Passenger	0.48	0.44
Transit	0.55	0.47
Bike	0.58	0.48
Walk	0.58	0.52

Using the conversion rates in **Table 7** and the peak period person trips for different travel modes in **Table 6**, the peak hour trips for different travel modes can be calculated as shown in **Table 8**.

Table 8: Residential Peak Hour Trips Generated - TRANS Mode Share

Travel Mode	Mode Share	AM Peak Hour (Trips/h)			Mode Share	PM Peak Hour (Trips/h)		
		In	Out	Total		In	Out	Total
Auto Driver	43%	26	57	83	55%	64	46	110
Auto Passenger	26%	15	34	49	19%	22	16	38
Transit	28%	19	42	61	21%	27	19	46
Cycling	0%	0	0	0	0%	0	0	0
Walking	4%	3	7	10	5%	6	4	11
Total Person Trips	100%	63	140	203	100%	118	86	204
Total 'New' Residential Auto Trips		**26**	**57**	**83**	-	**64**	**46**	**110**

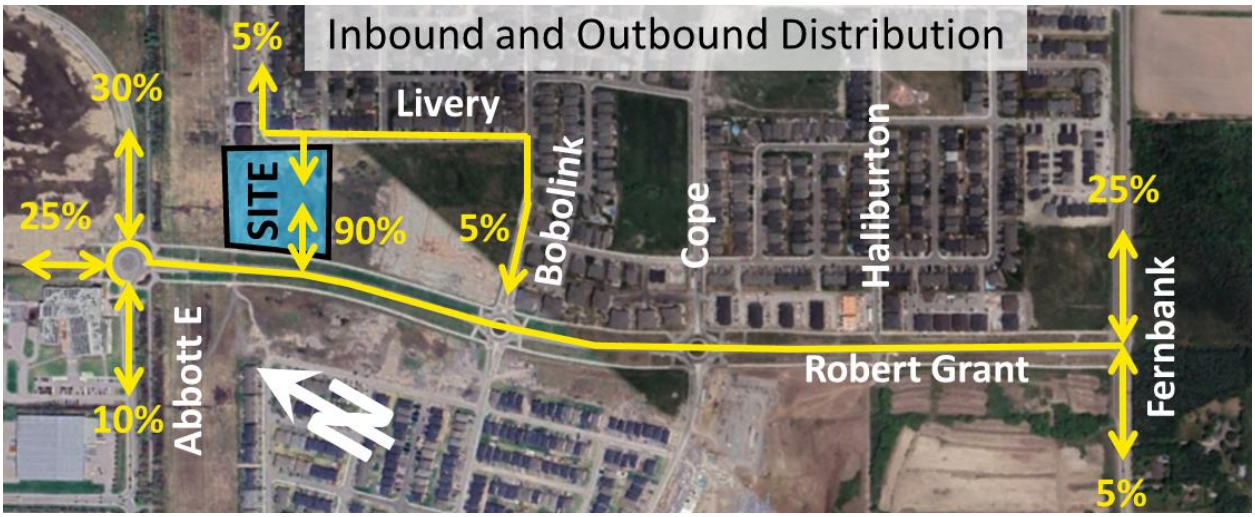
As shown above, the proposed development is anticipated to generate approximately 205 total person trips, 85 to 110 total vehicle trips, 60 to 45 total transit trips and 10 walking trips during the AM and PM peak hours respectively.

Although a future rapid transit station is proposed adjacent to the site at Abbott Station within the TMP and New Official Plan, City Staff have suggested that this transit priority expansion is not forecasted within the study horizon years. If and when it is built, it is anticipated that vehicular trips will decrease, and transit trips will increase. For the purpose of this report however, it will be assumed that no rapid transit corridor will be in place for all horizon years, only conventional bus service along Robert Grant (but with the expectation of bus stops in reasonably close proximity of the subject site), and as such, the average TRANS mode shares were considered adequate.

3.1.2. Trip Distribution and Assignment

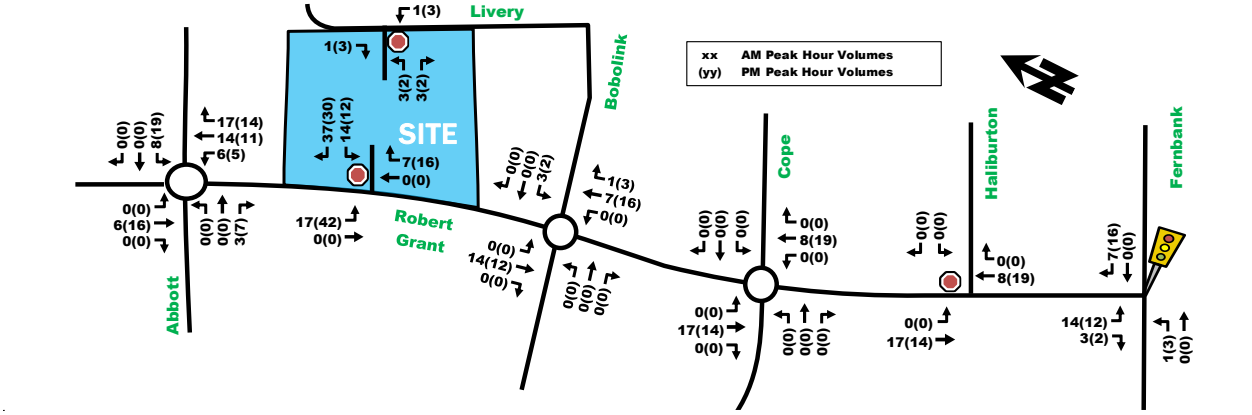
Based on the 2011 OD Survey (Kanata - Stittsville district) and the location of adjacent arterial roadways and neighbourhoods, the distribution of site-generated traffic volumes was estimated as shown in **Figure 16**. It is estimated that the majority of vehicles in/out of the site will use the Robert Grant Ave access. If and when Robert Grant Ave becomes widened and a median transit lane is added, then the Robert Grant Ave access would become a right-in-right-out (RIRO) type access. If this happens, it is estimated that a proportion of vehicles wanting to exit the site headed southbound or arrive from the north into the site would use the Bobolink/Robert Grant roundabout and some would change their route and use the Livery St access instead. Even though this would increase the proportion of vehicles to Livery St access, the amount of vehicles is still forecasted to be very low as improvements to transit should reduce car dependency.

Figure 16: Site Generated Traffic Percent Distribution



The anticipated 'new' auto trips for the proposed development from **Table 8** were then assigned to the road network with the distribution shown above, as shown in **Figure 17**, for the total site-generated traffic for TRANS mode share.

Figure 17: Site-Generated Traffic Using TRANS Mode Shares



3.2. Background Network Traffic

3.2.1. Transportation Network Plans

Refer to **Section 2.1.3**: **Planned Conditions**.

3.2.2. Background Growth and Other Area Developments

The Stittsville district and areas south of the development are still ripe for future growth, with farm fields and empty lots destined for suburban developments. As described in **Section 2.1.3**, there are significant number of new developments proposed. A large amount of these future developments have been documented and will be layered on individually. Some parcels have a general proposed land use but have not been refined or finalized, with no future traffic volumes forecasted yet.

Overall, all the possible developable areas within a 1km radius have been captured in other area developments as shown in **Section 2.1.3**. Today, there are limited transit options available within the study area, promoting driving behaviors. Once the area matures and transit services increase, it is anticipated that less people will drive within the study area. For this reason, a 0% annual growth rate is considered adequate given that all known other area developments within the 1km radius have been accounted for in background volumes and commuting habits will likely change over time, conducive to other modes of transportation that are not driving.

3.2.3. Future Background Volumes

The total number of new other area development vehicle trips projected to use study area intersections have been illustrated in **Figure 18** and **Figure 19** for 2025 and 2030 respectively.

Figure 18: Other Area Development – Vehicle Trips Generated 2025

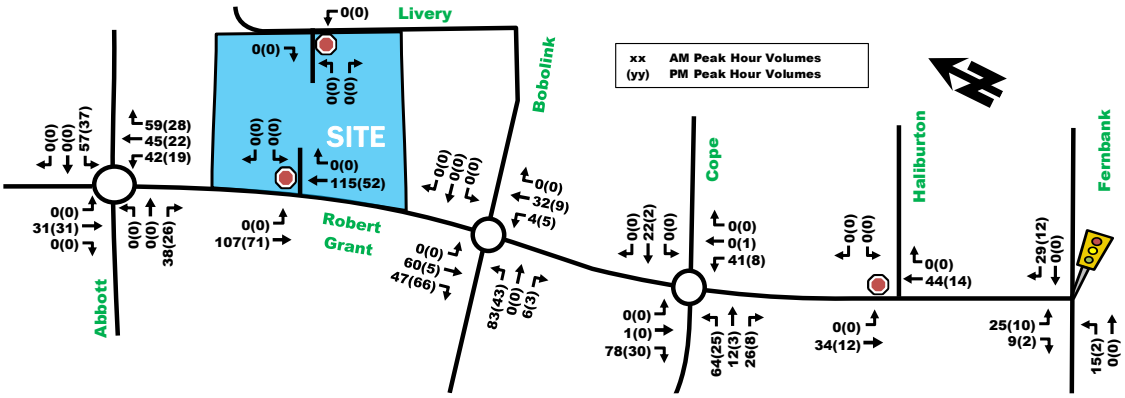
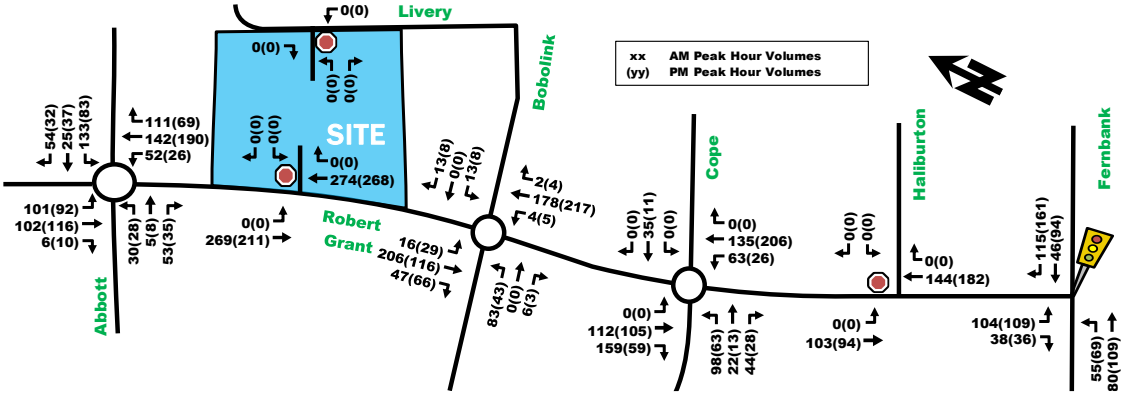


Figure 19: Other Area Development – Vehicle Trips Generated 2030



These other area development volumes were then layered on to existing volumes. Note that the existing volumes at Abbott/Robert Grant were redistributed to account for the anticipated extension from Abbott St E to Hazeldean Rd. The resultant background volumes for 2025 and 2030 have been provided in **Figure 20** and **Figure 21**.

Figure 20: Future Background 2025 Traffic Volumes

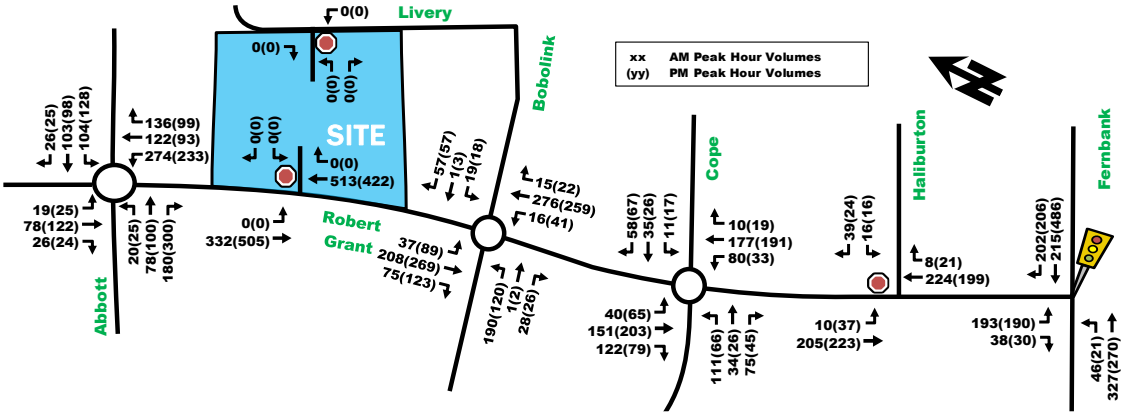
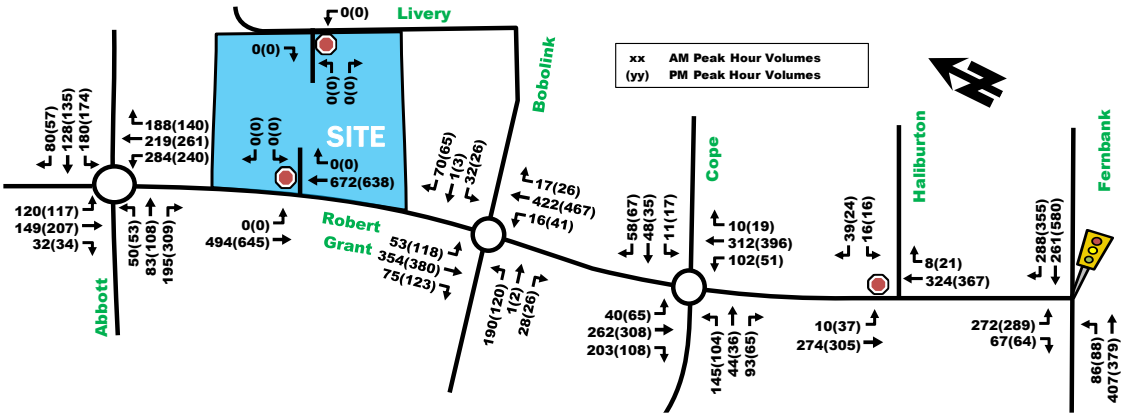


Figure 21: Future Background 2030 Traffic Volumes



3.3. Demand Rationalization

The following section indicates factors that may be used to rationalize the future travel demands in the study area and determine if there are potential capacity limitations and how they may be addressed.

The total projected 2025 and 2030 traffic volumes can be calculated by superimposing the site-generated traffic in **Figure 17**, onto the background traffic in **Figure 20** and **Figure 21**. The total projected 2025 and 2030 traffic volumes are illustrated in **Figure 22** and **Figure 23**, respectively.

Figure 22: Total Projected 2025 Traffic Volumes

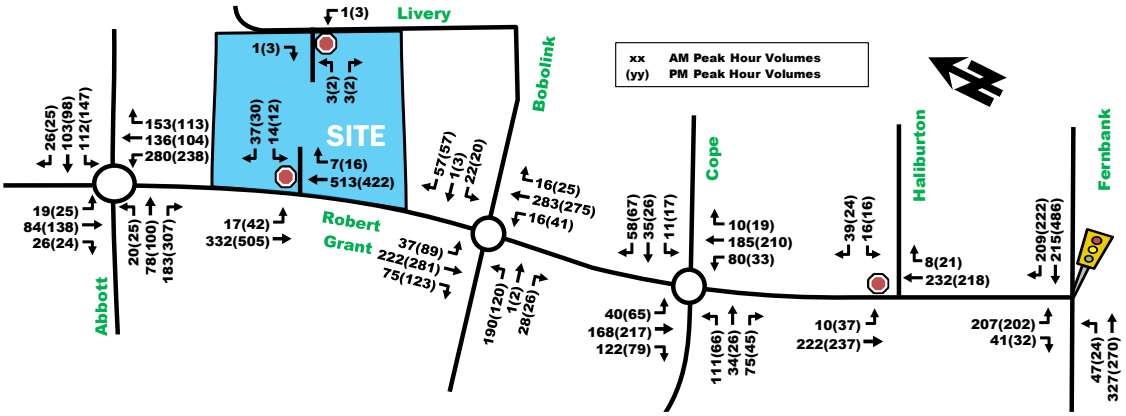
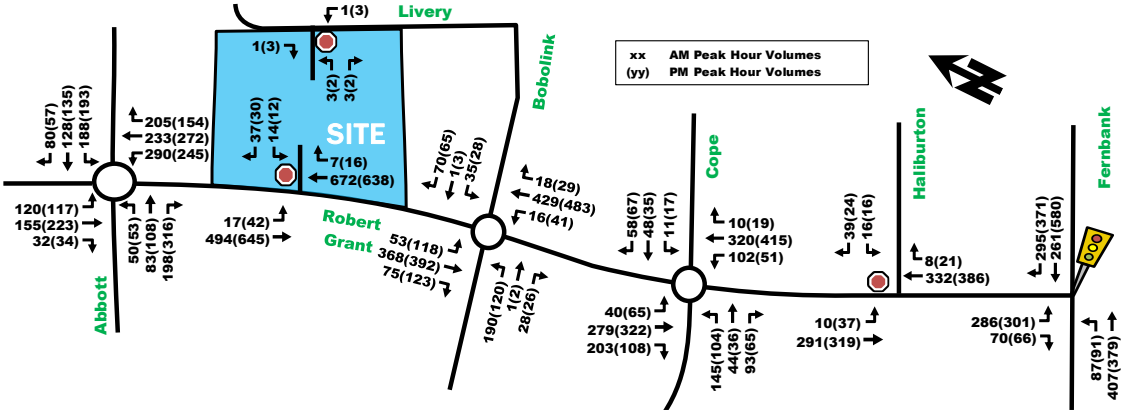


Figure 23: Total Projected 2030 Traffic Volumes



Transit Network

The City of Ottawa is currently in the process of completing Stage 2 LRT which will bring rapid transit to 77% of Ottawa citizens within a 5km radius[2]. Stage 3 which appears within the New Official Plan and within the ultimate transportation network in the Transportation Master Plan would further increase the catchment base. However, Stage 3 is not within the Affordable Network Map and is not anticipated to be built in the near future unless funding from higher up governments occurs. Closer to the site, a future BRT corridor is proposed including a rapid transit station to be located directly north of the site. City Staff however confirmed that a BRT corridor and even a transit priority corridor with isolated measures are not anticipated within the study horizon years. These major transit improvements would create an overall reduction in auto dependency throughout the City of Ottawa and replace it with transit and active transportation trips.

Robert Grant Ave

As mentioned in **Section 2.1.3.**, Robert Grant Ave is identified as a future transit priority corridor with isolated measures in the 2013 TMP and a future BRT dedicated facility in the ultimate network in the New Official Plan. Along with the transit upgrade, Robert Grant Ave is proposed to be widened from a 2-lane cross-section to a 4-lane cross-section, increasing the capacity of the road to accommodate future developments. City Staff however have noted that this road widening is not expected during the study horizon years. Robert Grant Ave is also identified as a future spine route with cycle-tracks along both sides of the road, offering cyclists a high-quality commute alternative.

Covid-19

The Covid-19 pandemic has had long-lasting effects on work culture, reducing many former traditional AM peak and PM peak hour work commute trips. Some trips have been eliminated altogether by people who have decided to continue to work from home. Others have adopted a more flexible work schedule, reducing pressures on the peak hour demands. Although some have begun to return to offices and places of work, it has become evident that a full return to in-person work is not likely.

Other Area Developments

The background traffic volumes were referenced from TIAs prepared for other development applications, with the majority of them using the 2009 TRANS Trip Generation Manual to forecast trip generation, which has been replaced by the 2020 TRANS Trip Generation Manual. The outdated TRANS model is known to over-estimate single and low-rise residential land use vehicle trip generation by over 30% compared to the 2020 TRANS currently used. It should also be noted that many other area developments set aggressive buildout schedules, of which some have already been delayed. It is unlikely that all developments assumed within the 2030 horizon will be fully occupied.

Conclusions

The future forecasted background volumes may be overly conservative as they reference older engineering forecasting metrics or may have overly aggressive buildout years which may not be achievable. Transit improvements have not taken place within the study area as of yet and may reflect a higher than expected driver mode share in existing conditions. It is forecasted that although volumes will likely increase from existing volumes, that they may perhaps not be as high as forecasted within the background volumes.

[2] https://ottawa.ca/en/planning-development-and-construction/major-projects/stage-2-light-rail-transit-project/overview#section-74f946f7-8138-491b-a748-f8e569072c88

4.0 ANALYSIS

4.1. Development Design

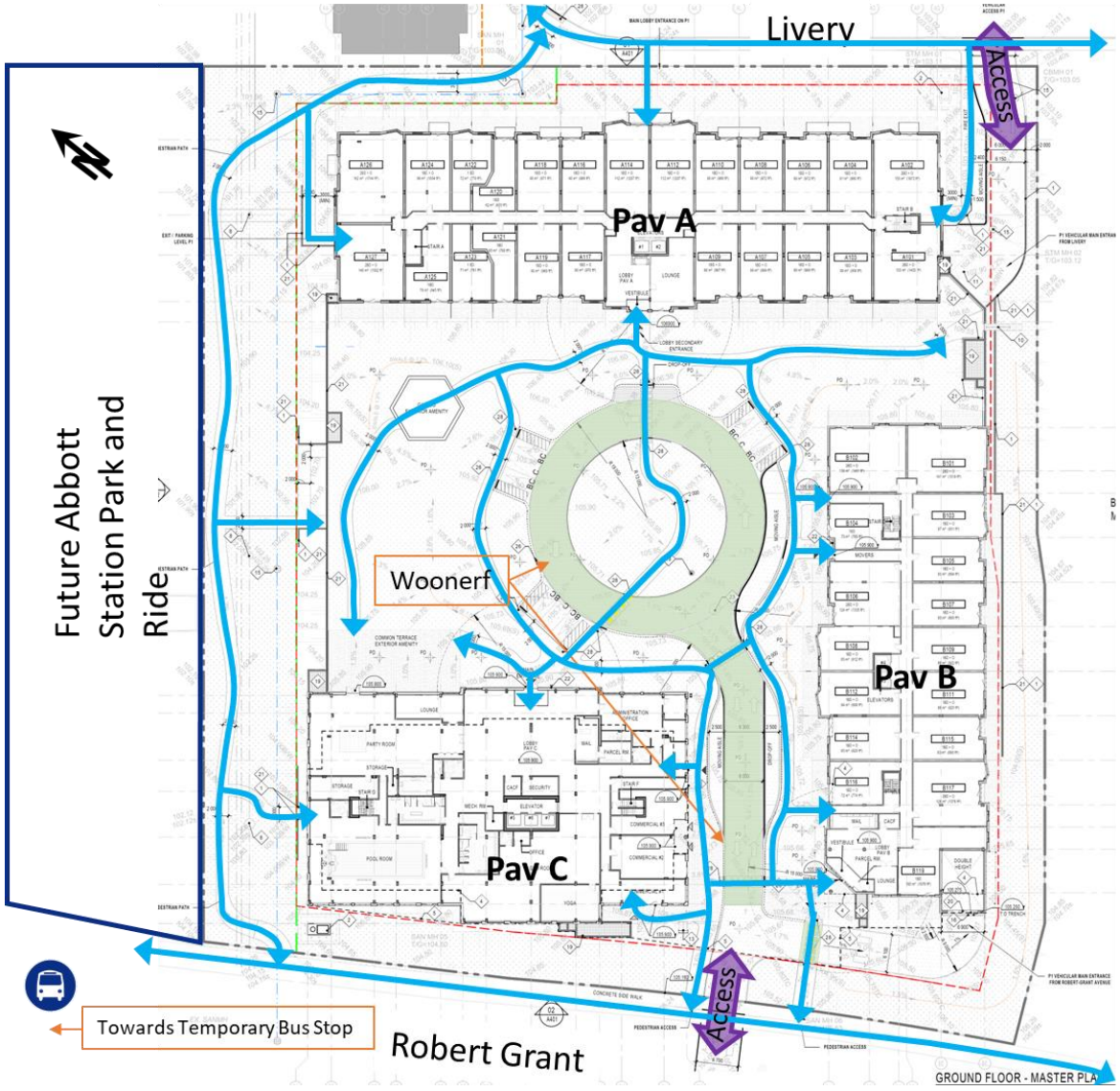
4.1.1. Design for Sustainable Modes

Pedestrian/Cycling Routes and Facilities

The site is located adjacent to a future transit priority corridor with isolated measures on Robert Grant Ave according to the Transportation Master Plan (TMP) and adjacent to a future at-grade transitway on Robert Grant Ave within the New Official Plan, although these improvements are not anticipated within the horizon study years.

To give priority to active transportation users, either recreationally or to connect to the future transit facilities, the developer has proposed a unique urban design of the driveway east of the ramp, which is a transition area to the more active friendly courtyard, functioning similarly to a Woonerf Desing, referred to as Woonerf-like treatment herein. The Woonerf-like driveway is not anticipated to handle much vehicular traffic as it is located beyond the main garage ramp which will attract the majority of site vehicular traffic, as shown in **Figure 24**.

Figure 24: Active Transportation Circulation and Connectivity to Future Transit



East of the car garage ramp, the driveway transitions to a woonerf that represents a more pedestrian oriented environment, and a gateway into the central courtyard area. There will be various supplementary active transportation facilities, including 2m to 3m wide pathways that permeate the site and provide connectivity from the front entrance of each pavilion to both boundary roads, Livery St and Robert Grant Ave.

It is forecasted that a major pedestrian/cyclist desire line will be to Robert Grant Ave, joining the site to the future Abbott Rapid Transit Station and Trans Canada Trail Pathway. Prior to the construction of the Abott Rapid Transit Station, transit users may walk to the recently constructed bus stops located approximately 65m north for northbound transit (towards downtown) and 180m walk for those alighting from the southbound bus stop near to the Abbott/Robert Grant roundabout.

Pavilion A has a direct connection to Robert Grant Ave via the proposed northern pedestrian pathway that ranges from 2m to 3m in width. A raised crosswalk is proposed across the garage ramp adjacent to Pavilion B. The pedestrian facilities surrounding Pavilion B and C also provide direct access to Robert Grant Ave and have been designed to at least minimum accessibility standards. TWSIs are proposed at all internal pedestrian crossings as well as at barrier free parking spaces. Livery St and Robert Grant Ave both have existing sidewalk facilities along the site's frontage. In addition to sidewalk facilities, Robert Grant Ave currently has a uni-directional cycling facility on both sides of the road, providing regional connectivity for cyclists via the Trans Canada Trail Pathway approximately 170m north of the site, and to the future Abbott Rapid Transit Station proposed directly north of the site.

Although a direct pathway connection between the subject site and the future Abbott Rapid Transit Station and Park and Ride via the hydro easement is not currently shown, the applicant is prepared to consider a future direct pathway connection once the transit project advances further into design.

A key focus of the site plan proposal is the courtyard area, which is to be protected from general vehicle activity, with priority given to active transportation users. The main vehicle parking garage ramp near Robert Grant Ave was designed specifically to reduce vehicular conflicts within the courtyard. The courtyard will only accommodate vehicle pickup/drop-off, moving vehicles, and nine visitor spaces with six of them being accessible parking only. The applicant also introduced unique urban design measures to dissuade vehicle use within the courtyard.

The site proposes 252 bicycle parking spaces which will be provided indoors in P1 which is located at grade level relative to Livery St and the northern pathway. Bike parking spaces are located near elevators. To get to the adjacent transportation network facilities, cyclists have the following options available and as shown in **Figure 25**: using the elevators to get to the courtyard level and use the woonerf/pathways to connect to cycling facilities; use the P1 link to the pathway on the north side of the site but have to walk their bikes up to the cycle tracks on Robert Grant Ave; or, use the at grade P1 connection to Livery St. There will be an additional outdoor bicycle parking area located near Pavilion C. The combination of easily accessible cycling facilities and convenient bicycle parking, plus integrated network of sidewalks and pathways provides a development design suitable for sustainable modes of transportation.

Figure 25: Location of Bike Parking and Access to Adjacent Facilities

Location of Transit Facilities

The nearest existing bus stops (currently inactive) to the proposed development are located west of the site at Iber/Abbott for rapid route #62 and approximately 600m south of the site at the intersection of Robert Grant Ave/Cope Dr for local route #67. It is anticipated that future bus routes will be added to Robert Grant Ave as the neighbourhood matures, with recently added bus pads located approximately 65m north for northbound and 180m walk to the southbound stop. OC Transpo was contacted to inquire about a timeline for these new routes, however no new information has been provided yet. In the long-range forecast, if an at-grade transitway is built,

a future rapid transit station is proposed to be situated directly north of the site along the hydro easement. The site proposes pathways which would connect to the existing active transportation facilities on Robert Grant Ave which would subsequently connect to the future Abbott Rapid Transit Station.

4.1.2. Circulation and Access

A moving aisle and pickup/drop-off area to Pavilion A is provided along the Livery St secondary access. The main driveway off Robert Grant Ave provides a pickup/drop off area for Pavilion B in front of the main entrance as well as a moving aisle within the courtyard, and a moving aisle in front of the main entrance to Pavilion C. The courtyard is envisioned predominantly for active transportation use, with a roundabout providing vehicular access for the occasional moving, pickup/drop-off and accessible parking user.

Garbage collection for the entire site will be accommodated at the Pavilion A moving aisle, along the Livery St driveway access. Garbage bins will be wheeled out into the aisle for the garbage truck, and then reverse out to Livery St.

The three pavilions are connected via a 3-level underground parking garage which is accessed via both Livery St (secondary access) and Robert Grant Ave (primary access). **Section 4.4** will provide further details regarding the driveway accesses and connectivity to the adjacent road network. The internal driveway widths within the parking garage are proposed at 6.1m which is greater than the minimum 6.0m wide required aisle width (Parking By-Law Section 107 1c ii) considered adequate for two-way travel and 90-degree parking stalls. The parking garage ramps are proposed at a maximum 14% incline, with proposed transition grades, mostly located indoors. Only the ramp accessing the parking garage from Robert Grant Ave is located outdoors and has a maximum proposed grade smaller than 2%, which according to the Private Approach Bylaw Section 26 h, is considered adequate. Melting devices are only required for ramps with grades between 6% to 12% which is not the case at this location.

Figure 26 illustrates the proposed locations for the Woonerf-like driveway, loading bays, garbage pick-up and accesses. Truck turning templates have been provided in **Appendix F.** Note that truck turning templates used a previously proposed site plan, however the road geometry has not changed between site plans and the truck turning templates are still considered applicable to the latest site plan.

4.1.3. New Streets Network

Exempt, only required for Plans of Subdivision.

4.2. Parking

The following parking analysis reflects the minimum number of parking rates and spaces required based on the City of Ottawa Zoning By-Law for developments located in Area C: Suburban on Schedule 1A. **Table 9** summarizes the minimum vehicle and bicycle parking rates from Part 4, Parking, Queueing and Loading Provisions parking by-law, referenced from Tables 101, 102, and 111A.

Table 9: Required Vehicle and Bicycle Parking Spaces

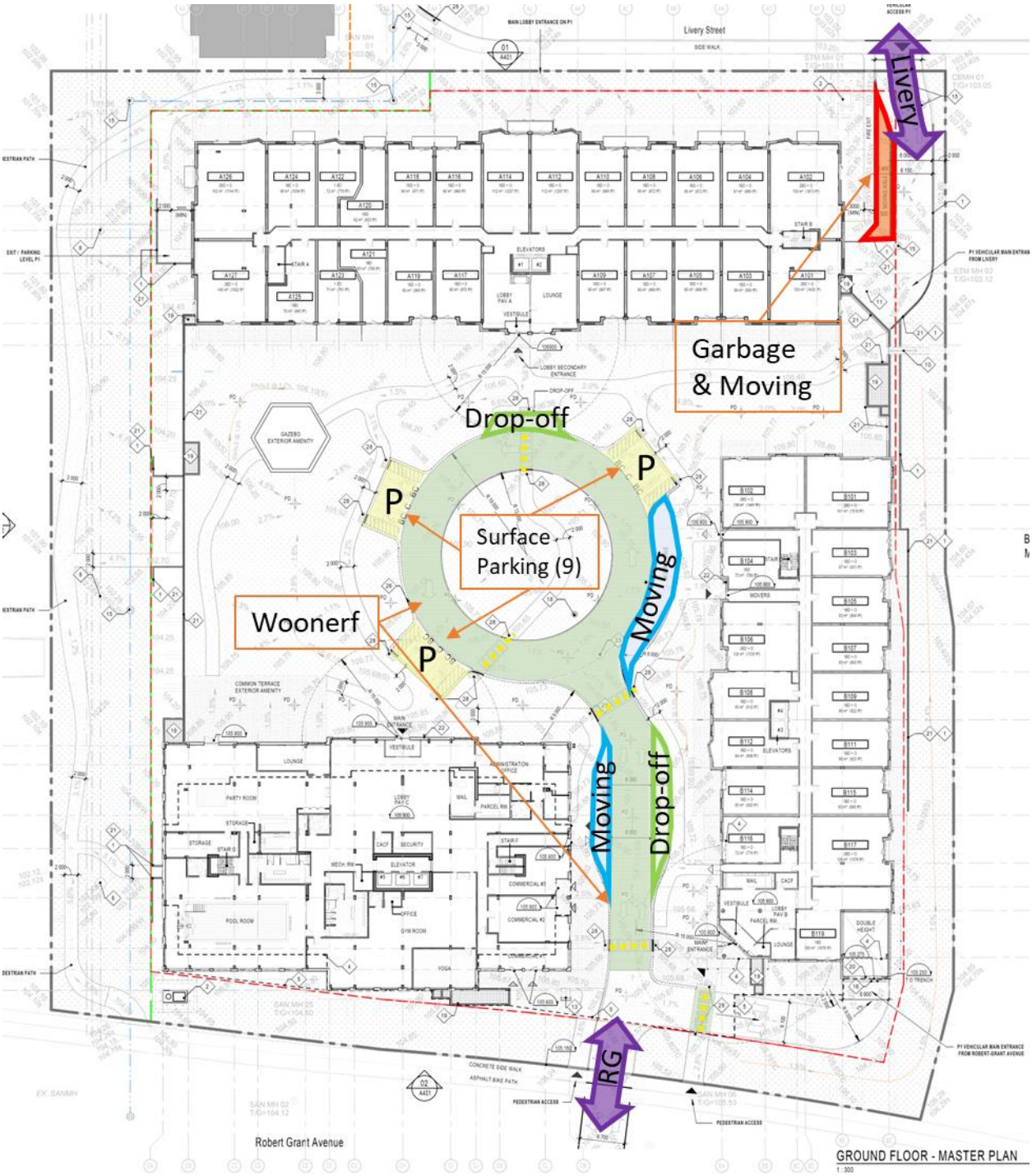
Land Use	Size (unit or m^2)	Residential Vehicle		Visitor Vehicle		Bicycles	
		Base Rate	Min Required Spaces	Base Rate	Min Required Spaces	Base Rate	Min Required Spaces
Dwelling, Mid-High-Rise Apartments (R12)	285	1.2/unit	342	0.2/unit	101	0.5/unit	252
Dwelling unit in a mixed-use building, all other cases (R15)	219	1.0/unit	219				
Commercial	203 m^2	N/A	N/A	3.4/100m^2	7	1/1500m^2	<1
Section 101 (6) Reduction [1] [2]			-20				
Total			**541**		**108**		**252**

Note:
1 – Reduced by 10% – Section 101 (6) (c) (i) All required spaces below grade
2 – Reduced by 20 spaces – Section 101 (6) (c) (ii) All required spaces below grade

As shown above in **Table 9**, the minimum required vehicle spaces are 541 for residents and 108 for visitors/commercial spaces, for a combined total of 649 vehicle parking spaces. A total of 651 vehicle parking spaces are proposed, with 541 spaces proposed for residents, 101 spaces for visitors and 9 spaces proposed for commercial use, meeting the parking by-law requirements. The vehicle parking spaces will be provided in a three-level underground parking lot with 9 surface parking spaces for commercial/visitors and accessible parking within the surface courtyard. Of the 9 surface parking spaces, 6 are barrier free parking spaces.

The minimum required bicycle spaces are 252, which will be provided in the P1 parking floor located at ground level relative to the adjacent City owned streets. Additionally, some outdoor bike parking racks will be included with the development on the ground floor for visitors, however their parking count has not been accounted for in the 252-spot calculation. Therefore, the proposed development meets the minimum required spaces based on the City of Ottawa Parking Provisions.

Figure 26: Proposed Surface Circulation Features



4.3. Boundary Street Design

Multi-Modal Level of Service (MMLOS) analysis was conducted for the site frontages, Robert Grant Ave and Livery Rd, based on the City of Ottawa's MMLOS Analysis Guidelines.

Robert Grant Ave is an arterial road that consists of the following features within the study area:

- 2-vehicle travel lanes in each direction existing and future horizon years. A 4-vehicle travel lane in each direction may be built if the BRT comes to fruition, however it is currently uncertain if it will ever be built.

- Approximately 2.0m wide sidewalks and an adjacent 2.0m unidirectional bike lanes with an approximate 14m boulevard on both sides of the road and future widened larger than 2m boulevard (spine route).
- Less than 3,000 average daily curb lane traffic existing but assumed higher than 3,000 in future.
- No on-street parking.
- No transit facilities existing nor expected in horizon year future. A future BRT corridor (isolated measures) may be built one day, but the future implementation of this BRT is unclear.
- Posted speed limit of 60km/h.
- Approximately 3.8m wide lane.

Livery Rd is a local road that consists of the following features within the study area:

- 2 vehicle travel lanes in each direction.
- Approximately 2.0m wide sidewalk on west side and no sidewalk on east side. No cycle facilities and no boulevard separation.
- Less than 3,000 average daily curb lane traffic.
- On-street parking on west side only.
- No transit facilities.
- 40km/h posted neighbourhood.

The multi-modal level of service analysis for adjacent site roadways is summarized in **Table 10**, with detailed analysis provided in **Appendix G.** The table also identifies the target LOS, based on the land-use designation and road classification of the development site and the boundary streets. The Transportation Master Plan (TMP) of the City of Ottawa identifies the land-use designation of the development site as a General Urban Area. The road classifications of each of the boundary streets were noted in the descriptions of features above.

Table 10: MMLOS - Boundary Road Analysis

Road Segment	Multi-Modal Level of Service							
	Pedestrian		Bicycle		Transit		Truck	
	PLoS	Target	BLoS	Target	TLoS	Target	TkLoS	Target
Livery (East) Existing & Future	F	C	B	D	-	N/A	-	N/A
Livery (West) Existing & Future	B	C	B	D	-	N/A	-	N/A
Robert Grant (East-West) 2-Lane Existing & Future	B	A	A	C	D	N/A	B	N/A
Robert Grant (East-West) 4-Lane Future if BRT Built	D	A	A	C	A	D	A	N/A

Pedestrian

- Robert Grant Ave: neither existing nor future desirable target PLoS 'A' is achieved (within 300m of school and 600m of future rapid transit station). To achieve the desired target, the speeds would need to be reduced to 50km/h and a speed survey would need to confirm that the 85th percentile of drivers are indeed obeying the speed limit for existing conditions. In the future, regardless of 2 or 4-lane cross section, if the daily curb lane traffic exceeds 3,000 vehicles a day, the speed would need to be further reduced to 30km/h.
- Livery St: the pedestrian PLoS target was only met on the west side. To meet the target on the east side, a 1.8m or greater sidewalk would need to be built. Note that if the pathway north of the development were built, then this road segment would be within 600m walking distance of rapid transit station and the new PLoS target would increase to 'A', where neither side of Livery St would meet the target goal. To meet a PLoS of 'A', either a 2m sidewalk with 0.5 to 2m boulevard or a 1.8m sidewalk with 2m boulevard would be required on each side of Livery St.

Bicycle

- The BLoS target is met at all boundary streets.

Transit

- Livery St does not have any transit routes.
- Robert Grant Ave currently does not have any transit routes, it is anticipated that transit routes will exists in the near future. The future transit target is met if an at-grade segregated transitway is built, as shown within the New Official Plan.

Truck

- None of the road segments are part of truck routes.

4.4. Access Intersection Design

Note, former sections 4.4.2 (Access Control) and 4.4.3 (Access Design) have been moved to Section 4.9.1 and 4.9.2 as per the revised TIA Guidelines, June 2023.

4.4.1. Location and Design of Access

Vehicle Access and Circulation

The site plan proposes two vehicle accesses, one located on the east side of Robert Grant Ave approximately 45m north of the southern property line and the west side of Livery St approximately 3.5m north of the southeast corner of the lot. The primary access (Robert Grant Ave) splits into a garage ramp that turns southbound approximately 25m east of the existing Robert Grant Ave (8m east of Robert Grant Ave right-of-way) and connects to the underground parking lot, while the other driveway transitions to a woonerf farther east, leading to the central courtyard.

The primary access off Robert Grant Ave will be 6.7m wide with 5m and 6m radii corners that accommodates HSU/emergency sized vehicles. The garage ramp will be 6.1m wide and the Woonerf-like driveway will be 6.0m wide, both providing two-way traffic. The secondary access (Livery St) will serve as a secondary connection to the parking garage, as a two-way driveway with a width of 7.0m near Livery St (to improve entry/exit maneuvers for trucks, which gradually reduces to 6.0m as it enters the site). The Livery St access accommodates two-way vehicular traffic plus a moving aisle/location for a garbage truck to pick up waste on the north side of the driveway. All moving, garbage pick-up and drop-off lay-bys are at least 2.4m wide.

Both accesses are anticipated to be STOP controlled for vehicles exiting the site. Based on the TAC Guidelines, Section 9.4.2.1, a minimum separation of 200m between intersection is suggested along arterial roads, which has been met, with the site access being located approximately 220m from the nearest intersection (Abbott/Robert Grant roundabout).

Throat Length

The Transportation Association of Canada (TAC) Geometric Design Guide for Canadian Roads, Chapter 8 (Access) provides guidelines for clear throat length. Clear throat lengths are only recommended for arterial and collector roads; therefore, Livery St access was excluded. Figure 27 illustrates the proposed Robert Grant Ave site access and available throat lengths to the adjoining city road network. An approximate clear throat length of 26m from the existing Robert Grant Ave curb line and 8m clear throat length from the reserved ROW is available when measured to the first conflict point at the access split to car parking garage ramp and courtyard. The reserved ROW has space for potential future transit facilities and widening of Robert Grant Ave, if it ever gets built.

Per TAC Table 8.9.3, the suggested minimum clear throat length to an arterial road for apartments (>200 units) is 40m for a development abutting an arterial road, which is not met with the current design proposing 26m of clear throat length for the foreseeable future. However, the following points were considered to justify the proposed clear throat length:

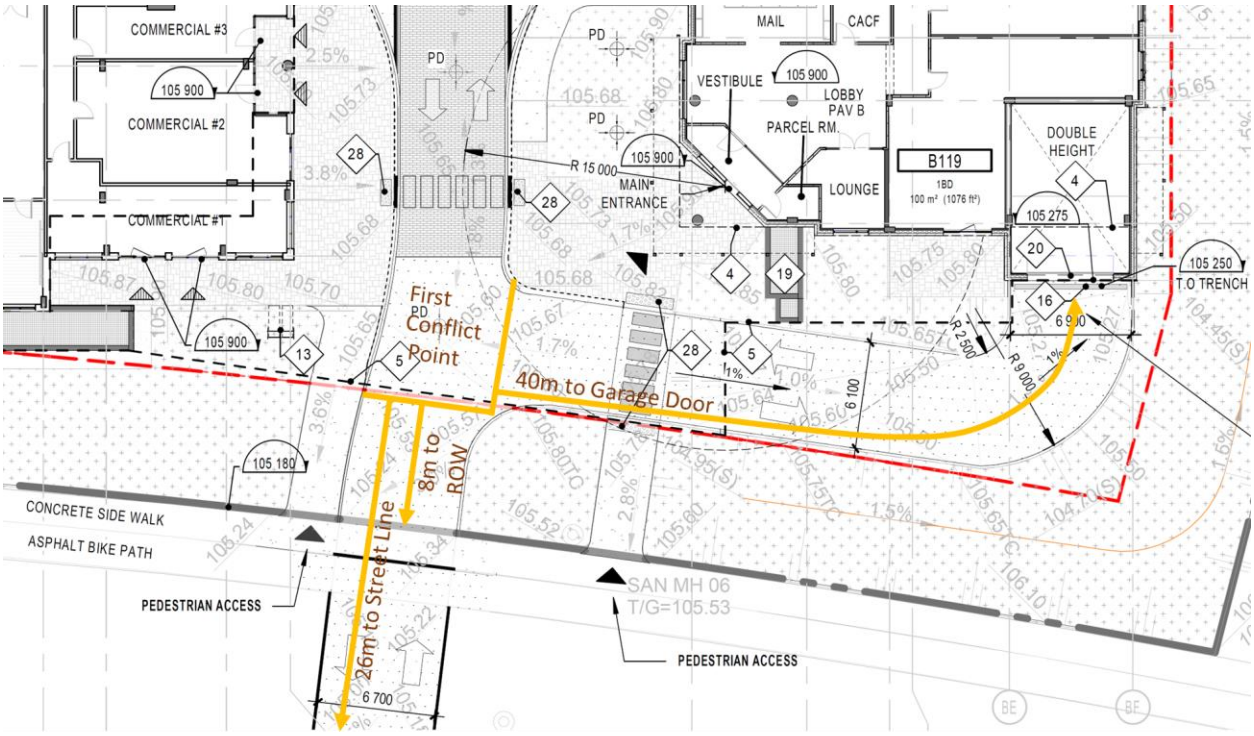
- The majority of vehicles will be entering or exiting the parking garage. Outbound vehicles do not pose a risk of spillback on to Robert Grant Ave. Inbound vehicles headed to the garage will turn right and have unimpeded movement by other vehicles and short infrequent conflicts with pedestrians crossing from Pavilion B to Robert Grant Ave (note that active users from Pavilion A and C are unlikely to use this crosswalk). While a pedestrian crosses the ramp, there is sufficient room for a car to queue within the ramp area while it yields to active transportation users. The garage door will be located approximately 40m from the main driveway, effectively creating roughly 65m clear throat from the existing Robert Grant Ave curb line, and roughly 50m from the protected ROW limit. Providing the raised crosswalk was the prefer option by the City of Ottawa transportation staff, even if it created a new conflict with vehicles.

- The site proposes two accesses, reducing some vehicle trips at Robert Grant Ave, which will enter via Livery St instead.

Garage Ramp

The approximate 40m ramp length plus the 26m or 8m clear throat lengths for the existing and widening of Robert Grant Ave scenarios respectively, are considered longer than the minimum 40m suggested clear throat length and are sufficient distances to limit risks of spillback onto Robert Grant Ave.

Figure 27: Clear Throat Length of Proposed Site Access



Private Approach By-law

Additionally, the Private Approach By-Law requirements for the City of Ottawa were reviewed, with the following observations:

- As required, the width of the proposed development drive aisles do not exceed 9m. The drive aisles will range between 6.0 to 7.0m wide and propose a partial flaring at the property line to accommodate HSU trucks at both accesses.
- The site frontage is approximately 130m which permits having up to two two-way private approaches.
- As required by part m section ii (Robert Grant Ave being an arterial), given the proposed number of parking spaces, the minimum distance between the proposed access and the nearest adjacent intersecting street line is 60m. The nearest adjacent intersecting street is Abbott St E which is located approximately 220m away and thus meets the requirements.
- The distance between the proposed accesses and the adjacent property line are approximately 42m and 3.5m at Robert Grant and Livery accesses respectively, which is greater than the minimum separation requirement of 3m.
- The grade of the private approach is to not exceed 2% within the private property for a distance of 9.0m to the curb line.

The access designs are in conformance with the City of Ottawa Private Approach By-law 2003-447. The accesses are to be constructed as per City of Ottawa Standard Detail SC 7.1.

Robert Grant Widening and BRT Implications

Both accesses will function as all-movement intersections until Robert Grant Ave is widened. When Robert Grant Ave is widened and transit priority lanes are added, a center median will restrict the site access at Robert Grant Ave to a right-in-right-out (RIRO) movement. When this happens, southbound drivers wanting to enter the site will have to continue to the Bobolink/Robert Grant intersection to perform a U-turn, while similarly, vehicles wanting to go south exiting the site could exit Robert Grant Ave headed northbound and perform a U-turn at Abbott/Robert Grant or exit via Livery St to the Bobolink/Robert Grant roundabout. It is not anticipated that these changes will occur within the study horizon years. During the years leading up to the construction of the transit priority lanes, Robert Grant Ave will allow full movement access to and from the site.

Left-Turn Warrant

It is understood that a zoning condition places Pavilion C on hold until Robert Grant Ave is extended to Maple Grove Rd, which is not anticipated within the study horizon years. At the time that this extension is complete, it is assumed that the widening and transit priority lanes will be built alongside this extension. For this reason, it is assumed that Pavilion C will only actually get built once the widening and transit priority lanes are in place and a left-turn restriction will be in place at that time by a physical median curb treatment. Therefore, a left-turn lane warrant analysis was performed for the southbound movement using the assumption that left-turns will only be allowed before Pavilion C and the widening and transit priority lanes are built. The warrant analysis only utilized the forecasted trip generation for Pavilions A and B.

Peak hour traffic generated by Pavilions A and B in the 2030 horizon triggered the left-turn lane warrant as shown in **Appendix H**. However, the introduction of a temporary left-turn lane was not considered justified in this specific context. The traffic warrant is highly sensitive to background traffic and would no longer be required when the ultimate BRT corridor is constructed. The following summary provides justification for why a left-turn lane is not necessary:

- The volume of southbound left-turning vehicles is very low, approximately 10 during the AM peak hour and 25 during the PM peak hour (accounting only for Pavilion A and B, and not C) which equates to less

than 1 vehicle every 2 minutes. The PM left-turn volume represents less than 5% of the total approach volume, while the lowest left-turn percentage nomograph is 5%. This creates an overly conservative warrant.

- As per the Geometric Design Manual, the design speed should be used, which is normally treated as the posted speed plus 10km/h. The proposed site access is located between two roundabouts, which by design reduce speeds. Therefore, assuming a 70km/h design is considered overly conservative.
- The background volumes have a high level of uncertainty and are overly conservative for the 2030 horizon:

    - The background traffic volumes were referenced from TIAs prepared for other development applications; the majority of them used the 2009 TRANS Trip Generation Manual which has been replaced by the 2020 TRANS Trip Generation Manual. The outdated TRANS model is known to over-estimate single and low-rise residential land use vehicle trip generation by over 30% compared to the 2020 TRANS currently used. It is worth noting that a 30% reduction in Robert Grant Ave volumes ensures the left-turn warrant is not triggered at a 70 km/h design speed in the afternoon peak hour.

    - The other developments set aggressive buildout schedules, of which some have already been delayed. It is unlikely that all developments assumed within the 2030 horizon will be fully occupied.

    - Transit service does not currently extend north of Cope Dr on Robert Grant Ave. The existing volumes reflect a predominant driver mode share due to lack of transit services. As transit service expands in the area, existing traffic along the Robert Grant Ave corridor may be reduced.

In the unlikely event there is safety or operational concern at the proposed Robert Grant Ave site access, a right-in right-out treatment to prohibit the southbound left-turn or additional signage with temporary traffic calming treatments (e.g. centerline flex-posts) to reduce vehicle speeds may be explored through this section to ensure safe left-turn operations in advance of the BRT corridor implementation.

4.5. Transportation Demand Management

4.5.1. Context for TDM

Based on the type of development, it is assumed that most trips generated by the proposed site will be residents leaving the site in the AM peak hour to go to work and returning from work to the proposed site in the PM peak hour. Sections 3.1.1 and 3.1.2 describe how many trips are anticipated per travel mode. The site is located within 600m of future rapid transit, however funding for transit has not yet been approved.

4.5.2. TDM Program

The TDM infrastructure checklist and TDM Measures are attached as **Appendix I**.

TDM Supportive Development Design and Infrastructure Checklist:

- Ten (10) out of the ten (10) “required” measures have been satisfied.
- At least twelve (12) of fourteen (14) “basic” measures related to walking, cycling, transit and parking have been satisfied or are not applicable.
- Zero (0) of the of the seven (7) candidate “better” measures are also proposed or are non-applicable.

TDM Measures Checklist:

- Six (6) out of seven (7) “basic” measures related to walking, cycling, transit, parking and TDM marketing have been satisfied or are not applicable. Three (3) of those, which have been designated by an asterisk

(*), are considered by the TDM Measures to be some of the most dependably effective tools to encourage sustainable travel modes. This includes:

- Display walking and cycling information at major entrances.
- Display transit information at major entrances (once transit becomes available).
- *Designate an internal coordinator or contract with external coordinator
- * Unbundle parking costs from monthly rent.
- * Provide multi-modal travel information package to new residents.

- One (1) out of eleven (11) "better" measures related to walking, cycling, transit, parking and TDM marketing have been satisfied. This includes:
  - Conduct periodic surveys to identify travel related behaviors and offer solutions.

4.5.3. Need and Opportunity

Since the development is located in a future transit priority area within 600m radius of future Abbott BRT Station, measures to provide sustainable active mode shares are encouraged. Such measures are described in more detail in Section 4.5.3 below, but include more aggressive Multi-Modal Levels of Service (MMLOS) such as providing minimum 2m wide pathways as described in Section 4.3 and 4.9 and safe and efficient connectivity to public transit as described in Section 4.1 and 4.7, to name a few.

4.6. Neighbourhood Traffic Management

This section is exempt as it does not meet all criteria outlined in the June 14, 2023 revision.

4.7. Transit

4.7.1. Route Capacity

The future development is expected to generate approximately 60 to 45 'new' two-way transit trips for the AM and PM peaks respectively.

Robert Grant Ave does not currently provide any transit routes, as the neighbourhoods surrounding are still being developed and constructed. As the neighbourhood matures, new transit routes are expected to operate on Robert Grant Ave, adjacent to the site. Recently built bus pads are located approximately 65m north of the site for northbound transit (towards downtown) and 180m walk to the southbound bus stop near to the Abbott/Robert Grant roundabout.

A likely local route would operate in general within 30-minute headways or less. OC Transpo has buses such as the New Flyer D60L with a total capacity of 110 passengers or Alexander Dennis Enviro 500 with approximately 100 passengers, so it is expected to have sufficient capacity to support the 'new' two-way transit passenger trips from this development and adjacent neighbourhood. As the neighbourhood continues to mature, more routes or more frequent service may be added as needed. In the long-term planning, an at-grade transitway is proposed, which would significantly improve transit travel times and capacity. OC Transpo is encouraged to monitor transit use and adjust routes based on origin destinations, capacity and needs.

4.7.2. Transit Priority

Robert Grant Ave is proposed a transit priority corridor with isolated measures in the long-term planning. Today, buses would have to operate in mixed conditions not favorable to transit priority; however, as illustrated in **Figure 12** in **Section 2.1.3**, a future BRT on Robert Grant Ave could include median segregated transit lanes which would significantly improve transit operations and priority. The design is still in its primitive stage and changes are expected as the design progresses and funding for the project become available.

4.8. Review of Network Concept

The site is zoned as AM [2151] and AM [2152] F(3.5) S437 which allows a development of this size and scale to be built at the proposed location, therefore this section can be exempt – see **Table 3**.

4.9. Intersection Design

4.9.1. Intersection Control

The site generated vehicle traffic is quite minimal and the existing intersection controls are anticipated to be kept as they are today. The new site accesses will not require traffic signals based on forecasted volumes.

4.9.2. Intersection Design

Multi-Modal Level of Service

As stated in the MMLOS Guidelines, only signalized intersections are considered for the intersection Level of Service measures. Fernbank/Robert Grant is the only signalized intersection within the study area. In the future, this intersection may be located adjacent to a rapid transit station if the BRT is built. The MMLOS analysis is summarized in **Table 11**, with detailed analyses provided in **Appendix J**.

Table 11: MMLOS – Existing and Future Adjacent Signalized Intersections

Road Segment	Multi-Modal Level of Service							
	Pedestrian		Bicycle		Transit		Truck	
	PLoS	Target	BLoS	Target	TLoS	Target	TkLoS	Target
Fernbank/Robert Grant	F	C / A*	C	C	F	- / D*	E	-
*target if a rapid transit station is built near to the intersection.								

Pedestrian

- For existing and future conditions if a BRT is built, pedestrians must cross the equivalent of at least 6 lanes of traffic. There are no options that can help improve the PLoS significantly enough to come anywhere near achieving the target PLoS 'A or C' without majorly affecting vehicular operations.

Bicycle

- The bicycle BLoS target was met for both existing and future conditions.

Transit

- The Transit TLoS target was not met as delays >40s are expected for the southbound left-turn. A queue jump or traffic signal priority could reduce these delays to meet future targets.

Truck

- Neither approach are truck routes and as such, there is no truck TKLoS targets.

Existing Conditions

The existing traffic volumes at study area intersections were assessed based on vehicle capacity v/c and delays (s) to determine their level of service. Synchro 11 software for signalized and unsignalized intersections was used and Sidra software for roundabouts with summarized results in **Table 12** and detailed output in **Appendix K.**

Table 12: Existing Intersection Performance

Intersection	Weekday AM Peak (PM Peak)					
	Critical Movement			Overall Intersection Performance		
	LoS	max. v/c or avg. delay (s)	Movement	Delay (s)	LoS	v/c
Abbott/Robert Grant (R)	B(B)	11(11)	WB(WB)	6(6)	A(A)	-
Bobolink/Robert Grant (R)	B(B)	11(11)	WB(EB)	6(6)	A(A)	-
Cope/Robert Grant (R)	B(B)	10(11)	WB(EB)	5(5)	A(A)	-
Haliburton/Robert Grant (U)	B(B)	11(11)	WB(WB)	2(2)	A(A)	-
Fernbank/Robert Grant (S)	B(D)	0.69(0.85)	WBT(WBT)	21.4(28.1)	A(C)	0.49(0.72)
Note: Analysis of signalized intersections assumes a PHF of 0.9 and a saturation flow rate of 1800 veh/h/lane. An environmental factor of 1.2 was used for roundabouts. (R) = Roundabout; (U) = Unsignalized; (S) = Signalized.						

As shown in **Table 12**, all study area intersections operate overall very well, with LoS 'C' or better and critical movements of 'D' or better.

Background Conditions 2030

The future background 2030 conditions represent the impact of additional background developments on existing volumes. Since 2030 background has the same intersection layouts as 2025 and is the more critical of the two scenarios, then only 2030 will be analyzed. The future projected 2030 background volumes are illustrated in **Figure 21** with projected operation outputs in **Table 13**. The detailed Synchro and Sidra results can be found in **Appendix L**.

Table 13: 2030 Background Intersection Performance

Intersection	Weekday AM Peak (PM Peak)					
	Critical Movement			Overall Intersection Performance		
	LoS	max. v/c or avg. delay (s)	Movement	Delay (s)	LoS	v/c
Abbott/Robert Grant (R)	B(B)	14(15)	WB(WB)	9(9)	A(A)	-
Bobolink/Robert Grant (R)	B(B)	13(13)	WB(WB)	6(6)	A(A)	-
Cope/Robert Grant (R)	B(B)	13(12)	WB(WB)	6(6)	A(A)	-
Haliburton/Robert Grant (U)	C(C)	17(23)	EB(EB)	3(4)	A(A)	-
Fernbank/Robert Grant (S)	B(D)	0.69(0.85)	WBT(WBT)	21.4(27.9)	A(C)	0.53(0.74)
Note: Analysis of signalized intersections assumes a PHF of 1.0 and a saturation flow rate of 1800 veh/h/lane. An environmental factor of 1.2 was used for roundabouts. (R) = Roundabout; (U) = Unsignalized; (S) = Signalized.						

As seen in **Table 13**, the study area roundabout intersections are anticipated to perform similarly to existing conditions. The unsignalized intersection of Haliburton/Robert Grant experienced the largest change in critical movement due to delays of vehicles turning left from the minor approach, but overall, the intersection continues to operate very well. The intersection of Fernbank/Robert Grant continues to operate within City acceptable standards.

Future Conditions 2030 – Full Buildout

Only the most critical future scenario 2030 will be analyzed, as it has the same road geometries and signal timing as 2025, but additional background developments have been added. The future full build-out 2030 volumes were derived by superimposing background 2030 volumes which include other area developments with future site-generated volumes. The future projected 2030 volumes are illustrated in **Figure 23** with projected operation outputs in **Table 14**. The detailed Synchro and Sidra results can be found in **Appendix M**.

Table 14: 2030 Full Build-Out with Development Intersection Performance

Intersection	Weekday AM Peak (PM Peak)					
	Critical Movement			Overall Intersection Performance		
	LoS	max. v/c or avg. delay (s)	Movement	Delay (s)	LoS	v/c
Abbott/Robert Grant (R)	B(B)	15(16)	WB(WB)	9(10)	A(B)	-
Bobolink/Robert Grant (R)	B(B)	13(13)	WB(WB)	6(6)	A(A)	-
Cope/Robert Grant (R)	B(B)	13(13)	WB(WB)	6(6)	A(A)	-
Haliburton/Robert Grant (U)	C(C)	17(24)	EB(EB)	3(4)	A(A)	-
Site/Robert Grant (U)	C(C)	18(20)	WB(WB)	1(1)	A(A)	-
Fernbank/Robert Grant (S)	B(D)	0.69(0.87)	WBT(WBT)	21.5(29.8)	A(C)	0.54(0.74)
Note: Analysis of signalized intersections assumes a PHF of 1.0 and a saturation flow rate of 1800 veh/h/lane. An environmental factor of 1.2 was used for roundabouts. (R) = Roundabout; (U) = Unsignalized; (S) = Signalized.						

As seen in **Table 14**, all study area intersections will continue to operate within City of Ottawa standards. Overall, intersection performance including this development operate relatively similar to 2030 background conditions, meaning that this development does not play a large role in worsening conditions from existing conditions, rather the majority of worsening conditions is in response to background traffic growth.

4.9.3. Queueing Assessment

The Sidra network confirmed that all roundabout intersections will have minimal queue implications, with none exceeding 50m for both AM and PM peak hours.

The Synchro model, however, identified southbound left-turn queues of up to 90m in the PM peak hour at Fernbank/Robert Grant. This queue would be approaching the auxiliary left-turn lane length capacity, but still acceptable. Further sensitivity using SimTraffic software showed a southbound left-turn queue of 95m which suggests there is a risk of queue spillback, but the average queue in both Synchro and SimTraffic are well within the storage capacity, suggesting the risk is low.

The city should continue to monitor queues as the neighbourhood matures with other new developments and the extension of Robert Grant Av. If queue capacity is reached, mitigation should be explored at that time.

5.0 FINDINGS, CONCLUSIONS AND RECOMMENDATIONS

Based on the results summarized herein the following findings and recommendations are provided:

Existing Conditions

- Fernbank Apartments Inc. is proposing a mixed-use development at the municipal address of 5000 Robert Grant Ave. The site is currently a vacant field.
- There are currently no bus services operating on Robert Grant Ave, however rapid route #62 and local route #67 operate approximately 600m walk from the site.
- The study area is fairly young and traffic has only increased in recent years. For this reason, not many collisions were recorded and no evident safety concerns were noted.
- All study area intersections currently operate at very good LoS 'C' or better, with critical movements operating at good LoS 'D' or better.

Proposed Development

- The development will consist of three pavilions with approximately 2,185 ft^2 of ground floor retail and 504 residential units. The development is assumed to be fully constructed by the year 2025 and will be built in two phases.

- The City of Ottawa's 2013 Transportation Master Plan (TMP) highlights Robert Grant Ave as a future transit priority corridor with isolated measures. The New Official Plan extends this vision by proposing an at-grade transitway which would connect to future Phase 3 LRT if approved. However, recent conversation with the City Planning group has identified that the City is not currently in a position to fund any transit projects within the study area corridor or Stage 3 LRT. It is therefore assumed that no transit priority will be built within the study horizon years. It is however anticipated that a new bus route (likely a local route until demand increases) will be added to Robert Grant Ave with bus stops located approximately 65m north of the site for northbound transit (towards downtown) and 180m walk to the southbound bus stop near to the Abbott/Robert Grant roundabout, to support the developing neighbourhoods near to the site.
- Similarly, Robert Grant Ave is identified within the TMP as a future widened road and extended north to Palladium Dr. City Staff have confirmed that the extension of Robert Grant Ave from Abbott St to Hazeldean Rd is anticipated by the 2025 horizon year, but no further extensions north or widenings are anticipated within the study horizon years.
- Given that no transit improvements are anticipated by the final horizon year, no reductions in vehicle driver mode share were justified. The TRANS mode share for Kanata-Stitsville from the origin destination survey were found appropriate. Using these mode shares, it was forecasted approximately 85 to 110 'new' two-way vehicle trips, 60 to 45 'new' two-way transit trips 0 'new' two-way cycling trips and 10 'new' two-way walking trips.
- The site meets the vehicle and bicycle parking bylaw requirements, with 651 vehicle parking spaces and at least 252 bicycle parking spaces proposed.
- The site proposes two accesses, one from Robert Grant Ave and the other from Livery St.
    - The access from Robert Grant Ave splits into two, with one branch continuing further east into the site using a Woonerf-like treatment to give priority to active mode share travelers. The Woonerf-like driveway is intended to be used as a drop off location, accessible parking and moving aisle, with intended very low vehicular traffic. The majority of traffic using this access are anticipated to turn right upon entry and continue down to the underground parking garage.
    - The Livery St driveway will function as a minor access, providing redundancy to the main Robert Grant Ave access. This access will also provide service to the garbage bins which will be located near the entrance of the driveway. All of the site's garbage will be picked up at this location, which would require trucks to enter a short distance, load the bins and reverse back to Livery St.
- The clear throat length recommended by TAC was not met; however, the risk of spillback from vehicles entering the site on to Robert Grant Ave was deemed very unlikely. Although clear throat distances are normally measured to the first point of conflict, since most vehicles will enter the site and turn right to head to the underground parking garage, without any opposition or need to yield to any vehicles, then the effective clear throat length should be measured to the next actual conflict point, which is located further away than the minimum recommended TAC clear throat distance. Refer to **Section 4.4** for more details.
- TDM measures are highly encouraged for the site if a transit priority corridor on Robert Grant Ave comes to fruition. Nonetheless, a strong TDM plan will encourage sustainable living and will reduce demands on the adjacent road network.

Future Conditions

- The adjacent neighbourhood is growing fast with plenty of new developments approved, under construction, recently built or proposed in the future. All known future development projected volumes within a 1km radius were manually added to existing volumes.

- The intersection of Abbott/Robert Grant was assumed to become a 4-legged roundabout, with a partial extension of Robert Grant Ave northward to Hazeldean Rd. Guidance from City Staff suggested that the further northward extension to Palladium Dr, the widening of Robert Grant Ave or the implementation of an at-grade transitway adjacent to the site are not expected by the study horizon year of 2030.
- The MMLOS road segment analysis showed that only the west side of Livery St would meet the PLoS target. As the traffic volumes increase on Robert Grant Ave and exceed 3,000 vehicles a day, a reduction in speeds to 30km/h would be required to meet the PLoS target. All other bicycle, transit and truck level of service targets are either met or not applicable.
- The MMLOS intersection (for signalized intersections only) analysis showed that only bicycle and truck target goals were met. The transit targets were not met as the southbound left-turn is forecasted to have delays larger than 40s. The pedestrian targets were not met due to the quantity of lanes required to cross.
- An auxiliary southbound left-turn lane warrant on Site/Robert Grant was completed and the need for a left-turn lane was not justified at this time. If safety or operational concerns are noted, the access to Robert Grant Ave could be converted to a right-in-right-out only or temporary traffic calming treatments such as centerline flex-poles may be considered through this section to ensure safe left-turn operations in advance of the BRT corridor implementation.
- The full build-out 2030 horizon has good overall intersection performance of LoS 'D' or better and acceptable critical movements of LoS 'D' or better, with most intersections operating overall at excellent LoS 'A'.
- The site is proposing a Woonerf-like driveway access with enhanced urban design catered to active transportation beyond the split from the main site access and parking garage ramp. The Woonerf-like design is focused on active transportation with supporting pathways that permeate the site and connect all pavilions and external active transportation facilities. The Woonerf-like driveway will provide minimal vehicular access for drop-offs, moving aisle and 9 surface parking spots with 6 of them being accessible parking. All pavilions will provide direct connectivity from their front doors to the existing active transportation facilities on Robert Grant Ave.

Based on the preceding report, the proposed Fernbank Apartments Inc located at 5000 Robert Grant Ave is recommended from a transportation perspective.

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Appendix A:

TIA Screening Form

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City of Ottawa 2017 TIA Guidelines

TIA Screening Form

Date 27-Jul-23

Project 5000 Rober Grant Ave

Project Number

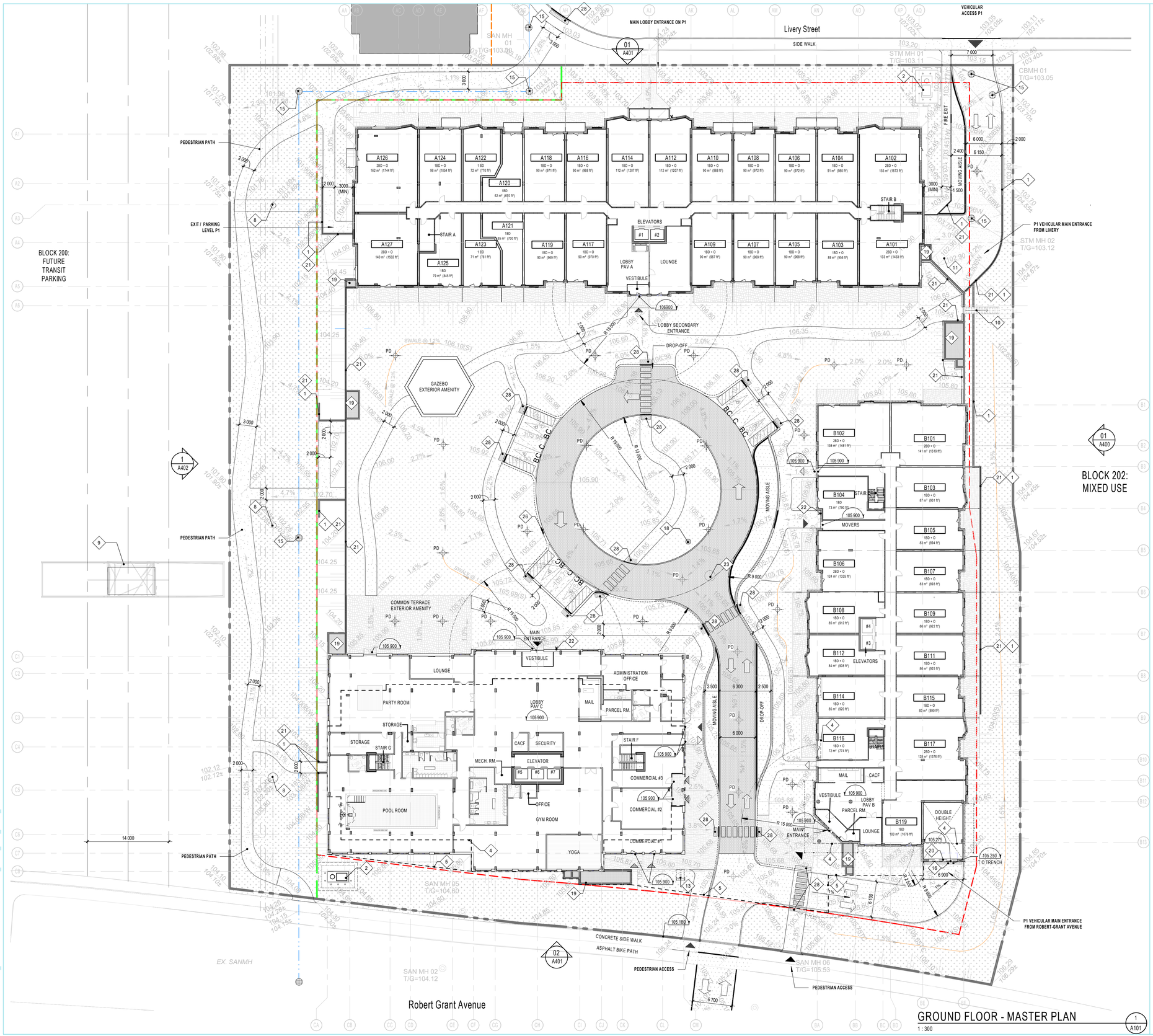
Results of Screening	Yes/No
Development Satisfies the Trip Generation Trigger	Yes
Development Satisfies the Location Trigger	Yes
Development Satisfies the Safety Trigger	No

Module 1.1 - Description of Proposed Development	
Municipal Address	5000 Robert Grant Ave
Description of location	Greenfield site located east of Robert Grant, west of Livery St and south of Abbott St E, fronting the hydro corridor
Land Use	Mixed-use, mainly residential
Development Size	504 units and 2,400 ft2 commercial
Number of Accesses and Locations	2. One access to Robert Grant Rd, one to Livery St
Development Phasing	Two phased development
Buildout Year	Assumed 2025
Sketch Plan / Site Plan	See attached

Module 1.2 - Trip Generation Trigger		
Land Use Type	Townhomes or Apartments	
Development Size	504	Units
Trip Generation Trigger Met?	Yes	

Module 1.3 - Location Triggers		
Development Proposes a new driveway to a boundary street that is designated as part of the City's Transit Priority, Rapid Transit, or Spine Bicycle Networks (See Sheet 3)	Yes	Robert Grant has cycletracks on both sides of the road and is classified as crosstown bikeway. Future BRT proposed on Robert Grant Ave.
Development is in a Design Priority Area (DPA) or Transit-oriented Development (TOD) zone. (See Sheet 3)	No	
Location Trigger Met?	Yes	

Module 1.4 - Safety Triggers		
Posted Speed Limit on any boundary road	<80	km/h
Horizontal / Vertical Curvature on a boundary street limits sight lines at a proposed driveway	No	
A proposed driveway is within the area of influence of an adjacent traffic signal or roundabout (i.e. within 300 m of intersection in rural conditions, or within 150 m of intersection in urban/ suburban conditions) or within auxiliary lanes of an intersection;	No	
A proposed driveway makes use of an existing median break that serves an existing site	No	
There is a documented history of traffic operations or safety concerns on the boundary streets within 500 m of the development	No	
The development includes a drive-thru facility	No	
Safety Trigger Met?	No	



GENERAL NOTES

Type	DESCRIPTION
Note 1	RETAINING WALL (REFER TO CIVIL)
Note 2	HYDRO TRANSFORMER
Note 3	PAV C PODIUM OUTLINE ABOVE
Note 4	BUILDING OUTLINE ABOVE
Note 5	PARKING LEVEL P1 OUTLINE
Note 6	PARKING LEVEL P2 OUTLINE
Note 7	PARKING LEVEL P3 OUTLINE
Note 8	HYDRO POLE & OVERHEAD LINE
Note 9	HYDRO OTTAWA TOWER ON CONCRETE PAD
Note 10	METAL STAIRS & PATHWAY TOWARDS ADJACENT BLOCK WILL BE PROVIDED AT LATER STAGE IN THE FUTURE.
Note 11	BOLLARD
Note 12	WATER TANK OUTLINE BELOW & ACCESS HATCH W LADDER
Note 13	BIKE RACK (FRONT LOADING) SET BACK 1800 (MIN) FROM PATHWAY
Note 14	OUTLINE OF POOL
Note 15	MANHOLE (REFER TO CIVIL)
Note 16	TRENCH DRAIN
Note 17	CONCRETE CURB (REFER STRUCT. ENG.)
Note 18	FIRE HYDRANT
Note 19	MECHANICAL SHAFT
Note 20	GARAGE DOOR - DOOR HEIGHT (2.1 MIN REQ.)
Note 21	GUARD RAIL (BY LANDSCAPING)
Note 22	SIAMESE CONNECTION
Note 23	OIL GRIT SEPARATOR
Note 24	TRANSFER BEAM
Note 25	VEHICLE CIRCULATION ON PODIUM ABOVE
Note 26	DEPRESSED CURB FOR FLOOD PATH (REFER TO CIVIL)
Note 27	GROUND FLOOR BUILDING OUTLINE
Note 28	TACTILE WALKING SURFACE INDICATOR

LINE TYPE & ACCESS LEGEND

- PROPERTY LINE
- SETBACK LINE
- EASEMENT LIMIT
- SETBACK LINE FOR HEIGHT LIMITS
- TRUNK SEWER
- P1 SLOPE SLAB
- MOUNTABLE CURB (REFER TO CIVIL)
- VEHICULAR ENTRY
- ACCESS TO BUILDING
- ACCESS TO COMMERCIAL
- EXITS
- CIRCULATION ARROW
- FIRE ROUTE (ON PODIUM)
- NEIGHBOUR 330 PROPERTY LINE ON LIVERY STREET.
- SWALE (REFER TO CIVIL)

SURFACE LEGEND

- PAVERS STACKED PATTERN (UPPER TERRACE)
- PAVERS MODULAR PATTERN (PODIUM & GRADE)
- CONCRETE FINISH
- LIGHT DUTY ASPHALT PAVEMENT (REFER TO CIVIL)
- HEAVY ASPHALT DUTY PAVEMENT (REFER TO CIVIL.)
- WOONERF PAVERS
- STONE BALLAST ON ROOF
- LANDSCAPING
- EXISTING BUILDINGS
- DEPRESSED CURB (REFER TO CIVIL.)
- BARRIER FREE UNLOADING

PLAN SYMBOL LEGEND

- RAILING OR GUARDRAIL TYPE • SEE PAGE A504 FOR DETAILS
- GENERAL NOTES • SEE LEGEND FOR DESCRIPTION
- WINDOW OR CURTAIN WALL TYPE • SEE PAGE A902 & A903 FOR DETAILS
- WALL TYPE • SEE PAGE A800 & A801 FOR DETAILS
- ROOF TYPE • SEE PAGE A800 & A801 FOR DETAILS
- DOOR NUMBER • SEE PAGE A900 & A901 FOR DETAILS
- ROOM NUMBER • SEE PLANS FOR DETAILS
- EXTERIOR MATERIAL TYPE • SEE PAGE A400 - A403 FOR LEGEND
- CIVIL DRAINS • SEE CIVIL PLANS FOR DETAILS

ROOF ASSEMBLIES

REFER TO ASSEMBLIES SCHEDULE A800 FOR ROOF TYPES

BICYCLE RACK LEGEND

- F.M.S. - FLOOR MOUNTED SINGLE - 600 x 1800
- F.M.D. - FLOOR MOUNTED DOUBLE - 600 x 1800
- W.M.S. - WALL MOUNTED SINGLE - 500 x 1500

PARKING LEGEND

- BARRIER FREE PARKING SPACE 5.2m X 3.4m (min.)
- BARRIER FREE PARKING SPACE 5.2m X 2.4m (min.)
- TYPICAL PARKING FOR VISITORS 5.2m X 2.6m (min.)
- COMMERCIAL BARRIER FREE PARKING SPACE 5.2m X 2.4m (min.)
- TYPICAL PARKING SPACE 5.2m X 2.6m (min.)
- SMALL CAR PARKING SPACE 4.6m X 2.4m (min.)
- COMMERCIAL TYPICAL PARKING SPACE 5.2m X 2.6m (min.)
- ZONE WITH A CLEAR HEIGHT OF 2300mm min.
- PEDESTRIAN TRAFFIC
- DRIVING AISLE IN GARAGE.
- ZONES WHICH ARE CONSIDERED PART OF THE EXIT AND THUS CANNOT BE PENETRATED BY ANY ELECTRICAL AND MECHANICAL SERVICES NOT SERVICING THE EXIT

PARKING SPACES

	COUNT
P3 PARKING LEVEL PAV B & C	
STANDARD SMALL: 2400x4600	19
STANDARD: 2600x5200	66
P2 PARKING LEVEL PAV B & C	
STANDARD SMALL: 2400x4600	39
STANDARD: 2600x5200	268
P1 PARKING LEVEL PAV A	
BARRIER FREE PARKING: 2400mmx5200mm	7
BARRIER FREE PARKING: 3400mmx5200mm	8
STANDARD SMALL: 2400x4600	26
STANDARD: 2600x5200	108
STANDARD: 2600X5200 - VISITORS	101
GROUND FLOOR LEVEL PAV B	
BARRIER FREE PARKING: 2400mmx5200mm - VISITORS COMMERCIAL	6
STANDARD COMMERCIAL: 2600X5200 - VISITORS COMMERCIAL	3
GRAND TOTAL	651

GRAPHIC SCALE: 1:300

GROUND FLOOR - MASTER PLAN

1 : 300

NOTES GÉNÉRALES General Notes

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COMPANY NAME
FERNBANK APARTMENTS INC.

RENÉS COURT

EMPLACEMENT Location
5000 Robert Grant Avenue
OTTAWA

NO PROJET No. 11186

DATE d'ouverture du projet / project start date (aa.mm.jj) 17.10.20

NO	RELEASE	DATE (aa-mm-jj)
1.A	ISSUED FOR PHASE 1 PRE-CONSULTATION	
1.B	ISSUED FOR PHASE 3 PRE-CONSULTATION	

DESSINÉ PAR Drawn by O.A. / A.W.

VÉRIFIÉ PAR Checked K.P.

DATE (aa.mm.jj) 23/10/27

ÉCHELLE Scale As indicated

TITRE DU DESSIN Drawing Title

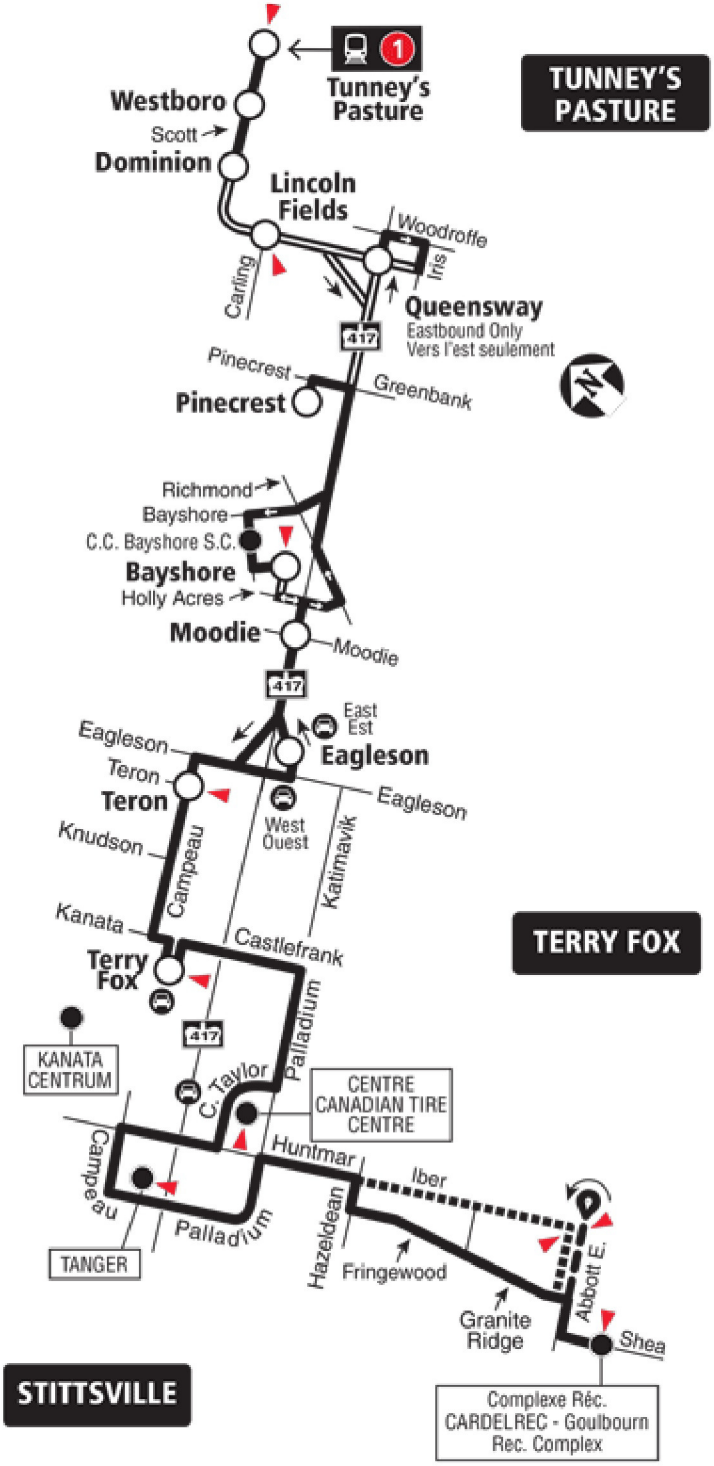
GROUND FLOOR- MASTER PLAN

FOR COORDINATION ONLY.
2024-02-15

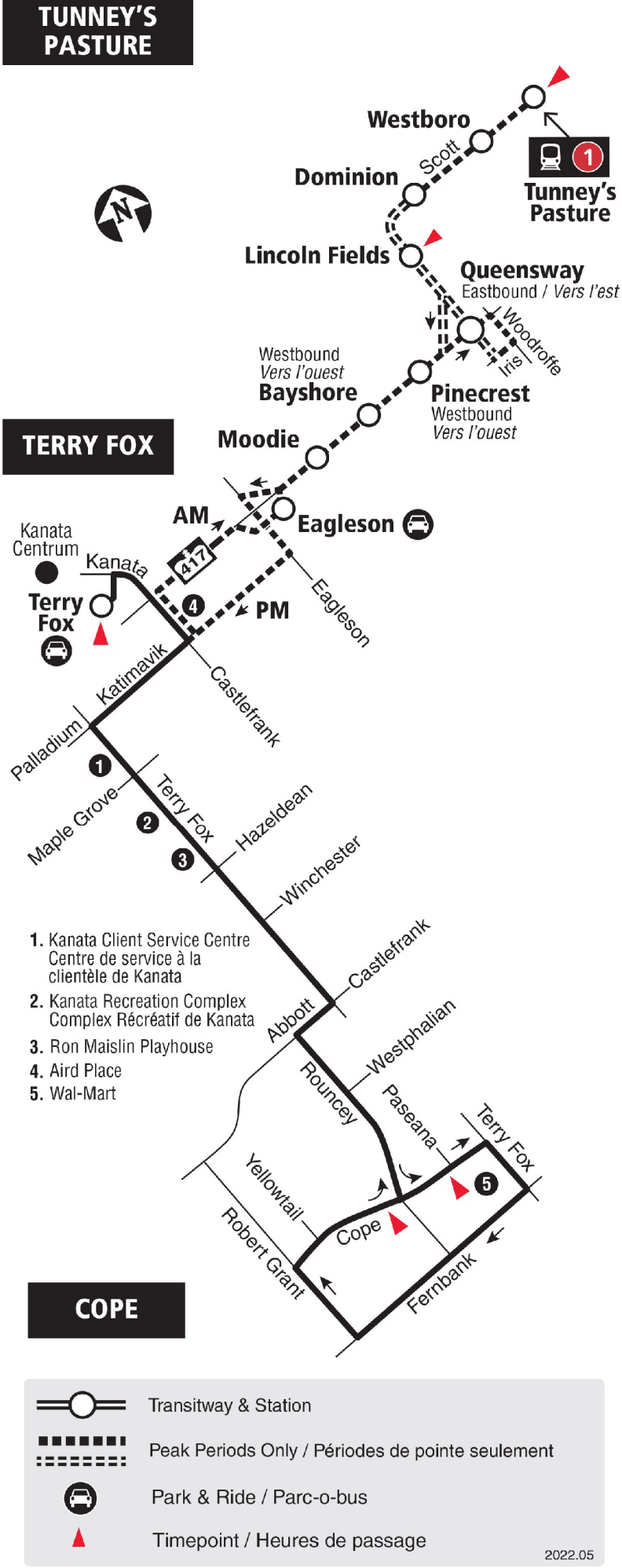
NUMÉRO DU DESSIN Drawing Number A101

Appendix B:

Transit Route Maps


TUNNEY'S PASTURE
1
Tunney's Pasture
Westboro
Scott
Dominion
Lincoln Fields
Woodroffe
Iris
Carling
Queensway
Eastbound Only
Vers l'est seulement
417
Pinecrest
Pinecrest
Greenbank
Richmond
Bayshore
C.C. Bayshore S.C.
Bayshore
Holly Acres
Moodie
Moodie
417
East
Est
Eagleson
Eagleson
Teron
Teron
Eagleson
West
Ouest
Knudson
Campeau
Katimavik
Kanata
Castlefrank
Terry Fox
TERRY FOX
417
Palladium
KANATA CENTRUM
CENTRE CANADIAN TIRE CENTRE
C. Taylor
Huntmar
Iber
Campeau
Palladium
TANGER
Hazeldean
Fringewood
Granite Ridge
Abbott E.
Shea
STITTSVILLE
Complexe Réc. CARDELREC - Goulbourn Rec. Complex
Transitway & Station
Weekday southbound trips before noon and weekday northbound trips between noon and 8 p.m. travel via Iber and Abbott E.
Trajets en semaine vers le sud en avant midi et trajets en semaine vers le nord entre midi et 20 h via Iber et Abbott E.
Saturday and Sunday / Samedi et dimanche
Park & Ride / Parc-o-bus
Timepoint / Heures de passage
2022.12

2022.12


TUNNEY'S PASTURE
Westboro
Scott
Dominion
1
Tunney's Pasture
Lincoln Fields
Queensway
Eastbound / Vers l'est
Woodroffe
Iris
Westbound
Vers l'ouest
Bayshore
Pinecrest
Westbound
Vers l'ouest
TERRY FOX
Moodie
AM
Eagleson
Kanata Centrum
Kanata
417
Terry Fox
4
PM
Eagleson
Katimavik
Castlefrank
Palladium
1
Maple Grove
Terry Fox
2
3
Hazeldean
Winchester
1. Kanata Client Service Centre
Centre de service à la clientèle de Kanata
2. Kanata Recreation Complex
Complex Récréatif de Kanata
3. Ron Maislin Playhouse
4. Aird Place
5. Wal-Mart
Castlefrank
Abbott
Westphalian
Rouncey
Paseana
Terry Fox
5
Yellowtail
Cope
Robert Grant
Fernbank
COPE
Transitway & Station
Peak Periods Only / Périodes de pointe seulement
Park & Ride / Parc-o-bus
Timepoint / Heures de passage
2022.05

Appendix C:

Existing Peak Hour Volumes

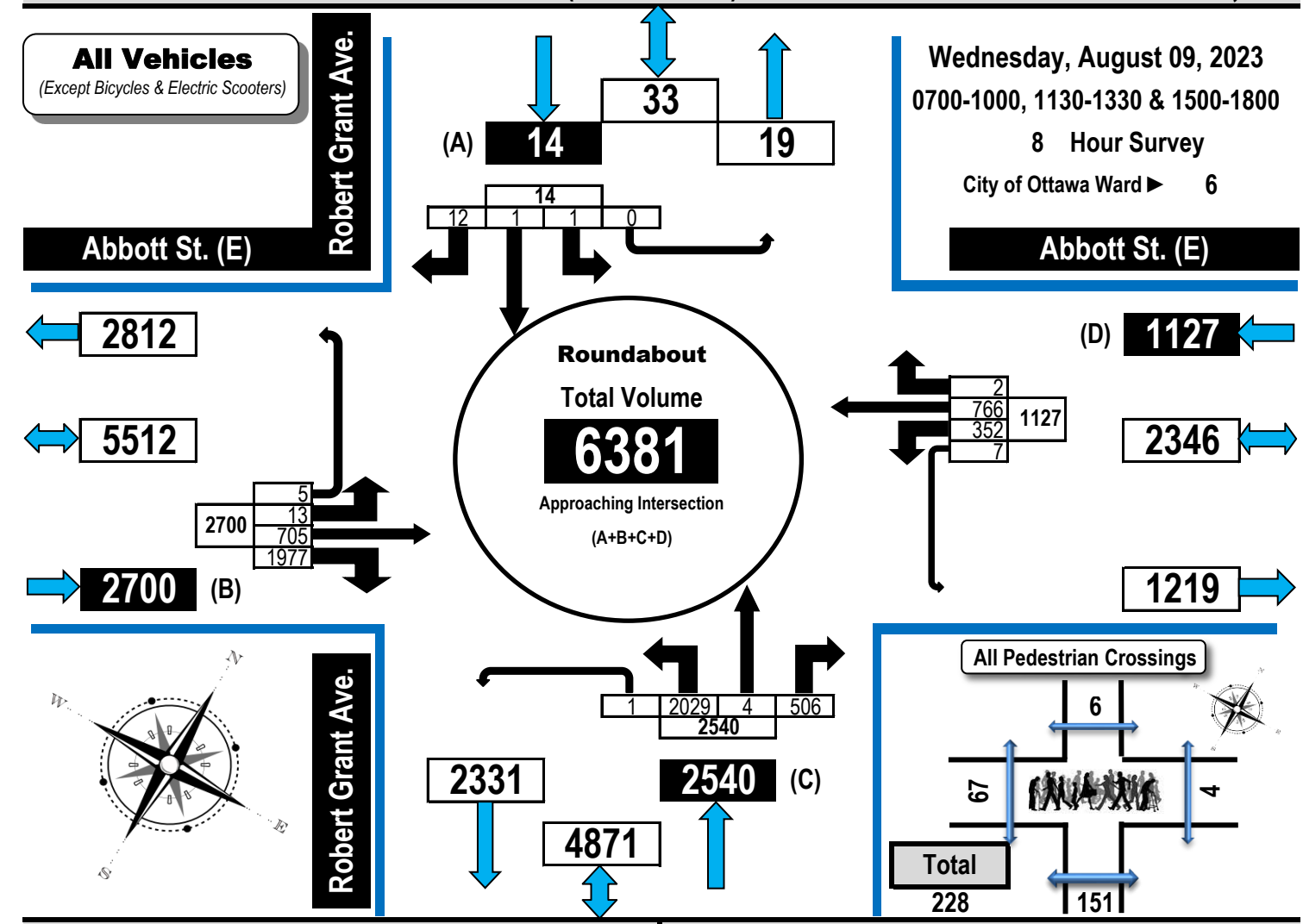
ACCURATE TRUSTED TRAFFIC DATA

Turning Movement Count
Summary, AM and PM Peak Hour Flow Diagrams
All Vehicles Except Bicycles

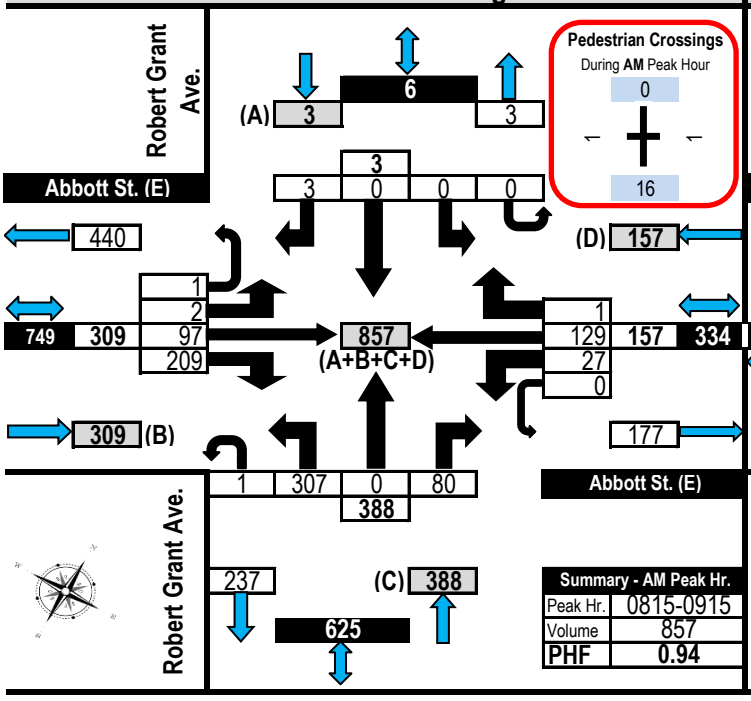
Abbott Street East & Robert Grant Avenue (Roundabout) — Stittsville, ON

All Vehicles
(Except Bicycles & Electric Scooters)

Wednesday, August 09, 2023
0700-1000, 1130-1330 & 1500-1800
8 Hour Survey
City of Ottawa Ward ▶ 6

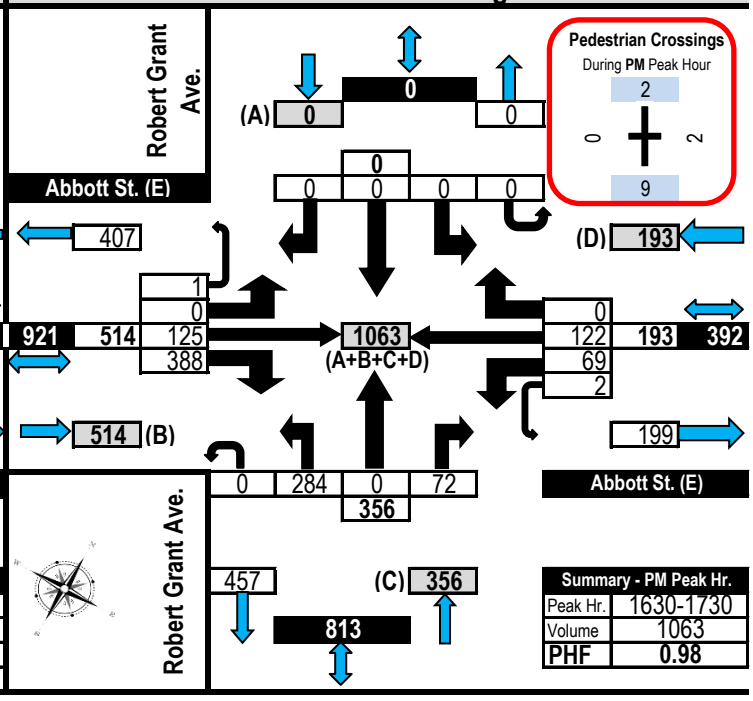


AM Peak Hour Flow Diagram



Summary - AM Peak Hr.	
Peak Hr.	0815-0915
Volume	857
PHF	0.94

PM Peak Hour Flow Diagram



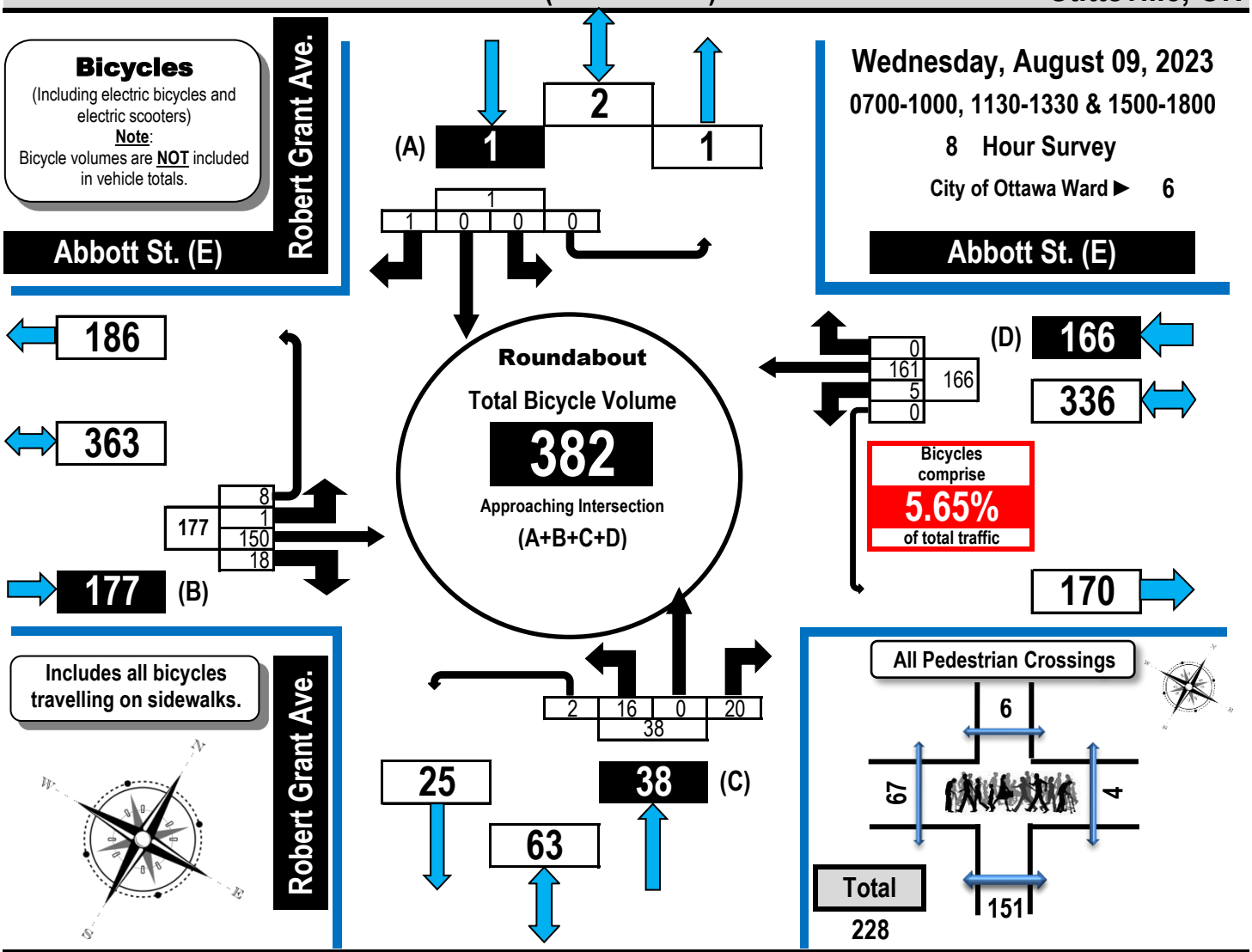
Summary - PM Peak Hr.	
Peak Hr.	1630-1730
Volume	1063
PHF	0.98

Turning Movement Count
Bicycle Summary
Flow Diagram

Abbott Street East & Robert Grant Avenue (Roundabout) — **Stittsville, ON**

Bicycles
(Including electric bicycles and electric scooters)
Note:
Bicycle volumes are **NOT** included in vehicle totals.

Wednesday, August 09, 2023
0700-1000, 1130-1330 & 1500-1800
8 Hour Survey
City of Ottawa Ward ► 6



	Abbott St. (E) Eastbound					Abbott St. (E) Westbound					Robert Grant Ave. Northbound					Robert Grant Ave. Southbound					
Time Period	LT	ST	RT	UT	EB Tot	LT	ST	RT	UT	WB Tot	LT	ST	RT	UT	NB Tot	LT	ST	RT	UT	SB Tot	GR Tot
0700-0800	0	8	3	1	12	1	20	0	0	21	0	0	2	0	2	0	0	0	0	0	35
0800-0900	0	20	1	3	24	0	18	0	0	18	2	0	4	0	6	0	0	0	0	0	48
0900-1000	0	18	2	0	20	1	22	0	0	23	3	0	4	0	7	0	0	0	0	0	50
1130-1230	0	17	3	0	20	0	30	0	0	30	4	0	2	0	6	0	0	0	0	0	56
1230-1330	0	29	3	0	32	0	23	0	0	23	2	0	3	0	5	0	0	0	0	0	60
1500-1600	1	17	1	3	22	1	13	0	0	14	1	0	3	0	4	0	0	1	0	1	41
1600-1700	0	17	4	1	22	2	18	0	0	20	1	0	1	0	2	0	0	0	0	0	44
1700-1800	0	24	1	0	25	0	17	0	0	17	3	0	1	2	6	0	0	0	0	0	48
Totals	**1**	**150**	**18**	**8**	**177**	**5**	**161**	**0**	**0**	**166**	**16**	**0**	**20**	**2**	**38**	**0**	**0**	**1**	**0**	**1**	**382**

Comments:

OC Transpo and Para Transpo buses and school buses comprise 2.77% of the heavy vehicle traffic. A large group of children with their chaperones crossed in the west side crossing between 12h00 & 12h15. The north leg (Robert Grant Avenue) is not yet open; however, there is a construction access on the west side accounting for some of the traffic in this area. The majority of the cyclists (E/B & W/B) use the Trans Canada Trail located approximately 20 m south of Abbott Street.

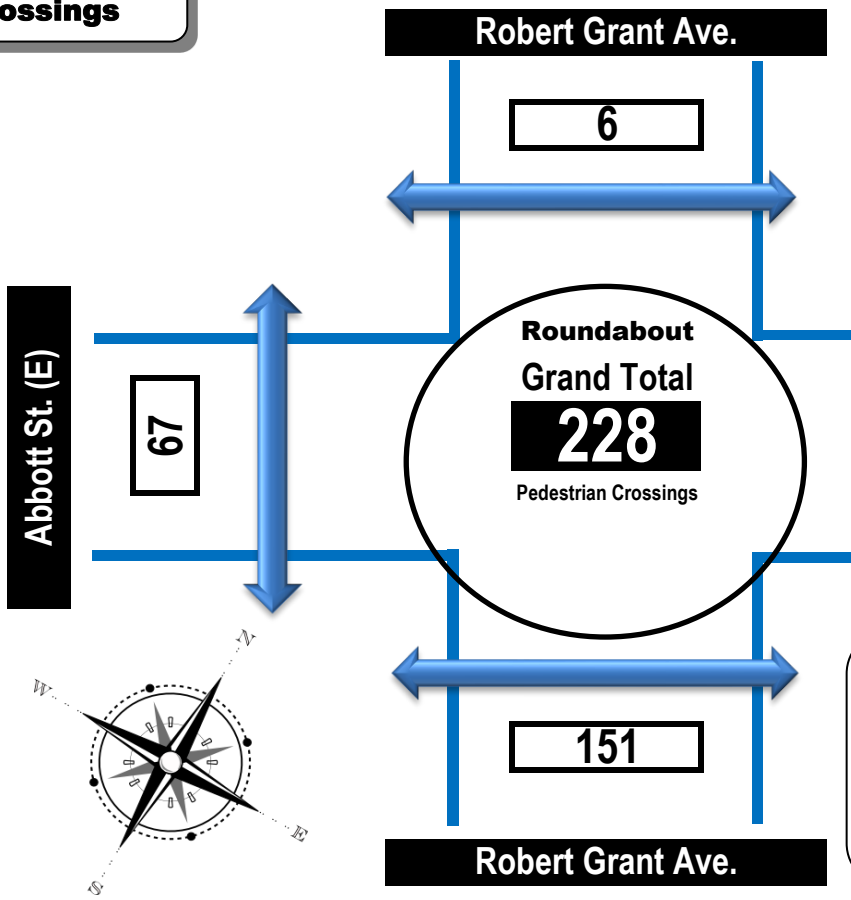
ACCURATE TRUSTED TRAFFIC DATA

Turning Movement Count
Pedestrian Crossings Summary and Flow Diagram

Abbott Street East & Robert Grant Avenue (Roundabout) — Stittsville, ON

Pedestrian Crossings

Wednesday, August 09, 2023
0700-1000, 1130-1330 & 1500-1800
8 Hour Survey
City of Ottawa Ward ► 6



Note

*The values in the summary table below and the flow diagram represent the number of pedestrian crossing**s** **NOT** the number of individual pedestrian**s** crossing. For example, some pedestrians will cross one approach, then another to reach their destination. Accordingly, one pedestrian crossing two approaches will be recorded as two crossings.*

Time Period	West Side Crossing Abbott St. (E)	East Side Crossing Abbott St. (E)	Street Total	South Side Crossing Robert Grant Ave.	North Side Crossing Robert Grant Ave.	Street Total	Grand Total
0700-0800	4	0	4	34	2	36	40
0800-0900	0	2	2	18	1	19	21
0900-1000	4	0	4	13	0	13	17
1130-1230	53	0	53	21	0	21	74
1230-1330	2	0	2	25	1	26	28
1500-1600	2	0	2	13	0	13	15
1600-1700	1	1	2	14	1	15	17
1700-1800	1	1	2	13	1	14	16
Totals	**67**	**4**	**71**	**151**	**6**	**157**	**228**

Comments:

OC Transpo and Para Transpo buses and school buses comprise 2.77% of the heavy vehicle traffic. A large group of children with their chaperones crossed in the west side crossing between 12h00 & 12h15. The north leg (Robert Grant Avenue) is not yet open; however, there is a construction access on the west side accounting for some of the traffic in this area. The majority of the cyclists (E/B & W/B) use the Trans Canada Trail located approximately 20 m south of Abbott Street.

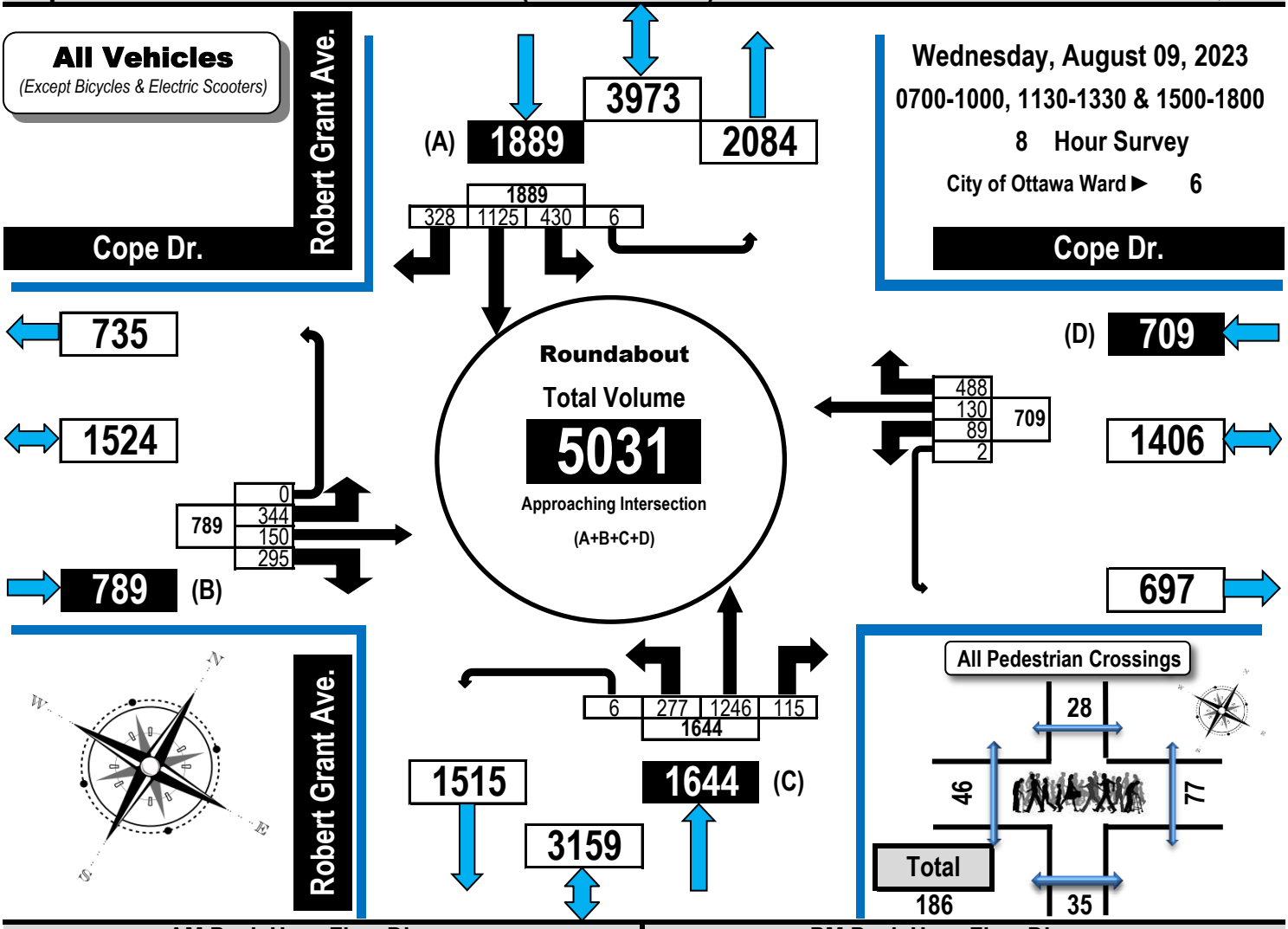
ACCURATE TRUSTED TRAFFIC DATA

Turning Movement Count
Summary, AM and PM Peak Hour Flow Diagrams
All Vehicles Except Bicycles

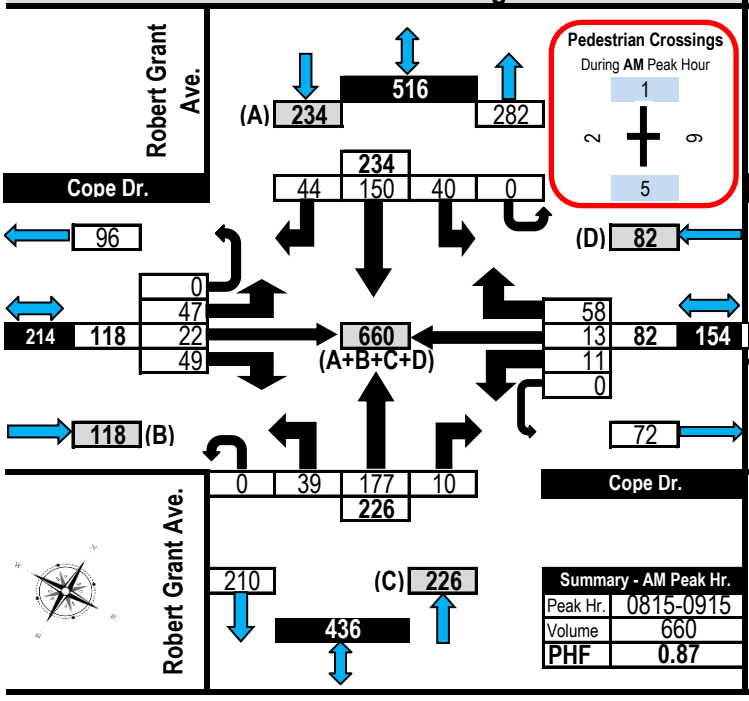
Cope Drive & Robert Grant Avenue (Roundabout) — Stittsville, ON

All Vehicles
(Except Bicycles & Electric Scooters)

Wednesday, August 09, 2023
0700-1000, 1130-1330 & 1500-1800
8 Hour Survey
City of Ottawa Ward ▶ 6

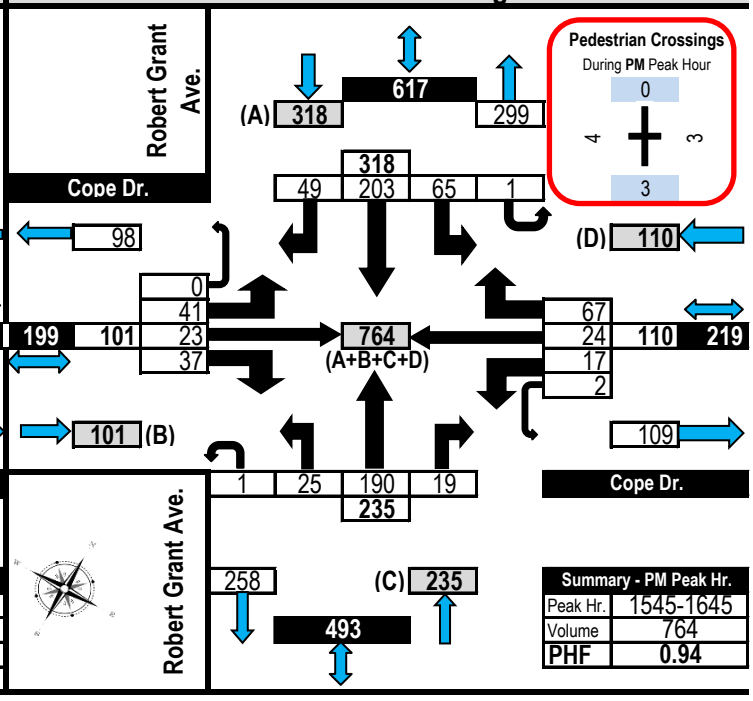


AM Peak Hour Flow Diagram



Summary - AM Peak Hr.	
Peak Hr.	0815-0915
Volume	660
PHF	0.87

PM Peak Hour Flow Diagram



Summary - PM Peak Hr.	
Peak Hr.	1545-1645
Volume	764
PHF	0.94

ACCURATE TRUSTED TRAFFIC DATA

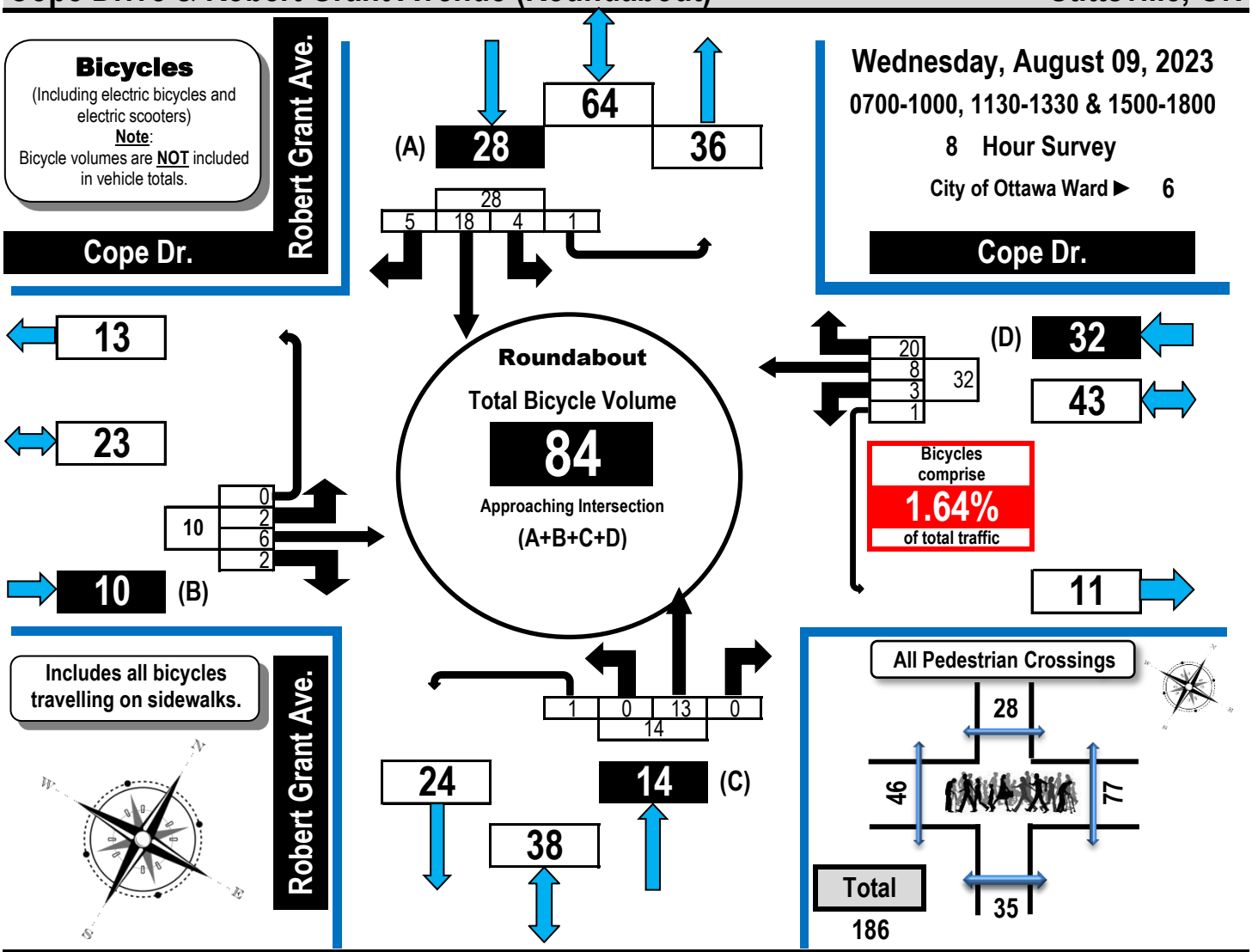
Turning Movement Count
Bicycle Summary
Flow Diagram

Cope Drive & Robert Grant Avenue (Roundabout) — Stittsville, ON

Bicycles
(Including electric bicycles and electric scooters)
Note:
Bicycle volumes are **NOT** included in vehicle totals.

Includes all bicycles travelling on sidewalks.

Wednesday, August 09, 2023
0700-1000, 1130-1330 & 1500-1800
8 Hour Survey
City of Ottawa Ward ► 6



	Cope Dr. Eastbound					Cope Dr. Westbound					Robert Grant Ave. Northbound					Robert Grant Ave. Southbound					
Time Period	LT	ST	RT	UT	EB Tot	LT	ST	RT	UT	WB Tot	LT	ST	RT	UT	NB Tot	LT	ST	RT	UT	SB Tot	GR Tot
0700-0800	0	0	0	0	0	0	0	1	0	1	0	4	0	0	4	0	0	0	0	0	5
0800-0900	1	1	1	0	3	0	0	4	0	4	0	3	0	0	3	1	1	1	0	3	13
0900-1000	1	0	1	0	2	1	0	2	0	3	0	3	0	0	3	0	2	0	0	2	10
1130-1230	0	1	0	0	1	0	0	4	0	4	0	0	0	0	0	0	0	0	0	0	5
1230-1330	0	0	0	0	0	0	1	3	0	4	0	0	0	1	1	0	3	2	0	5	10
1500-1600	0	3	0	0	3	0	1	1	1	3	0	1	0	0	1	1	2	1	0	4	11
1600-1700	0	0	0	0	0	2	1	3	0	6	0	1	0	0	1	1	5	0	0	6	13
1700-1800	0	1	0	0	1	0	5	2	0	7	0	1	0	0	1	1	5	1	1	8	17
Totals	2	6	2	0	10	3	8	20	1	32	0	13	0	1	14	4	18	5	1	28	84

Comments:
OC Transpo, Para Transpo buses and school buses comprise 4.78% of the heavy vehicle traffic. The majority of the heavy vehicle traffic appears to be associated with construction underway in the area.

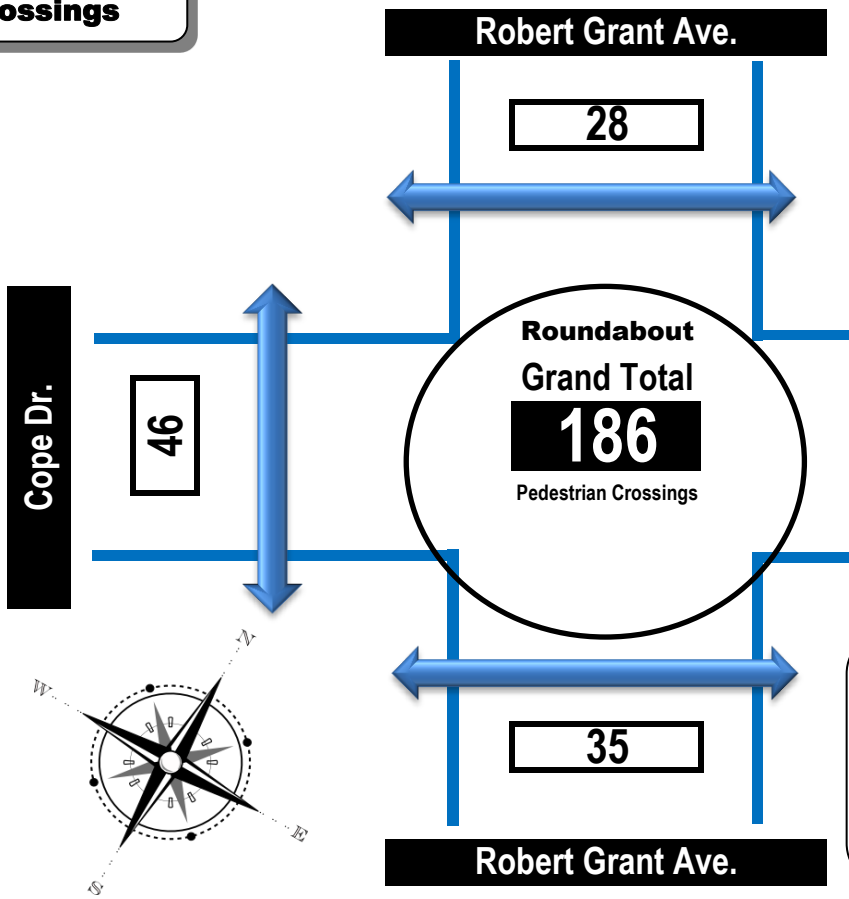
ACCURATE TRUSTED TRAFFIC DATA

Turning Movement Count
Pedestrian Crossings Summary and Flow Diagram

Cope Drive & Robert Grant Avenue (Roundabout) — Stittsville, ON

Pedestrian Crossings

Wednesday, August 09, 2023
0700-1000, 1130-1330 & 1500-1800
8 Hour Survey
City of Ottawa Ward ► 6



Note
*The values in the summary table below and the flow diagram represent the number of pedestrian crossing**s** **NOT** the number of individual pedestrian**s** crossing. For example, some pedestrians will cross one approach, then another to reach their destination. Accordingly, one pedestrian crossing two approaches will be recorded as two crossings.*

Time Period	West Side Crossing Cope Dr.	East Side Crossing Cope Dr.	Street Total	South Side Crossing Robert Grant Ave.	North Side Crossing Robert Grant Ave.	Street Total	Grand Total
0700-0800	7	14	21	4	9	13	34
0800-0900	1	10	11	4	3	7	18
0900-1000	5	13	18	5	5	10	28
1130-1230	8	9	17	2	1	3	20
1230-1330	10	14	24	5	6	11	35
1500-1600	0	8	8	2	1	3	11
1600-1700	5	3	8	7	0	7	15
1700-1800	10	6	16	6	3	9	25
Totals	**46**	**77**	**123**	**35**	**28**	**63**	**186**

Comments:
OC Transpo, Para Transpo buses and school buses comprise 4.78% of the heavy vehicle traffic. The majority of the heavy vehicle traffic appears to be associated with construction underway in the area.

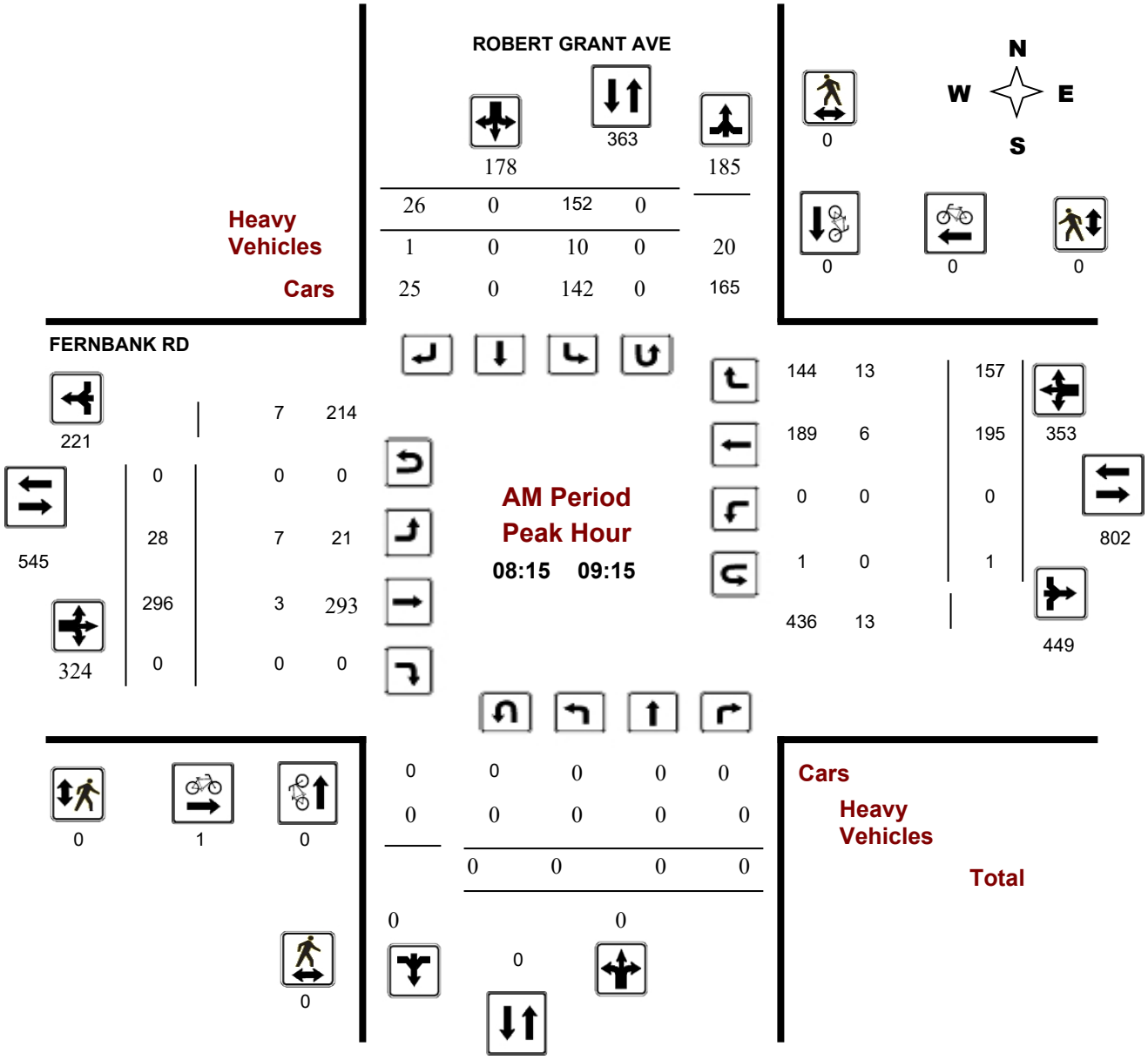
Transportation Services - Traffic Services

Turning Movement Count - Peak Hour Diagram

FERNBANK RD @ ROBERT GRANT AVE

Survey Date: Thursday, August 30, 2018 **WO No:** 38041

Start Time: 07:00 **Device:** Miovision



Comments

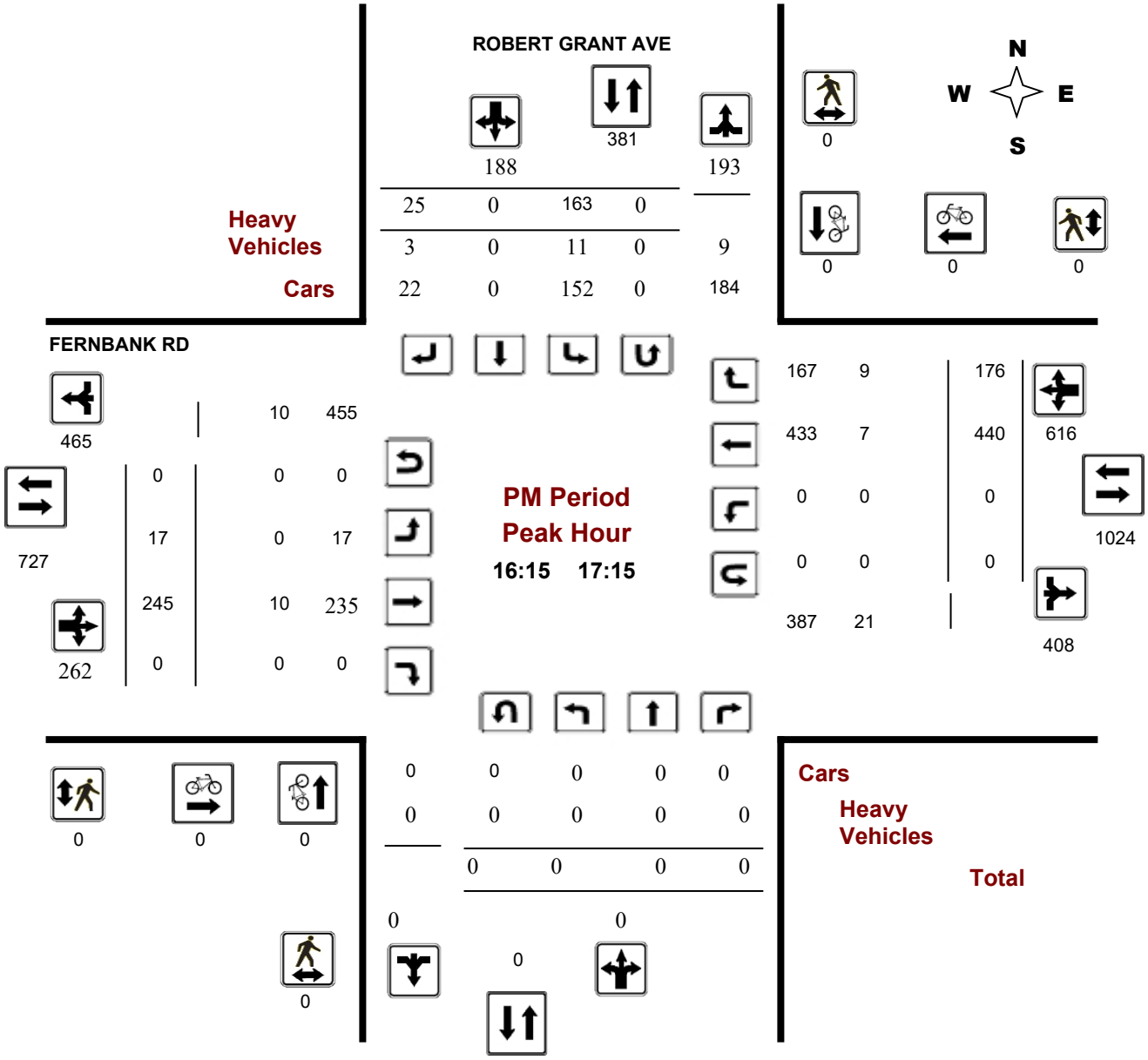
Transportation Services - Traffic Services

Turning Movement Count - Peak Hour Diagram

FERNBANK RD @ ROBERT GRANT AVE

Survey Date: Thursday, August 30, 2018 **WO No:** 38041

Start Time: 07:00 **Device:** Miovision



Comments

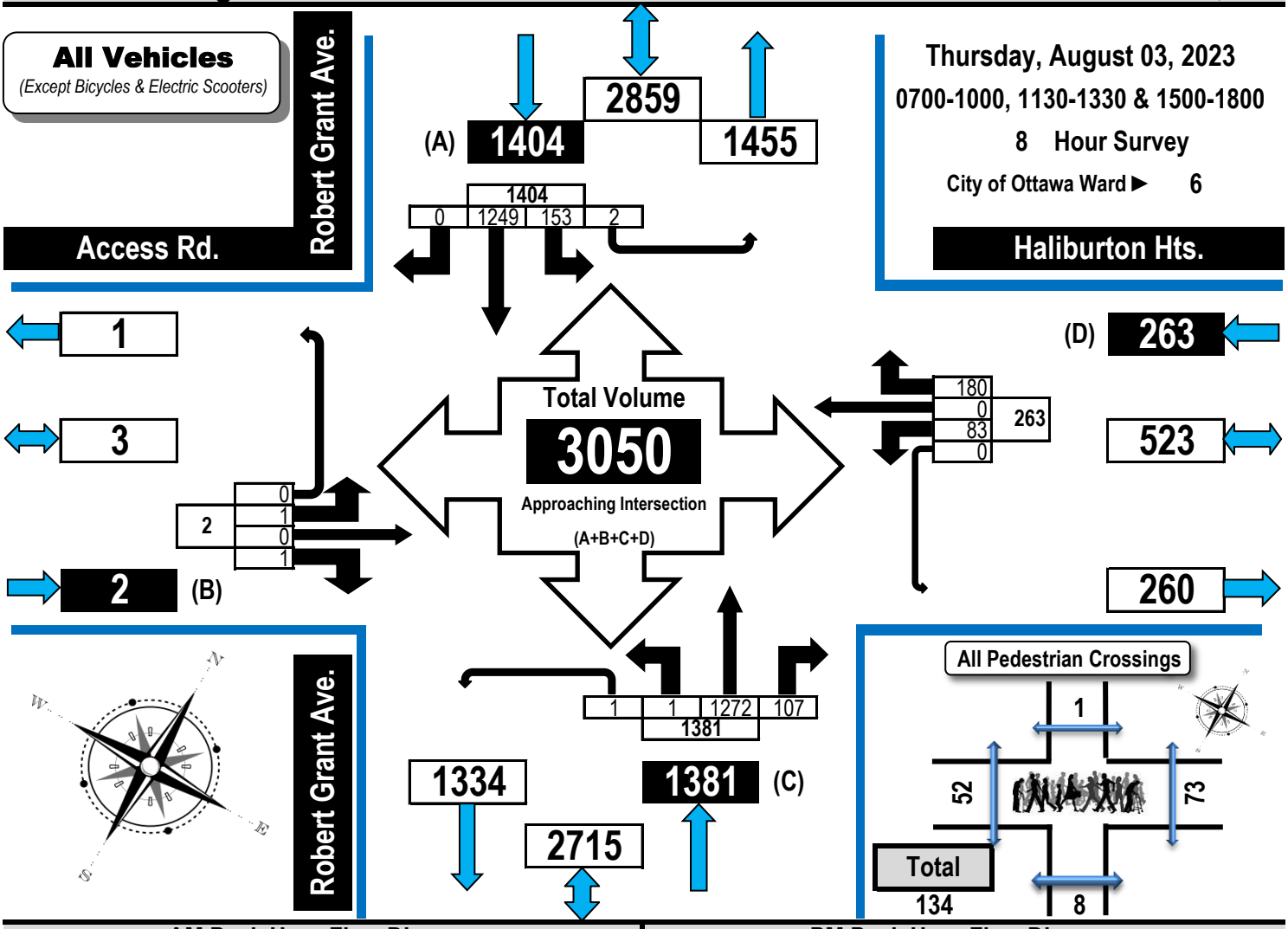
ACCURATE TRUSTED TRAFFIC DATA

Turning Movement Count
Summary, AM and PM Peak Hour Flow Diagrams
All Vehicles Except Bicycles

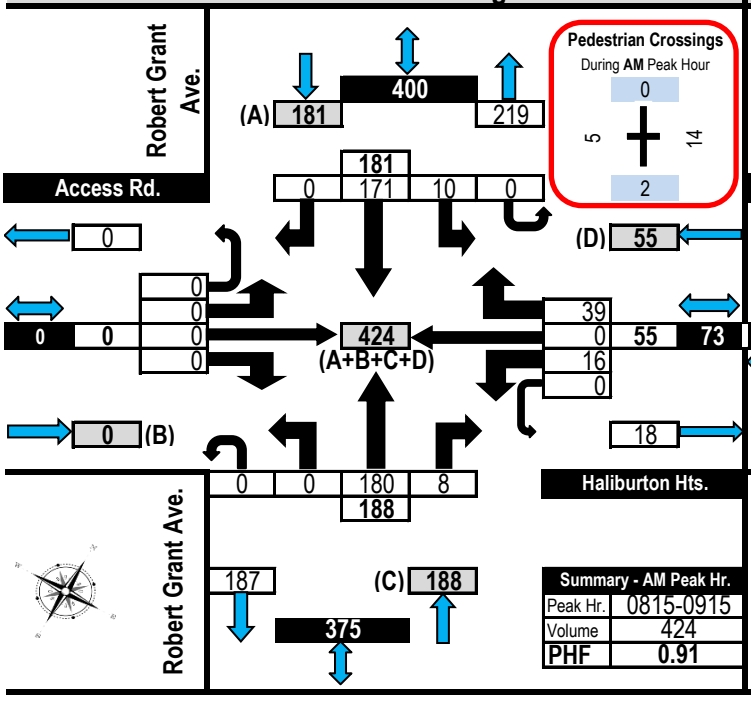
Haliburton Heights & Robert Grant Avenue — Stittsville, ON

All Vehicles
(Except Bicycles & Electric Scooters)

Thursday, August 03, 2023
0700-1000, 1130-1330 & 1500-1800
8 Hour Survey
City of Ottawa Ward ▶ 6

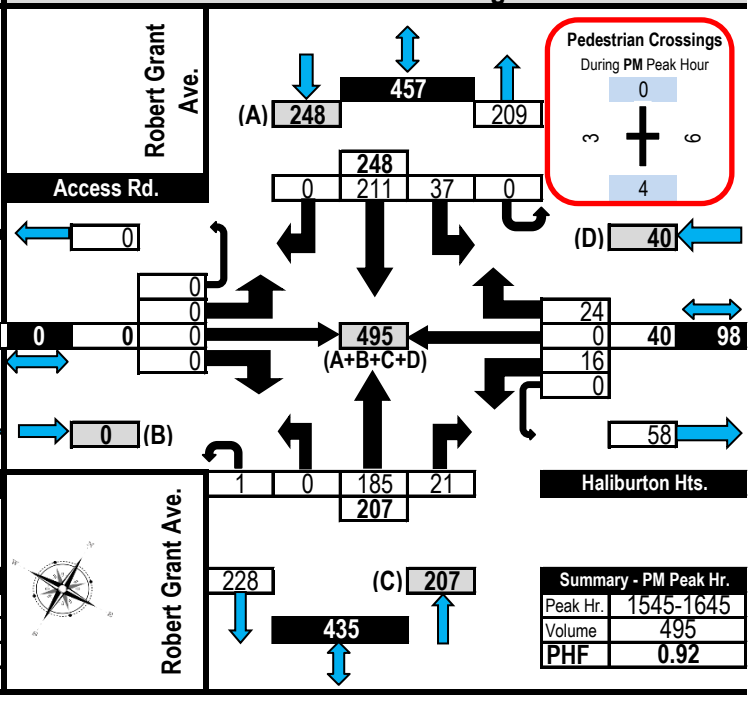


AM Peak Hour Flow Diagram



Summary - AM Peak Hr.	
Peak Hr.	0815-0915
Volume	424
PHF	0.91

PM Peak Hour Flow Diagram



Summary - PM Peak Hr.	
Peak Hr.	1545-1645
Volume	495
PHF	0.92

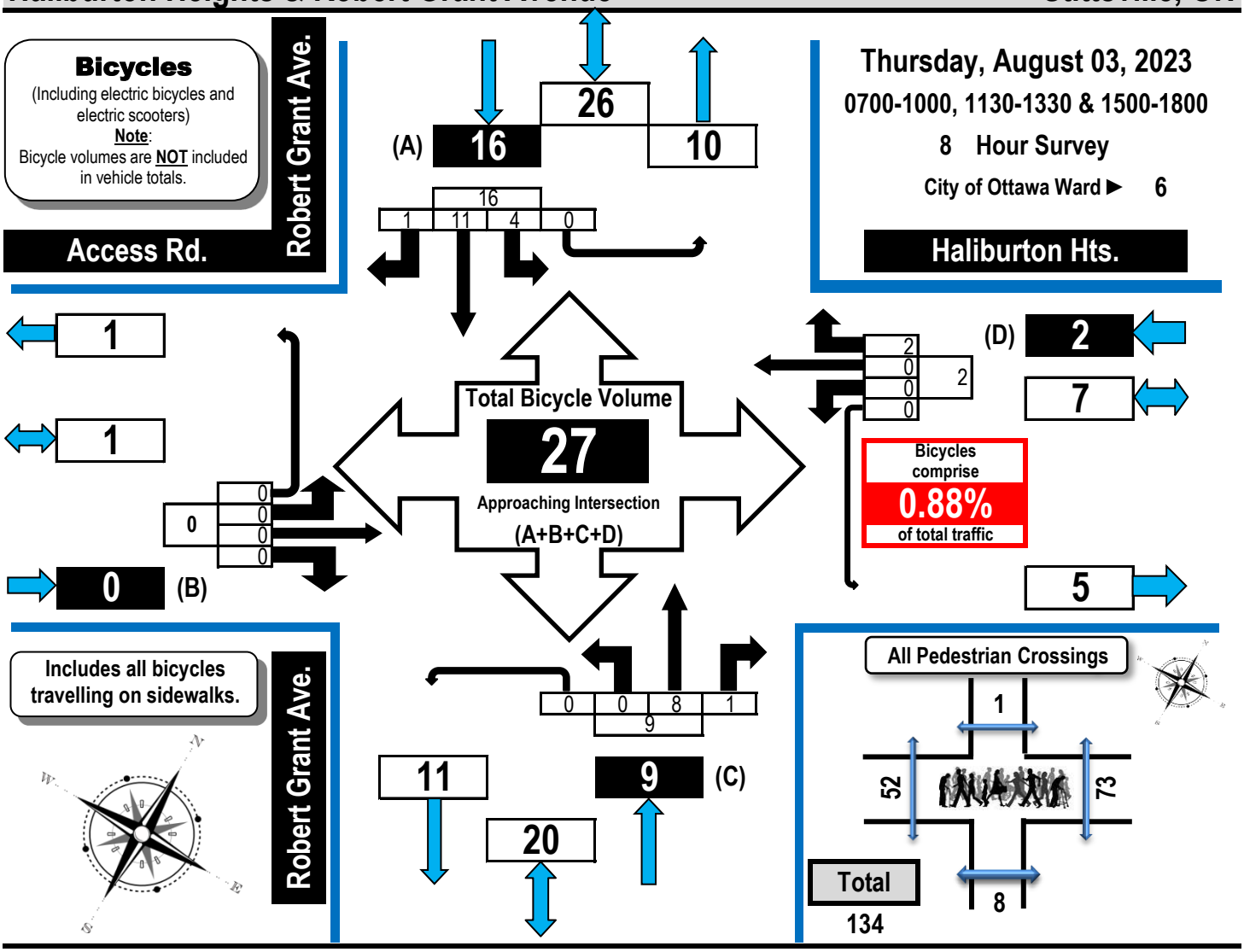
ACCURATE TRUSTED TRAFFIC DATA

Turning Movement Count
Bicycle Summary
Flow Diagram

Haliburton Heights & Robert Grant Avenue — Stittsville, ON

Bicycles
(Including electric bicycles and electric scooters)
Note:
Bicycle volumes are NOT included in vehicle totals.

Thursday, August 03, 2023
0700-1000, 1130-1330 & 1500-1800
8 Hour Survey
City of Ottawa Ward ► 6



Includes all bicycles travelling on sidewalks.

Robert Grant Ave.

	Access Rd.					Haliburton Hts.					Robert Grant Ave.					Robert Grant Ave.					
	Eastbound					Westbound					Northbound					Southbound					
Time Period	LT	ST	RT	UT	EB Tot	LT	ST	RT	UT	WB Tot	LT	ST	RT	UT	NB Tot	LT	ST	RT	UT	SB Tot	GR Tot
0700-0800	0	0	0	0	0	0	0	0	0	0	0	1	0	0	1	0	0	0	0	0	1
0800-0900	0	0	0	0	0	0	0	1	0	1	0	1	1	0	2	1	2	0	0	3	6
0900-1000	0	0	0	0	0	0	0	0	0	0	0	1	0	0	1	0	2	0	0	2	3
1130-1230	0	0	0	0	0	0	0	0	0	0	0	1	0	0	1	0	2	1	0	3	4
1230-1330	0	0	0	0	0	0	0	0	0	0	0	2	0	0	2	2	0	0	0	2	4
1500-1600	0	0	0	0	0	0	0	1	0	1	0	0	0	0	0	0	0	0	0	0	1
1600-1700	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	3	0	0	3	3
1700-1800	0	0	0	0	0	0	0	0	0	0	0	2	0	0	2	1	2	0	0	3	5
Totals	0	0	0	0	0	0	0	2	0	2	0	8	1	0	9	4	11	1	0	16	27

Comments:
OC Transpo buses and school buses comprise 9.76% of the heavy vehicle traffic. The westerly access does not yet connect to another street.

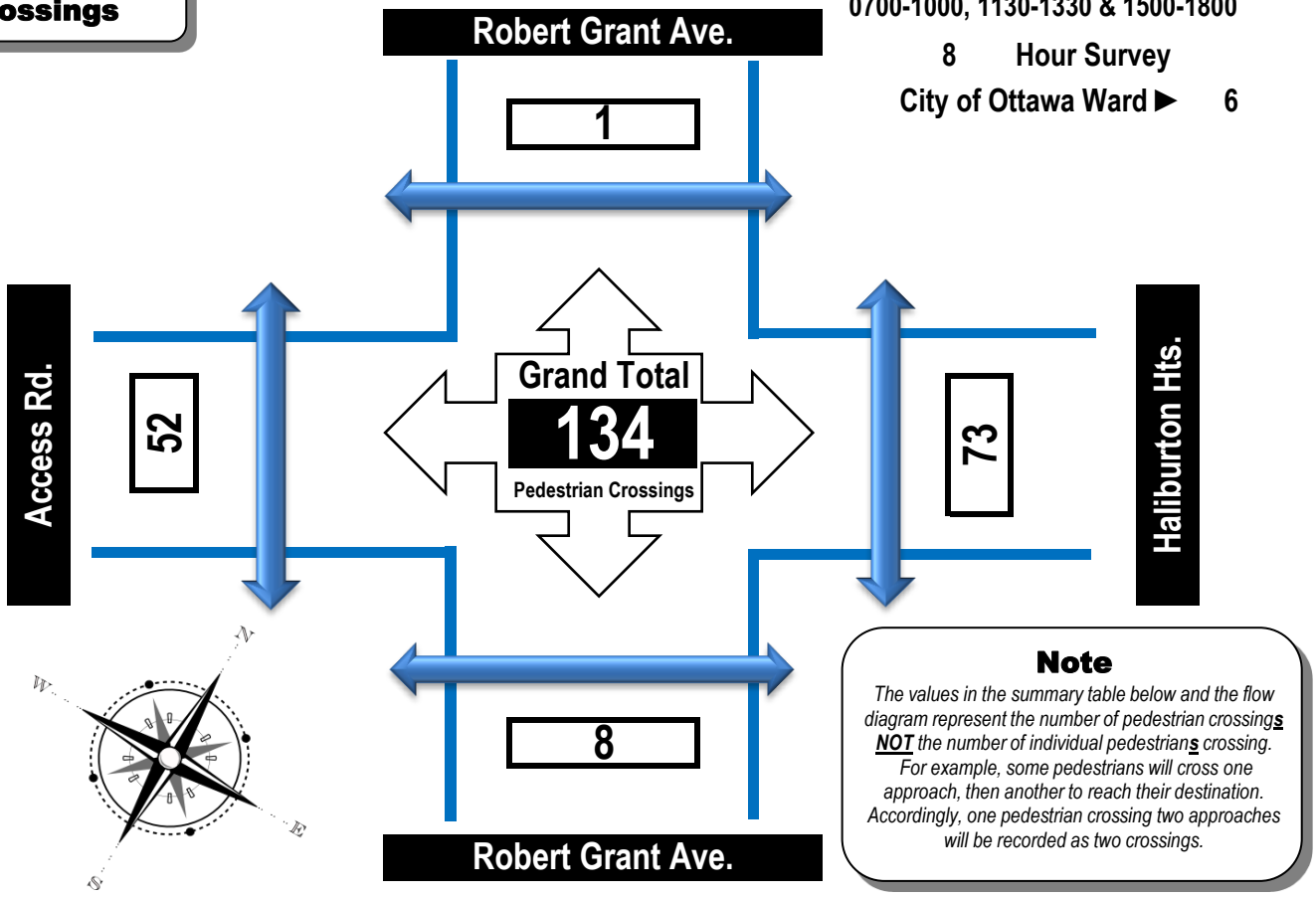
ACCURATE TRUSTED TRAFFIC DATA

Turning Movement Count
Pedestrian Crossings Summary and Flow Diagram

Haliburton Heights & Robert Grant Avenue — Stittsville, ON

Pedestrian Crossings

Thursday, August 03, 2023
0700-1000, 1130-1330 & 1500-1800
8 Hour Survey
City of Ottawa Ward ► 6



Note

*The values in the summary table below and the flow diagram represent the number of pedestrian crossing**s** **NOT** the number of individual pedestrian**s** crossing. For example, some pedestrians will cross one approach, then another to reach their destination. Accordingly, one pedestrian crossing two approaches will be recorded as two crossings.*

Time Period	West Side Crossing Access Rd.	East Side Crossing Haliburton Hts.	Street Total	South Side Crossing Robert Grant Ave.	North Side Crossing Robert Grant Ave.	Street Total	Grand Total
0700-0800	6	9	15	0	1	1	16
0800-0900	10	10	20	2	0	2	22
0900-1000	1	11	12	1	0	1	13
1130-1230	3	9	12	0	0	0	12
1230-1330	2	7	9	1	0	1	10
1500-1600	18	8	26	0	0	0	26
1600-1700	3	6	9	4	0	4	13
1700-1800	9	13	22	0	0	0	22
Totals	**52**	**73**	**125**	**8**	**1**	**9**	**134**

Comments:
OC Transpo buses and school buses comprise 9.76% of the heavy vehicle traffic. The westerly access does not yet connect to another street.

Appendix D:

Historic Collision Data

Total Area

Classification of Accident	Rear End	Turning Movement	Sideswipe	Angle	Approaching	SMV other	SMV unattended vehicle	Other	Total	
P.D. only	1	0	0	3	0	1	0	0	5	56%
Non-fatal injury	0	0	0	2	0	2	0	0	4	44%
Non-reportable	0	0	0	0	0	0	0	0	0	0%
Total	**1**	**0**	**0**	**5**	**0**	**3**	**0**	**0**	**9**	100%
	#3 or 11%	#4 or 0%	#4 or 0%	#1 or 56%	#4 or 0%	#2 or 33%	#4 or 0%	#4 or 0%		

ABBOTT ST/ROBERT GRANT AVE

Years	Total # Collisions	24 Hr AADT Veh Volume	Days	Collisions/MEV
2017-2021	3	n/a	1825	**n/a**

Peds	Cyclists
0	**1**

Classification of Accident	Rear End	Turning Movement	Sideswipe	Angle	Approaching	SMV other	SMV unattended vehicle	Other	Total	
P.D. only	0	0	0	0	0	1	0	0	1	33%
Non-fatal injury	0	0	0	1	0	1	0	0	2	67%
Non-reportable	0	0	0	0	0	0	0	0	0	0%
Total	**0**	**0**	**0**	**1**	**0**	**2**	**0**	**0**	**3**	100%
	0%	0%	0%	33%	0%	67%	0%	0%		

BOBOLINK RDG/ROBERT GRANT AVE

Years	Total # Collisions	24 Hr AADT Veh Volume	Days	Collisions/MEV
2017-2021	2	n/a	1825	**n/a**

Peds	Cyclists
0	**0**

Classification of Accident	Rear End	Turning Movement	Sideswipe	Angle	Approaching	SMV other	SMV unattended vehicle	Other	Total	
P.D. only	0	0	0	2	0	0	0	0	2	100%
Non-fatal injury	0	0	0	0	0	0	0	0	0	0%
Non-reportable	0	0	0	0	0	0	0	0	0	0%
Total	**0**	**0**	**0**	**2**	**0**	**0**	**0**	**0**	**2**	100%
	0%	0%	0%	100%	0%	0%	0%	0%		

COPE DR/ROBERT GRANT AVE

Years	Total # Collisions	24 Hr AADT Veh Volume	Days	Collisions/MEV
2017-2021	1	n/a	1825	**n/a**

Peds	Cyclists
1	**0**

Classification of Accident	Rear End	Turning Movement	Sideswipe	Angle	Approaching	SMV other	SMV unattended vehicle	Other	Total	
P.D. only	0	0	0	0	0	0	0	0	0	0%
Non-fatal injury	0	0	0	0	0	1	0	0	1	100%
Non-reportable	0	0	0	0	0	0	0	0	0	0%
Total	**0**	**0**	**0**	**0**	**0**	**1**	**0**	**0**	**1**	100%
	0%	0%	0%	0%	0%	100%	0%	0%		

FERNBANK RD/ROBERT GRANT AVE

Years	Total # Collisions	24 Hr AADT Veh Volume	Days	Collisions/MEV
2017-2021	3	n/a	1825	**n/a**

Peds	Cyclists
0	**0**

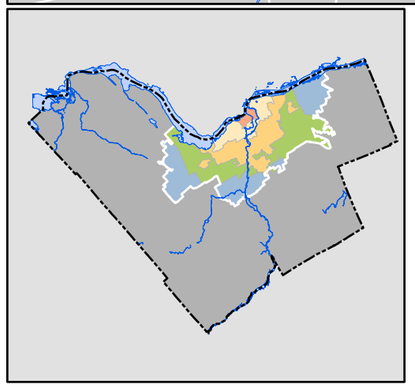
Classification of Accident	Rear End	Turning Movement	Sideswipe	Angle	Approaching	SMV other	SMV unattended vehicle	Other	Total	
P.D. only	1	0	0	1	0	0	0	0	2	67%
Non-fatal injury	0	0	0	1	0	0	0	0	1	33%
Non-reportable	0	0	0	0	0	0	0	0	0	0%
Total	**1**	**0**	**0**	**2**	**0**	**0**	**0**	**0**	**3**	100%
	33%	0%	0%	67%	0%	0%	0%	0%		

Appendix E:

New Official Plan Ultimate Rapid Transit Network

Expansion lands also form part of this Schedule, and an adjustment to this map will be undertaken at a later time to add these lands. In the interim the expansion lands are shown on Schedule C17 - Urban Expansion Areas

Les terrains de la zone d'extension font aussi partie de cette annexe; on mettra au point cette carte à une date ultérieure, pour y ajouter ces terrains. D'ici là, les terrains de la zone d'extension sont représentés dans l'annexe C17 - Zones d'expansion urbaine.



TRANSECT POLICY AREAS / SECTEURS STRATÉGIQUES DU TRANSECT

- Downtown Core / Centre-ville
- Inner Urban / Urbain intérieur
- Outer Urban / Urbain extérieur
- Greenbelt / Ceinture de verdure
- Suburban / Suburbain
- Rural / Rural

TRANSIT

- O-Train and Station / O-Train et station
- Future O-Train / O-Train et station (futur)
- Transitway – grade separated / Transitway en site propre
- Transitway – at grade / Transitway – Voie à niveau
- Transfer Station / Station de correspondance
- Terminus Station / Station terminus

- Gatineau RapiBus - grade-separated / Rapibus de Gatineau en site propre

Note: The transit network on this Schedule is provided for reference purposes only. For transit network policy, please refer to Schedule C2. / Remarque : Les renseignements relatifs au réseau de transport en commun qui sont présentés dans cette annexe sont fournis à titre de référence. Pour consulter les politiques du réseau de transport, veuillez vous référer à l'annexe C2.

- Urban Boundary / Périmètre d'urbanisation

November 24, 2021

Official Plan / Plan officiel

Schedule A - Transect Policy Areas
Annexe A – Secteurs stratégiques du transect

Consolidation and Amendments / Consolidation et amendements

0 0.5 1 2 3 4 5 km

Planning, Infrastructure and Economic Development Department, Geospatial Analytics, Technology and Solutions
Services de la planification, de l'infrastructure et du développement économique, Analyse géospatiale, technologie et solutions

Appendix F:

Truck Turning Templates

Page Setup: ----

Plot Date: Thursday, February 08, 2024 15:03:54

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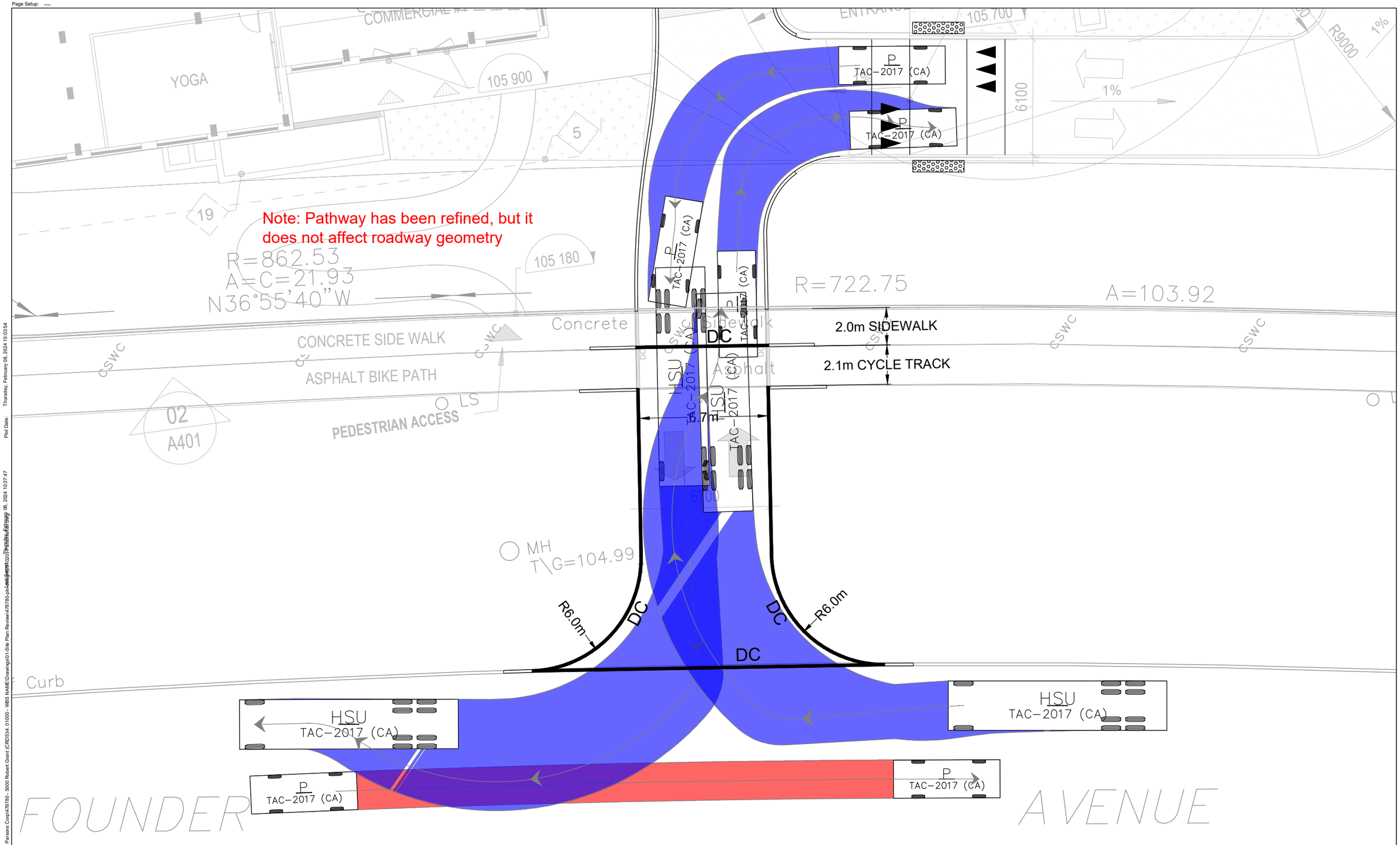

PARSONS®

NOTE: The location of utilities is approximate only, the exact location should be determined by consulting the municipal authorities and utility companies concerned. The contractor shall prove the location of utilities and shall be responsible for adequate protection from damage.

Legend

HSU

	meters
Width	: 2.60
Track	: 2.60
Lock to Lock Time	: 6.0
Steering Angle	: 40.0

P

	meters
Width	: 2.00
Track	: 2.00
Lock to Lock Time	: 6.0
Steering Angle	: 35.9

Not to Scale

Drawing Description: Robert Grant Access (P-Car and HSU)		
Client	Date: Feb 8, 2024	Figure Number: 001
Project Number: 478780	Project Description: 5000 Robert Grant	

Page Setup: ----

Plot Date: Tuesday, September 5, 2023 12:06:09 PM

Last Saved By: Tuesday, September 5, 2023 12:04:55 PM

C:\Users\jo0049780\OneDrive - Parsons Corp\478780 - 5000 Robert Grant (CRDS)\4_01000 - WBS NAME\Drawings\01-Site Plan Concepts\478780-Site Plan.dwg

Consultant's Information

ELEVATOR SHAFT

TERRACE 17TH FLOOR

BALCONY 4TH FLOOR

RAISED LOADING AISLE. DELINEATE USING PAVERS OR CONCRETE

A new pathway has been added but it does not affect road geometry

CONCRETE MOUNTABLE CURB WITH GUTTER AS PER SC.1.3

RAISED PARKING AISLE. DELINEATE USING PAVERS OR CONCRETE

RAISED LOADING AISLE. DELINEATE USING PAVERS OR CONCRETE

HSU TAC-2017 (CA)

6.0m

2.5m

R9.0m

2000 1500 MIN.

R13000

R19100

PD

22

18

PARSONS®

NOTE: The location of utilities is approximate only, the exact location should be determined by consulting the municipal authorities and utility companies concerned. The contractor shall prove the location of utilities and shall be responsible for adequate protection from damage.

Legend

HSU

	meters
Width	: 2.60
Track	: 2.60
Lock to Lock Time	: 6.0
Steering Angle	: 40.0

Not to Scale

Drawing Description: Site Loading Areas (HSU)		
Client	Date: Sep 05, 2023	Figure Number: 002
Project Number: 478780	Project Description: 5000 Robert Grant	

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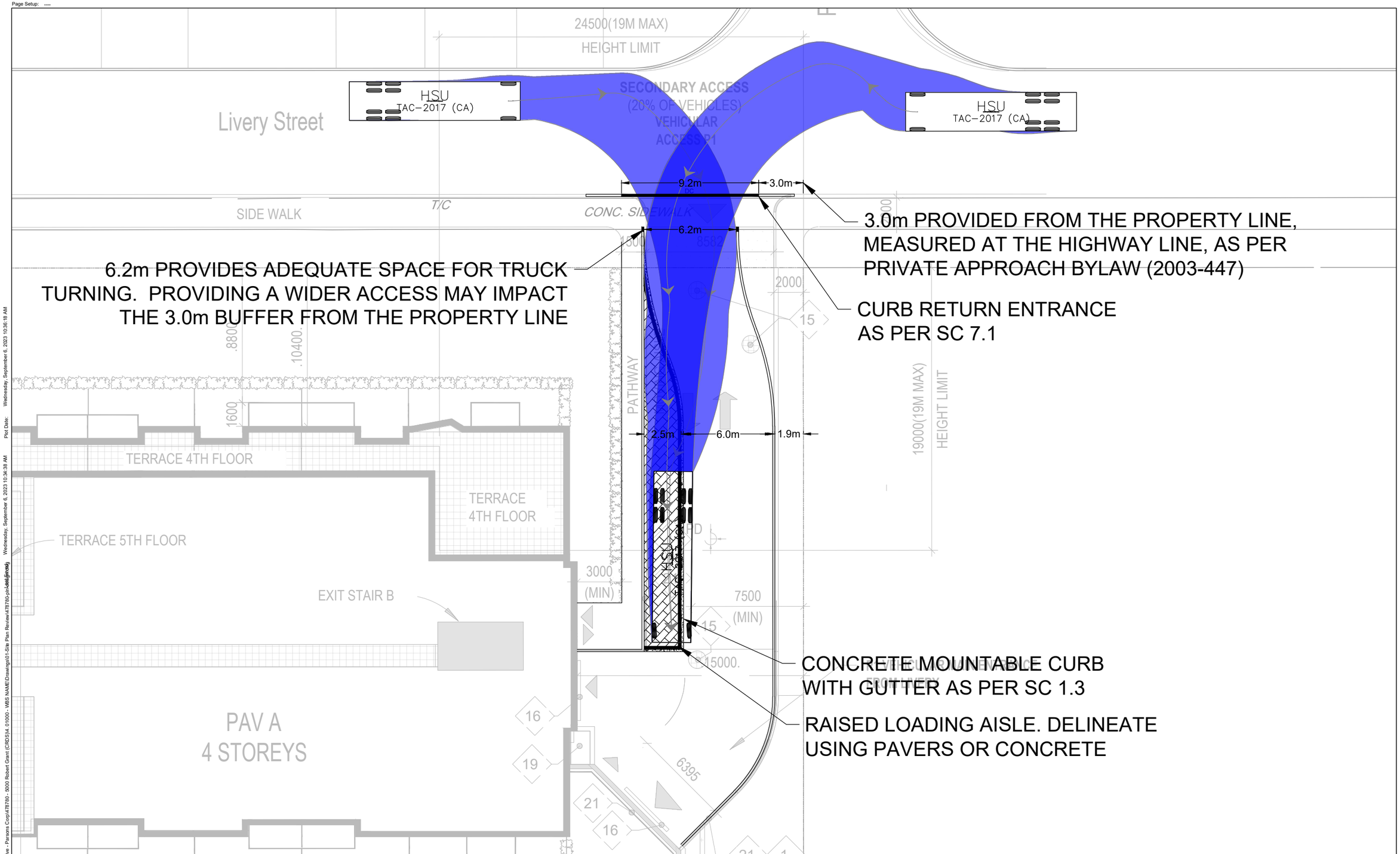
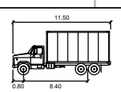


PARSONS®

NOTE: The location of utilities is approximate only, the exact location should be determined by consulting the municipal authorities and utility companies concerned. The contractor shall prove the location of utilities and shall be responsible for adequate protection from damage.

Legend



Not to Scale

Drawing Description	Livery Access - Garbage/Moving Trucks (HSU IN)
Client	
Date	Sep 06, 2023
Figure Number	003
Project Number	478780
Project Description	5000 Robert Grant

Consultants Information

Plot Date: Wednesday, September 6, 2023 10:36:18 AM

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Livery Street

24500(19M MAX)
HEIGHT LIMIT

SECONDARY ACCESS (20% OF VEHICLES) [illegible]

HSU TAC-2017 (CA)

HSU TAC-2017 (CA)

HSU TAC-2017 (CA)

HSU TAC-2017 (CA)

9.2m

3.0m

T/C

SIDE WALK

CONC. SIDEWALK

6.2m

6.2m PROVIDES ADEQUATE SPACE FOR TRUCK TURNING. PROVIDING A WIDER ACCESS MAY IMPACT THE 3.0m BUFFER FROM THE PROPERTY LINE

3.0m PROVIDED FROM THE PROPERTY LINE, MEASURED AT THE HIGHWAY LINE, AS PER PRIVATE APPROACH BYLAW (2003-447)

CURB RETURN ENTRANCE AS PER SC 7.1

PATHWAY

2.5m 6.0m 1.9m

19000(19M MAX)
HEIGHT LIMIT

TERRACE 4TH FLOOR

TERRACE 5TH FLOOR

EXIT STAIR B

PAV A
4 STOREYS

3000 (MIN)

7500 (MIN)

CONCRETE MOUNTABLE CURB WITH GUTTER AS PER SC 1.3

RAISED LOADING AISLE. DELINEATE USING PAVERS OR CONCRETE

PARSONS®

NOTE: The location of utilities is approximate only, the exact location should be determined by consulting the municipal authorities and utility companies concerned. The contractor shall prove the location of utilities and shall be responsible for adequate protection from damage.

Legend

HSU

	meters
Width	: 2.60
Track	: 2.60
Lock to Lock Time	: 6.0
Steering Angle	: 40.0

Not to Scale

Drawing Description: Livery Access - Garbage/Moving Trucks (HSU OUT)		
Client	Date: Sep 06, 2023	Figure Number: 004
Project Number: 478780	Project Description: 5000 Robert Grant	

Appendix G:

MMLOS: Road Segments

Multi-Modal Level of Service - Segments Form

Consultant	**Parsons**	**Project**	**478780**
Scenario	**5000 Robert Grant**	**Date**	**Aug 24 2023**
Comments			

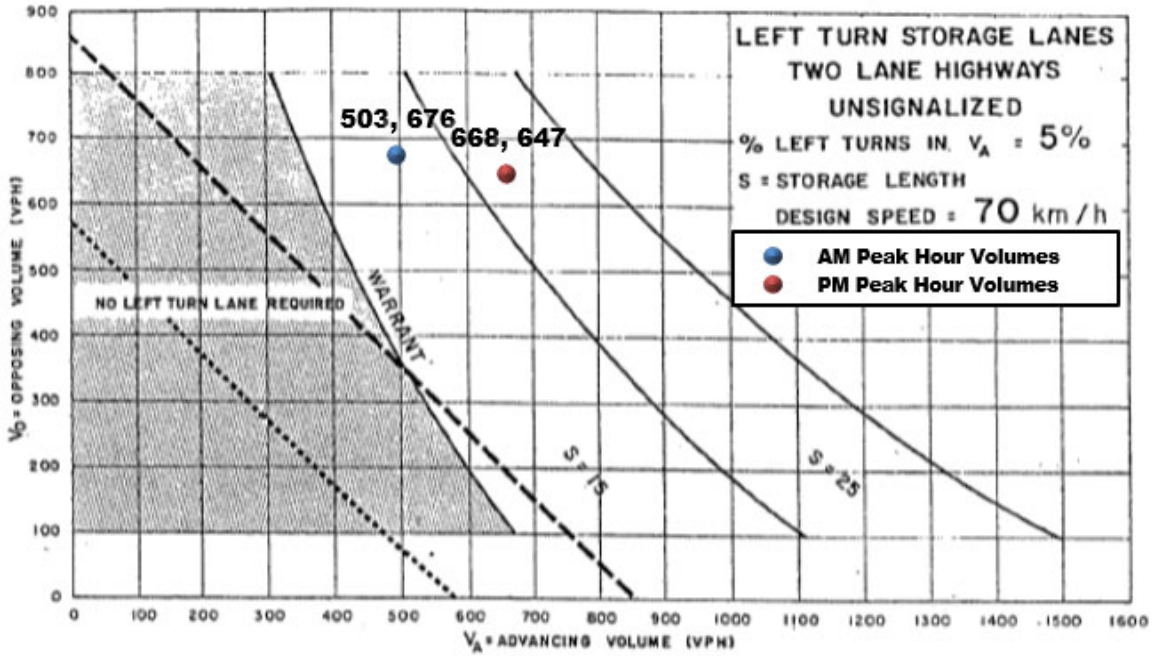
SEGMENTS		**Robert Grant**	Abbott-Bobolink Existing	Abbott-Bobolink Future	Livery East Existing & Future	Livery West Existing & Future	Section 5	Section 6	Section 7	Section 8	Section 9
Pedestrian	Sidewalk Width Boulevard Width	-	≥ 2 m > 2 m	≥ 2 m > 2 m	no sidewalk n/a	≥ 2 m < 0.5					
	Avg Daily Curb Lane Traffic Volume		≤ 3000	> 3000	≤ 3000	≤ 3000					
	Operating Speed On-Street Parking		> 60 km/h no	> 60 km/h no	> 30 to 50 km/h no	> 30 to 50 km/h yes					
	Exposure to Traffic PLoS		**B**	**D**	**F**	**B**	**-**	**-**	**-**	**-**	**-**
	Effective Sidewalk Width										
	Pedestrian Volume										
	Crowding PLoS		**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**
	Level of Service		**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**
Bicycle	Type of Cycling Facility	B	Physically Separated	Physically Separated	Mixed Traffic	Mixed Traffic					
	Number of Travel Lanes				≤ 2 (no centreline)	≤ 2 (no centreline)					
	Operating Speed				>40 to <50 km/h	>40 to <50 km/h					
	# of Lanes & Operating Speed LoS		**-**	**-**	**B**	**B**	**-**	**-**	**-**	**-**	**-**
	Bike Lane (+ Parking Lane) Width										
	Bike Lane Width LoS		**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**
	Bike Lane Blockages										
	Blockage LoS		**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**
	Median Refuge Width (no median = < 1.8 m)				< 1.8 m refuge	< 1.8 m refuge					
	No. of Lanes at Unsignalized Crossing				≤ 3 lanes	≤ 3 lanes					
	Sidestreet Operating Speed				>40 to 50 km/h	>40 to 50 km/h					
	Unsignalized Crossing - Lowest LoS		**A**	**A**	**B**	**B**	**-**	**-**	**-**	**-**	**-**
	Level of Service		**A**	**A**	**B**	**B**	**-**	**-**	**-**	**-**	**-**
Transit	Facility Type	D	Mixed Traffic	Segregated ROW							
	Friction or Ratio Transit:Posted Speed		Vt/Vp ≥ 0.8								
	Level of Service		**D**	**A**	**-**	**-**	**-**	**-**	**-**	**-**	**-**
Truck	Truck Lane Width	B	> 3.7 m	≤ 3.5 m							
	Travel Lanes per Direction		1	> 1							
	Level of Service		**B**	**A**	**-**	**-**	**-**	**-**	**-**	**-**	**-**

Appendix H:

Left-Turn Lane Warrant

	Design Speed	Advancing Traffic Volume (V_A)		Opposing Traffic Volume (V_O)		Left Turn Traffic Volume (V_L)		% of Left Turning Traffic		Warrant Left Turn Lane
		AM	PM	AM	PM	AM	PM	AM	PM	
Pav A+B Horizon Year 2030										
Robert Grant/Site	60+10	503	668	676	647	9	23	2%	3%	Yes

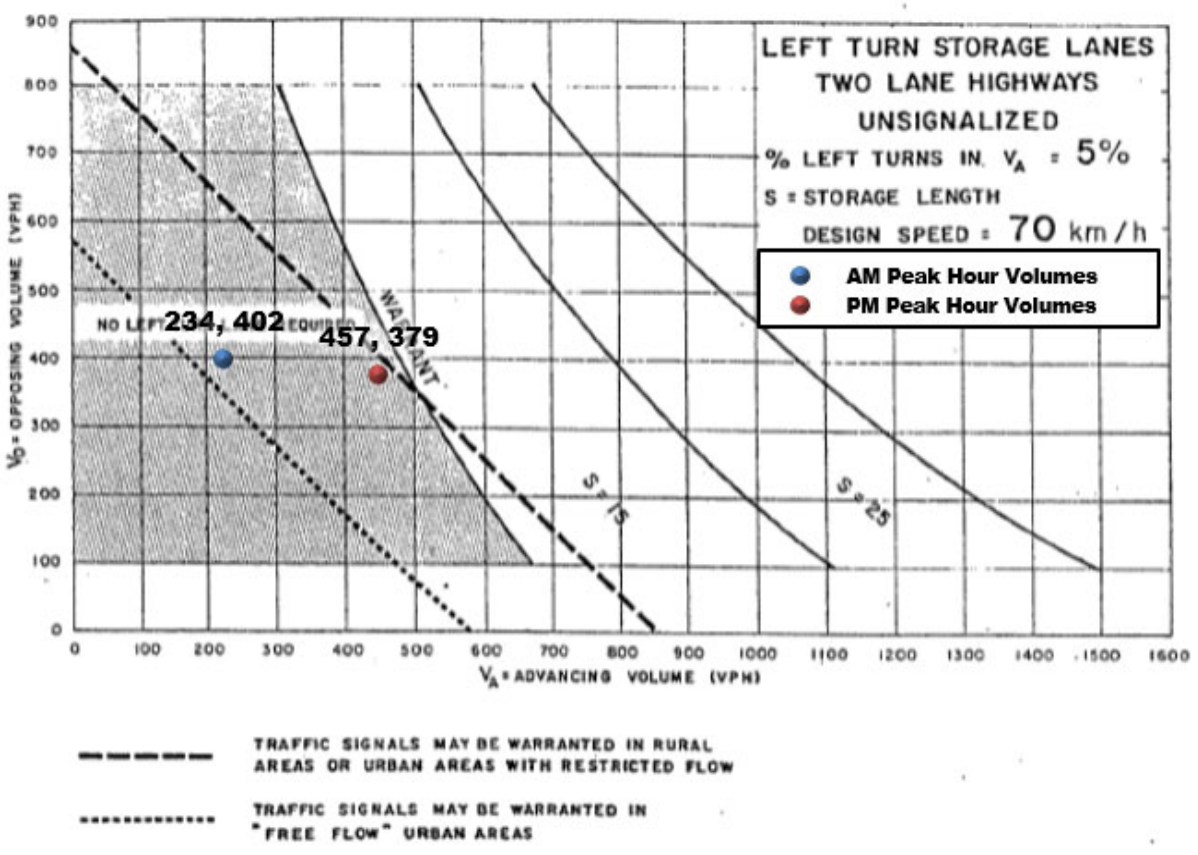
Peak	NBL	NBT	NBR	SBL	SBT	SBR	EBL	EBT	EBR	WBL	WBT	WBR
				Warrant?								
AM		672	4	9	494					8		21
PM		638	9	23	645					7		17



Used posted speed + 10km/h.

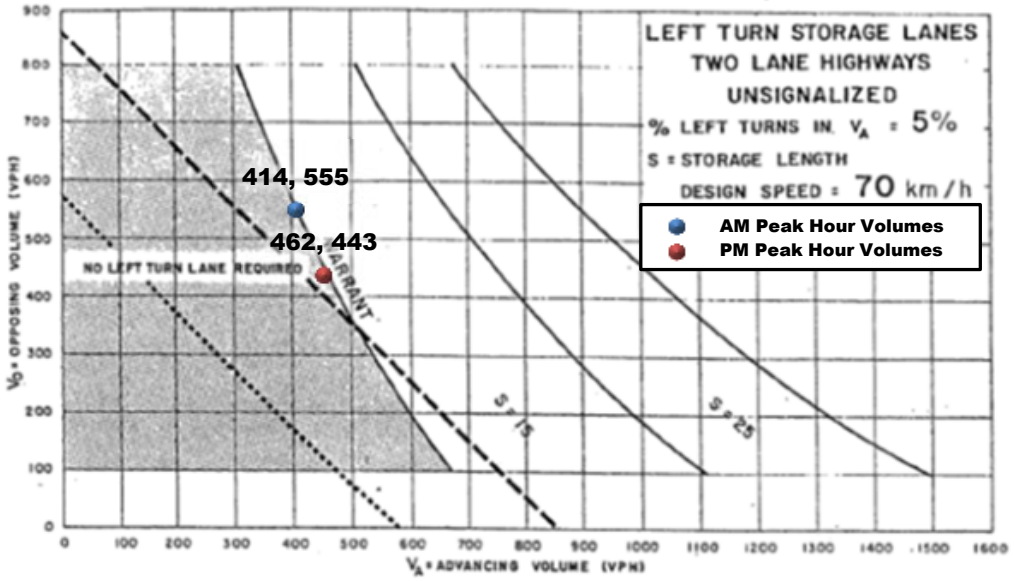
	Design Speed	Advancing Traffic Volume (V_A)		Opposing Traffic Volume (V_O)		Left Turn Traffic Volume (V_L)		% of Left Turning Traffic		Warrant Left Turn Lane
		AM	PM	AM	PM	AM	PM	AM	PM	
Existing Volumes										
Robert Grant/Site	60+10	234	457	402	379	9	23	4%	5%	No

Peak	NBL	NBT	NBR	SBL	SBT	SBR	EBL	EBT	EBR	WBL	WBT	WBR
				Warrant?								
AM		398	4	9	225					14		37
PM		370	9	23	434					12		30



	Design Speed	Advancing Traffic Volume (V_A)		Opposing Traffic Volume (V_O)		Left Turn Traffic Volume (V_L)		% of Left Turning Traffic		Warrant Left Turn Lane
		AM	PM	AM	PM	AM	PM	AM	PM	
Pav A+B Horizon 2030 (-18% AM / -32% PM)										
Robert Grant/Site	60+10	414	462	555	443	9	23	2%	5%	No

Peak	NBL	NBT	NBR	SBL	SBT	SBR	EBL	EBT	EBR	WBL	WBT	WBR
				Warrant?								
AM		551	4	9	405					8		21
PM		434	9	23	439					7		17



Appendix I:

TDM Checklists

TDM-Supportive Development Design and Infrastructure Checklist:
Residential Developments (multi-family or condominium)

Legend

REQUIRED	The Official Plan or Zoning By-law provides related guidance that must be followed
BASIC	The measure is generally feasible and effective, and in most cases would benefit the development and its users
BETTER	The measure could maximize support for users of sustainable modes, and optimize development performance

		TDM-supportive design & infrastructure measures: *Residential developments*	Check if completed & add descriptions, explanations or plan/drawing references
	1.	**WALKING & CYCLING: ROUTES**	
	1.1	**Building location & access points**	
BASIC	1.1.1	Locate building close to the street, and do not locate parking areas between the street and building entrances	☑ Parking proposed underground
BASIC	1.1.2	Locate building entrances in order to minimize walking distances to sidewalks and transit stops/stations	☑
BASIC	1.1.3	Locate building doors and windows to ensure visibility of pedestrians from the building, for their security and comfort	☑ modern design building
	1.2	**Facilities for walking & cycling**	
REQUIRED	1.2.1	Provide convenient, direct access to stations or major stops along rapid transit routes within 600 metres; minimize walking distances from buildings to rapid transit; provide pedestrian-friendly, weather-protected (where possible) environment between rapid transit accesses and building entrances; ensure quality linkages from sidewalks through building entrances to integrated stops/stations *(see Official Plan policy 4.3.3)*	☑ paths connect to city sidewalks which will connect to future Abbott Rapid Transit Station
REQUIRED	1.2.2	Provide safe, direct and attractive pedestrian access from public sidewalks to building entrances through such measures as: reducing distances between public sidewalks and major building entrances; providing walkways from public streets to major building entrances; within a site, providing walkways along the front of adjoining buildings, between adjacent buildings, and connecting areas where people may congregate, such as courtyards and transit stops; and providing weather protection through canopies, colonnades, and other design elements wherever possible *(see Official Plan policy 4.3.12)*	☑ pathways permeate site and connect all buildings to city AT infrastructure

		TDM-supportive design & infrastructure measures: *Residential developments*	Check if completed & add descriptions, explanations or plan/drawing references
REQUIRED	1.2.3	Provide sidewalks of smooth, well-drained walking surfaces of contrasting materials or treatments to differentiate pedestrian areas from vehicle areas, and provide marked pedestrian crosswalks at intersection sidewalks *(see Official Plan policy 4.3.10)*	☑ to be built to city standards
REQUIRED	1.2.4	Make sidewalks and open space areas easily accessible through features such as gradual grade transition, depressed curbs at street corners and convenient access to extra-wide parking spaces and ramps *(see Official Plan policy 4.3.10)*	☑ to be built to AODA standards
REQUIRED	1.2.5	Include adequately spaced inter-block/street cycling and pedestrian connections to facilitate travel by active transportation. Provide links to the existing or planned network of public sidewalks, multi-use pathways and on-road cycle routes. Where public sidewalks and multi-use pathways intersect with roads, consider providing traffic control devices to give priority to cyclists and pedestrians *(see Official Plan policy 4.3.11)*	☑ internal AT network will connect to existing city infrastructure
BASIC	1.2.6	Provide safe, direct and attractive walking routes from building entrances to nearby transit stops	☑ refer to 1.2.1
BASIC	1.2.7	Ensure that walking routes to transit stops are secure, visible, lighted, shaded and wind-protected wherever possible	☑ street lighting already exists on Robert Grant and Livery St
BASIC	1.2.8	Design roads used for access or circulation by cyclists using a target operating speed of no more than 30 km/h, or provide a separated cycling facility	☑ internal road proposed 30km/h. Separated cycling on Robert Grant
	1.3	**Amenities for walking & cycling**	
BASIC	1.3.1	Provide lighting, landscaping and benches along walking and cycling routes between building entrances and streets, sidewalks and trails	☑ street lighting proposed internal to site
BASIC	1.3.2	Provide wayfinding signage for site access (where required, e.g. when multiple buildings or entrances exist) and egress (where warranted, such as when directions to reach transit stops/stations, trails or other common destinations are not obvious)	☑

		TDM-supportive design & infrastructure measures: *Residential developments*	Check if completed & add descriptions, explanations or plan/drawing references
	2.	**WALKING & CYCLING: END-OF-TRIP FACILITIES**	
	2.1	**Bicycle parking**	
REQUIRED	2.1.1	Provide bicycle parking in highly visible and lighted areas, sheltered from the weather wherever possible *(see Official Plan policy 4.3.6)*	☑ 252 bike parking located indoors in bike rooms
REQUIRED	2.1.2	Provide the number of bicycle parking spaces specified for various land uses in different parts of Ottawa; provide convenient access to main entrances or well-used areas *(see Zoning By-law Section 111)*	☑ meets bylaw
REQUIRED	2.1.3	Ensure that bicycle parking spaces and access aisles meet minimum dimensions; that no more than 50% of spaces are vertical spaces; and that parking racks are securely anchored *(see Zoning By-law Section 111)*	☑ meets bylaw
BASIC	2.1.4	Provide bicycle parking spaces equivalent to the expected number of resident-owned bicycles, plus the expected peak number of visitor cyclists	☐
	2.2	**Secure bicycle parking**	
REQUIRED	2.2.1	Where more than 50 bicycle parking spaces are provided for a single residential building, locate at least 25% of spaces within a building/structure, a secure area (e.g. supervised parking lot or enclosure) or bicycle lockers *(see Zoning By-law Section 111)*	☑ meets bylaw
BETTER	2.2.2	Provide secure bicycle parking spaces equivalent to at least the number of units at condominiums or multi-family residential developments	☐
	2.3	**Bicycle repair station**	
BETTER	2.3.1	Provide a permanent bike repair station, with commonly used tools and an air pump, adjacent to the main bicycle parking area (or secure bicycle parking area, if provided)	☐
	3.	**TRANSIT**	
	3.1	**Customer amenities**	
BASIC	3.1.1	Provide shelters, lighting and benches at any on-site transit stops	☐ not applicable
BASIC	3.1.2	Where the site abuts an off-site transit stop and insufficient space exists for a transit shelter in the public right-of-way, protect land for a shelter and/or install a shelter	☐ not applicable
BETTER	3.1.3	Provide a secure and comfortable interior waiting area by integrating any on-site transit stops into the building	☐

	TDM-supportive design & infrastructure measures: *Residential developments*		Check if completed & add descriptions, explanations or plan/drawing references
	4.	**RIDESHARING**	
	4.1	**Pick-up & drop-off facilities**	
BASIC	4.1.1	Provide a designated area for carpool drivers (plus taxis and ride-hailing services) to drop off or pick up passengers without using fire lanes or other no-stopping zones	☑ two drop off locations are proposed
	5.	**CARSHARING & BIKESHARING**	
	5.1	**Carshare parking spaces**	
BETTER	5.1.1	Provide up to three carshare parking spaces in an R3, R4 or R5 Zone for specified residential uses *(see Zoning By-law Section 94)*	☐
	5.2	**Bikeshare station location**	
BETTER	5.2.1	Provide a designated bikeshare station area near a major building entrance, preferably lighted and sheltered with a direct walkway connection	☐
	6.	**PARKING**	
	6.1	**Number of parking spaces**	
REQUIRED	6.1.1	Do not provide more parking than permitted by zoning, nor less than required by zoning, unless a variance is being applied for	☑ meets bylaw
BASIC	6.1.2	Provide parking for long-term and short-term users that is consistent with mode share targets, considering the potential for visitors to use off-site public parking	☑ visitor and residential parking separate
BASIC	6.1.3	Where a site features more than one use, provide shared parking and reduce the cumulative number of parking spaces accordingly *(see Zoning By-law Section 104)*	☐
BETTER	6.1.4	Reduce the minimum number of parking spaces required by zoning by one space for each 13 square metres of gross floor area provided as shower rooms, change rooms, locker rooms and other facilities for cyclists in conjunction with bicycle parking *(see Zoning By-law Section 111)*	☐
	6.2	**Separate long-term & short-term parking areas**	
BETTER	6.2.1	Provide separate areas for short-term and long-term parking (using signage or physical barriers) to permit access controls and simplify enforcement (i.e. to discourage residents from parking in visitor spaces, and vice versa)	☐

TDM Measures Checklist:
Residential Developments (multi-family, condominium or subdivision)

Legend

BASIC — The measure is generally feasible and effective, and in most cases would benefit the development and its users

BETTER — The measure could maximize support for users of sustainable modes, and optimize development performance

★ — The measure is one of the most dependably effective tools to encourage the use of sustainable modes

		TDM measures: *Residential developments*	Check if proposed & add descriptions
	1.	**TDM PROGRAM MANAGEMENT**	
	1.1	**Program coordinator**	
BASIC ★	1.1.1	Designate an internal coordinator, or contract with an external coordinator	☑
	1.2	**Travel surveys**	
BETTER	1.2.1	Conduct periodic surveys to identify travel-related behaviours, attitudes, challenges and solutions, and to track progress	☑
	2.	**WALKING AND CYCLING**	
	2.1	**Information on walking/cycling routes & destinations**	
BASIC	2.1.1	Display local area maps with walking/cycling access routes and key destinations at major entrances *(multi-family, condominium)*	☑
	2.2	**Bicycle skills training**	
BETTER	2.2.1	Offer on-site cycling courses for residents, or subsidize off-site courses	☐

			TDM measures: *Residential developments*	Check if proposed & add descriptions
		3.	**TRANSIT**	
		3.1	**Transit information**	
BASIC		3.1.1	Display relevant transit schedules and route maps at entrances *(multi-family, condominium)*	☑
BETTER		3.1.2	Provide real-time arrival information display at entrances *(multi-family, condominium)*	☐
		3.2	**Transit fare incentives**	
BASIC	★	3.2.1	Offer PRESTO cards preloaded with one monthly transit pass on residence purchase/move-in, to encourage residents to use transit	☐
BETTER		3.2.2	Offer at least one year of free monthly transit passes on residence purchase/move-in	☐
		3.3	**Enhanced public transit service**	
BETTER	★	3.3.1	Contract with OC Transpo to provide early transit services until regular services are warranted by occupancy levels *(subdivision)*	☐
		3.4	**Private transit service**	
BETTER		3.4.1	Provide shuttle service for seniors homes or lifestyle communities (e.g. scheduled mall or supermarket runs)	☐ not applicable
		4.	**CARSHARING & BIKESHARING**	
		4.1	**Bikeshare stations & memberships**	
BETTER		4.1.1	Contract with provider to install on-site bikeshare station (*multi-family)*	☐
BETTER		4.1.2	Provide residents with bikeshare memberships, either free or subsidized *(multi-family)*	☐
		4.2	**Carshare vehicles & memberships**	
BETTER		4.2.1	Contract with provider to install on-site carshare vehicles and promote their use by residents	☐
BETTER		4.2.2	Provide residents with carshare memberships, either free or subsidized	☐
		5.	**PARKING**	
		5.1	**Priced parking**	
BASIC	★	5.1.1	Unbundle parking cost from purchase price *(condominium)*	☐ not applicable
BASIC	★	5.1.2	Unbundle parking cost from monthly rent *(multi-family)*	☑

TDM measures: *Residential developments*				Check if proposed & add descriptions
		6.	**TDM MARKETING & COMMUNICATIONS**	
		6.1	**Multimodal travel information**	
BASIC	★	6.1.1	Provide a multimodal travel option information package to new residents	☑
		6.2	**Personalized trip planning**	
BETTER	★	6.2.1	Offer personalized trip planning to new residents	☐

Appendix J:

MMLOS: Intersections

Multi-Modal Level of Service - Intersections Form

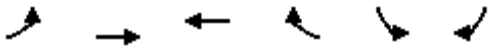
Consultant	**Parsons**	**Project**	**478780**
Scenario	**5000 Robert Grant**	**Date**	**Aug 24 2023**
Comments			

Unlocked Rows for Replicating

INTERSECTIONS		Fernbank/Robert Grant (existing)				Fernbank/Robert Grant (future)				Intersection C			
	Crossing Side	NORTH	SOUTH	EAST	WEST	NORTH	SOUTH	EAST	WEST	NORTH	SOUTH	EAST	WEST
Pedestrian	Lanes	6		6	6	9		6	6				
	Median	No Median - 2.4 m		No Median - 2.4 m	No Median - 2.4 m	No Median - 2.4 m		No Median - 2.4 m	No Median - 2.4 m				
	Conflicting Left Turns	Protected		Permissive	No left turn / Prohib.	Protected		Permissive	No left turn / Prohib.				
	Conflicting Right Turns	Permissive or yield control		No right turn	Permissive or yield control	Permissive or yield control		No right turn	Permissive or yield control				
	Right Turns on Red (RToR) ?	RTOR allowed		RTOR prohibited	RTOR allowed	RTOR allowed		RTOR prohibited	RTOR allowed				
	Ped Signal Leading Interval?	No		No	No	No		No	No				
	Right Turn Channel	No Channel		No Right Turn	No Channel	No Channel		No Right Turn	No Channel				
	Corner Radius	10-15m		No Right Turn	10-15m	10-15m		No Right Turn	10-15m				
	Crosswalk Type	Std transverse markings		Std transverse markings	Std transverse markings	Std transverse markings		Std transverse markings	Std transverse markings				
	PETSI Score	**28**		**38**	**28**	**-21**		**38**	**28**				
	Ped. Exposure to Traffic LoS	**F**	**-**	**E**	**F**	**#N/A**	**-**	**E**	**F**	**-**	**-**	**-**	**-**
	Cycle Length	120		120	120	120		120	120				
	Effective Walk Time	24		17	17	24		17	17				
	Average Pedestrian Delay	**38**		**44**	**44**	**38**		**44**	**44**				
	Pedestrian Delay LoS	**D**	**-**	**E**	**E**	**D**	**-**	**E**	**E**	**-**	**-**	**-**	**-**
	Level of Service	**F**	**-**	**E**	**F**	**#N/A**	**-**	**E**	**F**	**-**	**-**	**-**	**-**
		F				**#N/A**				**-**			
Approach From		NORTH	SOUTH	EAST	WEST	NORTH	SOUTH	EAST	WEST	NORTH	SOUTH	EAST	WEST
Bicycle	Bicycle Lane Arrangement on Approach	Curb Bike Lane, Cycletrack or MUP		Curb Bike Lane, Cycletrack or MUP	Curb Bike Lane, Cycletrack or MUP	Curb Bike Lane, Cycletrack or MUP		Curb Bike Lane, Cycletrack or MUP	Curb Bike Lane, Cycletrack or MUP				
	Right Turn Lane Configuration	Not Applicable		Not Applicable	Not Applicable	Not Applicable		Not Applicable	Not Applicable				
	Right Turning Speed	Not Applicable		Not Applicable	Not Applicable	Not Applicable		Not Applicable	Not Applicable				
	Cyclist relative to RT motorists	**Not Applicable**	**-**	**Not Applicable**	**Not Applicable**	**Not Applicable**	**-**	**Not Applicable**	**Not Applicable**	**-**	**-**	**-**	**-**
	Separated or Mixed Traffic	**Separated**	**-**	**Separated**	**Separated**	**Separated**	**-**	**Separated**	**Separated**	**-**	**-**	**-**	**-**
	Left Turn Approach	No lane crossed		No lane crossed	No lane crossed	No lane crossed		No lane crossed	No lane crossed				
	Operating Speed	≥ 60 km/h		≥ 60 km/h	≥ 60 km/h	≥ 60 km/h		≥ 60 km/h	≥ 60 km/h				
	Left Turning Cyclist	**C**	**-**	**C**	**C**	**C**	**-**	**C**	**C**	**-**	**-**	**-**	**-**
	Level of Service	**C**	**-**	**C**	**C**	**C**	**-**	**C**	**C**	**-**	**-**	**-**	**-**
		C				**C**				**-**			
Transit	Average Signal Delay	> 40 sec		≤ 10 sec		> 40 sec		≤ 10 sec					
	Level of Service	**F**	**-**	**B**	**-**	**F**	**-**	**B**	**-**	**-**	**-**	**-**	**-**
		F				**F**				**-**			
Truck	Effective Corner Radius	10 - 15 m			10 - 15 m	10 - 15 m			10 - 15 m				
	Number of Receiving Lanes on Departure from Intersection	1			1	1			1				
	Level of Service	**E**	**-**	**-**	**E**	**E**	**-**	**-**	**E**	**-**	**-**	**-**	**-**
		E				**E**				**-**			
Auto	Volume to Capacity Ratio												
	Level of Service	**-**				**-**				**-**			

Appendix K:

Synchro and Sidra Analysis: Existing Intersection Performance



Lane Group	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Volume (vph)	31	327	215	173	168	29
Future Volume (vph)	31	327	215	173	168	29
Satd. Flow (prot)	1695	1784	1784	1517	1695	1517
Flt Permitted	0.950				0.950	
Satd. Flow (perm)	1695	1784	1784	1517	1695	1517
Satd. Flow (RTOR)				192		32
Lane Group Flow (vph)	34	363	239	192	187	32
Turn Type	Prot	NA	NA	Perm	Perm	Perm
Protected Phases	5	2	6			
Permitted Phases				6	4	4
Detector Phase	5	2	6	6	4	4
Switch Phase						
Minimum Initial (s)	5.0	5.0	5.0	5.0	10.0	10.0
Minimum Split (s)	26.2	57.2	57.2	57.2	30.0	30.0
Total Split (s)	26.2	83.4	57.2	57.2	36.0	36.0
Total Split (%)	21.9%	69.8%	47.9%	47.9%	30.2%	30.2%
Yellow Time (s)	4.6	4.6	4.6	4.6	3.3	3.3
All-Red Time (s)	1.6	1.6	1.6	1.6	2.7	2.7
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	0.0
Total Lost Time (s)	6.2	6.2	6.2	6.2	6.0	6.0
Lead/Lag	Lead		Lag	Lag		
Lead-Lag Optimize?	Yes		Yes	Yes		
Recall Mode	Max	Min	Min	Min	Max	Max
Act Effct Green (s)	20.1	42.9	16.6	16.6	30.1	30.1
Actuated g/C Ratio	0.24	0.50	0.19	0.19	0.35	0.35
v/c Ratio	0.09	0.40	0.69	0.43	0.31	0.06
Control Delay	27.9	14.6	42.4	7.6	22.9	7.9
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	27.9	14.6	42.4	7.6	22.9	7.9
LOS	C	B	D	A	C	A
Approach Delay		15.7	26.9		20.7	
Approach LOS		B	C		C	
Queue Length 50th (m)	4.0	32.1	33.5	0.0	19.9	0.0
Queue Length 95th (m)	11.5	49.4	54.3	14.4	38.9	5.5
Internal Link Dist (m)		227.6	295.8		320.1	
Turn Bay Length (m)	100.0			100.0	90.0	
Base Capacity (vph)	398	1620	1070	987	598	556
Starvation Cap Reductn	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0
Reduced v/c Ratio	0.09	0.22	0.22	0.19	0.31	0.06

Intersection Summary
Cycle Length: 119.4
Actuated Cycle Length: 85.2
Natural Cycle: 115
Control Type: Semi Act-Uncoord
Maximum v/c Ratio: 0.69

Intersection Signal Delay: 21.4 Intersection LOS: C
Intersection Capacity Utilization 41.3% ICU Level of Service A
Analysis Period (min) 15

Splits and Phases: 5: Fernbank & Robert Grant

Intersection	
Int Delay, s/veh	1.5

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Vol, veh/h	0	0	0	16	0	39	0	180	8	10	171	0
Future Vol, veh/h	0	0	0	16	0	39	0	180	8	10	171	0
Conflicting Peds, #/hr	0	0	2	2	0	0	10	0	10	10	0	10
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop	Free	Free	Free	Free	Free	Free
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	-	-	-	65	-	-	65	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	90	90	90	90	90	90	90	90	90	90	90	90
Heavy Vehicles, %	2	2	2	2	2	2	2	2	2	2	2	2
Mvmt Flow	0	0	0	18	0	43	0	200	9	11	190	0

Major/Minor	Minor2			Minor1			Major1			Major2		
Conflicting Flow All	448	441	202	429	437	215	200	0	0	219	0	0
Stage 1	222	222	-	215	215	-	-	-	-	-	-	-
Stage 2	226	219	-	214	222	-	-	-	-	-	-	-
Critical Hdwy	7.12	6.52	6.22	7.12	6.52	6.22	4.12	-	-	4.12	-	-
Critical Hdwy Stg 1	6.12	5.52	-	6.12	5.52	-	-	-	-	-	-	-
Critical Hdwy Stg 2	6.12	5.52	-	6.12	5.52	-	-	-	-	-	-	-
Follow-up Hdwy	3.518	4.018	3.318	3.518	4.018	3.318	2.218	-	-	2.218	-	-
Pot Cap-1 Maneuver	521	510	839	536	513	825	1372	-	-	1350	-	-
Stage 1	780	720	-	787	725	-	-	-	-	-	-	-
Stage 2	777	722	-	788	720	-	-	-	-	-	-	-
Platoon blocked, %								-	-		-	-
Mov Cap-1 Maneuver	486	497	830	527	500	817	1359	-	-	1338	-	-
Mov Cap-2 Maneuver	486	497	-	527	500	-	-	-	-	-	-	-
Stage 1	773	708	-	780	718	-	-	-	-	-	-	-
Stage 2	736	716	-	780	708	-	-	-	-	-	-	-

Approach	EB	WB	NB	SB
HCM Control Delay, s	0	10.6	0	0.4
HCM LOS	A	B		

Minor Lane/Major Mvmt	NBL	NBT	NBR	EBLn1	WBLn1	SBL	SBT	SBR
Capacity (veh/h)	1359	-	-	-	704	1338	-	-
HCM Lane V/C Ratio	-	-	-	-	0.087	0.008	-	-
HCM Control Delay (s)	0	-	-	0	10.6	7.7	-	-
HCM Lane LOS	A	-	-	A	B	A	-	-
HCM 95th %tile Q(veh)	0	-	-	-	0.3	0	-	-

MOVEMENT SUMMARY

Site: 101 [Existing Abbott/Robert Grant (Site Folder: Existing AM)]

Output produced by SIDRA INTERSECTION Version: 9.1.1.200

Network: N101 [Existing AM (Network Folder: General)]

New Site
Site Category: Future Conditions 1
Roundabout

Vehicle Movement Performance

Mov ID	Turn	Mov Class	Demand Flows [Total veh/h	HV] %	Arrival Flows [Total veh/h	HV] %	Deg. Satn v/c	Aver. Delay sec	Level of Service	Aver. Back Of Queue [Veh. veh	Dist] m	Prop. Que	Eff. Stop Rate	Aver. No. of Cycles	Aver. Speed km/h
South: Robert Grant Ave															
1	L2	All MCs	323	2.0	323	2.0	0.301	9.7	LOS A	0.7	5.3	0.30	0.57	0.30	50.9
3	R2	All MCs	84	2.0	84	2.0	0.301	4.0	LOS A	0.7	5.3	0.30	0.57	0.30	51.4
Approach			407	2.0	407	2.0	0.301	8.5	LOS A	0.7	5.3	0.30	0.57	0.30	51.0
East: Abbott St E															
4	L2	All MCs	28	2.0	28	2.0	0.155	10.8	LOS B	0.3	2.5	0.49	0.53	0.49	49.2
5	T1	All MCs	136	2.0	136	2.0	0.155	5.0	LOS A	0.3	2.5	0.49	0.53	0.49	53.2
Approach			164	2.0	164	2.0	0.155	6.0	LOS A	0.3	2.5	0.49	0.53	0.49	52.7
West: Abbott St E															
11	T1	All MCs	102	2.0	102	2.0	0.212	3.5	LOS A	0.5	3.8	0.15	0.38	0.15	55.5
12	R2	All MCs	220	2.0	220	2.0	0.212	3.5	LOS A	0.5	3.8	0.15	0.38	0.15	53.0
Approach			322	2.0	322	2.0	0.212	3.5	LOS A	0.5	3.8	0.15	0.38	0.15	54.2
All Vehicles			894	2.0	894	2.0	0.301	6.3	LOS A	0.7	5.3	0.28	0.50	0.28	52.2

Site Level of Service (LOS) Method: Delay (SIDRA). Site LOS Method is specified in the Network Data dialog (Override Site Data tab).
Roundabout LOS Method: SIDRA Roundabout LOS.
Vehicle movement LOS values are based on average delay per movement.
Intersection and Approach LOS values are based on average delay for all vehicle movements.
Roundabout Capacity Model: SIDRA Standard.
Delay Model: SIDRA Standard (Control Delay: Geometric Delay is included).
Queue Model: SIDRA queue estimation methods are used for Back of Queue and Queue at Start of Gap.
Gap-Acceptance Capacity Formula: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.
Arrival Flows used in performance calculations are adjusted to include any Initial Queued Demand and Upstream Capacity Constraint effects.

MOVEMENT SUMMARY

Site: 101 [Existing Bobolink/Robert Grant (Site Folder: Existing AM)]

Output produced by SIDRA INTERSECTION Version: 9.1.1.200

Network: N101 [Existing AM (Network Folder: General)]

New Site
Site Category: (None)
Roundabout

Vehicle Movement Performance

Mov ID	Turn	Mov Class	Demand Flows [Total veh/h	HV] %	Arrival Flows [Total veh/h	HV] %	Deg. Satn v/c	Aver. Delay sec	Level of Service	Aver. Back Of Queue [Veh. veh	Dist] m	Prop. Que	Eff. Stop Rate	Aver. No. of Cycles	Aver. Speed km/h
South: Robert Grant Ave															
1	L2	All MCs	13	2.0	13	2.0	0.232	9.9	LOS A	0.5	3.9	0.36	0.43	0.36	53.1
2	T1	All MCs	257	2.0	257	2.0	0.232	4.3	LOS A	0.5	3.9	0.36	0.43	0.36	50.7
3	R2	All MCs	16	2.0	16	2.0	0.232	4.3	LOS A	0.5	3.9	0.36	0.43	0.36	53.7
Approach			285	2.0	285	2.0	0.232	4.6	LOS A	0.5	3.9	0.36	0.43	0.36	51.2
East: Bobolink Rdg															
4	L2	All MCs	20	2.0	20	2.0	0.081	11.0	LOS B	0.2	1.2	0.50	0.59	0.50	49.2
5	T1	All MCs	1	2.0	1	2.0	0.081	5.4	LOS A	0.2	1.2	0.50	0.59	0.50	53.2
6	R2	All MCs	60	2.0	60	2.0	0.081	5.4	LOS A	0.2	1.2	0.50	0.59	0.50	49.2
Approach			81	2.0	81	2.0	0.081	6.8	LOS A	0.2	1.2	0.50	0.59	0.50	49.2
North: Robert Grant Ave															
7	L2	All MCs	39	2.0	39	2.0	0.153	9.2	LOS A	0.3	2.5	0.15	0.42	0.15	53.6
8	T1	All MCs	156	2.0	156	2.0	0.153	3.7	LOS A	0.3	2.5	0.15	0.42	0.15	51.7
9	R2	All MCs	29	2.0	29	2.0	0.153	3.7	LOS A	0.3	2.5	0.15	0.42	0.15	54.2
Approach			224	2.0	224	2.0	0.153	4.6	LOS A	0.3	2.5	0.15	0.42	0.15	52.6
West: Bobolink Rdg															
10	L2	All MCs	113	2.0	113	2.0	0.120	10.1	LOS B	0.2	1.7	0.38	0.61	0.38	46.5
11	T1	All MCs	1	2.0	1	2.0	0.120	4.6	LOS A	0.2	1.7	0.38	0.61	0.38	51.4
12	R2	All MCs	23	2.0	23	2.0	0.120	4.6	LOS A	0.2	1.7	0.38	0.61	0.38	46.5
Approach			137	2.0	137	2.0	0.120	9.1	LOS A	0.2	1.7	0.38	0.61	0.38	46.5
All Vehicles			727	2.0	727	2.0	0.232	5.7	LOS A	0.5	3.9	0.32	0.48	0.32	50.6

Site Level of Service (LOS) Method: Delay (SIDRA). Site LOS Method is specified in the Network Data dialog (Override Site Data tab).
Roundabout LOS Method: SIDRA Roundabout LOS.
Vehicle movement LOS values are based on average delay per movement.
Intersection and Approach LOS values are based on average delay for all vehicle movements.
Roundabout Capacity Model: SIDRA Standard.
Delay Model: SIDRA Standard (Control Delay: Geometric Delay is included).
Queue Model: SIDRA queue estimation methods are used for Back of Queue and Queue at Start of Gap.
Gap-Acceptance Capacity Formula: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.
Arrival Flows used in performance calculations are adjusted to include any Initial Queued Demand and Upstream Capacity Constraint effects.

MOVEMENT SUMMARY

Site: 101 [Existing Cope/Robert Grant (Site Folder: Existing AM)]

Output produced by SIDRA INTERSECTION Version: 9.1.1.200

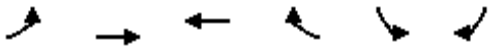
Network: N101 [Existing AM (Network Folder: General)]

New Site
Site Category: (None)
Roundabout

Vehicle Movement Performance

Mov ID	Turn	Mov Class	Demand Flows [Total veh/h	HV] %	Arrival Flows [Total veh/h	HV] %	Deg. Satn v/c	Aver. Delay sec	Level of Service	Aver. Back Of Queue [Veh. veh	Dist] m	Prop. Que	Eff. Stop Rate	Aver. No. of Cycles	Aver. Speed km/h
South: Robert Grant Ave															
1	L2	All MCs	41	2.0	41	2.0	0.184	9.7	LOS A	0.4	2.9	0.29	0.43	0.29	53.1
2	T1	All MCs	186	2.0	186	2.0	0.184	3.9	LOS A	0.4	2.9	0.29	0.43	0.29	50.7
3	R2	All MCs	11	2.0	11	2.0	0.184	4.0	LOS A	0.4	2.9	0.29	0.43	0.29	53.7
Approach			238	2.0	238	2.0	0.184	4.9	LOS A	0.4	2.9	0.29	0.43	0.29	51.5
East: Cope Dr															
4	L2	All MCs	12	2.0	12	2.0	0.078	10.4	LOS B	0.2	1.1	0.43	0.52	0.43	52.9
5	T1	All MCs	14	2.0	14	2.0	0.078	4.7	LOS A	0.2	1.1	0.43	0.52	0.43	53.9
6	R2	All MCs	61	2.0	61	2.0	0.078	4.7	LOS A	0.2	1.1	0.43	0.52	0.43	50.3
Approach			86	2.0	86	2.0	0.078	5.5	LOS A	0.2	1.1	0.43	0.52	0.43	51.7
North: Robert Grant Ave															
7	L2	All MCs	42	2.0	42	2.0	0.177	9.4	LOS A	0.4	2.8	0.21	0.42	0.21	53.4
8	T1	All MCs	158	2.0	158	2.0	0.177	3.7	LOS A	0.4	2.8	0.21	0.42	0.21	54.5
9	R2	All MCs	46	2.0	46	2.0	0.177	3.7	LOS A	0.4	2.8	0.21	0.42	0.21	54.1
Approach			246	2.0	246	2.0	0.177	4.7	LOS A	0.4	2.8	0.21	0.42	0.21	54.2
West: Cope Dr															
10	L2	All MCs	49	2.0	49	2.0	0.107	10.2	LOS B	0.2	1.6	0.38	0.54	0.38	49.0
11	T1	All MCs	23	2.0	23	2.0	0.107	4.4	LOS A	0.2	1.6	0.38	0.54	0.38	53.1
12	R2	All MCs	52	2.0	52	2.0	0.107	4.4	LOS A	0.2	1.6	0.38	0.54	0.38	52.7
Approach			124	2.0	124	2.0	0.107	6.7	LOS A	0.2	1.6	0.38	0.54	0.38	51.8
All Vehicles			695	2.0	695	2.0	0.184	5.2	LOS A	0.4	2.9	0.30	0.46	0.30	52.8

Site Level of Service (LOS) Method: Delay (SIDRA). Site LOS Method is specified in the Network Data dialog (Override Site Data tab).
Roundabout LOS Method: SIDRA Roundabout LOS.
Vehicle movement LOS values are based on average delay per movement.
Intersection and Approach LOS values are based on average delay for all vehicle movements.
Roundabout Capacity Model: SIDRA Standard.
Delay Model: SIDRA Standard (Control Delay: Geometric Delay is included).
Queue Model: SIDRA queue estimation methods are used for Back of Queue and Queue at Start of Gap.
Gap-Acceptance Capacity Formula: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.
Arrival Flows used in performance calculations are adjusted to include any Initial Queued Demand and Upstream Capacity Constraint effects.



Lane Group	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Volume (vph)	19	270	486	194	180	28
Future Volume (vph)	19	270	486	194	180	28
Satd. Flow (prot)	1695	1784	1784	1517	1695	1517
Flt Permitted	0.950				0.950	
Satd. Flow (perm)	1695	1784	1784	1517	1695	1517
Satd. Flow (RTOR)				216		31
Lane Group Flow (vph)	21	300	540	216	200	31
Turn Type	Prot	NA	NA	Perm	Perm	Perm
Protected Phases	5	2	6			
Permitted Phases				6	4	4
Detector Phase	5	2	6	6	4	4
Switch Phase						
Minimum Initial (s)	5.0	5.0	5.0	5.0	10.0	10.0
Minimum Split (s)	26.2	57.2	57.2	57.2	30.0	30.0
Total Split (s)	26.2	94.4	68.2	68.2	36.0	36.0
Total Split (%)	20.1%	72.4%	52.3%	52.3%	27.6%	27.6%
Yellow Time (s)	4.6	4.6	4.6	4.6	3.3	3.3
All-Red Time (s)	1.6	1.6	1.6	1.6	2.7	2.7
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	0.0
Total Lost Time (s)	6.2	6.2	6.2	6.2	6.0	6.0
Lead/Lag	Lead		Lag	Lag		
Lead-Lag Optimize?	Yes		Yes	Yes		
Recall Mode	Max	Min	Min	Min	Max	Max
Act Effct Green (s)	20.2	64.8	38.4	38.4	30.3	30.3
Actuated g/C Ratio	0.19	0.60	0.36	0.36	0.28	0.28
v/c Ratio	0.07	0.28	0.85	0.32	0.42	0.07
Control Delay	41.0	10.5	44.6	4.1	37.1	12.1
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	41.0	10.5	44.6	4.1	37.1	12.1
LOS	D	B	D	A	D	B
Approach Delay		12.5	33.0		33.8	
Approach LOS		B	C		C	
Queue Length 50th (m)	3.3	25.4	93.9	0.0	31.1	0.0
Queue Length 95th (m)	11.0	37.4	130.9	12.4	60.1	7.2
Internal Link Dist (m)		227.6	295.8		320.1	
Turn Bay Length (m)	100.0			100.0	90.0	
Base Capacity (vph)	318	1479	1039	974	477	450
Starvation Cap Reductn	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0
Reduced v/c Ratio	0.07	0.20	0.52	0.22	0.42	0.07

Intersection Summary
Cycle Length: 130.4
Actuated Cycle Length: 107.4
Natural Cycle: 115
Control Type: Semi Act-Uncoord
Maximum v/c Ratio: 0.85

Intersection Signal Delay: 28.1 Intersection LOS: C
Intersection Capacity Utilization 47.7% ICU Level of Service A
Analysis Period (min) 15

Splits and Phases: 5: Fernbank & Robert Grant

Intersection	
Int Delay, s/veh	1.5

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Vol, veh/h	0	0	0	16	0	24	0	185	21	37	211	0
Future Vol, veh/h	0	0	0	16	0	24	0	185	21	37	211	0
Conflicting Peds, #/hr	0	0	0	0	0	0	18	0	8	8	0	18
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop	Free	Free	Free	Free	Free	Free
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	-	-	-	65	-	-	65	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	90	90	90	90	90	90	90	90	90	90	90	90
Heavy Vehicles, %	2	2	2	2	2	2	2	2	2	2	2	2
Mvmt Flow	0	0	0	18	0	27	0	206	23	41	234	0

Major/Minor	Minor2			Minor1			Major1			Major2		
Conflicting Flow All	565	571	252	542	560	226	252	0	0	237	0	0
Stage 1	334	334	-	226	226	-	-	-	-	-	-	-
Stage 2	231	237	-	316	334	-	-	-	-	-	-	-
Critical Hdwy	7.12	6.52	6.22	7.12	6.52	6.22	4.12	-	-	4.12	-	-
Critical Hdwy Stg 1	6.12	5.52	-	6.12	5.52	-	-	-	-	-	-	-
Critical Hdwy Stg 2	6.12	5.52	-	6.12	5.52	-	-	-	-	-	-	-
Follow-up Hdwy	3.518	4.018	3.318	3.518	4.018	3.318	2.218	-	-	2.218	-	-
Pot Cap-1 Maneuver	436	431	787	451	437	813	1313	-	-	1330	-	-
Stage 1	680	643	-	777	717	-	-	-	-	-	-	-
Stage 2	772	709	-	695	643	-	-	-	-	-	-	-
Platoon blocked, %								-	-		-	-
Mov Cap-1 Maneuver	405	408	774	437	413	807	1291	-	-	1320	-	-
Mov Cap-2 Maneuver	405	408	-	437	413	-	-	-	-	-	-	-
Stage 1	668	613	-	772	712	-	-	-	-	-	-	-
Stage 2	746	704	-	673	613	-	-	-	-	-	-	-

Approach	EB	WB	NB	SB
HCM Control Delay, s	0	11.4	0	1.2
HCM LOS	A	B		

Minor Lane/Major Mvmt	NBL	NBT	NBR	EBLn1	WBLn1	SBL	SBT	SBR
Capacity (veh/h)	1291	-	-	-	603	1320	-	-
HCM Lane V/C Ratio	-	-	-	-	0.074	0.031	-	-
HCM Control Delay (s)	0	-	-	0	11.4	7.8	-	-
HCM Lane LOS	A	-	-	A	B	A	-	-
HCM 95th %tile Q(veh)	0	-	-	-	0.2	0.1	-	-

MOVEMENT SUMMARY

Site: 101 [Existing Abbott/Robert Grant PM (Site Folder: Existing PM)]

Output produced by SIDRA INTERSECTION Version: 9.1.1.200

Network: N101 [Existing PM (Network Folder: General)]

New Site
Site Category: Future Conditions 1
Roundabout

Vehicle Movement Performance

Mov ID	Turn	Mov Class	Demand Flows [Total veh/h	HV] %	Arrival Flows [Total veh/h	HV] %	Deg. Satn v/c	Aver. Delay sec	Level of Service	Aver. Back Of Queue [Veh. veh	Dist] m	Prop. Que	Eff. Stop Rate	Aver. No. of Cycles	Aver. Speed km/h
South: Robert Grant Ave															
1	L2	All MCs	299	2.0	299	2.0	0.291	9.9	LOS A	0.7	5.2	0.35	0.58	0.35	50.7
3	R2	All MCs	76	2.0	76	2.0	0.291	4.2	LOS A	0.7	5.2	0.35	0.58	0.35	51.2
Approach			375	2.0	375	2.0	0.291	8.7	LOS A	0.7	5.2	0.35	0.58	0.35	50.8
East: Abbott St E															
4	L2	All MCs	73	2.0	73	2.0	0.187	10.7	LOS B	0.4	3.0	0.49	0.56	0.49	48.3
5	T1	All MCs	128	2.0	128	2.0	0.187	4.9	LOS A	0.4	3.0	0.49	0.56	0.49	52.6
Approach			201	2.0	201	2.0	0.187	7.0	LOS A	0.4	3.0	0.49	0.56	0.49	51.6
West: Abbott St E															
11	T1	All MCs	132	2.0	132	2.0	0.378	3.8	LOS A	1.1	8.1	0.30	0.41	0.30	54.9
12	R2	All MCs	408	2.0	408	2.0	0.378	3.8	LOS A	1.1	8.1	0.30	0.41	0.30	52.0
Approach			540	2.0	540	2.0	0.378	3.8	LOS A	1.1	8.1	0.30	0.41	0.30	53.1
All Vehicles			1116	2.0	1116	2.0	0.378	6.0	LOS A	1.1	8.1	0.35	0.49	0.35	51.8

Site Level of Service (LOS) Method: Delay (SIDRA). Site LOS Method is specified in the Network Data dialog (Override Site Data tab).
Roundabout LOS Method: SIDRA Roundabout LOS.
Vehicle movement LOS values are based on average delay per movement.
Intersection and Approach LOS values are based on average delay for all vehicle movements.
Roundabout Capacity Model: SIDRA Standard.
Delay Model: SIDRA Standard (Control Delay: Geometric Delay is included).
Queue Model: SIDRA queue estimation methods are used for Back of Queue and Queue at Start of Gap.
Gap-Acceptance Capacity Formula: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.
Arrival Flows used in performance calculations are adjusted to include any Initial Queued Demand and Upstream Capacity Constraint effects.

MOVEMENT SUMMARY

Site: 101 [Existing Bobolink/Robert Grant PM (Site Folder: Existing PM)]

Output produced by SIDRA INTERSECTION Version: 9.1.1.200

Network: N101 [Existing PM (Network Folder: General)]

New Site
Site Category: (None)
Roundabout

Vehicle Movement Performance

Mov ID	Turn	Mov Class	Demand Flows [Total veh/h	HV] %	Arrival Flows [Total veh/h	HV] %	Deg. Satn v/c	Aver. Delay sec	Level of Service	Aver. Back Of Queue [Veh. veh	Dist] m	Prop. Que	Eff. Stop Rate	Aver. No. of Cycles	Aver. Speed km/h
South: Robert Grant Ave															
1	L2	All MCs	38	2.0	38	2.0	0.269	10.1	LOS B	0.6	4.6	0.40	0.46	0.40	52.7
2	T1	All MCs	263	2.0	263	2.0	0.269	4.5	LOS A	0.6	4.6	0.40	0.46	0.40	50.1
3	R2	All MCs	23	2.0	23	2.0	0.269	4.5	LOS A	0.6	4.6	0.40	0.46	0.40	53.3
Approach			324	2.0	324	2.0	0.269	5.2	LOS A	0.6	4.6	0.40	0.46	0.40	50.9
East: Bobolink Rdg															
4	L2	All MCs	19	2.0	19	2.0	0.082	11.0	LOS B	0.2	1.3	0.51	0.59	0.51	49.2
5	T1	All MCs	3	2.0	3	2.0	0.082	5.4	LOS A	0.2	1.3	0.51	0.59	0.51	53.2
6	R2	All MCs	60	2.0	60	2.0	0.082	5.4	LOS A	0.2	1.3	0.51	0.59	0.51	49.2
Approach			82	2.0	82	2.0	0.082	6.7	LOS A	0.2	1.3	0.51	0.59	0.51	49.5
North: Robert Grant Ave															
7	L2	All MCs	94	2.0	94	2.0	0.301	9.4	LOS A	0.8	5.5	0.23	0.44	0.23	53.1
8	T1	All MCs	278	2.0	278	2.0	0.301	3.8	LOS A	0.8	5.5	0.23	0.44	0.23	50.8
9	R2	All MCs	60	2.0	60	2.0	0.301	3.8	LOS A	0.8	5.5	0.23	0.44	0.23	53.7
Approach			432	2.0	432	2.0	0.301	5.0	LOS A	0.8	5.5	0.23	0.44	0.23	52.1
West: Bobolink Rdg															
10	L2	All MCs	81	2.0	81	2.0	0.108	11.1	LOS B	0.2	1.6	0.51	0.65	0.51	46.3
11	T1	All MCs	2	2.0	2	2.0	0.108	5.5	LOS A	0.2	1.6	0.51	0.65	0.51	51.2
12	R2	All MCs	24	2.0	24	2.0	0.108	5.5	LOS A	0.2	1.6	0.51	0.65	0.51	46.3
Approach			107	2.0	107	2.0	0.108	9.7	LOS A	0.2	1.6	0.51	0.65	0.51	46.4
All Vehicles			945	2.0	945	2.0	0.301	5.7	LOS A	0.8	5.5	0.34	0.48	0.34	50.9

Site Level of Service (LOS) Method: Delay (SIDRA). Site LOS Method is specified in the Network Data dialog (Override Site Data tab).
Roundabout LOS Method: SIDRA Roundabout LOS.
Vehicle movement LOS values are based on average delay per movement.
Intersection and Approach LOS values are based on average delay for all vehicle movements.
Roundabout Capacity Model: SIDRA Standard.
Delay Model: SIDRA Standard (Control Delay: Geometric Delay is included).
Queue Model: SIDRA queue estimation methods are used for Back of Queue and Queue at Start of Gap.
Gap-Acceptance Capacity Formula: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.
Arrival Flows used in performance calculations are adjusted to include any Initial Queued Demand and Upstream Capacity Constraint effects.

MOVEMENT SUMMARY

Site: 101 [Existing Cope/Robert Grant PM (Site Folder: Existing PM)]

Output produced by SIDRA INTERSECTION Version: 9.1.1.200

Network: N101 [Existing PM (Network Folder: General)]

New Site
Site Category: (None)
Roundabout

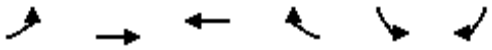
Vehicle Movement Performance

Mov ID	Turn	Mov Class	Demand Flows [Total veh/h	HV] %	Arrival Flows [Total veh/h	HV] %	Deg. Satn v/c	Aver. Delay sec	Level of Service	Aver. Back Of Queue [Veh. veh	Dist] m	Prop. Que	Eff. Stop Rate	Aver. No. of Cycles	Aver. Speed km/h
South: Robert Grant Ave															
1	L2	All MCs	26	2.0	26	2.0	0.195	9.8	LOS A	0.4	3.1	0.32	0.43	0.32	53.2
2	T1	All MCs	200	2.0	200	2.0	0.195	4.1	LOS A	0.4	3.1	0.32	0.43	0.32	50.9
3	R2	All MCs	20	2.0	20	2.0	0.195	4.1	LOS A	0.4	3.1	0.32	0.43	0.32	53.8
Approach			246	2.0	246	2.0	0.195	4.7	LOS A	0.4	3.1	0.32	0.43	0.32	51.6
East: Cope Dr															
4	L2	All MCs	18	2.0	18	2.0	0.102	10.4	LOS B	0.2	1.5	0.43	0.52	0.43	52.8
5	T1	All MCs	25	2.0	25	2.0	0.102	4.7	LOS A	0.2	1.5	0.43	0.52	0.43	53.8
6	R2	All MCs	71	2.0	71	2.0	0.102	4.7	LOS A	0.2	1.5	0.43	0.52	0.43	50.1
Approach			114	2.0	114	2.0	0.102	5.6	LOS A	0.2	1.5	0.43	0.52	0.43	51.8
North: Robert Grant Ave															
7	L2	All MCs	68	2.0	68	2.0	0.238	9.5	LOS A	0.6	4.0	0.23	0.43	0.23	53.2
8	T1	All MCs	214	2.0	214	2.0	0.238	3.7	LOS A	0.6	4.0	0.23	0.43	0.23	54.2
9	R2	All MCs	52	2.0	52	2.0	0.238	3.8	LOS A	0.6	4.0	0.23	0.43	0.23	53.9
Approach			334	2.0	334	2.0	0.238	4.9	LOS A	0.6	4.0	0.23	0.43	0.23	54.0
West: Cope Dr															
10	L2	All MCs	43	2.0	43	2.0	0.098	10.6	LOS B	0.2	1.5	0.45	0.57	0.45	48.6
11	T1	All MCs	24	2.0	24	2.0	0.098	4.8	LOS A	0.2	1.5	0.45	0.57	0.45	52.8
12	R2	All MCs	39	2.0	39	2.0	0.098	4.9	LOS A	0.2	1.5	0.45	0.57	0.45	52.4
Approach			106	2.0	106	2.0	0.098	7.2	LOS A	0.2	1.5	0.45	0.57	0.45	51.4
All Vehicles			800	2.0	800	2.0	0.238	5.2	LOS A	0.6	4.0	0.32	0.46	0.32	52.8

Site Level of Service (LOS) Method: Delay (SIDRA). Site LOS Method is specified in the Network Data dialog (Override Site Data tab).
Roundabout LOS Method: SIDRA Roundabout LOS.
Vehicle movement LOS values are based on average delay per movement.
Intersection and Approach LOS values are based on average delay for all vehicle movements.
Roundabout Capacity Model: SIDRA Standard.
Delay Model: SIDRA Standard (Control Delay: Geometric Delay is included).
Queue Model: SIDRA queue estimation methods are used for Back of Queue and Queue at Start of Gap.
Gap-Acceptance Capacity Formula: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.
Arrival Flows used in performance calculations are adjusted to include any Initial Queued Demand and Upstream Capacity Constraint effects.

Appendix L:

Synchro and Sidra Analysis: 2030 Background Intersection Performance



Lane Group	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Volume (vph)	86	407	261	288	272	67
Future Volume (vph)	86	407	261	288	272	67
Satd. Flow (prot)	1695	1784	1784	1517	1695	1517
Flt Permitted	0.950				0.950	
Satd. Flow (perm)	1654	1784	1784	1428	1653	1438
Satd. Flow (RTOR)				288		67
Lane Group Flow (vph)	86	407	261	288	272	67
Turn Type	Prot	NA	NA	Perm	Perm	Perm
Protected Phases	5	2	6			
Permitted Phases				6	4	4
Detector Phase	5	2	6	6	4	4
Switch Phase						
Minimum Initial (s)	5.0	5.0	5.0	5.0	10.0	10.0
Minimum Split (s)	26.2	57.2	57.2	57.2	30.0	30.0
Total Split (s)	26.2	83.4	57.2	57.2	36.0	36.0
Total Split (%)	21.9%	69.8%	47.9%	47.9%	30.2%	30.2%
Yellow Time (s)	4.6	4.6	4.6	4.6	3.3	3.3
All-Red Time (s)	1.6	1.6	1.6	1.6	2.7	2.7
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	0.0
Total Lost Time (s)	6.2	6.2	6.2	6.2	6.0	6.0
Lead/Lag	Lead		Lag	Lag		
Lead-Lag Optimize?	Yes		Yes	Yes		
Recall Mode	Max	Min	Min	Min	Max	Max
Act Effct Green (s)	20.1	44.7	18.4	18.4	30.1	30.1
Actuated g/C Ratio	0.23	0.51	0.21	0.21	0.35	0.35
v/c Ratio	0.22	0.44	0.69	0.55	0.48	0.12
Control Delay	30.6	14.9	41.6	7.7	26.8	6.7
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	30.6	14.9	41.6	7.7	26.8	6.7
LOS	C	B	D	A	C	A
Approach Delay		17.7	23.8		22.8	
Approach LOS		B	C		C	
Queue Length 50th (m)	10.8	37.1	37.1	0.0	32.3	0.0
Queue Length 95th (m)	23.9	56.1	59.2	16.8	59.3	8.2
Internal Link Dist (m)		227.6	295.8		320.1	
Turn Bay Length (m)	100.0			100.0	90.0	
Base Capacity (vph)	390	1588	1049	958	571	541
Starvation Cap Reductn	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0
Reduced v/c Ratio	0.22	0.26	0.25	0.30	0.48	0.12

Intersection Summary
Cycle Length: 119.4
Actuated Cycle Length: 87
Natural Cycle: 115
Control Type: Semi Act-Uncoord
Maximum v/c Ratio: 0.69

Intersection Signal Delay: 21.4 | Intersection LOS: C
Intersection Capacity Utilization 54.9% | ICU Level of Service A
Analysis Period (min) 15

Splits and Phases: 5: Fernbank & Robert Grant

Intersection	
Int Delay, s/veh	2.9

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Vol, veh/h	48	0	39	16	0	39	26	324	8	10	274	61
Future Vol, veh/h	48	0	39	16	0	39	26	324	8	10	274	61
Conflicting Peds, #/hr	10	0	10	10	0	10	20	0	20	20	0	20
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop	Free	Free	Free	Free	Free	Free
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	-	-	-	65	-	-	65	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	100	100	100	100	100	100	100	100	100	100	100	100
Heavy Vehicles, %	2	2	2	2	2	2	2	2	2	2	2	2
Mvmt Flow	48	0	39	16	0	39	26	324	8	10	274	61

Major/Minor	Minor2			Minor1			Major1			Major2		
Conflicting Flow All	755	749	335	754	775	358	355	0	0	352	0	0
Stage 1	345	345	-	400	400	-	-	-	-	-	-	-
Stage 2	410	404	-	354	375	-	-	-	-	-	-	-
Critical Hdwy	7.12	6.52	6.22	7.12	6.52	6.22	4.12	-	-	4.12	-	-
Critical Hdwy Stg 1	6.12	5.52	-	6.12	5.52	-	-	-	-	-	-	-
Critical Hdwy Stg 2	6.12	5.52	-	6.12	5.52	-	-	-	-	-	-	-
Follow-up Hdwy	3.518	4.018	3.318	3.518	4.018	3.318	2.218	-	-	2.218	-	-
Pot Cap-1 Maneuver	325	341	707	326	329	686	1204	-	-	1207	-	-
Stage 1	671	636	-	626	602	-	-	-	-	-	-	-
Stage 2	619	599	-	663	617	-	-	-	-	-	-	-
Platoon blocked, %								-	-		-	-
Mov Cap-1 Maneuver	291	319	688	292	308	667	1182	-	-	1185	-	-
Mov Cap-2 Maneuver	291	319	-	292	308	-	-	-	-	-	-	-
Stage 1	644	619	-	601	578	-	-	-	-	-	-	-
Stage 2	565	575	-	614	601	-	-	-	-	-	-	-

Approach	EB	WB	NB	SB
HCM Control Delay, s	16.7	13.4	0.6	0.2
HCM LOS	C	B		

Minor Lane/Major Mvmt	NBL	NBT	NBR	EBLn1	WBLn1	SBL	SBT	SBR
Capacity (veh/h)	1182	-	-	393	486	1185	-	-
HCM Lane V/C Ratio	0.022	-	-	0.221	0.113	0.008	-	-
HCM Control Delay (s)	8.1	-	-	16.7	13.4	8.1	-	-
HCM Lane LOS	A	-	-	C	B	A	-	-
HCM 95th %tile Q(veh)	0.1	-	-	0.8	0.4	0	-	-

MOVEMENT SUMMARY

Site: 101 [BG 2030 Abbott/Robert Grant AM (Site Folder: Background 2030 AM)]

Output produced by SIDRA INTERSECTION Version: 9.1.1.200

Network: N101 [Background 2030 AM (Network Folder: General)]

New Site
Site Category: Future Conditions 1
Roundabout

Vehicle Movement Performance

Mov ID	Turn	Mov Class	Demand Flows [Total veh/h	HV] %	Arrival Flows [Total veh/h	HV] %	Deg. Satn v/c	Aver. Delay sec	Level of Service	Aver. Back Of Queue [Veh. veh	Dist] m	Prop. Que	Eff. Stop Rate	Aver. No. of Cycles	Aver. Speed km/h
South: Robert Grant Ave															
1	L2	All MCs	299	2.0	299	2.0	0.636	11.9	LOS B	2.5	17.5	0.71	0.63	0.74	50.8
2	T1	All MCs	231	2.0	231	2.0	0.636	6.1	LOS A	2.5	17.5	0.71	0.63	0.74	51.8
3	R2	All MCs	198	2.0	198	2.0	0.636	6.1	LOS A	2.5	17.5	0.71	0.63	0.74	51.4
Approach			727	2.0	727	2.0	0.636	8.5	LOS A	2.5	17.5	0.71	0.63	0.74	51.3
East: Abbott St E															
4	L2	All MCs	189	2.0	189	2.0	0.506	14.3	LOS B	1.7	12.1	0.84	0.77	0.93	44.7
5	T1	All MCs	135	2.0	135	2.0	0.506	8.5	LOS A	1.7	12.1	0.84	0.77	0.93	50.3
6	R2	All MCs	84	2.0	84	2.0	0.506	8.6	LOS A	1.7	12.1	0.84	0.77	0.93	50.0
Approach			408	2.0	408	2.0	0.506	11.2	LOS B	1.7	12.1	0.84	0.77	0.93	48.4
North: Robert Grant Ave															
7	L2	All MCs	126	2.0	126	2.0	0.394	13.4	LOS B	1.1	7.7	0.78	0.71	0.78	50.1
8	T1	All MCs	157	2.0	157	2.0	0.394	7.7	LOS A	1.1	7.7	0.78	0.71	0.78	45.7
9	R2	All MCs	34	2.0	34	2.0	0.394	7.7	LOS A	1.1	7.7	0.78	0.71	0.78	50.6
Approach			317	2.0	317	2.0	0.394	10.0	LOS A	1.1	7.7	0.78	0.71	0.78	48.6
West: Abbott St E															
10	L2	All MCs	53	2.0	53	2.0	0.376	12.2	LOS B	1.0	7.3	0.70	0.64	0.70	51.7
11	T1	All MCs	87	2.0	87	2.0	0.376	6.4	LOS A	1.0	7.3	0.70	0.64	0.70	52.7
12	R2	All MCs	205	2.0	205	2.0	0.376	6.5	LOS A	1.0	7.3	0.70	0.64	0.70	48.3
Approach			345	2.0	345	2.0	0.376	7.4	LOS A	1.0	7.3	0.70	0.64	0.70	50.5
All Vehicles			1798	2.0	1798	2.0	0.636	9.1	LOS A	2.5	17.5	0.75	0.68	0.78	50.1

Site Level of Service (LOS) Method: Delay (SIDRA). Site LOS Method is specified in the Network Data dialog (Override Site Data tab).
Roundabout LOS Method: SIDRA Roundabout LOS.
Vehicle movement LOS values are based on average delay per movement.
Intersection and Approach LOS values are based on average delay for all vehicle movements.
Roundabout Capacity Model: SIDRA Standard.
Delay Model: SIDRA Standard (Control Delay: Geometric Delay is included).
Queue Model: SIDRA queue estimation methods are used for Back of Queue and Queue at Start of Gap.
Gap-Acceptance Capacity Formula: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.
Arrival Flows used in performance calculations are adjusted to include any Initial Queued Demand and Upstream Capacity Constraint effects.

MOVEMENT SUMMARY

Site: 101 [BG 2030 Bobolink/Robert Grant AM (Site Folder: Background 2030 AM)]

Output produced by SIDRA INTERSECTION Version: 9.1.1.200

Network: N101 [Background 2030 AM (Network Folder: General)]

New Site
Site Category: (None)
Roundabout

Vehicle Movement Performance

Mov ID	Turn	Mov Class	Demand Flows [Total veh/h	HV] %	Arrival Flows [Total veh/h	HV] %	Deg. Satn v/c	Aver. Delay sec	Level of Service	Aver. Back Of Queue [Veh. veh	Dist] m	Prop. Que	Eff. Stop Rate	Aver. No. of Cycles	Aver. Speed km/h
South: Robert Grant Ave															
1	L2	All MCs	17	2.0	17	2.0	0.431	10.8	LOS B	1.2	8.9	0.57	0.52	0.57	52.1
2	T1	All MCs	444	2.0	444	2.0	0.431	5.3	LOS A	1.2	8.9	0.57	0.52	0.57	49.1
3	R2	All MCs	18	2.0	18	2.0	0.431	5.3	LOS A	1.2	8.9	0.57	0.52	0.57	52.7
Approach			479	2.0	479	2.0	0.431	5.5	LOS A	1.2	8.9	0.57	0.52	0.57	49.5
East: Bobolink Rdg															
4	L2	All MCs	34	2.0	34	2.0	0.141	13.0	LOS B	0.3	2.4	0.70	0.69	0.70	46.6
5	T1	All MCs	1	2.0	1	2.0	0.141	7.4	LOS A	0.3	2.4	0.70	0.69	0.70	51.6
6	R2	All MCs	74	2.0	74	2.0	0.141	7.4	LOS A	0.3	2.4	0.70	0.69	0.70	46.6
Approach			108	2.0	108	2.0	0.141	9.2	LOS A	0.3	2.4	0.70	0.69	0.70	46.7
North: Robert Grant Ave															
7	L2	All MCs	56	2.0	56	2.0	0.347	9.3	LOS A	1.0	7.2	0.24	0.40	0.24	53.4
8	T1	All MCs	373	2.0	373	2.0	0.347	3.8	LOS A	1.0	7.2	0.24	0.40	0.24	51.4
9	R2	All MCs	79	2.0	79	2.0	0.347	3.8	LOS A	1.0	7.2	0.24	0.40	0.24	54.1
Approach			507	2.0	507	2.0	0.347	4.4	LOS A	1.0	7.2	0.24	0.40	0.24	52.3
West: Bobolink Rdg															
10	L2	All MCs	200	2.0	200	2.0	0.245	11.8	LOS B	0.6	4.1	0.60	0.68	0.60	45.1
11	T1	All MCs	1	2.0	1	2.0	0.245	6.3	LOS A	0.6	4.1	0.60	0.68	0.60	50.5
12	R2	All MCs	29	2.0	29	2.0	0.245	6.3	LOS A	0.6	4.1	0.60	0.68	0.60	45.1
Approach			231	2.0	231	2.0	0.245	11.1	LOS B	0.6	4.1	0.60	0.68	0.60	45.2
All Vehicles			1325	2.0	1325	2.0	0.431	6.3	LOS A	1.2	8.9	0.46	0.51	0.46	49.7

Site Level of Service (LOS) Method: Delay (SIDRA). Site LOS Method is specified in the Network Data dialog (Override Site Data tab).
Roundabout LOS Method: SIDRA Roundabout LOS.
Vehicle movement LOS values are based on average delay per movement.
Intersection and Approach LOS values are based on average delay for all vehicle movements.
Roundabout Capacity Model: SIDRA Standard.
Delay Model: SIDRA Standard (Control Delay: Geometric Delay is included).
Queue Model: SIDRA queue estimation methods are used for Back of Queue and Queue at Start of Gap.
Gap-Acceptance Capacity Formula: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.
Arrival Flows used in performance calculations are adjusted to include any Initial Queued Demand and Upstream Capacity Constraint effects.

MOVEMENT SUMMARY

Site: 101 [BG 2030 Cope/Robert Grant AM (Site Folder: Background 2030 AM)]

Output produced by SIDRA INTERSECTION Version: 9.1.1.200

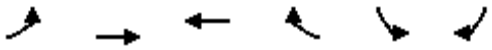
Network: N101 [Background 2030 AM (Network Folder: General)]

New Site
Site Category: (None)
Roundabout

Vehicle Movement Performance

Mov ID	Turn	Mov Class	Demand Flows [Total veh/h	HV] %	Arrival Flows [Total veh/h	HV] %	Deg. Satn v/c	Aver. Delay sec	Level of Service	Aver. Back Of Queue [Veh. veh	Dist] m	Prop. Que	Eff. Stop Rate	Aver. No. of Cycles	Aver. Speed km/h
South: RoadName															
1	L2	All MCs	107	2.0	107	2.0	0.392	10.7	LOS B	1.1	7.8	0.54	0.53	0.54	51.9
2	T1	All MCs	328	2.0	328	2.0	0.392	4.9	LOS A	1.1	7.8	0.54	0.53	0.54	48.6
3	R2	All MCs	11	2.0	11	2.0	0.392	5.0	LOS A	1.1	7.8	0.54	0.53	0.54	52.5
Approach			446	2.0	446	2.0	0.392	6.3	LOS A	1.1	7.8	0.54	0.53	0.54	49.9
East: RoadName															
4	L2	All MCs	12	2.0	12	2.0	0.147	12.5	LOS B	0.3	2.5	0.66	0.63	0.66	51.8
5	T1	All MCs	51	2.0	51	2.0	0.147	6.7	LOS A	0.3	2.5	0.66	0.63	0.66	52.8
6	R2	All MCs	61	2.0	61	2.0	0.147	6.7	LOS A	0.3	2.5	0.66	0.63	0.66	48.4
Approach			123	2.0	123	2.0	0.147	7.3	LOS A	0.3	2.5	0.66	0.63	0.66	51.1
North: RoadName															
7	L2	All MCs	42	2.0	42	2.0	0.424	10.2	LOS B	1.2	8.7	0.46	0.47	0.46	52.8
8	T1	All MCs	276	2.0	276	2.0	0.424	4.5	LOS A	1.2	8.7	0.46	0.47	0.46	53.8
9	R2	All MCs	214	2.0	214	2.0	0.424	4.5	LOS A	1.2	8.7	0.46	0.47	0.46	53.4
Approach			532	2.0	532	2.0	0.424	4.9	LOS A	1.2	8.7	0.46	0.47	0.46	53.6
West: RoadName															
10	L2	All MCs	153	2.0	153	2.0	0.287	11.1	LOS B	0.7	5.1	0.56	0.61	0.56	47.4
11	T1	All MCs	46	2.0	46	2.0	0.287	5.3	LOS A	0.7	5.1	0.56	0.61	0.56	52.0
12	R2	All MCs	98	2.0	98	2.0	0.287	5.4	LOS A	0.7	5.1	0.56	0.61	0.56	51.7
Approach			297	2.0	297	2.0	0.287	8.3	LOS A	0.7	5.1	0.56	0.61	0.56	50.1
All Vehicles			1398	2.0	1398	2.0	0.424	6.3	LOS A	1.2	8.7	0.52	0.54	0.52	51.7

Site Level of Service (LOS) Method: Delay (SIDRA). Site LOS Method is specified in the Network Data dialog (Override Site Data tab).
Roundabout LOS Method: SIDRA Roundabout LOS.
Vehicle movement LOS values are based on average delay per movement.
Intersection and Approach LOS values are based on average delay for all vehicle movements.
Roundabout Capacity Model: SIDRA Standard.
Delay Model: SIDRA Standard (Control Delay: Geometric Delay is included).
Queue Model: SIDRA queue estimation methods are used for Back of Queue and Queue at Start of Gap.
Gap-Acceptance Capacity Formula: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.
Arrival Flows used in performance calculations are adjusted to include any Initial Queued Demand and Upstream Capacity Constraint effects.



Lane Group	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Volume (vph)	88	379	580	355	289	64
Future Volume (vph)	88	379	580	355	289	64
Satd. Flow (prot)	1695	1784	1784	1517	1695	1517
Flt Permitted	0.950				0.950	
Satd. Flow (perm)	1666	1784	1784	1424	1649	1434
Satd. Flow (RTOR)				355		64
Lane Group Flow (vph)	88	379	580	355	289	64
Turn Type	Prot	NA	NA	Perm	Perm	Perm
Protected Phases	5	2	6			
Permitted Phases				6	4	4
Detector Phase	5	2	6	6	4	4
Switch Phase						
Minimum Initial (s)	5.0	5.0	5.0	5.0	10.0	10.0
Minimum Split (s)	26.2	57.2	57.2	57.2	30.0	30.0
Total Split (s)	26.2	94.4	68.2	68.2	36.0	36.0
Total Split (%)	20.1%	72.4%	52.3%	52.3%	27.6%	27.6%
Yellow Time (s)	4.6	4.6	4.6	4.6	3.3	3.3
All-Red Time (s)	1.6	1.6	1.6	1.6	2.7	2.7
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	0.0
Total Lost Time (s)	6.2	6.2	6.2	6.2	6.0	6.0
Lead/Lag	Lead		Lag	Lag		
Lead-Lag Optimize?	Yes		Yes	Yes		
Recall Mode	Max	Min	Min	Min	Max	Max
Act Effct Green (s)	20.2	69.4	43.0	43.0	30.3	30.3
Actuated g/C Ratio	0.18	0.62	0.38	0.38	0.27	0.27
v/c Ratio	0.29	0.34	0.85	0.46	0.65	0.15
Control Delay	46.2	10.9	43.6	4.2	46.5	10.2
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	46.2	10.9	43.6	4.2	46.5	10.2
LOS	D	B	D	A	D	B
Approach Delay		17.5	28.6		40.0	
Approach LOS		B	C		D	
Queue Length 50th (m)	15.4	33.9	104.3	0.0	51.1	0.0
Queue Length 95th (m)	33.9	47.8	142.9	14.6	#99.4	10.7
Internal Link Dist (m)		227.6	295.8		320.1	
Turn Bay Length (m)	100.0			100.0	90.0	
Base Capacity (vph)	305	1418	997	952	445	434
Starvation Cap Reductn	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0
Reduced v/c Ratio	0.29	0.27	0.58	0.37	0.65	0.15

Intersection Summary
Cycle Length: 130.4
Actuated Cycle Length: 112.1
Natural Cycle: 115
Control Type: Semi Act-Uncoord
Maximum v/c Ratio: 0.85

Intersection Signal Delay: 27.9 Intersection LOS: C
Intersection Capacity Utilization 72.7% ICU Level of Service C
Analysis Period (min) 15
95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.

Splits and Phases: 5: Fernbank & Robert Grant

Intersection	
Int Delay, s/veh	4.1

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↔			↔		↰	↑		↰	↑	
Traffic Vol, veh/h	63	0	51	16	0	24	49	367	21	37	305	32
Future Vol, veh/h	63	0	51	16	0	24	49	367	21	37	305	32
Conflicting Peds, #/hr	10	0	10	10	0	10	30	0	20	20	0	30
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop	Free	Free	Free	Free	Free	Free
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	-	-	-	65	-	-	65	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	100	100	100	100	100	100	100	100	100	100	100	100
Heavy Vehicles, %	2	2	2	2	2	2	2	2	2	2	2	2
Mvmt Flow	63	0	51	16	0	24	49	367	21	37	305	32

Major/Minor	Minor2			Minor1			Major1			Major2		
Conflicting Flow All	923	931	361	927	937	408	367	0	0	408	0	0
Stage 1	425	425	-	496	496	-	-	-	-	-	-	-
Stage 2	498	506	-	431	441	-	-	-	-	-	-	-
Critical Hdwy	7.12	6.52	6.22	7.12	6.52	6.22	4.12	-	-	4.12	-	-
Critical Hdwy Stg 1	6.12	5.52	-	6.12	5.52	-	-	-	-	-	-	-
Critical Hdwy Stg 2	6.12	5.52	-	6.12	5.52	-	-	-	-	-	-	-
Follow-up Hdwy	3.518	4.018	3.318	3.518	4.018	3.318	2.218	-	-	2.218	-	-
Pot Cap-1 Maneuver	250	267	684	249	265	643	1192	-	-	1151	-	-
Stage 1	607	586	-	556	545	-	-	-	-	-	-	-
Stage 2	554	540	-	603	577	-	-	-	-	-	-	-
Platoon blocked, %								-	-		-	-
Mov Cap-1 Maneuver	219	236	659	211	234	625	1159	-	-	1130	-	-
Mov Cap-2 Maneuver	219	236	-	211	234	-	-	-	-	-	-	-
Stage 1	565	551	-	523	513	-	-	-	-	-	-	-
Stage 2	505	508	-	533	542	-	-	-	-	-	-	-

Approach	EB	WB	NB	SB
HCM Control Delay, s	23	16.6	0.9	0.8
HCM LOS	C	C		

Minor Lane/Major Mvmt	NBL	NBT	NBR	EBLn1	WBLn1	SBL	SBT	SBR
Capacity (veh/h)	1159	-	-	312	350	1130	-	-
HCM Lane V/C Ratio	0.042	-	-	0.365	0.114	0.033	-	-
HCM Control Delay (s)	8.2	-	-	23	16.6	8.3	-	-
HCM Lane LOS	A	-	-	C	C	A	-	-
HCM 95th %tile Q(veh)	0.1	-	-	1.6	0.4	0.1	-	-

MOVEMENT SUMMARY

Site: 101 [BG 2030 Abbott/Robert Grant PM (Site Folder: Background 2030 PM)]

Output produced by SIDRA INTERSECTION Version: 9.1.1.200

Network: N101 [Background 2030 PM (Network Folder: General)]

New Site
Site Category: Future Conditions 1
Roundabout

Vehicle Movement Performance

Mov ID	Turn	Mov Class	Demand Flows [Total veh/h	HV] %	Arrival Flows [Total veh/h	HV] %	Deg. Satn v/c	Aver. Delay sec	Level of Service	Aver. Back Of Queue [Veh. veh	Dist] m	Prop. Que	Eff. Stop Rate	Aver. No. of Cycles	Aver. Speed km/h
South: Robert Grant Ave															
1	L2	All MCs	253	2.0	253	2.0	0.614	12.0	LOS B	2.3	16.5	0.72	0.64	0.76	50.8
2	T1	All MCs	275	2.0	275	2.0	0.614	6.3	LOS A	2.3	16.5	0.72	0.64	0.76	51.7
3	R2	All MCs	147	2.0	147	2.0	0.614	6.3	LOS A	2.3	16.5	0.72	0.64	0.76	51.4
Approach			675	2.0	675	2.0	0.614	8.4	LOS A	2.3	16.5	0.72	0.64	0.76	51.3
East: Abbott St E															
4	L2	All MCs	183	2.0	183	2.0	0.478	13.9	LOS B	1.5	11.0	0.83	0.75	0.89	45.0
5	T1	All MCs	142	2.0	142	2.0	0.478	8.1	LOS A	1.5	11.0	0.83	0.75	0.89	50.5
6	R2	All MCs	60	2.0	60	2.0	0.478	8.2	LOS A	1.5	11.0	0.83	0.75	0.89	50.1
Approach			385	2.0	385	2.0	0.478	10.9	LOS B	1.5	11.0	0.83	0.75	0.89	48.5
North: Robert Grant Ave															
7	L2	All MCs	123	2.0	123	2.0	0.451	13.5	LOS B	1.3	9.6	0.79	0.72	0.82	50.3
8	T1	All MCs	218	2.0	218	2.0	0.451	7.8	LOS A	1.3	9.6	0.79	0.72	0.82	46.0
9	R2	All MCs	36	2.0	36	2.0	0.451	7.8	LOS A	1.3	9.6	0.79	0.72	0.82	50.8
Approach			377	2.0	377	2.0	0.451	9.6	LOS A	1.3	9.6	0.79	0.72	0.82	48.5
West: Abbott St E															
10	L2	All MCs	56	2.0	56	2.0	0.567	14.5	LOS B	2.1	14.8	0.83	0.76	0.96	50.5
11	T1	All MCs	114	2.0	114	2.0	0.567	8.8	LOS A	2.1	14.8	0.83	0.76	0.96	51.4
12	R2	All MCs	325	2.0	325	2.0	0.567	8.8	LOS A	2.1	14.8	0.83	0.76	0.96	46.2
Approach			495	2.0	495	2.0	0.567	9.5	LOS A	2.1	14.8	0.83	0.76	0.96	48.6
All Vehicles			1932	2.0	1932	2.0	0.614	9.4	LOS A	2.3	16.5	0.78	0.71	0.85	49.7

Site Level of Service (LOS) Method: Delay (SIDRA). Site LOS Method is specified in the Network Data dialog (Override Site Data tab).
Roundabout LOS Method: SIDRA Roundabout LOS.
Vehicle movement LOS values are based on average delay per movement.
Intersection and Approach LOS values are based on average delay for all vehicle movements.
Roundabout Capacity Model: SIDRA Standard.
Delay Model: SIDRA Standard (Control Delay: Geometric Delay is included).
Queue Model: SIDRA queue estimation methods are used for Back of Queue and Queue at Start of Gap.
Gap-Acceptance Capacity Formula: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.
Arrival Flows used in performance calculations are adjusted to include any Initial Queued Demand and Upstream Capacity Constraint effects.

MOVEMENT SUMMARY

Site: 101 [BG 2030 Bobolink/Robert Grant PM (Site Folder: Background 2030 PM)]

Output produced by SIDRA INTERSECTION Version: 9.1.1.200

Network: N101 [Background 2030 PM (Network Folder: General)]

New Site
Site Category: (None)
Roundabout

Vehicle Movement Performance

Mov ID	Turn	Mov Class	Demand Flows [Total veh/h	HV] %	Arrival Flows [Total veh/h	HV] %	Deg. Satn v/c	Aver. Delay sec	Level of Service	Aver. Back Of Queue [Veh. veh	Dist] m	Prop. Que	Eff. Stop Rate	Aver. No. of Cycles	Aver. Speed km/h
South: Robert Grant Ave															
1	L2	All MCs	43	2.0	43	2.0	0.495	10.9	LOS B	1.5	10.6	0.59	0.53	0.59	52.0
2	T1	All MCs	492	2.0	492	2.0	0.495	5.4	LOS A	1.5	10.6	0.59	0.53	0.59	48.8
3	R2	All MCs	27	2.0	27	2.0	0.495	5.4	LOS A	1.5	10.6	0.59	0.53	0.59	52.5
Approach			562	2.0	562	2.0	0.495	5.8	LOS A	1.5	10.6	0.59	0.53	0.59	49.5
East: Bobolink Rdg															
4	L2	All MCs	27	2.0	27	2.0	0.131	13.0	LOS B	0.3	2.3	0.71	0.69	0.71	46.8
5	T1	All MCs	3	2.0	3	2.0	0.131	7.4	LOS A	0.3	2.3	0.71	0.69	0.71	51.7
6	R2	All MCs	68	2.0	68	2.0	0.131	7.4	LOS A	0.3	2.3	0.71	0.69	0.71	46.8
Approach			99	2.0	99	2.0	0.131	8.9	LOS A	0.3	2.3	0.71	0.69	0.71	47.1
North: Robert Grant Ave															
7	L2	All MCs	124	2.0	124	2.0	0.458	9.5	LOS A	1.5	10.4	0.32	0.44	0.32	52.9
8	T1	All MCs	400	2.0	400	2.0	0.458	4.0	LOS A	1.5	10.4	0.32	0.44	0.32	50.4
9	R2	All MCs	129	2.0	129	2.0	0.458	4.0	LOS A	1.5	10.4	0.32	0.44	0.32	53.5
Approach			654	2.0	654	2.0	0.458	5.0	LOS A	1.5	10.4	0.32	0.44	0.32	51.9
West: Bobolink Rdg															
10	L2	All MCs	126	2.0	126	2.0	0.180	12.3	LOS B	0.4	3.0	0.64	0.70	0.64	44.9
11	T1	All MCs	2	2.0	2	2.0	0.180	6.7	LOS A	0.4	3.0	0.64	0.70	0.64	50.4
12	R2	All MCs	27	2.0	27	2.0	0.180	6.7	LOS A	0.4	3.0	0.64	0.70	0.64	44.9
Approach			156	2.0	156	2.0	0.180	11.2	LOS B	0.4	3.0	0.64	0.70	0.64	45.1
All Vehicles			1471	2.0	1471	2.0	0.495	6.2	LOS A	1.5	10.6	0.48	0.52	0.48	50.0

Site Level of Service (LOS) Method: Delay (SIDRA). Site LOS Method is specified in the Network Data dialog (Override Site Data tab).
Roundabout LOS Method: SIDRA Roundabout LOS.
Vehicle movement LOS values are based on average delay per movement.
Intersection and Approach LOS values are based on average delay for all vehicle movements.
Roundabout Capacity Model: SIDRA Standard.
Delay Model: SIDRA Standard (Control Delay: Geometric Delay is included).
Queue Model: SIDRA queue estimation methods are used for Back of Queue and Queue at Start of Gap.
Gap-Acceptance Capacity Formula: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.
Arrival Flows used in performance calculations are adjusted to include any Initial Queued Demand and Upstream Capacity Constraint effects.

MOVEMENT SUMMARY

Site: 101 [BG 2030 Cope/Robert Grant PM (Site Folder: Background 2030 PM)]

Output produced by SIDRA INTERSECTION Version: 9.1.1.200

Network: N101 [Background 2030 PM (Network Folder: General)]

New Site
Site Category: (None)
Roundabout

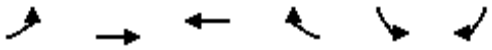
Vehicle Movement Performance

Mov ID	Turn	Mov Class	Demand Flows [Total veh/h	HV] %	Arrival Flows [Total veh/h	HV] %	Deg. Satn v/c	Aver. Delay sec	Level of Service	Aver. Back Of Queue [Veh. veh	Dist] m	Prop. Que	Eff. Stop Rate	Aver. No. of Cycles	Aver. Speed km/h
South: RoadName															
1	L2	All MCs	54	2.0	54	2.0	0.415	10.5	LOS B	1.2	8.4	0.51	0.49	0.51	52.3
2	T1	All MCs	417	2.0	417	2.0	0.415	4.8	LOS A	1.2	8.4	0.51	0.49	0.51	49.4
3	R2	All MCs	20	2.0	20	2.0	0.415	4.8	LOS A	1.2	8.4	0.51	0.49	0.51	52.9
Approach			491	2.0	491	2.0	0.415	5.4	LOS A	1.2	8.4	0.51	0.49	0.51	50.1
East: RoadName															
4	L2	All MCs	18	2.0	18	2.0	0.149	12.4	LOS B	0.4	2.5	0.66	0.64	0.66	51.7
5	T1	All MCs	37	2.0	37	2.0	0.149	6.6	LOS A	0.4	2.5	0.66	0.64	0.66	52.7
6	R2	All MCs	71	2.0	71	2.0	0.149	6.7	LOS A	0.4	2.5	0.66	0.64	0.66	48.3
Approach			125	2.0	125	2.0	0.149	7.5	LOS A	0.4	2.5	0.66	0.64	0.66	50.6
North: RoadName															
7	L2	All MCs	68	2.0	68	2.0	0.375	9.8	LOS A	1.1	7.5	0.35	0.43	0.35	53.0
8	T1	All MCs	324	2.0	324	2.0	0.375	4.0	LOS A	1.1	7.5	0.35	0.43	0.35	54.0
9	R2	All MCs	114	2.0	114	2.0	0.375	4.1	LOS A	1.1	7.5	0.35	0.43	0.35	53.6
Approach			506	2.0	506	2.0	0.375	4.8	LOS A	1.1	7.5	0.35	0.43	0.35	53.8
West: RoadName															
10	L2	All MCs	109	2.0	109	2.0	0.220	11.4	LOS B	0.5	3.7	0.58	0.63	0.58	47.2
11	T1	All MCs	38	2.0	38	2.0	0.220	5.7	LOS A	0.5	3.7	0.58	0.63	0.58	51.9
12	R2	All MCs	68	2.0	68	2.0	0.220	5.7	LOS A	0.5	3.7	0.58	0.63	0.58	51.6
Approach			216	2.0	216	2.0	0.220	8.6	LOS A	0.5	3.7	0.58	0.63	0.58	50.0
All Vehicles			1338	2.0	1338	2.0	0.415	5.9	LOS A	1.2	8.4	0.48	0.51	0.48	51.9

Site Level of Service (LOS) Method: Delay (SIDRA). Site LOS Method is specified in the Network Data dialog (Override Site Data tab).
Roundabout LOS Method: SIDRA Roundabout LOS.
Vehicle movement LOS values are based on average delay per movement.
Intersection and Approach LOS values are based on average delay for all vehicle movements.
Roundabout Capacity Model: SIDRA Standard.
Delay Model: SIDRA Standard (Control Delay: Geometric Delay is included).
Queue Model: SIDRA queue estimation methods are used for Back of Queue and Queue at Start of Gap.
Gap-Acceptance Capacity Formula: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.
Arrival Flows used in performance calculations are adjusted to include any Initial Queued Demand and Upstream Capacity Constraint effects.

Appendix M:

Synchro and Sidra Analysis: 2030 Full Buildout Intersection Performance



Lane Group	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Volume (vph)	87	407	261	295	286	70
Future Volume (vph)	87	407	261	295	286	70
Satd. Flow (prot)	1695	1784	1784	1517	1695	1517
Flt Permitted	0.950				0.950	
Satd. Flow (perm)	1654	1784	1784	1428	1653	1438
Satd. Flow (RTOR)				295		70
Lane Group Flow (vph)	87	407	261	295	286	70
Turn Type	Prot	NA	NA	Perm	Perm	Perm
Protected Phases	5	2	6			
Permitted Phases				6	4	4
Detector Phase	5	2	6	6	4	4
Switch Phase						
Minimum Initial (s)	5.0	5.0	5.0	5.0	10.0	10.0
Minimum Split (s)	26.2	57.2	57.2	57.2	30.0	30.0
Total Split (s)	26.2	83.4	57.2	57.2	36.0	36.0
Total Split (%)	21.9%	69.8%	47.9%	47.9%	30.2%	30.2%
Yellow Time (s)	4.6	4.6	4.6	4.6	3.3	3.3
All-Red Time (s)	1.6	1.6	1.6	1.6	2.7	2.7
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	0.0
Total Lost Time (s)	6.2	6.2	6.2	6.2	6.0	6.0
Lead/Lag	Lead		Lag	Lag		
Lead-Lag Optimize?	Yes		Yes	Yes		
Recall Mode	Max	Min	Min	Min	Max	Max
Act Effct Green (s)	20.1	44.7	18.4	18.4	30.1	30.1
Actuated g/C Ratio	0.23	0.51	0.21	0.21	0.35	0.35
v/c Ratio	0.22	0.44	0.69	0.55	0.50	0.13
Control Delay	30.7	14.9	41.6	7.8	27.4	6.6
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	30.7	14.9	41.6	7.8	27.4	6.6
LOS	C	B	D	A	C	A
Approach Delay		17.7	23.7		23.3	
Approach LOS		B	C		C	
Queue Length 50th (m)	10.9	37.1	37.1	0.0	34.3	0.0
Queue Length 95th (m)	24.3	56.1	59.2	17.0	62.6	8.4
Internal Link Dist (m)		227.6	295.8		320.1	
Turn Bay Length (m)	100.0			100.0	90.0	
Base Capacity (vph)	390	1588	1049	961	571	543
Starvation Cap Reductn	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0
Reduced v/c Ratio	0.22	0.26	0.25	0.31	0.50	0.13

Intersection Summary
Cycle Length: 119.4
Actuated Cycle Length: 87
Natural Cycle: 115
Control Type: Semi Act-Uncoord
Maximum v/c Ratio: 0.69

Intersection Signal Delay: 21.5 | Intersection LOS: C
Intersection Capacity Utilization 54.9% | ICU Level of Service A
Analysis Period (min) 15

Splits and Phases: 5: Fernbank & Robert Grant

Intersection	
Int Delay, s/veh	2.9

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Vol, veh/h	48	0	39	16	0	39	26	332	8	10	291	61
Future Vol, veh/h	48	0	39	16	0	39	26	332	8	10	291	61
Conflicting Peds, #/hr	10	0	10	10	0	10	20	0	20	20	0	20
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop	Free	Free	Free	Free	Free	Free
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	-	-	-	65	-	-	65	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	100	100	100	100	100	100	100	100	100	100	100	100
Heavy Vehicles, %	2	2	2	2	2	2	2	2	2	2	2	2
Mvmt Flow	48	0	39	16	0	39	26	332	8	10	291	61

Major/Minor	Minor2			Minor1			Major1			Major2		
Conflicting Flow All	780	774	352	779	800	366	372	0	0	360	0	0
Stage 1	362	362	-	408	408	-	-	-	-	-	-	-
Stage 2	418	412	-	371	392	-	-	-	-	-	-	-
Critical Hdwy	7.12	6.52	6.22	7.12	6.52	6.22	4.12	-	-	4.12	-	-
Critical Hdwy Stg 1	6.12	5.52	-	6.12	5.52	-	-	-	-	-	-	-
Critical Hdwy Stg 2	6.12	5.52	-	6.12	5.52	-	-	-	-	-	-	-
Follow-up Hdwy	3.518	4.018	3.318	3.518	4.018	3.318	2.218	-	-	2.218	-	-
Pot Cap-1 Maneuver	313	329	692	313	318	679	1186	-	-	1199	-	-
Stage 1	657	625	-	620	597	-	-	-	-	-	-	-
Stage 2	612	594	-	649	606	-	-	-	-	-	-	-
Platoon blocked, %								-	-		-	-
Mov Cap-1 Maneuver	280	308	673	280	298	660	1164	-	-	1177	-	-
Mov Cap-2 Maneuver	280	308	-	280	298	-	-	-	-	-	-	-
Stage 1	631	609	-	595	573	-	-	-	-	-	-	-
Stage 2	558	570	-	601	590	-	-	-	-	-	-	-

Approach	EB	WB	NB	SB
HCM Control Delay, s	17.3	13.6	0.6	0.2
HCM LOS	C	B		

Minor Lane/Major Mvmt	NBL	NBT	NBR	EBLn1	WBLn1	SBL	SBT	SBR
Capacity (veh/h)	1164	-	-	379	473	1177	-	-
HCM Lane V/C Ratio	0.022	-	-	0.23	0.116	0.008	-	-
HCM Control Delay (s)	8.2	-	-	17.3	13.6	8.1	-	-
HCM Lane LOS	A	-	-	C	B	A	-	-
HCM 95th %tile Q(veh)	0.1	-	-	0.9	0.4	0	-	-

Intersection	
Int Delay, s/veh	0.9

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Vol, veh/h	14	37	672	7	17	494
Future Vol, veh/h	14	37	672	7	17	494
Conflicting Peds, #/hr	0	0	0	10	10	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	0	-	-	-	-	-
Veh in Median Storage, #	0	-	0	-	-	0
Grade, %	0	-	0	-	-	0
Peak Hour Factor	100	100	100	100	100	100
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	14	37	672	7	17	494

Major/Minor	Minor1		Major1		Major2	
Conflicting Flow All	1214	686	0	0	689	0
Stage 1	686	-	-	-	-	-
Stage 2	528	-	-	-	-	-
Critical Hdwy	6.42	6.22	-	-	4.12	-
Critical Hdwy Stg 1	5.42	-	-	-	-	-
Critical Hdwy Stg 2	5.42	-	-	-	-	-
Follow-up Hdwy	3.518	3.318	-	-	2.218	-
Pot Cap-1 Maneuver	201	447	-	-	905	-
Stage 1	500	-	-	-	-	-
Stage 2	592	-	-	-	-	-
Platoon blocked, %			-	-		-
Mov Cap-1 Maneuver	194	443	-	-	897	-
Mov Cap-2 Maneuver	194	-	-	-	-	-
Stage 1	496	-	-	-	-	-
Stage 2	577	-	-	-	-	-

Approach	WB	NB	SB
HCM Control Delay, s	18	0	0.3
HCM LOS	C		

Minor Lane/Major Mvmt	NBT	NBR	WBLn1	SBL	SBT
Capacity (veh/h)	-	-	328	897	-
HCM Lane V/C Ratio	-	-	0.155	0.019	-
HCM Control Delay (s)	-	-	18	9.1	0
HCM Lane LOS	-	-	C	A	A
HCM 95th %tile Q(veh)	-	-	0.5	0.1	-

MOVEMENT SUMMARY

Site: 101 [TP 2030 Abbott/Robert Grant AM (Site Folder: Future 2030 AM)]

Output produced by SIDRA INTERSECTION Version: 9.1.1.200

Network: N101 [Future 2030 AM (Network Folder: General)]

New Site
Site Category: Future Conditions 1
Roundabout

Vehicle Movement Performance

Mov ID	Turn	Mov Class	Demand Flows [Total veh/h	HV] %	Arrival Flows [Total veh/h	HV] %	Deg. Satn v/c	Aver. Delay sec	Level of Service	Aver. Back Of Queue [Veh. veh	Dist] m	Prop. Que	Eff. Stop Rate	Aver. No. of Cycles	Aver. Speed km/h
South: Robert Grant Ave															
1	L2	All MCs	305	2.0	305	2.0	0.617	10.7	LOS B	2.4	16.8	0.62	0.56	0.62	51.3
2	T1	All MCs	245	2.0	245	2.0	0.617	4.9	LOS A	2.4	16.8	0.62	0.56	0.62	52.2
3	R2	All MCs	216	2.0	216	2.0	0.617	5.0	LOS A	2.4	16.8	0.62	0.56	0.62	51.8
Approach			766	2.0	766	2.0	0.617	7.2	LOS A	2.4	16.8	0.62	0.56	0.62	51.7
East: Abbott St E															
4	L2	All MCs	198	2.0	198	2.0	0.520	14.8	LOS B	1.8	12.8	0.85	0.79	0.96	44.3
5	T1	All MCs	135	2.0	135	2.0	0.520	9.0	LOS A	1.8	12.8	0.85	0.79	0.96	50.0
6	R2	All MCs	84	2.0	84	2.0	0.520	9.1	LOS A	1.8	12.8	0.85	0.79	0.96	49.7
Approach			417	2.0	417	2.0	0.520	11.8	LOS B	1.8	12.8	0.85	0.79	0.96	47.9
North: Robert Grant Ave															
7	L2	All MCs	126	2.0	126	2.0	0.408	13.6	LOS B	1.1	8.1	0.79	0.72	0.79	50.0
8	T1	All MCs	163	2.0	163	2.0	0.408	7.8	LOS A	1.1	8.1	0.79	0.72	0.79	45.6
9	R2	All MCs	34	2.0	34	2.0	0.408	7.9	LOS A	1.1	8.1	0.79	0.72	0.79	50.6
Approach			323	2.0	323	2.0	0.408	10.1	LOS B	1.1	8.1	0.79	0.72	0.79	48.5
West: Abbott St E															
10	L2	All MCs	53	2.0	53	2.0	0.292	12.1	LOS B	0.7	5.3	0.67	0.64	0.67	51.8
11	T1	All MCs	3	2.0	3	2.0	0.292	6.3	LOS A	0.7	5.3	0.67	0.64	0.67	52.8
12	R2	All MCs	208	2.0	208	2.0	0.292	6.4	LOS A	0.7	5.3	0.67	0.64	0.67	48.5
Approach			264	2.0	264	2.0	0.292	7.5	LOS A	0.7	5.3	0.67	0.64	0.67	49.6
All Vehicles			1771	2.0	1771	2.0	0.617	8.9	LOS A	2.4	16.8	0.71	0.65	0.74	50.1

Site Level of Service (LOS) Method: Delay (SIDRA). Site LOS Method is specified in the Network Data dialog (Override Site Data tab).
Roundabout LOS Method: SIDRA Roundabout LOS.
Vehicle movement LOS values are based on average delay per movement.
Intersection and Approach LOS values are based on average delay for all vehicle movements.
Roundabout Capacity Model: SIDRA Standard.
Delay Model: SIDRA Standard (Control Delay: Geometric Delay is included).
Queue Model: SIDRA queue estimation methods are used for Back of Queue and Queue at Start of Gap.
Gap-Acceptance Capacity Formula: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.
Arrival Flows used in performance calculations are adjusted to include any Initial Queued Demand and Upstream Capacity Constraint effects.

MOVEMENT SUMMARY

Site: 101 [TP 2030 Bobolink/Robert Grant AM (Site Folder: Future 2030 AM)]

Output produced by SIDRA INTERSECTION Version: 9.1.1.200

Network: N101 [Future 2030 AM (Network Folder: General)]

New Site
Site Category: (None)
Roundabout

Vehicle Movement Performance

Mov ID	Turn	Mov Class	Demand Flows [Total veh/h	HV] %	Arrival Flows [Total veh/h	HV] %	Deg. Satn v/c	Aver. Delay sec	Level of Service	Aver. Back Of Queue [Veh. veh	Dist] m	Prop. Que	Eff. Stop Rate	Aver. No. of Cycles	Aver. Speed km/h
South: Robert Grant Ave															
1	L2	All MCs	17	2.0	17	2.0	0.439	10.8	LOS B	1.3	9.1	0.58	0.52	0.58	52.1
2	T1	All MCs	452	2.0	452	2.0	0.439	5.3	LOS A	1.3	9.1	0.58	0.52	0.58	49.1
3	R2	All MCs	19	2.0	19	2.0	0.439	5.3	LOS A	1.3	9.1	0.58	0.52	0.58	52.7
Approach			487	2.0	487	2.0	0.439	5.5	LOS A	1.3	9.1	0.58	0.52	0.58	49.5
East: Bobolink Rdg															
4	L2	All MCs	37	2.0	37	2.0	0.146	13.1	LOS B	0.4	2.5	0.71	0.70	0.71	46.4
5	T1	All MCs	1	2.0	1	2.0	0.146	7.5	LOS A	0.4	2.5	0.71	0.70	0.71	51.5
6	R2	All MCs	74	2.0	74	2.0	0.146	7.5	LOS A	0.4	2.5	0.71	0.70	0.71	46.4
Approach			112	2.0	112	2.0	0.146	9.4	LOS A	0.4	2.5	0.71	0.70	0.71	46.5
North: Robert Grant Ave															
7	L2	All MCs	56	2.0	56	2.0	0.359	9.4	LOS A	1.1	7.6	0.25	0.40	0.25	53.4
8	T1	All MCs	387	2.0	387	2.0	0.359	3.8	LOS A	1.1	7.6	0.25	0.40	0.25	51.3
9	R2	All MCs	79	2.0	79	2.0	0.359	3.8	LOS A	1.1	7.6	0.25	0.40	0.25	54.0
Approach			522	2.0	522	2.0	0.359	4.4	LOS A	1.1	7.6	0.25	0.40	0.25	52.3
West: Bobolink Rdg															
10	L2	All MCs	200	2.0	200	2.0	0.249	11.9	LOS B	0.6	4.2	0.62	0.69	0.62	45.0
11	T1	All MCs	1	2.0	1	2.0	0.249	6.4	LOS A	0.6	4.2	0.62	0.69	0.62	50.4
12	R2	All MCs	29	2.0	29	2.0	0.249	6.4	LOS A	0.6	4.2	0.62	0.69	0.62	45.0
Approach			231	2.0	231	2.0	0.249	11.2	LOS B	0.6	4.2	0.62	0.69	0.62	45.0
All Vehicles			1352	2.0	1352	2.0	0.439	6.4	LOS A	1.3	9.1	0.47	0.52	0.47	49.6

Site Level of Service (LOS) Method: Delay (SIDRA). Site LOS Method is specified in the Network Data dialog (Override Site Data tab).
Roundabout LOS Method: SIDRA Roundabout LOS.
Vehicle movement LOS values are based on average delay per movement.
Intersection and Approach LOS values are based on average delay for all vehicle movements.
Roundabout Capacity Model: SIDRA Standard.
Delay Model: SIDRA Standard (Control Delay: Geometric Delay is included).
Queue Model: SIDRA queue estimation methods are used for Back of Queue and Queue at Start of Gap.
Gap-Acceptance Capacity Formula: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.
Arrival Flows used in performance calculations are adjusted to include any Initial Queued Demand and Upstream Capacity Constraint effects.

MOVEMENT SUMMARY

Site: 101 [TP 2030 Cope/Robert Grant AM (Site Folder: Future 2030 AM)]

Output produced by SIDRA INTERSECTION Version: 9.1.1.200

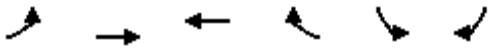
Network: N101 [Future 2030 AM (Network Folder: General)]

New Site
Site Category: (None)
Roundabout

Vehicle Movement Performance

Mov ID	Turn	Mov Class	Demand Flows [Total veh/h	HV] %	Arrival Flows [Total veh/h	HV] %	Deg. Satn v/c	Aver. Delay sec	Level of Service	Aver. Back Of Queue [Veh. veh	Dist] m	Prop. Que	Eff. Stop Rate	Aver. No. of Cycles	Aver. Speed km/h
South: RoadName															
1	L2	All MCs	107	2.0	107	2.0	0.399	10.7	LOS B	1.1	8.0	0.54	0.53	0.54	51.9
2	T1	All MCs	337	2.0	337	2.0	0.399	4.9	LOS A	1.1	8.0	0.54	0.53	0.54	48.6
3	R2	All MCs	11	2.0	11	2.0	0.399	5.0	LOS A	1.1	8.0	0.54	0.53	0.54	52.4
Approach			455	2.0	455	2.0	0.399	6.3	LOS A	1.1	8.0	0.54	0.53	0.54	49.9
East: RoadName															
4	L2	All MCs	12	2.0	12	2.0	0.148	12.5	LOS B	0.4	2.5	0.67	0.64	0.67	51.8
5	T1	All MCs	51	2.0	51	2.0	0.148	6.8	LOS A	0.4	2.5	0.67	0.64	0.67	52.7
6	R2	All MCs	61	2.0	61	2.0	0.148	6.8	LOS A	0.4	2.5	0.67	0.64	0.67	48.4
Approach			123	2.0	123	2.0	0.148	7.3	LOS A	0.4	2.5	0.67	0.64	0.67	51.1
North: RoadName															
7	L2	All MCs	42	2.0	42	2.0	0.438	10.3	LOS B	1.3	9.2	0.47	0.47	0.47	52.8
8	T1	All MCs	294	2.0	294	2.0	0.438	4.5	LOS A	1.3	9.2	0.47	0.47	0.47	53.8
9	R2	All MCs	214	2.0	214	2.0	0.438	4.5	LOS A	1.3	9.2	0.47	0.47	0.47	53.4
Approach			549	2.0	549	2.0	0.438	5.0	LOS A	1.3	9.2	0.47	0.47	0.47	53.6
West: RoadName															
10	L2	All MCs	153	2.0	153	2.0	0.291	11.2	LOS B	0.7	5.2	0.58	0.62	0.58	47.3
11	T1	All MCs	46	2.0	46	2.0	0.291	5.4	LOS A	0.7	5.2	0.58	0.62	0.58	52.0
12	R2	All MCs	98	2.0	98	2.0	0.291	5.5	LOS A	0.7	5.2	0.58	0.62	0.58	51.6
Approach			297	2.0	297	2.0	0.291	8.4	LOS A	0.7	5.2	0.58	0.62	0.58	50.1
All Vehicles			1424	2.0	1424	2.0	0.438	6.3	LOS A	1.3	9.2	0.53	0.54	0.53	51.7

Site Level of Service (LOS) Method: Delay (SIDRA). Site LOS Method is specified in the Network Data dialog (Override Site Data tab).
Roundabout LOS Method: SIDRA Roundabout LOS.
Vehicle movement LOS values are based on average delay per movement.
Intersection and Approach LOS values are based on average delay for all vehicle movements.
Roundabout Capacity Model: SIDRA Standard.
Delay Model: SIDRA Standard (Control Delay: Geometric Delay is included).
Queue Model: SIDRA queue estimation methods are used for Back of Queue and Queue at Start of Gap.
Gap-Acceptance Capacity Formula: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.
Arrival Flows used in performance calculations are adjusted to include any Initial Queued Demand and Upstream Capacity Constraint effects.



Lane Group	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Volume (vph)	91	379	580	371	301	66
Future Volume (vph)	91	379	580	371	301	66
Satd. Flow (prot)	1695	1784	1784	1517	1695	1517
Flt Permitted	0.950				0.950	
Satd. Flow (perm)	1666	1784	1784	1423	1649	1436
Satd. Flow (RTOR)				371		66
Lane Group Flow (vph)	91	379	580	371	301	66
Turn Type	Prot	NA	NA	Perm	Perm	Perm
Protected Phases	5	2	6			
Permitted Phases				6	4	4
Detector Phase	5	2	6	6	4	4
Switch Phase						
Minimum Initial (s)	5.0	5.0	5.0	5.0	10.0	10.0
Minimum Split (s)	26.2	57.2	57.2	57.2	30.0	30.0
Total Split (s)	26.2	89.2	63.0	63.0	41.2	41.2
Total Split (%)	20.1%	68.4%	48.3%	48.3%	31.6%	31.6%
Yellow Time (s)	4.6	4.6	4.6	4.6	3.3	3.3
All-Red Time (s)	1.6	1.6	1.6	1.6	2.7	2.7
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	0.0
Total Lost Time (s)	6.2	6.2	6.2	6.2	6.0	6.0
Lead/Lag	Lead		Lag	Lag		
Lead-Lag Optimize?	Yes		Yes	Yes		
Recall Mode	Max	Min	Min	Min	Max	Max
Act Effct Green (s)	20.1	70.4	44.0	44.0	35.5	35.5
Actuated g/C Ratio	0.17	0.60	0.37	0.37	0.30	0.30
v/c Ratio	0.31	0.36	0.87	0.49	0.61	0.14
Control Delay	49.2	13.0	49.1	4.6	43.6	9.1
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	49.2	13.0	49.1	4.6	43.6	9.1
LOS	D	B	D	A	D	A
Approach Delay		20.0	31.7		37.4	
Approach LOS		C	C		D	
Queue Length 50th (m)	17.3	38.7	113.0	0.0	55.5	0.0
Queue Length 95th (m)	34.9	54.7	154.8	16.0	93.4	10.1
Internal Link Dist (m)		227.6	295.8		320.1	
Turn Bay Length (m)	100.0			100.0	90.0	
Base Capacity (vph)	289	1262	864	880	495	477
Starvation Cap Reductn	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0
Reduced v/c Ratio	0.31	0.30	0.67	0.42	0.61	0.14

Intersection Summary
Cycle Length: 130.4
Actuated Cycle Length: 118.1
Natural Cycle: 115
Control Type: Semi Act-Uncoord
Maximum v/c Ratio: 0.87

Intersection Signal Delay: 29.8 | Intersection LOS: C
Intersection Capacity Utilization 72.9% | ICU Level of Service C
Analysis Period (min) 15

Splits and Phases: 5: Fernbank & Robert Grant

Intersection	
Int Delay, s/veh	4.2

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↔			↔		↰	↑		↰	↑	
Traffic Vol, veh/h	63	0	51	16	0	24	49	386	21	37	319	32
Future Vol, veh/h	63	0	51	16	0	24	49	386	21	37	319	32
Conflicting Peds, #/hr	10	0	10	10	0	10	30	0	20	20	0	30
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop	Free	Free	Free	Free	Free	Free
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	-	-	-	65	-	-	65	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	100	100	100	100	100	100	100	100	100	100	100	100
Heavy Vehicles, %	2	2	2	2	2	2	2	2	2	2	2	2
Mvmt Flow	63	0	51	16	0	24	49	386	21	37	319	32

Major/Minor	Minor2			Minor1			Major1			Major2		
Conflicting Flow All	956	964	375	960	970	427	381	0	0	427	0	0
Stage 1	439	439	-	515	515	-	-	-	-	-	-	-
Stage 2	517	525	-	445	455	-	-	-	-	-	-	-
Critical Hdwy	7.12	6.52	6.22	7.12	6.52	6.22	4.12	-	-	4.12	-	-
Critical Hdwy Stg 1	6.12	5.52	-	6.12	5.52	-	-	-	-	-	-	-
Critical Hdwy Stg 2	6.12	5.52	-	6.12	5.52	-	-	-	-	-	-	-
Follow-up Hdwy	3.518	4.018	3.318	3.518	4.018	3.318	2.218	-	-	2.218	-	-
Pot Cap-1 Maneuver	238	255	671	236	253	628	1177	-	-	1132	-	-
Stage 1	597	578	-	543	535	-	-	-	-	-	-	-
Stage 2	541	529	-	592	569	-	-	-	-	-	-	-
Platoon blocked, %								-	-		-	-
Mov Cap-1 Maneuver	208	225	646	199	223	611	1144	-	-	1111	-	-
Mov Cap-2 Maneuver	208	225	-	199	223	-	-	-	-	-	-	-
Stage 1	556	543	-	510	503	-	-	-	-	-	-	-
Stage 2	493	497	-	522	535	-	-	-	-	-	-	-

Approach	EB	WB	NB	SB
HCM Control Delay, s	24.3	17.2	0.9	0.8
HCM LOS	C	C		

Minor Lane/Major Mvmt	NBL	NBT	NBR	EBLn1	WBLn1	SBL	SBT	SBR
Capacity (veh/h)	1144	-	-	299	334	1111	-	-
HCM Lane V/C Ratio	0.043	-	-	0.381	0.12	0.033	-	-
HCM Control Delay (s)	8.3	-	-	24.3	17.2	8.4	-	-
HCM Lane LOS	A	-	-	C	C	A	-	-
HCM 95th %tile Q(veh)	0.1	-	-	1.7	0.4	0.1	-	-

Intersection	
Int Delay, s/veh	0.9

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Vol, veh/h	12	30	638	16	42	645
Future Vol, veh/h	12	30	638	16	42	645
Conflicting Peds, #/hr	0	0	0	10	10	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	0	-	-	-	-	-
Veh in Median Storage, #	0	-	0	-	-	0
Grade, %	0	-	0	-	-	0
Peak Hour Factor	100	100	100	100	100	100
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	12	30	638	16	42	645

Major/Minor	Minor1		Major1		Major2	
Conflicting Flow All	1385	656	0	0	664	0
Stage 1	656	-	-	-	-	-
Stage 2	729	-	-	-	-	-
Critical Hdwy	6.42	6.22	-	-	4.12	-
Critical Hdwy Stg 1	5.42	-	-	-	-	-
Critical Hdwy Stg 2	5.42	-	-	-	-	-
Follow-up Hdwy	3.518	3.318	-	-	2.218	-
Pot Cap-1 Maneuver	158	465	-	-	925	-
Stage 1	516	-	-	-	-	-
Stage 2	477	-	-	-	-	-
Platoon blocked, %			-	-		-
Mov Cap-1 Maneuver	146	461	-	-	916	-
Mov Cap-2 Maneuver	146	-	-	-	-	-
Stage 1	511	-	-	-	-	-
Stage 2	443	-	-	-	-	-

Approach	WB	NB	SB
HCM Control Delay, s	19.8	0	0.6
HCM LOS	C		

Minor Lane/Major Mvmt	NBT	NBR	WBLn1	SBL	SBT
Capacity (veh/h)	-	-	285	916	-
HCM Lane V/C Ratio	-	-	0.147	0.046	-
HCM Control Delay (s)	-	-	19.8	9.1	0
HCM Lane LOS	-	-	C	A	A
HCM 95th %tile Q(veh)	-	-	0.5	0.1	-

MOVEMENT SUMMARY

Site: 101 [TP 2030 Abbott/Robert Grant PM (Site Folder: Future 2030 PM)]

Output produced by SIDRA INTERSECTION Version: 9.1.1.200

Network: N101 [Future 2030 PM (Network Folder: General)]

New Site
Site Category: Future Conditions 1
Roundabout

Vehicle Movement Performance

Mov ID	Turn	Mov Class	Demand Flows [Total veh/h	HV] %	Arrival Flows [Total veh/h	HV] %	Deg. Satn v/c	Aver. Delay sec	Level of Service	Aver. Back Of Queue [Veh. veh	Dist] m	Prop. Que	Eff. Stop Rate	Aver. No. of Cycles	Aver. Speed km/h
South: Robert Grant Ave															
1	L2	All MCs	258	2.0	258	2.0	0.643	12.4	LOS B	2.6	18.6	0.75	0.66	0.81	50.7
2	T1	All MCs	286	2.0	286	2.0	0.643	6.6	LOS A	2.6	18.6	0.75	0.66	0.81	51.6
3	R2	All MCs	162	2.0	162	2.0	0.643	6.6	LOS A	2.6	18.6	0.75	0.66	0.81	51.3
Approach			706	2.0	706	2.0	0.643	8.7	LOS A	2.6	18.6	0.75	0.66	0.81	51.2
East: Abbott St E															
4	L2	All MCs	203	2.0	203	2.0	0.514	14.6	LOS B	1.8	12.7	0.86	0.78	0.96	44.3
5	T1	All MCs	142	2.0	142	2.0	0.514	8.9	LOS A	1.8	12.7	0.86	0.78	0.96	50.0
6	R2	All MCs	60	2.0	60	2.0	0.514	8.9	LOS A	1.8	12.7	0.86	0.78	0.96	49.7
Approach			405	2.0	405	2.0	0.514	11.8	LOS B	1.8	12.7	0.86	0.78	0.96	47.8
North: Robert Grant Ave															
7	L2	All MCs	123	2.0	123	2.0	0.485	14.3	LOS B	1.6	11.1	0.82	0.75	0.90	50.0
8	T1	All MCs	235	2.0	235	2.0	0.485	8.5	LOS A	1.6	11.1	0.82	0.75	0.90	45.6
9	R2	All MCs	36	2.0	36	2.0	0.485	8.6	LOS A	1.6	11.1	0.82	0.75	0.90	50.6
Approach			394	2.0	394	2.0	0.485	10.3	LOS B	1.6	11.1	0.82	0.75	0.90	48.1
West: Abbott St E															
10	L2	All MCs	56	2.0	56	2.0	0.597	15.5	LOS B	2.3	16.6	0.87	0.81	1.05	49.8
11	T1	All MCs	114	2.0	114	2.0	0.597	9.7	LOS A	2.3	16.6	0.87	0.81	1.05	50.7
12	R2	All MCs	333	2.0	333	2.0	0.597	9.8	LOS A	2.3	16.6	0.87	0.81	1.05	45.2
Approach			502	2.0	502	2.0	0.597	10.4	LOS B	2.3	16.6	0.87	0.81	1.05	47.6
All Vehicles			2007	2.0	2007	2.0	0.643	10.1	LOS B	2.6	18.6	0.81	0.74	0.92	49.2

Site Level of Service (LOS) Method: Delay (SIDRA). Site LOS Method is specified in the Network Data dialog (Override Site Data tab).
Roundabout LOS Method: SIDRA Roundabout LOS.
Vehicle movement LOS values are based on average delay per movement.
Intersection and Approach LOS values are based on average delay for all vehicle movements.
Roundabout Capacity Model: SIDRA Standard.
Delay Model: SIDRA Standard (Control Delay: Geometric Delay is included).
Queue Model: SIDRA queue estimation methods are used for Back of Queue and Queue at Start of Gap.
Gap-Acceptance Capacity Formula: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.
Arrival Flows used in performance calculations are adjusted to include any Initial Queued Demand and Upstream Capacity Constraint effects.

MOVEMENT SUMMARY

Site: 101 [TP 2030 Bobolink/Robert Grant PM (Site Folder: Future 2030 PM)]

Output produced by SIDRA INTERSECTION Version: 9.1.1.200

Network: N101 [Future 2030 PM (Network Folder: General)]

New Site
Site Category: (None)
Roundabout

Vehicle Movement Performance

Mov ID	Turn	Mov Class	Demand Flows [Total veh/h	HV] %	Arrival Flows [Total veh/h	HV] %	Deg. Satn v/c	Aver. Delay sec	Level of Service	Aver. Back Of Queue [Veh. veh	Dist] m	Prop. Que	Eff. Stop Rate	Aver. No. of Cycles	Aver. Speed km/h
South: Robert Grant Ave															
1	L2	All MCs	43	2.0	43	2.0	0.512	11.0	LOS B	1.6	11.2	0.60	0.53	0.60	49.6
2	T1	All MCs	508	2.0	508	2.0	0.512	5.4	LOS A	1.6	11.2	0.60	0.53	0.60	41.1
3	R2	All MCs	31	2.0	31	2.0	0.512	5.4	LOS A	1.6	11.2	0.60	0.53	0.60	50.3
Approach			582	2.0	582	2.0	0.512	5.8	LOS A	1.6	11.2	0.60	0.53	0.60	43.3
East: Bobolink Rdg															
4	L2	All MCs	29	2.0	29	2.0	0.136	13.1	LOS B	0.3	2.4	0.72	0.70	0.72	46.6
5	T1	All MCs	3	2.0	3	2.0	0.136	7.6	LOS A	0.3	2.4	0.72	0.70	0.72	51.6
6	R2	All MCs	68	2.0	68	2.0	0.136	7.6	LOS A	0.3	2.4	0.72	0.70	0.72	46.6
Approach			101	2.0	101	2.0	0.136	9.2	LOS A	0.3	2.4	0.72	0.70	0.72	46.8
North: Robert Grant Ave															
7	L2	All MCs	124	2.0	124	2.0	0.487	9.6	LOS A	1.6	11.5	0.33	0.44	0.33	52.8
8	T1	All MCs	413	2.0	413	2.0	0.487	4.0	LOS A	1.6	11.5	0.33	0.44	0.33	50.3
9	R2	All MCs	158	2.0	158	2.0	0.487	4.0	LOS A	1.6	11.5	0.33	0.44	0.33	53.4
Approach			695	2.0	695	2.0	0.487	5.0	LOS A	1.6	11.5	0.33	0.44	0.33	51.9
West: Bobolink Rdg															
10	L2	All MCs	126	2.0	126	2.0	0.183	12.4	LOS B	0.4	3.1	0.65	0.70	0.65	44.8
11	T1	All MCs	2	2.0	2	2.0	0.183	6.8	LOS A	0.4	3.1	0.65	0.70	0.65	50.3
12	R2	All MCs	27	2.0	27	2.0	0.183	6.8	LOS A	0.4	3.1	0.65	0.70	0.65	44.8
Approach			156	2.0	156	2.0	0.183	11.3	LOS B	0.4	3.1	0.65	0.70	0.65	44.9
All Vehicles			1534	2.0	1534	2.0	0.512	6.2	LOS A	1.6	11.5	0.49	0.52	0.49	48.6

Site Level of Service (LOS) Method: Delay (SIDRA). Site LOS Method is specified in the Network Data dialog (Override Site Data tab).
Roundabout LOS Method: SIDRA Roundabout LOS.
Vehicle movement LOS values are based on average delay per movement.
Intersection and Approach LOS values are based on average delay for all vehicle movements.
Roundabout Capacity Model: SIDRA Standard.
Delay Model: SIDRA Standard (Control Delay: Geometric Delay is included).
Queue Model: SIDRA queue estimation methods are used for Back of Queue and Queue at Start of Gap.
Gap-Acceptance Capacity Formula: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.
Arrival Flows used in performance calculations are adjusted to include any Initial Queued Demand and Upstream Capacity Constraint effects.

MOVEMENT SUMMARY

Site: 101 [TP 2030 Cope/Robert Grant PM (Site Folder: Future 2030 PM)]

Output produced by SIDRA INTERSECTION Version: 9.1.1.200

Network: N101 [Future 2030 PM (Network Folder: General)]

New Site
Site Category: (None)
Roundabout

Vehicle Movement Performance

Mov ID	Turn	Mov Class	Demand Flows [Total veh/h	HV] %	Arrival Flows [Total veh/h	HV] %	Deg. Satn v/c	Aver. Delay sec	Level of Service	Aver. Back Of Queue [Veh. veh	Dist] m	Prop. Que	Eff. Stop Rate	Aver. No. of Cycles	Aver. Speed km/h
South: RoadName															
1	L2	All MCs	54	2.0	54	2.0	0.431	10.6	LOS B	1.3	8.9	0.52	0.50	0.52	52.3
2	T1	All MCs	437	2.0	437	2.0	0.431	4.8	LOS A	1.3	8.9	0.52	0.50	0.52	49.3
3	R2	All MCs	20	2.0	20	2.0	0.431	4.9	LOS A	1.3	8.9	0.52	0.50	0.52	52.9
Approach			511	2.0	511	2.0	0.431	5.4	LOS A	1.3	8.9	0.52	0.50	0.52	50.1
East: RoadName															
4	L2	All MCs	18	2.0	18	2.0	0.152	12.6	LOS B	0.4	2.6	0.68	0.65	0.68	51.6
5	T1	All MCs	37	2.0	37	2.0	0.152	6.8	LOS A	0.4	2.6	0.68	0.65	0.68	52.6
6	R2	All MCs	71	2.0	71	2.0	0.152	6.8	LOS A	0.4	2.6	0.68	0.65	0.68	48.1
Approach			125	2.0	125	2.0	0.152	7.6	LOS A	0.4	2.6	0.68	0.65	0.68	50.5
North: RoadName															
7	L2	All MCs	68	2.0	68	2.0	0.386	9.8	LOS A	1.1	7.8	0.36	0.43	0.36	50.9
8	T1	All MCs	339	2.0	339	2.0	0.386	4.0	LOS A	1.1	7.8	0.36	0.43	0.36	52.2
9	R2	All MCs	114	2.0	114	2.0	0.386	4.1	LOS A	1.1	7.8	0.36	0.43	0.36	51.7
Approach			521	2.0	521	2.0	0.386	4.8	LOS A	1.1	7.8	0.36	0.43	0.36	51.9
West: RoadName															
10	L2	All MCs	109	2.0	109	2.0	0.223	11.5	LOS B	0.5	3.8	0.59	0.64	0.59	47.1
11	T1	All MCs	38	2.0	38	2.0	0.223	5.8	LOS A	0.5	3.8	0.59	0.64	0.59	51.9
12	R2	All MCs	68	2.0	68	2.0	0.223	5.8	LOS A	0.5	3.8	0.59	0.64	0.59	51.5
Approach			216	2.0	216	2.0	0.223	8.7	LOS A	0.5	3.8	0.59	0.64	0.59	50.0
All Vehicles			1373	2.0	1373	2.0	0.431	5.9	LOS A	1.3	8.9	0.48	0.51	0.48	50.8

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