

901 Essa Road and Block 281 Brown Bear Street

Traffic Impact Study Report
Draft Final

December 1, 2023

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Executive Summary

AECOM Canada Ltd. (ACL) was commissioned by Brown Bear Dev Ltd. to provide traffic engineering services to prepare a Traffic Impact Study (TIS) for the development proposed on 901 Essa Road and Block 281 Brown Bear Street, within the Salem Secondary Plan area. 901 Essa Road is 2.19 acres in size and has its frontage towards Essa Road. Block 281 Brown Bear Street is approximately 0.87 acres.

This TIS report has been prepared in support of the new development proposed by Brown Bear Dev Ltd. on 901 Essa Road, located immediately west of the Salem Road and Essa Road intersection in the City of Barrie (the City). The study area is bound by Essa Road to the east, Salem Road to the south, County Road 27 to the west, and Athabaska Road to the north. There is a newly developed Crisdawn subdivision north of the proposed development.

Based on information provided by Brown Bear Dev Ltd., the proposed development is anticipated to be completed by 2027 consisting of two apartment buildings with a total of 437 residential units. There would be three (3) access intersections for the proposed development, which are fully operational under the existing conditions. Brown Bear Street is expected to accommodate 70% of the trips generated by the proposed development, Koda Street is expected to accommodate 20% of the trips, and Mabern Street is expected to accommodate 10% of the trips. These assumptions are based on the proximity of the access points to the proposed development.

Traffic operations analysis was performed for four (4) scenarios, as shown in **Table E-1**, to evaluate the impacts of traffic and vehicle trips generated by the proposed development on the surrounding road network. Highway Capacity Manual 2000 (HCM 2000) intersection operations procedures and methodologies were used to perform the analysis. The intersection performance was undertaken using the traffic analysis software, Synchro (Version 11) which models the road network providing detailed outputs using the HCM 2000 methodologies. Synchro 11 allows for the evaluation of both signalized and unsignalized intersections. SimTraffic, a complementary traffic operations analysis software to Synchro, was used to conduct the queue and delay analysis. Lastly, ARCADY software was used to perform a preliminary assessment of roundabout traffic operations at the intersection of Essa Road at Salem Road.

Table E-1: Traffic Analysis Scenarios

Scenario #	1	2	3	4
Scenario	Existing Conditions	Full Build-Out	Five years after Full Build-Out	Ten years after Full Build-Out
Horizon Year	2022	2027	2032	2037

The key findings of the analysis conducted for the study are as follows:

- The analysis indicates that, under 2022 Existing Conditions (**Scenario 1**), all intersections demonstrate acceptable traffic operations.
- The analysis indicates that, under 2027 Full Build-Out (**Scenario 2**) the eastbound and westbound minor movements on Essa Road/Salem Road operate at a critical LOS of E during PM peak hour, although their v/c ratios are well below 0.85. The signal warrant analysis (**Appendix F**) indicates no signalization required for intersections during this horizon year..
- The 2032 (**Scenario 3: 5 Years After Full Build-Out**) traffic analysis key findings are listed below:
 - The City has plans in its post-2031 capital budget to potentially construct a roundabout at the intersection of Essa Road / Salem Road.
 - A sensitivity test was performed for the roundabout configuration at the intersection of Salem Road/Essa Road using 2032 future scenario traffic volumes with ARCADY software. The analysis showed the intersection is predicted to perform well without significant delays and queueing with a LOS of A and maximum v/c ratio of 0.61.
 - Under the 2032 traffic volumes, the signal warrant analysis identifies signalization to mitigate traffic operations deficiencies for three intersections overall:

- Essa Road/Salem Road intersection including the following geometric improvements:
 - Dedicated eastbound and westbound left turn lane
- Essa Road/Mabern Street intersection.
- Essa Road/Athabaska Road intersection.
- The 2037 (**Scenario 4: 10 Years After Full Build-Out**) traffic analysis key findings are listed below:
 - A sensitivity test was also performed for the potential roundabout at the intersection at Salem Road/Essa Road under the 2037 future scenario traffic volumes using ARCADY. The analysis showed that the intersection is predicted to perform well with a LOS A and maximum v/c ratio of 0.62.

Essa Road and Salem Road Mitigation Measure Options and Timeline of Improvements

Based on the traffic operations analysis and resultant network performance over the selected horizon years, there is a need for mitigation measures to be implemented at the intersection of Essa Road / Salem Road as highlighted in the above text. It is also acknowledged that the City has progressed design of a potential roundabout at this intersection, slated for potential inclusion in the 2031 capital plan. As a result, two potential mitigation options have been identified for the Essa Road/Salem Road intersection with varying timeframes for implementation over the analysed horizon years:

1. **Option 1:** Implement a roundabout to coincide with the +5 years after Full Build-Out scenario (2032). It is acknowledged that the planned roundabout is currently part of the 2031 capital plan. Opening day traffic operations under the existing traffic control were shown to be acceptable.
2. **Option 2:** Implement a permanent traffic signal with geometric improvements to coincide with the +5 years after Full Build-Out scenario (2032). This option future proofs for the future traffic growth by incorporating geometric improvements to the intersection including adding turn lanes for additional capacity and signalized control of turning movements

It is important to note that analysing background traffic operations (no development site generated demand) compared to do-nothing total traffic operations (inclusive of development site generated demand), the incremental change to traffic operations caused by the development was shown to be limited, with the future growth to background traffic already causing deficiencies which are slightly exacerbated by the increase from development site traffic.

Considerations for Sustainable Transportation Improvements

- In line with the City's MMATMP, enhanced active transportation connections and facilities around the study area would support mode shift and further integration of the transportation network. This may include incorporation of bike parking (on-site and off-site).
- There is a lack of existing active transportation facilities on Salem Road, County Road 27 and Essa Road (except for a short stretch of interim sidewalk on the west side of the road). Multi-use paths on these streets would boost connectivity and general access points to/from the new developments to support an active transportation network.
- Furthermore, as part of future transit plan reviews and updates, the extension of existing and/or new transit service routes would improve service to these existing/new developments.

Table of Contents

Executive Summary	v
List of Acronyms.....	IX
1. Introduction	1
2. Project Background.....	1
2.1 Study Area	1
2.2 Proposed Development	2
3. Existing Conditions	2
3.1 Road Network.....	2
3.2 Transit Service.....	3
3.3 Active Transportation Network.....	4
4. Transportation Assessment Methodology	6
4.1 Traffic Operations Analysis	6
4.2 Traffic Data Collection.....	7
4.3 Horizon Years and Scenarios	7
4.4 Mitigation Measures Identification	8
5. Existing Conditions (Scenario 1).....	8
5.1 Existing Traffic Volume	8
5.2 Existing Traffic Operations	8
6. Future Conditions.....	9
6.1 Trip Generation.....	9
6.1.1 Proposed Developments	9
6.1.2 Background Traffic Growth	9
6.1.3 Site Generated Traffic.....	9
6.2 Future Traffic Operations	10
6.2.1 Scenario 2 – Full Build-Out (2027)	10
6.2.2 Scenario 3 – Full Build-Out + 5 years (2032).....	12
6.2.3 Scenario 4 – Full Build-Out + 10 years (2037).....	16
7. Travel Demand Management Review	19
7.1 Potential TDM Measures for the Development Site	19
8. Key Findings	20
Appendix A – Site Plan.....	22
Appendix B – Traffic Analysis Results	40
B.1 Existing Conditions	40
B.2 Background Traffic.....	59
B.3 Do-nothing Total Traffic.....	108
B.4 Optimized Total Traffic	163
B.5 Roundabout Analysis.....	200
Appendix C – Traffic Volume Figures	233

C.1	Existing Conditions	233
C.2	Future Traffic Conditions.....	234
Appendix D Transportation Tomorrow Survey (TTS) – Excerpts		242
Appendix E – Roundabout Design Draft at Essa Road / Salem Road.....		246
Appendix F – Signal Warrant Analysis		249

List of Figures

Figure 2-1: Proposed Study Area	1
Figure 3-1: Existing Study Area Road Network	3
Figure 3-2: Barrie Transit System Map (Source: City of Barrie)	4
Figure 3-3: Existing Sidewalk Network (Source: City of Barrie).....	5
Figure 6-1: Scenario 2 2027 Do-nothing Total Traffic Operations Analysis Graphic	12
Figure 6-2: Scenario 3 2032 Do-nothing Total Traffic Operations Analysis Graphic	14
Figure 6-3: Scenario 4 2037 Do-nothing Total Traffic Operations Analysis Graphic	17
Figure 8-1: Scenario 1 2022 Background Traffic Operations Analysis Graphic	28
Figure 8-2: Adjacent Developments Traffic Operations Analysis Graphic.....	29
Figure 8-3: Full Build-Out Site Generated Traffic Operations Analysis Graphic	30
Figure 8-4: Scenario 2 2027 Background Traffic Operations Analysis Graphic	31
Figure 8-5: Scenario 2 2027 Do-nothing Total Traffic Operations Analysis Graphic	32
Figure 8-6: Scenario 3 2032 Background Traffic Operations Analysis Graphic	33
Figure 8-7: Scenario 3 2032 Do-nothing Total Traffic Operations Analysis Graphic	34
Figure 8-8: Scenario 4 2037 Background Traffic Operations Analysis Graphic	35
Figure 8-9: Scenario 4 2037 Do-nothing Total Traffic Operations Analysis Graphic	36

List of Tables

Table E-1: Traffic Analysis Scenarios	v
Table 2-1: Study Area Intersection Traffic Control Summary	2
Table 4-1: Volume-to-Capacity Ratio (v/c) Criteria	6
Table 4-2: Level of Service (LOS)	7
Table 4-3: Future Horizon Year Scenarios and Analysis Type	8
Table 6-1: Proposed Land-Use	9
Table 6-2: Proposed Development Vehicle Trip Generation	9
Table 6-3: 2016 TTS Trip Distribution	10
Table 6-4: Access Points for the Proposed Development	10
Table 6-5: Scenario 2 2027 Do-nothing Total Traffic Operations Analysis Results for Critical Intersections	11
Table 6-6: Scenario 3 2032 Background Traffic Operations Analysis Results for Critical Intersections	13
Table 6-7: Scenario 3 2032 Do-nothing Total Traffic Operations Analysis Results for Critical Intersections	13
Table 6-8: Scenario 3 2032 Optimized Total Roundabout Analysis (ARCADY Analysis)	14
Table 6-9: Potential Improvements For The Critical Intersections Under The 2032 Optimized Total Scenario	15
Table 6-10: Scenario 3 2032 Optimized Total Traffic Operations Analysis Results for Critical Intersections	15
Table 6-11: Scenario 4 2037 Background Traffic Operations Analysis Results for Critical Intersections	16
Table 6-12: Scenario 4 2037 Do-nothing Total Traffic Operations Analysis Results for Critical Intersections	17
Table 6-13: Scenario 4 2037 Optimized Total Traffic Roundabout Analysis	18
Table 6-14: Potential Improvements For The Critical Intersections Under The 2037 Optimized Total Scenario	18
Table 6-15: Scenario 4 2037 Optimized Total Traffic Operations Analysis Results for Critical Intersections	18
Table 8-1: Traffic Analysis Scenarios	20

List of Acronyms

Acronym	Description
EB	Eastbound
EBL	Eastbound left turn movement
EBLTR	Eastbound left, thru, right turn movement (single lane)
HCM	Highway Capacity Manual
LOS	Level of Service
MMATMP	Multi-Modal Active Transportation Master Plan
NB	Northbound
NBL	Northbound left turn movement
NBLTR	Northbound left, thru, right turn movement (single lane)
OTM	Ontario Traffic Manual
PCE	Passenger Car Equivalent
SB	Southbound
SBL	Southbound left turn movement
SBLTR	Southbound left, thru, right turn movement (single lane)
TTS	Transportation Tomorrow Survey
V/C	Volume-to-Capacity Ratio
WB	Westbound
WBL	Westbound left turn movement
WBLTR	Westbound left, thru, right turn movement (single lane)

1. Introduction

AECOM Canada Ltd (ACL) has been commissioned by Brown Bear Dev Ltd. to perform traffic engineering services for the proposed developments located at 901 Essa Road and Block 281 Brown Bear Street, within the Salem Secondary plan area. 901 Essa Road is 2.19 acres in size and has its frontage towards Essa Road. Block 281, Brown Bear Street, is approximately 0.87 acres. This report aims to evaluate the existing and future traffic conditions under various development full build-out scenarios to determine potential road and intersection improvements that may be required in the immediate vicinity of the proposed development.

2. Project Background

2.1 Study Area

Figure 2-1 shows the study area which is located on the northwest side of Essa Road and north of Salem Road. Six (6) stop-controlled intersections, as shown in **Table 2-1**, are included in the traffic analysis study area.

The study area is bound by Essa Road to the east, Salem Road to the south, County Road 27 to the west, and Athabaska Road to the north. The proposed development is adjacent to the newly developed Crisdawn subdivision on the north and shares three (3) access roads at Brown Bear Street, Koda Street, and Mabern Street. Salem Road also provides access to an industrial facility located on the southwest side of the intersection. There is existing development on the west side of the intersection at Essa Road/Athabaska Road.

Figure 2-1: Proposed Study Area

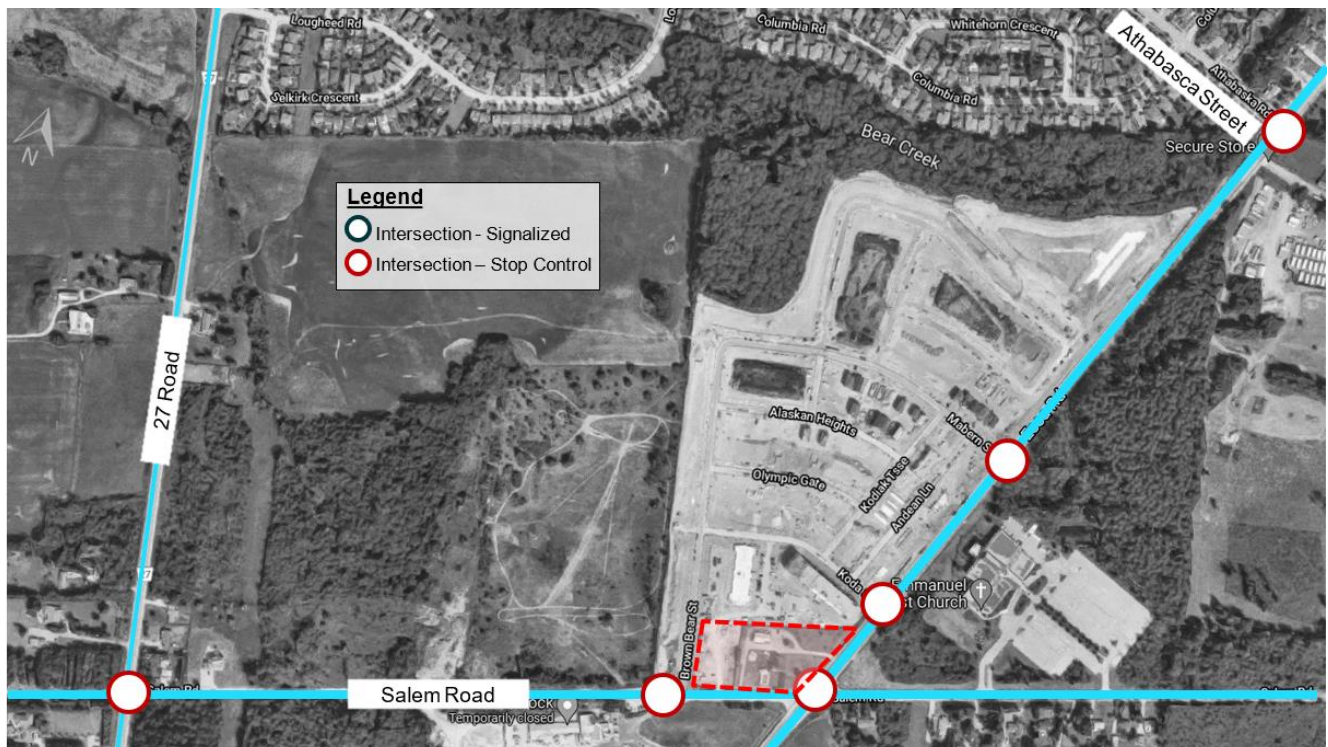


Table 2-1: Study Area Intersection Traffic Control Summary

Intersections	Control Method
Simcoe County Road 27 / Salem Road	Stop Control
Brown Bear Street / Salem Road	Stop Control
Essa Road / Salem Road	Stop Control
Essa Road / Koda Street	Stop Control
Essa Road / Mabern Street	Stop Control
Essa Road / Athabaska Road	Stop Control

2.2 Proposed Development

The proposed development on the subject site consists of a two apartment building with a total of 437 units. As per discussions with Brown Bear Dev Ltd., the development is expected to be completed by 2027. The proposed development site plan is provided in **Appendix A** for reference.

Other developments adjacent to the study area as part of the Salem Secondary Plan include:

- Crisdawn;
- DiPoce;
- Watersand; and
- H&H Capital.

Discussions with the City confirmed that the Crisdawn subdivision is fully built out; therefore, the trips generated from this development are assumed to be captured in the existing background volumes. The DiPoce, Watersand and H&H Capital subdivisions are expected to be built out prior to 2031. All adjacent development-generated trips from these developments would form part of the future traffic scenarios (2032 Scenario 3 and 2037 Scenario 4). See **Appendix C** for the adjacent development generated site traffic.

3. Existing Conditions

3.1 Road Network

A general description of the existing road network in the study area is described below and illustrated in **Figure 3-1**, along with the existing traffic control measures.

Essa Road: Two-lane arterial road with a rural cross-section and a posted maximum speed limit of 60 km/h. Essa Road has dedicated left turn lanes at the intersection of Salem Road/Essa Road in each direction, northbound left turn lane at Essa Road/Mabern Street and northbound left turn lane at Essa Road/Athabaska Road. Essa Road connects surrounding dwellings to Highway 400 on the north.

Salem Road: A two-lane collector road with a rural cross-section connecting County Road 27 and Veterans Drive, terminating prior to Highway 400. Salem Road has a posted speed limit of 80km/h. There are plans to provide a crossing between Salem Road and Highway 400, which may affect the traffic distribution on the road network.

County Road 27: A two-lane arterial road with a rural cross-section with a posted maximum speed limit of 80km/h providing a connection between Highway 90 and Highway 9.

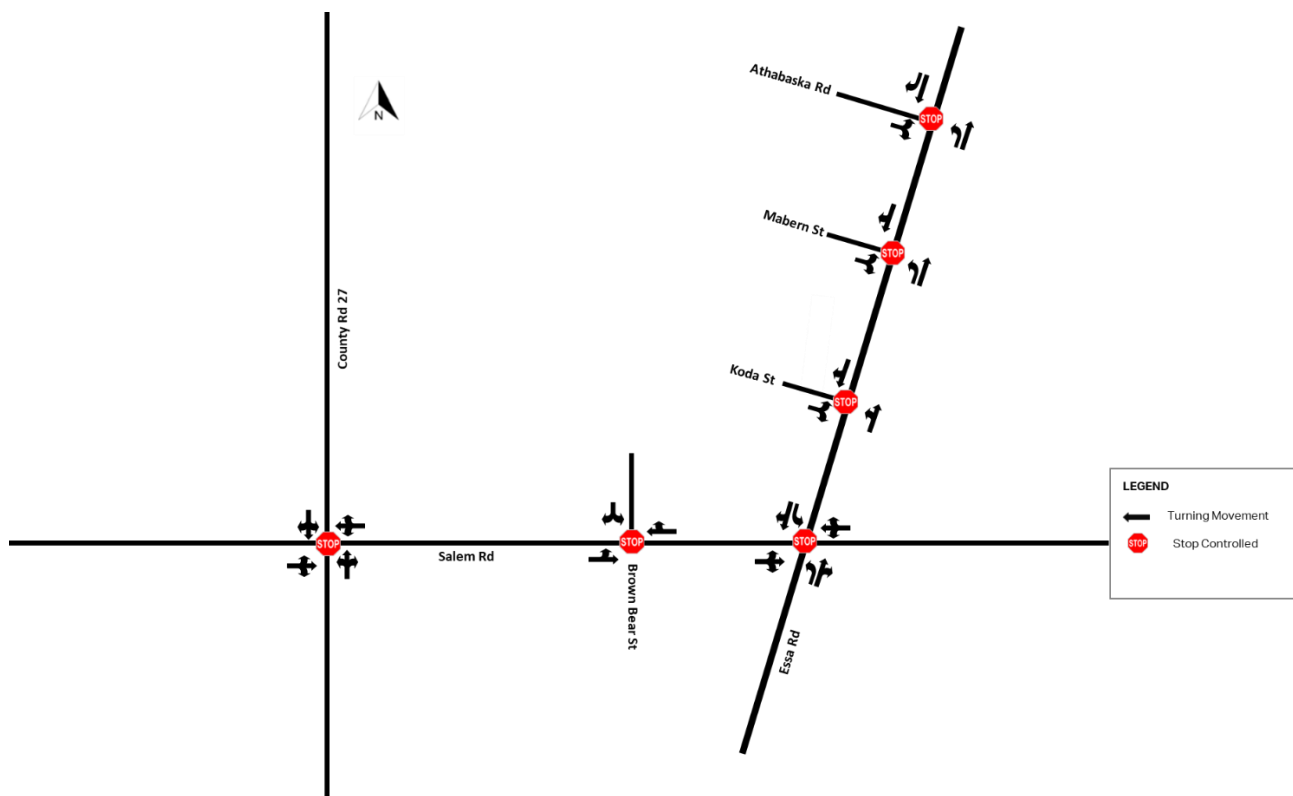
Athabaska Road: An 800m long two-lane collector road with an urban cross-section connecting the surrounding dwellings between Longheed Road and Essa Road. Athabaska Road has a posted speed limit of 50km/h.

Mabern Street: A newly developed two-lane local access road connecting the Crisdawn community to Essa Road. Mabern Street has an unposted assumed speed limit of 50km/h.

Koda Street: A newly developed two-lane local access road connecting the Crisdawn community to Essa Road. Koda Street has an unposted assumed speed limit of 50km/h.

Brown Bear Street: A newly developed two-lane local access road connecting the Crisdawn community to Salem Road. Koda Street has an unposted assumed speed limit of 50km/h.

Figure 3-1: Existing Study Area Road Network

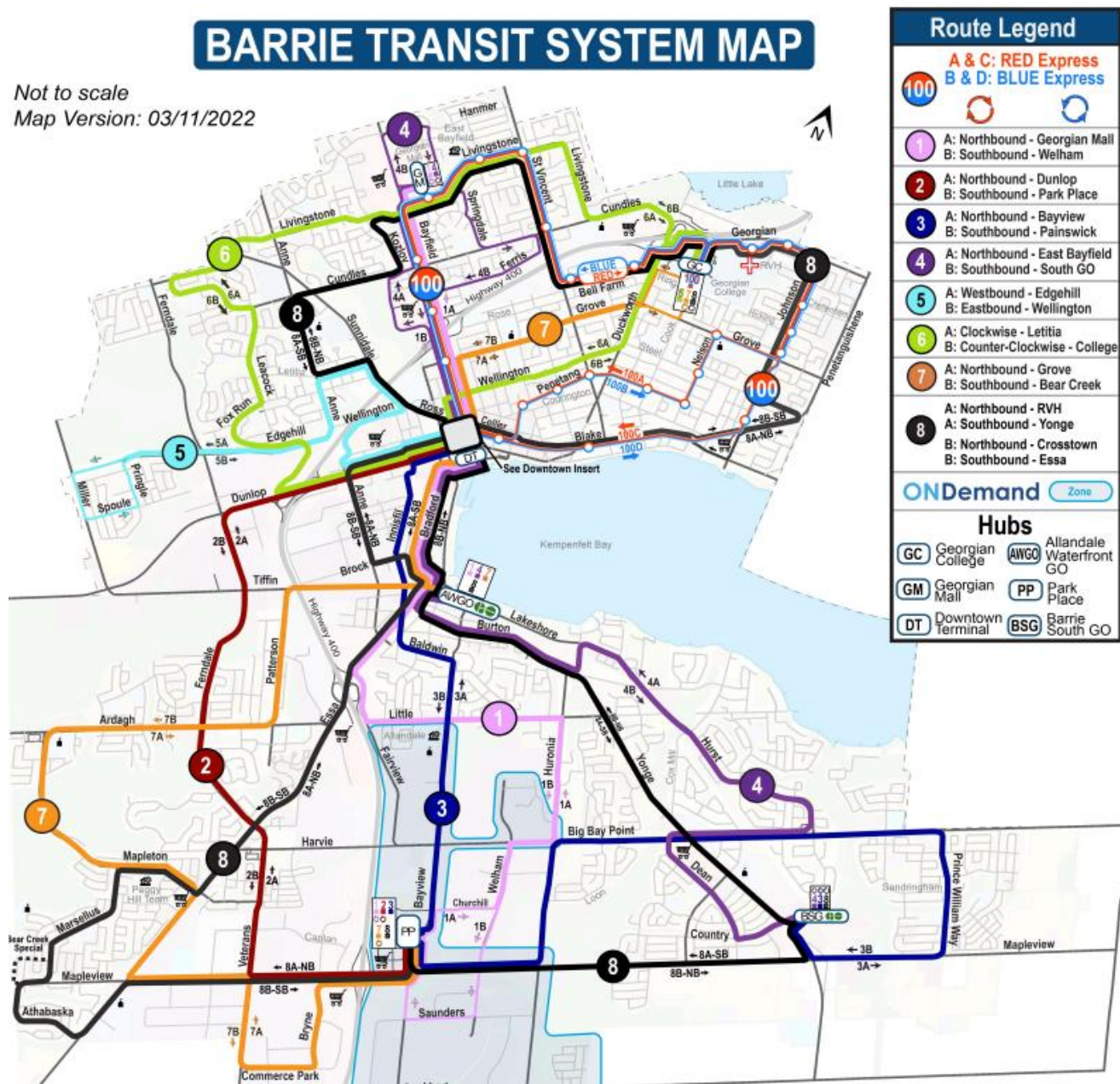


3.2 Transit Service

There are currently no dedicated bus routes available in the proximity of the proposed development. The closest routes are Route 7 (Grove/Bear Creek) and Route 8 (RVH/Yonge and Crosstown/Essa), as shown in **Figure 3-2**.

Route 7 connects the area around Georgian College and Park Place shopping plaza northeast of the intersection at Maplevue Drive West and Highway 400. Route 8 operates in the opposite direction, connecting the Barrie GO station and the Georgian Mall area.

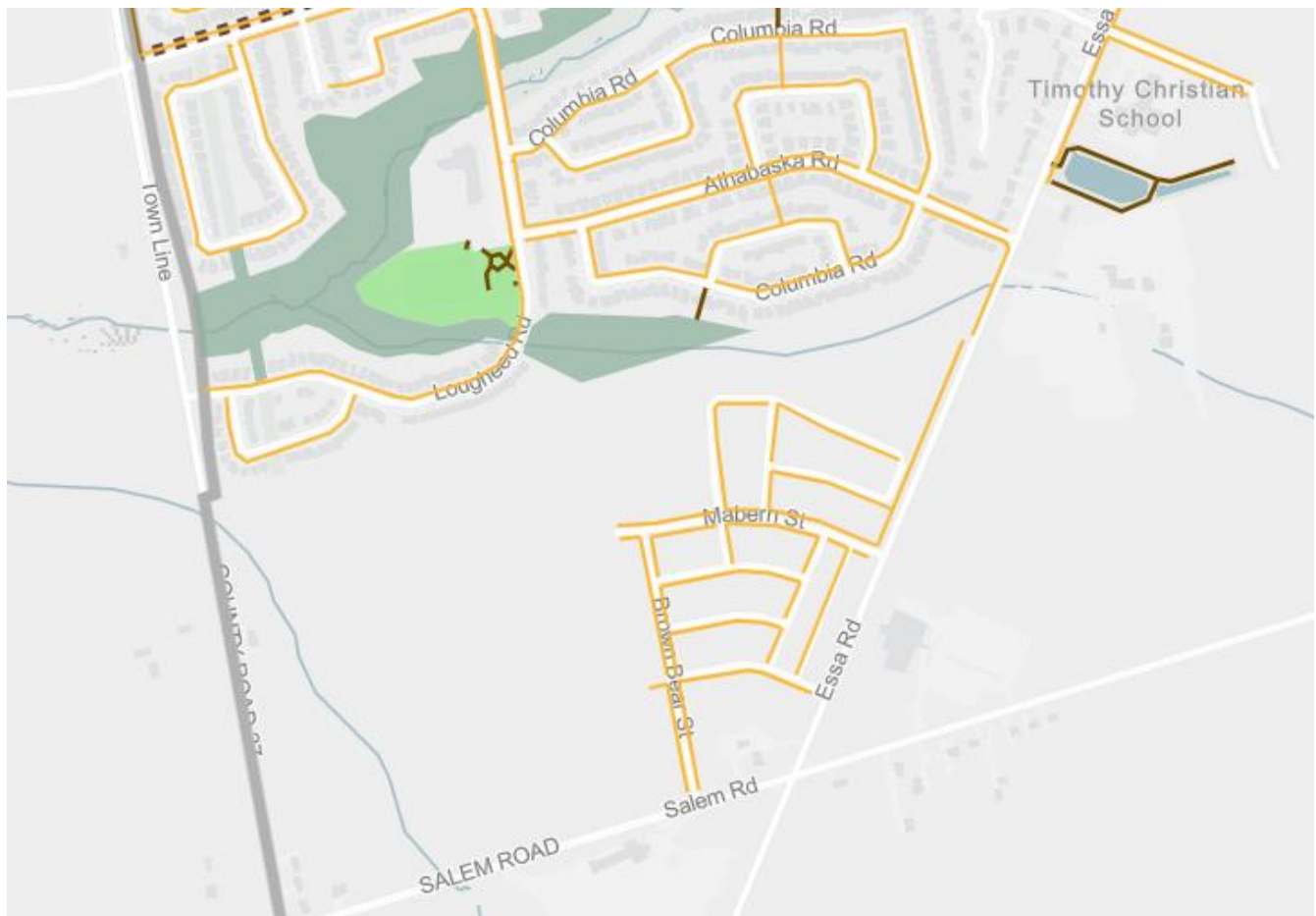
Figure 3-2: Barrie Transit System Map (Source: City of Barrie)



3.3 Active Transportation Network

There is a recently implemented sidewalk network in the study area. There are currently no sidewalks present on Salem Road and County Road 27. Essa Road has an asphalt walkway path on the west side between Athabaska Road and Mabern Street, which transitions from the curb alignment to a boulevard alignment heading towards Mabern Street. Athabaska Road and Mabern Street have sidewalks on both sides of the road, whereas Koda Street only has a sidewalk on the south side. An illustration of the sidewalk network is shown in **Figure 3-3**. There are no existing dedicated cycling facilities in the study area.

Figure 3-3: Existing Sidewalk Network (Source: City of Barrie)



4. Transportation Assessment Methodology

4.1 Traffic Operations Analysis

A detailed traffic operations analysis was performed to evaluate the effects of the proposed developments on the surrounding road network in the study area. The intersection operations were analyzed using the procedures and methodologies in the Highway Capacity Manual 2000 (HCM 2000).

The intersection performance was undertaken using the traffic analysis software, Synchro (Version 11) which models the road network providing detailed outputs using the HCM 2000 methodologies. Synchro 11 allows the evaluation of both signalized and unsignalized intersections. ARCADY was used for the analysis of proposed roundabouts.

The threshold of the intersections will be assessed in terms of the delays, Volume-to-Capacity (v/c) ratios, 95th percentile queue and the Level of Service (LOS).

Delay experienced by a driver is a criterion that can be used to determine the intersection performance of the road network. Control delay is the component of delays caused by the type of control at an intersection while the driver experiences queue delay from queue spillback due to overcapacity.

The v/c ratio represents the closeness an intersection is to reaching capacity. Lane approaches with a v/c ratio less than 0.85 are typically classified as unsaturated and have adequate operational capacity. **Table 4-1** provides ranges for the v/c ratio along with the threshold.

Table 4-1: Volume-to-Capacity Ratio (v/c) Criteria

V/C Ratio	Description	Threshold
< 0.85	An Intersection is operating under capacity. Excessive delays are not experienced.	Acceptable
0.85–0.95	An Intersection is operating near its capacity. Higher delays may be expected, but continuously increasing queues should not occur.	Acceptable
0.95–1.00	Unstable flow results in a wide range of delays. Intersection improvements will be required soon to avoid excessive delays.	Unacceptable
> 1.00	The demand exceeds the available capacity of the intersection. Excessive delays and queuing are anticipated.	Unacceptable

The 95th percentile queue length is defined as the length of the queue in metres with a 5 percent probability of being exceeded during the analysis. It is useful in determining the queue length of an individual movement or lane group.

The LOS utilizes Synchro's control delays and queue duration data to determine the operating conditions for the overall intersection and individual turning movements. LOS 'A' indicates free-flowing traffic with no delays, whereas LOS 'F' represents overcapacity flow with excessive details. **Table 4-2** provides detailed criteria of the LOS classification for signalized and unsignalized intersections.

Table 4-2: Level of Service (LOS)

LOS	Description	Total Delay (Sec/Veh)		Threshold
		Signalized	Unsignalized	
A	Free Flow / Insignificant Delay Extremely favourable progression. Individual users are virtually unaffected by others in the traffic stream.	< 10	< 10	Acceptable
B	Stable Operations / Minimum Delays Good progression. The presence of other users in the traffic stream becomes noticeable.	> 10 to 20	> 10 to 15	Acceptable
C	Stable Operations / Acceptable Delays Fair progression. The operation of individual users is affected by interactions with others in the traffic stream	> 20 to 35	> 15 to 25	Acceptable
D	Approaching Unstable Flows / Tolerable Delays Marginal progression. Operating conditions are noticeably more constrained.	> 35 to 55	> 25 to 35	Acceptable
E	Unstable Operations / Significant Delays Can Occur Poor progression. Operating conditions are at or near capacity.	> 55 to 80	> 35 to 50	Unacceptable
F	Forced, Unpredictable Flows / Excessive Delays Unacceptable progression with forced or breakdown of operating conditions.	> 80	> 50	Unacceptable

SimTraffic will be used to conduct the queueing analysis for the study area. Queues exceeding the storage length or reaching the adjacent intersections will be considered critical. The key parameters for the Synchro/SimTraffic analyses include:

- The peak hour factor (PHF) will be calculated from existing traffic counts, and a default value of 0.92 will be assumed where the data is not available;
- Analysis period of 10 minutes for the HCM delay and capacity analysis; 60 minutes for the SimTraffic queueing results. An average of three (3) runs will be considered for queueing results;
- Heavy vehicle percentage will be calculated from the existing counts; a default value of 2% will be used where the data is not available;
- Link speeds are set to posted speed limits; and
- Synchro defaults for all other parameters

4.2 Traffic Data Collection

The traffic data, such as the Turning Movement Counts (TMC), was obtained from the past TIS reports, including the 2018 DiPoce and 2017 Crisdawn TIS'. The traffic volumes for the Essa Road/Salem Road intersection were derived from the 2015 TMC data provided by the City. This decision was made as the volumes reported in previous TIS' were elevated due to the a new Highway 400 crossing and improvements to the McKay Road Highway 400 interchange. The traffic data was thoroughly reviewed and scaled to match the existing conditions considering adjacent developments' current and planned buildout.

4.3 Horizon Years and Scenarios

Four (4) scenarios were developed to align with the development projections. **Table 4-3** summarizes the four scenarios including mitigation measure investigation to be performed for each stage of development. In total, 12 permutations of traffic operations models each consisting of the AM Peak and the PM Peak periods in addition to the base year model are analysed.

Table 4-3: Future Horizon Year Scenarios and Analysis Type

Analysis Type (AM/PM)	Scenario #1	Scenario #2	Scenario #3	Scenario #4
	Base Year 2022	Full Build-Out 2027	Full Build-Out + 5 Years 2032	Full Build-Out +10 Years 2037
Background	Y	Y	Y	Y
Do-Nothing		Y	Y	Y
Warrant Analysis / Optimization		Y	Y	Y
Roundabout Analysis			Y	Y

4.4 Mitigation Measures Identification

If traffic operations deficiencies are identified in the road network as a result of the travel demand forecasts from the growth in background traffic and development site traffic, the following three (3) mitigation measure investigations for each applicable future horizon year scenario are provided:

- Identifying signalization requirements for the critical intersections subject to a signal warrant analysis in accordance with the justification criteria identified in Ontario Traffic Manual (OTM) Book 12.
- The optimization approach identifying strategies requiring efforts to achieve acceptable operational conditions for the critical intersections.
- Roundabout analysis identifying the feasibility of the roundabout planned to be implemented post 2031 at the intersection on Essa Road and Salem Road. This mitigation measure provides a sensitivity test of the proposed roundabout in the context of the proposed development and associated site traffic.

5. Existing Conditions (Scenario 1)

This section will describe the 2022 Scenario 1 existing conditions results from the traffic analysis.

5.1 Existing Traffic Volume

The impacts of the COVID-19 pandemic on traffic counts from the 2017 Crisdawn and 2018 DiPoce TIS reports were adjusted to reflect the change in traffic volumes from 2019 to 2022. The base year of 2019 was selected to represent the existing 2022 conditions, and it is assumed that the existing 2022 traffic volumes are comparable to the 2019 pre-COVID traffic volumes.

A linear growth rate of 2% as agreed by the City, was applied to the 2017 and 2018 historical counts from the 2017 Crisdawn and 2018 DiPoce TIS' to scale the volumes to the 2019 base year. Further volume adjustments were applied to balance the network. Lastly, as described earlier, traffic volumes were evaluated to ensure adjacent construction activities including upgrades to the McKay Road Highway 400 interchange did not artificially inflate volumes on select roadways. The complete balanced existing traffic volumes for the AM and PM peak hours are shown in **Appendix B** and **Appendix C**.

5.2 Existing Traffic Operations

The existing traffic operations were analyzed in both AM and PM peak hours. During both peak hours, all the intersections in the study area operate at an acceptable level of service with LOS C or better. A detailed breakdown of all intersections and critical movements has been provided in **Appendix B** and **Appendix C**.

6. Future Conditions

This section will describe the future conditions of the development and the surrounding area.

6.1 Trip Generation

6.1.1 Proposed Developments

The traffic volumes generated from the proposed development at the study intersections have been calculated using trip generation rates for land use types in the study area based on ITE's Trip Generation Manual 10th Edition. The High-Density Units (LUC-222) and Quality Restaurant (LUC-931) land use code is used for the proposed development on the subject site. **Table 6-1** illustrates the trip generation rates for the associated land use. **Table 6-2** presents the number of vehicular trips from the proposed development which accounts for pass by trips and a marginal reduction to account for transit uptake resulting in a decrease of 5% to demand.

Table 6-1: Proposed Land-Use

Land Use	Land Use Code (LUC)	Measurement	Rate	AM Peak Hour		Rate	PM Peak Hour	
				Enter	Exit		Enter	Exit
High-Density Units	LUC-222	trips per units	0.31	0.07	0.24	0.36	0.22	0.14
Quality Restaurant	LUC-931	trips/1000 Sq ft. GLA	4.47	0.80	0.20	8.28	0.61	0.39

Table 6-2: Proposed Development Vehicle Trip Generation

Development	Build-Out Year	Metric	Two-Way Vehicle Trips Generated	
			AM Peak Hour	PM Peak Hour
Apartment Units	2027	437 units	142	149
Quality Restaurant	2027	3,843 Sq ft. GLA	8	15

Trips from other developments (Crisdawn, DiPoce, Watersand and H&H Capital) around the study area have been extracted from the 2018 DiPoce TIS reports. The volumes generated from these developments will only be included in the future 2032 Scenario 3 and 2037 Scenario 4.

6.1.2 Background Traffic Growth

The existing background traffic volumes have been factored up to 2019 (pre-Covid) to represent the 2022 existing condition volumes for the subject site. As per City's direction, a future background growth rate of 2% for Essa Road and 8% for Salem Road was applied to the study area road network from 2022 to 2031. The City advises that the higher 8% growth on Salem Road stems from the planned conversion of the agricultural land to residential use along the Salem Road corridor.

6.1.3 Site Generated Traffic

The proposed development consists of two condo apartment buildings and townhouse buildings for a total of 437 units. Access to the residential buildings is proposed via an access road off of Brown Bear Street. The sections below discuss the calculation, distribution, and assignment of site-generated vehicular trips.

6.1.3.1 Trip Distribution

The trip distribution data has been extracted from the 2016 Transportation Tomorrow Survey (TTS) Data Retrieval System (DRS) for traffic zone 8523. An output of the TTS data is attached in **Appendix D. Table 6-3** illustrates a summary of the trip

distribution in each direction. It is observed that 43% of the trips are in the northerly direction. Most of these trips are concentrated internally within the City of Barrie, specifically around downtown.

Most trips outside of the City are concentrated in the southern direction, with the City of Toronto receiving a significant portion of these trips. In the east, most trips originate from the City of Innisfil, while in the west, most trips originate from the City of Essa. The Town of Oro-Medonte is the origin and destination of most trips towards the north. Based on a geographic overview of the potential routes to/from the study area, the primary route externally for most travellers is Highway 400.

Table 6-3: 2016 TTS Trip Distribution

Direction	Directional Distribution
N	43%
S	20%
E	27%
W	10%

6.1.3.2 Trip Distribution – Proposed Development

The trips generated from the proposed developments have been distributed based on the findings mentioned above, along with various pre-determined site access points and road configurations within the study area. **Table 6-4** shows three (3) access points for the proposed development, all of which have been assumed to be fully operational under existing conditions.

Table 6-4: Access Points for the Proposed Development

Access Points	Operational by (date)
1. Brown Bear Street	2022
2. Koda Street	2022
3. Mabern Street	2022

Based on the information provided by the TTS data, 70% of the trips from the subject site have been distributed to Brown Bear Street as it is the closest access point to the development for access to Essa Road via Salem Road. 20% of the trips have been distributed to Koda Street and 10% to Mabern Street.

6.2 Future Traffic Operations

The Synchro traffic operations analyses have been performed under three (3) conditions for each future scenario:

1. **Background Traffic Condition** - generally consists of two components: traffic growth and adjacent area development.
2. **Do-Nothing Total Traffic Condition** – consists of background traffic and site generated traffic with the road network retaining its existing lane configurations and intersection control type.
3. **Optimized Total Traffic Condition** - lane configurations (as required) and changes to intersection control type to mitigate identified deficiencies.

Study area road network traffic volume figures can be found in **Appendix B** and **Appendix C**.

6.2.1 Scenario 2 – Full Build-Out (2027)

This section will describe Scenario 2 and the results of the traffic analysis. Scenario 2 consists of the full build-out of the development by 2027.

6.2.1.1 Background Traffic Analysis Results

During the AM and PM peak hour, all the intersections in the study area operate at an acceptable level of service with LOS D or better with v/c ratios below 0.85. A detailed breakdown of all intersections has been provided in **Appendix B** and **Appendix C**.

6.2.1.2 Do-Nothing Total Traffic Analysis Results

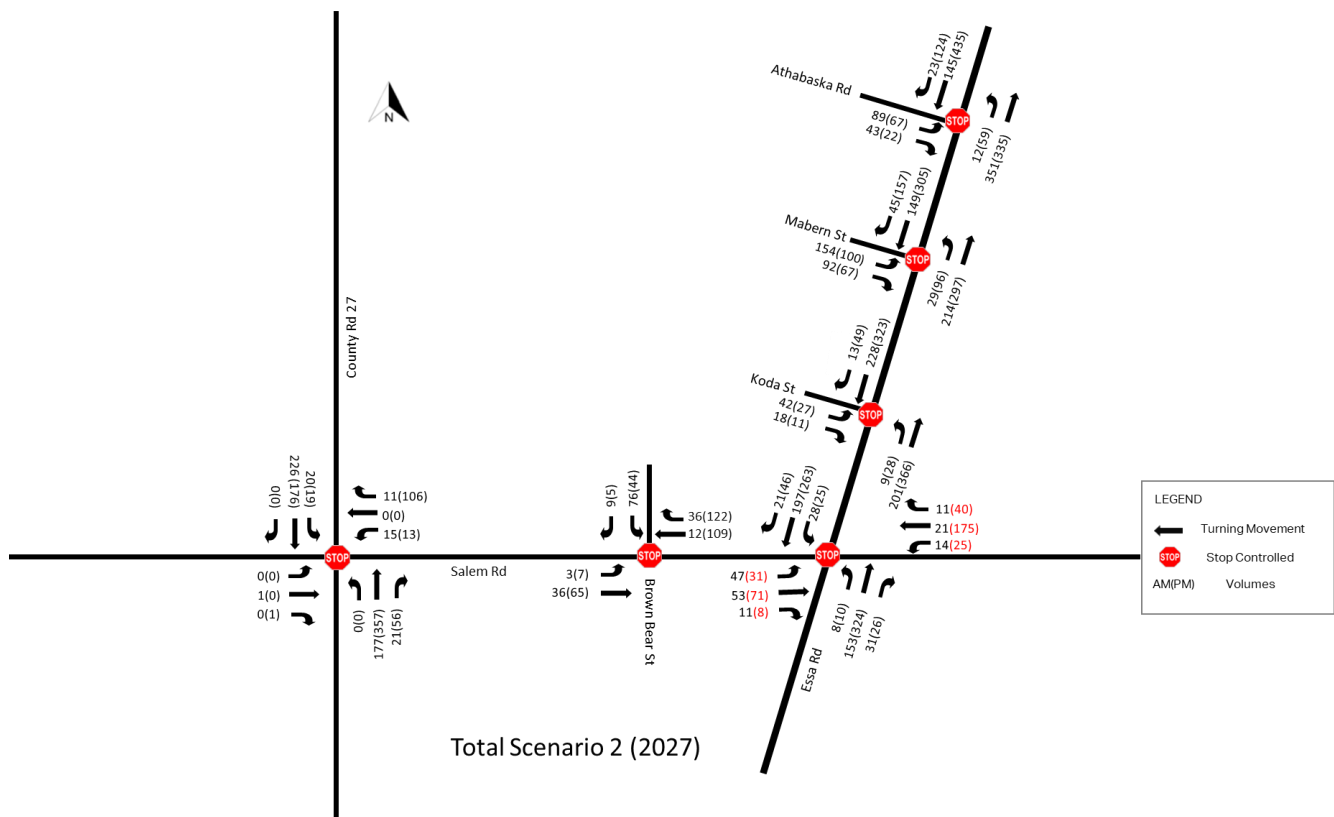
This scenario includes site generated traffic volumes in addition to background traffic volumes. **Table 6-5** summarizes only the critical intersections in the study area, where the resultant traffic operations performance exceeds the established thresholds. Metrics used to evaluate the intersection performance include v/c ratios, delays, LOS, and 95th percentile queue (m) lengths. Only the critical intersections in the study area are included where the resultant traffic operations performance exceeds the established thresholds. The critical movements with significant delays, extensive queues, v/c ratios greater than 0.85 and LOS E/F have been highlighted in red text in **Table 6-5** and **Figure 6-1**. A detailed breakdown of all other intersections and critical movements has been provided in **Appendix B** and **Appendix C**.

In the AM peak hour, all intersections within the study area maintain an acceptable level of service, achieving LOS C or better, and the v/c ratios remain below 0.85. Conversely, during the PM peak hour, the eastbound and westbound minor movements on Essa Road/Salem Road operate at a critical LOS of E, although their v/c ratios are well below 0.85. The analysis indicates that the Brown Bear Street intersection functions at an acceptable level of service.

Table 6-5: Scenario 2 2027 Do-nothing Total Traffic Operations Analysis Results for Critical Intersections

Locations	Approach	AM Peak Hour				PM Peak Hour			
		V/C Ratio	Delay (s)	Level of Service	95 th Percentile Queue (m)	V/C Ratio	Delay (s)	Level of Service	95 th Percentile Queue (m)
Scenario 2									
Essa Road / Salem Road	EBLTR	0.25	15	C	16	0.51	35	E	21
	WBLTR	0.10	13	B	13	0.77	44	E	47

Figure 6-1: Scenario 2 2027 Do-nothing Total Traffic Operations Analysis Graphic



6.2.1.3 Optimized Total Traffic Analysis Results

Despite the minor movements at Essa Road/Salem Road operating at LOS E, they remain below capacity with minimal observed queuing, prompting no recommended improvements for this scenario. Signal Warrant Analysis has been conducted for the Essa Rd/Salem Rd intersection, determining that signalization is not required here based on the 2027 volumes, see **Appendix F**. Overall, the intersection maintains an acceptable LOS B and a v/c ratio of 0.77.

6.2.2 Scenario 3 – Full Build-Out + 5 years (2032)

This section will describe Scenario 3 and the results of the traffic analysis. Scenario 3 considers the traffic analysis five years after the full build-out of the development in 2032. The background and total traffic include the volumes from the adjacent developments DiPoce and Watersand/H&H post 2031.

6.2.2.1 Background Traffic Analysis Results

Table 6-6 summarizes the v/c ratios, delays, LOS, and 95th percentile queue (m) lengths for only the critical intersections in the study area with only background traffic demand. It should be noted that background traffic under this horizon year includes site traffic from adjacent developments including DiPoce and Watersand/H&H. Metrics used in the assessment include v/c ratios, delays, LOS, and 95th percentile queue (m) lengths and only the critical intersections in the study area are shown in the table. The critical movements with significant delays, extensive queues, v/c ratios greater than 0.85 and LOS E/F have been highlighted in **red**. A detailed breakdown of all other intersections and critical movements has been provided in **Appendix B** and **Appendix C**.

The AM and PM peak hours were found to have several movements operating at LOS E/F. In the AM Peak hour, only the Essa Road / Mabern Street intersection has a v/c ratio above 0.85. In the PM peak hour, all minor street intersections at Essa Road / Salem Road, Essa Road / Mabern Street, and Essa Road / Athabaska Road were found to have critical approach movements. The analysis also shows that the Brown Bear Street intersection operates at an acceptable level of service.

Table 6-6: Scenario 3 2032 Background Traffic Operations Analysis Results for Critical Intersections

Locations	Approach	AM Peak Hour				PM Peak Hour			
		V/C Ratio	Delay (s)	Level of Service	95 th Percentile Queue (m)	V/C Ratio	Delay (s)	Level of Service	95 th Percentile Queue (m)
Scenario 3									
Essa Road / Salem Road	EBLTR	0.28	26	D	15	-	-	F	21
	WBLTR	0.25	25	C	16	1.43	267	F	116
Essa Road / Mabern Street	EBLR	1.03	88	F	72	1.23	184	F	63
Essa Road / Athabaska Road	EBLR	0.50	27	D	24	0.57	48	E	23

6.2.2.2 Do-nothing Total Traffic Analysis Results

This scenario includes site generated traffic volumes in addition to background traffic volumes. **Table 6-7** summarizes the v/c ratios, delays, LOS, and 95th percentile queue (m) lengths for only the critical intersections in the study area, where the resultant traffic operations performance exceeds the established thresholds. **Figure 6-2** shows the total traffic volumes. These outputs include the background traffic, site generated traffic and the traffic generated from the DiPoce and Watersand/H&H adjacent developments post 2031, which can be found in **Appendix C**. The critical movements with significant delays, extensive queues, v/c ratios greater than 0.85 and LOS E/F have been highlighted in red in **Table 6-7** and **Figure 6-2**. A detailed breakdown of all other intersections and critical movements is in **Appendix B** and **Appendix C**.

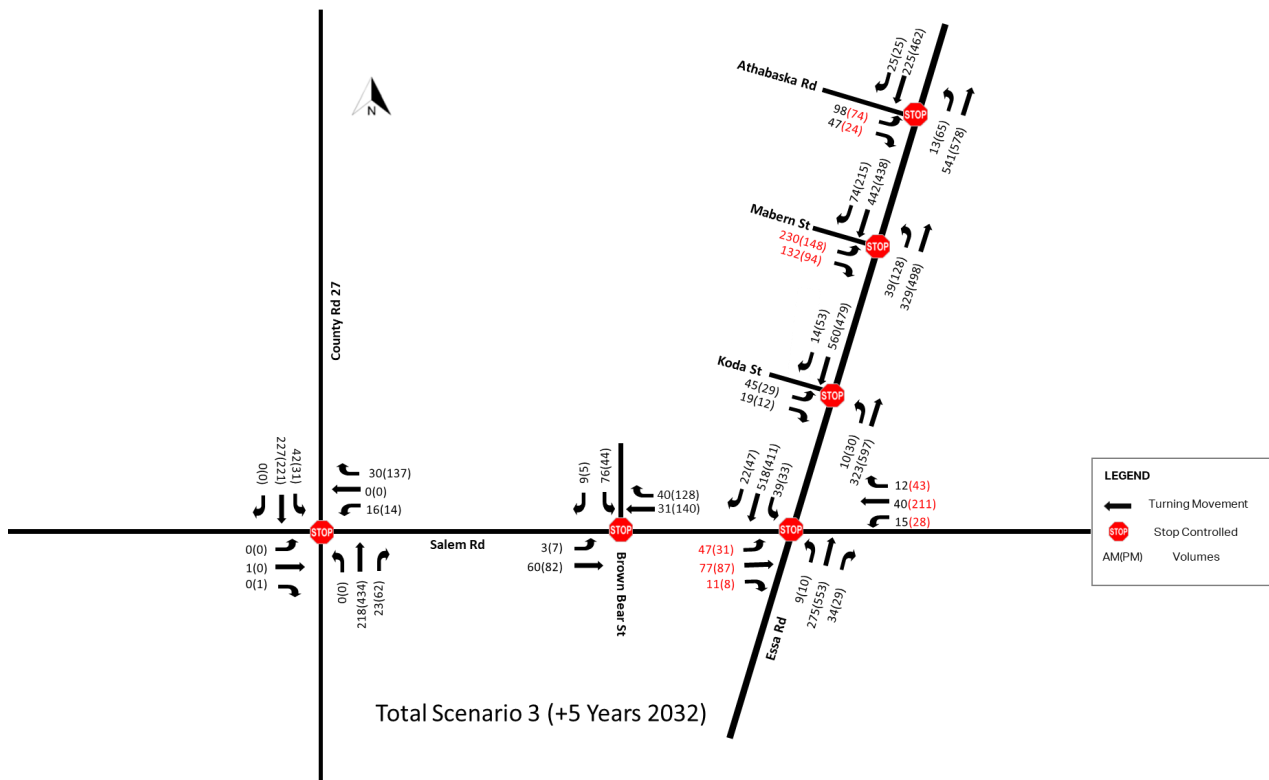
Under the 2032 total traffic volumes, multiple intersection movements operate at an unacceptable LOS of F during both the AM and PM peak hours. Specifically, the eastbound approaches at Essa Road/Salem Road and Essa Road/Mabern Street exhibit LOS F during these peak periods. Additionally, during the PM peak hour, the westbound approach at Essa Road/Salem Road and the eastbound approach at Essa Road/Athabaska Road operate at an unacceptable LOS F.

However, it's worth noting that the eastbound approach at Essa Road/Salem Road during the AM peak period and the Essa Road/Athabaska Road during the PM peak period maintain a v/c ratio of below 0.85.

Table 6-7: Scenario 3 2032 Do-nothing Total Traffic Operations Analysis Results for Critical Intersections

Locations	Approach	AM Peak Hour				PM Peak Hour			
		V/C Ratio	Delay (s)	Level of Service	95 th Percentile Queue (m)	V/C Ratio	Delay (s)	Level of Service	95 th Percentile Queue (m)
Scenario 4									
Essa Road / Salem Road	EBLTR	0.68	51	F	31	-	-	F	33
	WBLTR	0.32	28	D	18	1.76	410	F	642
Essa Road / Mabern Street	EBLR	1.18	141	F	77	1.46	281	F	75
Essa Road / Athabaska Road	EBLR	0.56	33	D	29	0.66	63	F	21

Figure 6-2: Scenario 3 2032 Do-nothing Total Traffic Operations Analysis Graphic



6.2.2.3 Optimized Total Traffic Analysis Results

This section describes the proposed mitigation measures and their impact on the traffic analysis. A signal warrant analysis and roundabout warrant analysis were also completed as described below.

Under the projected 2032 traffic conditions, the signal warrant analysis (**Appendix F**) indicates the necessity for signalization at several intersections, namely Essa Road/Salem Road, Essa Road/Mabern Street, and Essa Road/Athabaska Road. Notably, the requirement for signalization at the Essa Road/Mabern Street intersection primarily arises from the demand stemming from the Crisdawn and DiPoce subdivisions. It's important to highlight that the volumes attributed to the proposed development at 901 Essa Road have minimal impact on the traffic distribution at this particular intersection.

It is acknowledged that a roundabout is currently planned for the intersection of Essa Road/Salem Road as part of the post-2031 capital plan and is currently at a 60% design stage. Therefore, it is important to test the impact of a roundabout to evaluate the viability of such an improvement in the context of additional traffic stemming from the proposed development. A sensitivity test was performed for a single lane roundabout configuration under the 2032 future scenario traffic volumes using ARCADY software. The software is tailored to evaluate roundabout traffic operations. The analysis indicates that the intersection is predicted to perform well without significant delays and queueing with a LOS A and maximum v/c ratio of 0.61, see **Table 6-8, Appendix B** and **Appendix C** for further details. A schematic of the proposed draft roundabout design can be found in **Appendix E**.

Table 6-8: Scenario 3 2032 Optimized Total Roundabout Analysis (ARCADY Analysis)

	AM Peak						PM Peak					
	Queue (PCE)	Delay (s)	V/C Ratio	LOS	Intersection Delay (s)	Intersection LOS	Queue (PCE)	Delay (s)	V/C Ratio	LOS	Intersection Delay (s)	Intersection LOS
2032 - Scenario 3												
South Leg - Essa Rd	0.50	5.21	0.33	A	6.52	A	1.60	8.96	0.61	A	7.91	A
East Leg - Salem Rd	0.08	4.12	0.08	A			0.61	7.17	0.38	A		
North Leg - Essa Rd	1.37	7.79	0.58	A			1.17	7.84	0.54	A		
West Leg - Salem Rd	0.22	5.35	0.18	A			0.19	4.90	0.16	A		

Table 6-9 summarizes the potential optimizations at the critical intersections.

Table 6-9: Potential Improvements For The Critical Intersections Under The 2032 Optimized Total Scenario

Location	Potential Improvement	Rationale
Salem Road/Essa Road	- Full traffic signal with geometric improvements to coincide with development opening. This option accounts for future growth. - o Add dedicated left turn lanes on east and west approach. - o Change all left turn movements to permissive-protective. - o Optimization of the Signal Timing Plan (STP). Adjust cycle length to 75s	- Accommodates traffic from the minor approaches.
	OR - Roundabout built to coincide with development opening. Currently planned as part of capital budget in 2031 and beyond.	
Essa Road/Mabern Street	- Signalization of the intersection with no further geometric adjustments. - Optimize Signal Timing Plan (STP) to accommodate traffic demands.	- Accommodates traffic volumes to/from Mabern Street.
	- Signalization of the intersection with no further geometric adjustments. - Optimization of the Signal Timing Plan (STP) to accommodate traffic demand.	
Essa Road/Athabaska Road	- Signalization of the intersection with no further geometric adjustments. - Optimization of the Signal Timing Plan (STP) to accommodate traffic demand.	- Improve gaps for safe passage at downstream intersections and accommodate growth in vehicle demand.
	- Signalization of the intersection with no further geometric adjustments. - Optimization of the Signal Timing Plan (STP) to accommodate traffic demand.	

Table 6-10 summarizes the v/c ratios, delays, LOS, and 95th percentile queue (m) lengths for only the critical intersections in the study area, where the resultant traffic operations performance exceeds the established thresholds. These outputs include the background traffic, site generated traffic and the traffic generated from the DiPoce and Watersand/H&H adjacent developments post 2031, which can be found in **Appendix C**. The critical movements with significant delays, extensive queues, v/c ratios greater than 0.85 and LOS E/F have been highlighted in **red**. A detailed breakdown of all other intersections and critical movements has been provided in **Appendix B** and **Appendix C**

Under future optimized total traffic conditions, the implementation of the signalization at the identified deficient intersections yields considerable improvements during AM and PM peak hour, whereby the study area intersections are expected to operate at acceptable D or better and v/c ratio below 0.85. The analysis also shows that the Brown Bear Street intersection operates at an acceptable level of service. Overall the proposed mitigation measures demonstrate considerable benefits to traffic operations performance under the 2032 traffic volumes.

Table 6-10: Scenario 3 2032 Optimized Total Traffic Operations Analysis Results for Critical Intersections

Locations	Approach	AM Peak Hour				PM Peak Hour			
		V/C Ratio	Delay (s)	Level of Service	95 th Percentile Queue (m)	V/C Ratio	Delay (s)	Level of Service	95 th Percentile Queue (m)
Scenario 3									
	EBL	0.23	26	C	15	0.20	24	C	9

Essa Road / Salem Road	EBTR	0.34	30	C	29	0.27	26	C	26
	WBL	0.09	29	C	6	0.10	23	C	8
	WBTR	0.22	30	C	20	0.74	36	D	56
Essa Road / Mabern Street	EBLR	0.75	26	C	70	0.61	24	C	51
Essa Road / Athabaska Road	EBLR	0.52	26	C	39	0.41	26	C	28

6.2.3 Scenario 4 – Full Build-Out + 10 years (2037)

Scenario 4 considers the traffic analysis ten years after the full build-out of the development in 2037. The background and total traffic include the adjacent developments including DiPoce and Watersand/H&H adjacent developments post-2031 as described in the previous scenario.

6.2.3.1 Background Traffic Analysis Results

Table 6-11 summarizes the v/c ratios, delays, LOS, and 95th percentile queue (m) lengths for only the critical intersections in the study area with background traffic only, where the resultant traffic operations performance exceeds the established thresholds. The critical movements with significant delays, extensive queues, v/c ratios greater than 0.85 and LOS E/F have been highlighted in red text in the table. A detailed breakdown of all other intersections and critical movements has been provided in **Appendix B** and **Appendix C**

The AM and PM peak hour was found to have several movements operating at LOS F. In the PM peak hour, only the Essa Road/Athabaska Road intersections has a v/c ratios below 0.85. All minor street intersections at Essa Road/Salem Road, Essa Road/Mabern Street, and Essa Road/Athabaska Road were found to have critical approaches. The analysis shows that the Brown Bear Street intersection operates at an acceptable level of service.

Table 6-11: Scenario 4 2037 Background Traffic Operations Analysis Results for Critical Intersections

Locations	Approach	AM Peak Hour				PM Peak Hour			
		V/C Ratio	Delay (s)	Level of Service	95 th Percentile Queue (m)	V/C Ratio	Delay (s)	Level of Service	95 th Percentile Queue (m)
Scenario 4									
Essa Road / Salem Road	EBLTR	0.32	28	D	15	-	-	F	23
	WBLTR	0.30	28	D	16	1.82	436	F	286
Essa Road / Mabern Street	EBLR	1.18	139	F	80	1.52	309	F	87
Essa Road / Athabaska Road	EBLR	0.59	33	D	25	0.74	73	F	27

6.2.3.2 Do-nothing Total Traffic Analysis Results

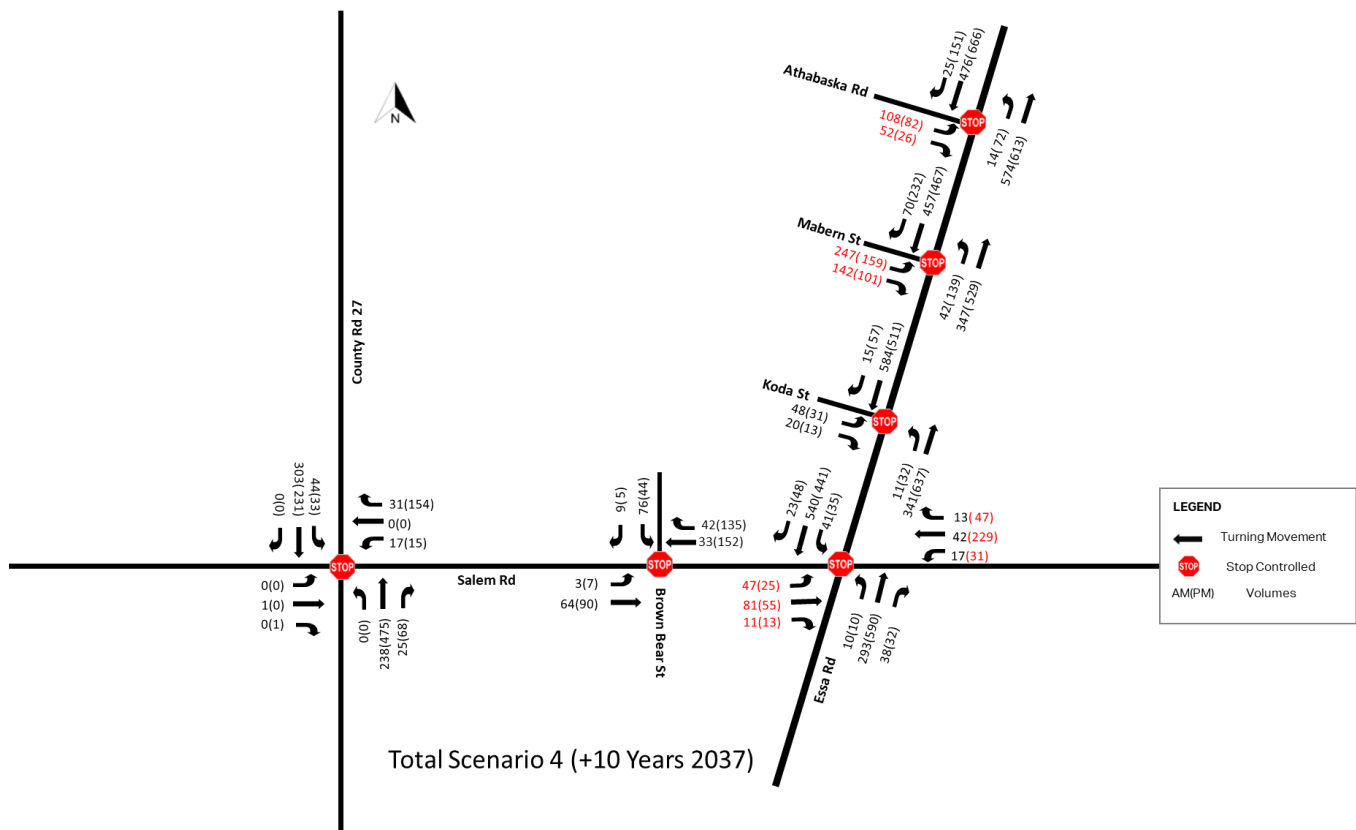
This scenario includes site generated traffic volumes in addition to background traffic volumes. **Table 6-12** summarizes the v/c ratios, delays, LOS, and 95th percentile queue (m) lengths for only the critical intersections in the study area, where the resultant traffic operations performance exceeds the established thresholds. The critical movements with significant delays, extensive queues, v/c ratios greater than 0.85 and LOS E/F have been highlighted in red in **Table 6-12** and **Figure 6-3**. A detailed breakdown of all other intersections and critical movements has been provided in **Appendix B** and **Appendix C**

The AM and PM peak periods were found to have several movements operating at LOS F. All minor eastbound approaches at Essa Road/Salem Road, Essa Road/Mabern Street, and Essa Road/Athabaska Road were found to have unacceptable traffic operation conditions. However, the eastbound approach at Essa Road/Salem Road and Essa Road/Athabaska Road have v/c ratios below 0.85 during the AM peak hour. The analysis shows that the Brown Bear Street intersection operates at an acceptable level of service.

Table 6-12: Scenario 4 2037 Do-nothing Total Traffic Operations Analysis Results for Critical Intersections

Locations	Approach	AM Peak Hour				PM Peak Hour			
		V/C Ratio	Delay (s)	Level of Service	95 th Percentile Queue (m)	V/C Ratio	Delay (s)	Level of Service	95 th Percentile Queue (m)
Scenario 5									
Essa Road / Salem Road	EBLTR	0.77	66	F	40	-	-	F	88
	WBLTR	0.38	33	D	20	2.25	631	F	781
Essa Road / Mabern Street	EBLR	1.34	206	F	89	1.82	442	F	92
Essa Road / Athabaska Road	EBLR	0.66	42	E	29	0.85	104	F	29

Figure 6-3: Scenario 4 2037 Do-nothing Total Traffic Operations Analysis Graphic



6.2.3.3 Optimized Total Traffic Analysis Results

A sensitivity test was also performed for the roundabout configuration on the intersection at Salem Road/Essa Road under the 2037 future scenario traffic volumes. **Table 6-13** shows the intersection is predicted to perform well without significant delays and queueing with a LOS A and maximum v/c ratio of 0.62. See **Appendix B** and **Appendix C** for further details.

Table 6-13: Scenario 4 2037 Optimized Total Traffic Roundabout Analysis

	AM Peak						PM Peak					
	Queue (PCE)	Delay (s)	V/C Ratio	LOS	Intersection Delay (s)	Intersection LOS	Queue (PCE)	Delay (s)	V/C Ratio	LOS	Intersection Delay (s)	Intersection LOS
2037 - Scenario 4												
South Leg - Essa Rd	0.52	4.97	0.34	A	6.12	A	1.66	8.69	0.62	A	7.73	A
East Leg - Salem Rd	0.09	3.94	0.08	A			0.67	7.18	0.40	A		
North Leg - Essa Rd	1.33	7.26	0.57	A			1.22	7.66	0.55	A		
West Leg - Salem Rd	0.22	5.13	0.18	A			0.19	4.75	0.16	A		

Table 6-14 presents the potential optimizations for the critical intersections.

Table 6-14: Potential Improvements For The Critical Intersections Under The 2037 Optimized Total Scenario

Location	Potential Improvement	Rationale
Salem Road/Essa Road	– Retain Improvements from 2032	– Accommodates significant traffic from the minor approaches.
Essa Road/Mabern Street	– Retain Improvements from 2032	– Accommodates traffic volumes to/from Mabern Street.
Essa Road/Athabaska Road	– Retain improvements from 2032	– Improve gaps for safe passage at downstream intersections and accommodate growth in vehicle demand.

Table 6-15 summarizes the v/c ratios, delays, LOS, and 95th percentile queue (m) lengths for only the critical intersections in the study area, where the resultant traffic operations performance exceeds the established thresholds. The critical movements with significant delays, extensive queues, v/c ratios greater than 0.85 and LOS E/F have been highlighted in red. A detailed breakdown of all other intersections and critical movements has been provided in **Appendix B** and **Appendix C**

The 2037 scenario does not require further enhancements, as all intersections consistently maintain an acceptable LOS and operate under capacity by retaining the improvements introduced in the 2032 scenario.

Table 6-15: Scenario 4 2037 Optimized Total Traffic Operations Analysis Results for Critical Intersections

Locations	Approach	AM Peak Hour				PM Peak Hour			
		V/C Ratio	Delay (s)	Level of Service	95 th Percentile Queue (m)	V/C Ratio	Delay (s)	Level of Service	95 th Percentile Queue (m)
Scenario 4									
Essa Road / Salem Road	EBL	0.22	26	C	9	0.20	23	C	7
	EBTR	0.32	27	C	27	0.28	24	C	30
	WBL	0.11	29	C	5	0.11	22	C	9
	WBTR	0.24	31	C	19	0.77	37	D	64
Essa Road / Mabern Street	EBLR	0.78	27	C	75	0.63	24	C	57
Essa Road / Athabaska Road	EBLR	0.55	26	C	39	0.44	26	C	30

7. Travel Demand Management Review

Transportation Demand Management (TDM) strategies have the goal to reduce travel demand and shift to sustainable modes of transportation through ongoing action before and after occupation of their unit in addition to aiding the City in achieving modal targets contained in the Transportation Master Plan (TMP). A successful TDM program can influence travel behaviour away from single occupancy vehicle use towards more sustainable modes including transit, cycling or walking. The need for TDM measures is discussed below for each travel mode in the context of the scale and location of the development plan. It should be noted that bicycle parking has been proposed as part of the development.

7.1 Potential TDM Measures for the Development Site

Active Transportation Connections

The 901 Essa Road floor plans show a proposed 2.1m sidewalk surrounding the development with a public space at the corner of Brown Bear Street and Salem Road. There are no proposed cycling connections with the development. According to the Barrie TMP, there are proposed cycling facilities with an In-Boulevard Pathway on Essa Road and a Cycle Track on Salem Road. To increase walking and cycling trips to and from the development, north-south active transportation connections on Brown Bear Street could be improved, which would connect to northern neighbourhoods and services. In addition to this the property owner should ensure that there is sufficient illumination, benches and receptacles along all on-site sidewalks.

Bicycle Repair Station

The property owner should consider bicycle maintenance facilities in a designated, secure area within the building with proper drainage, where sufficient workspace with bicycle maintenance tools and supplies are readily available on a permanent basis and offered in good condition to encourage bicycling. Tools and supplies should include at minimum, those necessary for fixing a flat tire, adjusting a chain, and performing other basic bicycle maintenance such as; a bicycle pump, wrenches, a chain tool, lubricants, tire levers, hex keys/Allen wrenches, torx keys, screwdrivers, and spoke wrenches.

Bicycle Parking

The property owner may consider implementing on-site bike parking facilities including bike racks or dedicated bike storage units. These improvements provide an additional incentive for cycling allowing for transfers between to or from cycling to other modes. It should be noted that the current development outlay contains the following bicycle parking provisions:

1. Total short term bicycle parking is 30 spaces.
2. Total long-term bicycle parking is 222 spaces.
 - a. Level 1(B) 58 , P1 166 spots comprised of 156 stacked, 7 Horizontal and 3 vertical)

Real Time TV Screen

The property owner should consider real-time transportation information on a large television screen in prominent locations (e.g. entry / exit areas, lobbies, elevator bays) on the project site, to highlight sustainable transportation options and support informed trip making. The displays shall include real time information on sustainable transportation options in the vicinity of the project site, which may include, transit arrivals and departures for nearby Barrie Transit routes, walking times to these bus stops, and the availability of car share vehicles, shared bicycles and shuttles within and adjacent to the building.

Transit Prioritization

The Route 8 operates on Essa Road and Athabaska Road with permissive left and right turns. The proposed signalization of the intersection at Essa Road and Athabaska Road would improve transit operations. As part of future transit plan reviews and updates, the extension of existing and/or new transit service routes be considered to serve the existing/new developments with a fuller range of more sustainable transportation options to maximize the potential for sustainable transportation in the area.

The property owner should consider proactively offering monthly Barrie Transit transit pass subsidies to residents and/or employees.

8. Key Findings

This TIS report has been prepared in support of the new development proposed by Brown Bear Dev Ltd. on 901 Essa Road, located immediately west of the Salem Road and Essa Road intersection in the City of Barrie (the City). Based on information provided by Brown Bear Dev Ltd., the proposed development is anticipated to be completed by 2027 consisting of two apartment buildings with a total of 437 units.

Traffic operations analysis was performed for four (4) scenarios, as shown in **Table 8-1**, to evaluate the impacts of traffic and vehicle trips generated by the proposed development on the surrounding road network.

Table 8-1: Traffic Analysis Scenarios

Scenario #	1	2	3	4
Scenario	Existing Conditions	Full Build-Out	Five years after Full Build-Out	Ten years after Full Build-Out
Horizon Year	2022	2027	2032	2037

The key findings of the analysis conducted for the study are as follows:

- The full build-out of the 901 Essa Road development is expected to generate 150 vehicle trips in the AM weekday peak hour and 164 vehicle trips in the PM weekday peak hour.
- Brown Bear Street intersection (access) operates acceptably under all future scenarios with current stop-control and lane geometry.
- The analysis indicates that, under 2022 Existing Conditions (**Scenario 1**), all intersections demonstrate acceptable traffic operations.
- The analysis indicates that, under 2027 Full Build-Out (**Scenario 2**) the eastbound and westbound minor movements on Essa Road/Salem Road operate at a critical LOS of E during PM peak hour, although their v/c ratios are well below 0.85. The signal warrant analysis indicates no signalization required for intersections during this scenario.
- The 2032 (**Scenario 3: 5 Years After Full Build-Out**) traffic analysis key findings are listed below:
 - The City has plans in its post-2031 capital budget to potentially construct a roundabout at the intersection of Essa Road / Salem Road.
 - A sensitivity test was performed for the roundabout configuration at the intersection of Salem Road/Essa Road using 2032 future scenario traffic volumes with ARCADY software. The analysis showed the intersection is predicted to perform well without significant delays and queueing with a LOS of A and maximum v/c ratio of 0.61.
 - Under the 2032 traffic volumes, the signal warrant analysis identifies signalization to mitigate traffic operations deficiencies for three intersections overall:
 - Essa Road/Salem Road intersection including the following geometric improvements:
 - Dedicated eastbound and westbound left turn lane
 - Essa Road/Mabern Street intersection.
 - Essa Road/Athabaska Road intersection.
- The 2037 (**Scenario 4: 10 Years After Full Build-Out**) traffic analysis key findings are listed below:
 - A sensitivity test was also performed for the potential roundabout at the intersection at Salem Road/Essa Road under the 2037 future scenario traffic volumes using ARCADY. The analysis showed that the intersection is predicted to perform well with a LOS A and maximum v/c ratio of 0.62.

Overall, with implementation of the above mitigation measures, traffic operations with the fully built-out development can be improved to operate acceptably.

Essa Road and Salem Road Mitigation Measure Options and Timeline of Improvements

Based on the traffic operations analysis and resultant network performance over the selected horizon years, there is a need for mitigation measures to be implemented at the intersection of Essa Road / Salem Road as highlighted in the above text. It is also acknowledged that the City has progressed design of a potential roundabout at this intersection, slated for potential inclusion in the 2031 capital plan. As a result, two potential mitigation options have been identified for the Essa Road/Salem Road intersection with varying timeframes for implementation over the analysed horizon years:

Option 1: Implement a roundabout to coincide with the +5 years after Full Build-Out scenario (2032). It is acknowledged that the planned roundabout is currently part of the 2031 capital plan. Opening day traffic operations under the existing traffic control were shown to be acceptable.

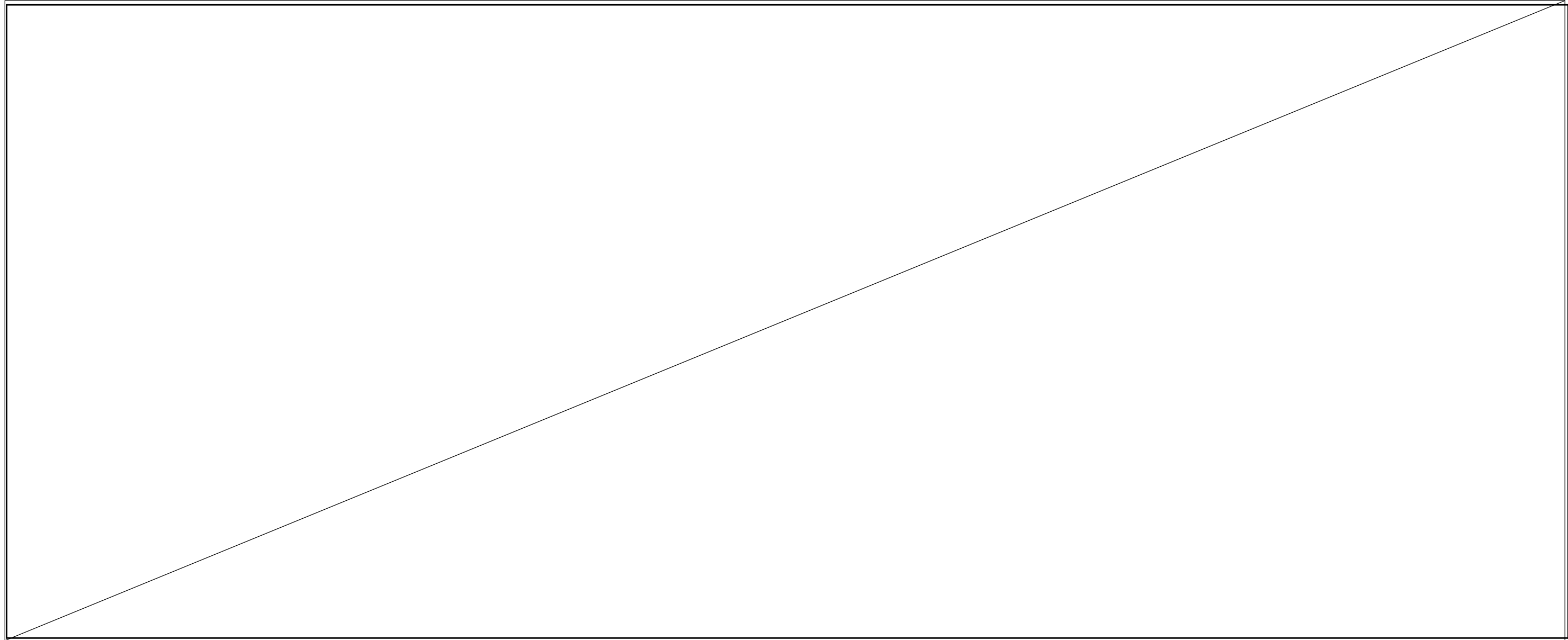
Option 2: Implement a permanent traffic signal with geometric improvements to coincide with the +5 years after Full Build-Out scenario (2032). This option future proofs for the future traffic growth by incorporating geometric improvements to the intersection including adding turn lanes for additional capacity and signalized control of turning movements.

It is important to note that analysing background traffic operations (no development site generated demand) compared to do-nothing total traffic operations (inclusive of development site generated demand), the incremental change to traffic operations caused by the development was shown to be limited, with the future growth to background traffic already causing deficiencies which are slightly exacerbated by the increase from development site traffic.

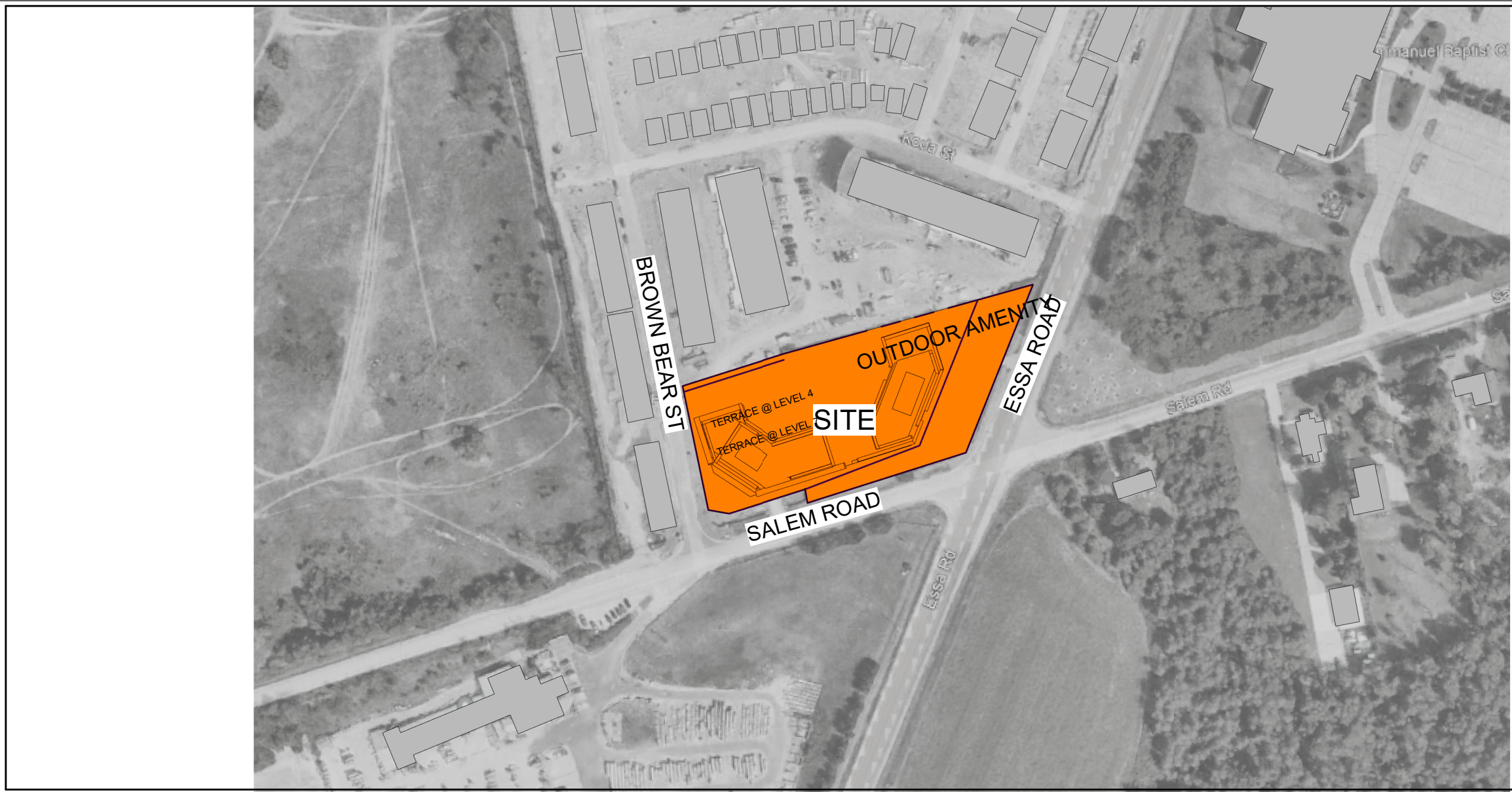
Considerations for Sustainable Transportation Improvements

- In line with the City's MMATMP, enhanced active transportation connections and facilities around the study area would support mode shift and further integration of the transportation network. This may include incorporation of bike parking (on-site and off-site).
- There is a lack of existing active transportation facilities on Salem Road, County Road 27 and Essa Road (except for a short stretch of interim sidewalk on the west side of the road). Multi-use paths on these streets would boost connectivity and general access points to/from the new developments to support an active transportation network.
- Furthermore, as part of future transit plan reviews and updates, the extension of existing and/or new transit service routes would improve service to these existing/new developments.

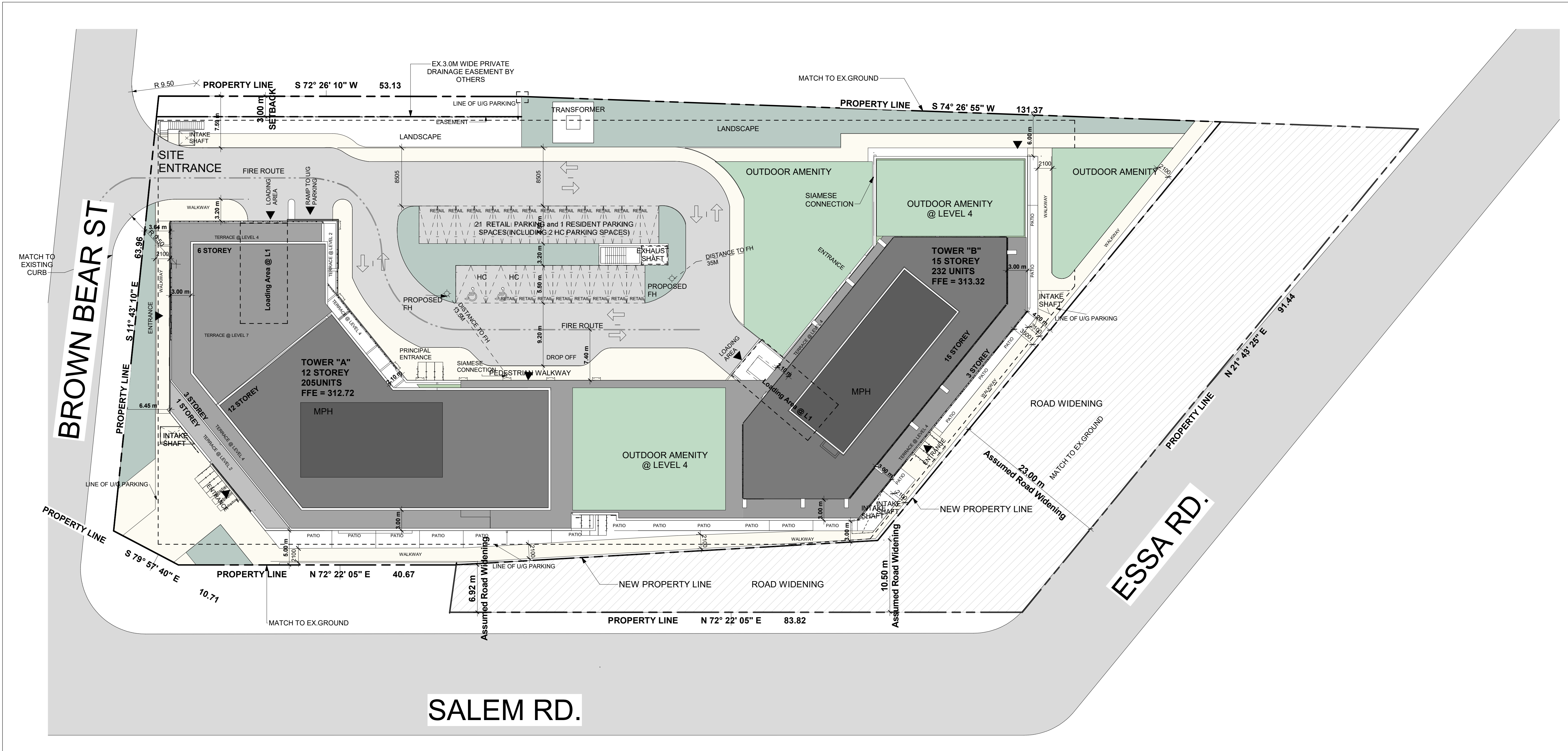
Appendix A – Site Plan



Reserved for OBC Matrix
NTS 2
dA1.02



Context Plan 3
NTS dA1.02



Site Plan 1
1 : 300 dA1.02

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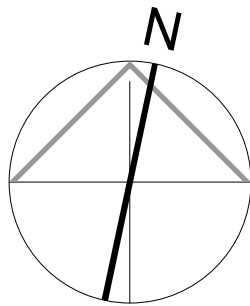
No. :01	Issued For OPA, ZBA SUBMISSION	Date: NOV30,2022
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Client:
ACE Development

901 Essa Road, BARRIE, ON
Proposed Residential Development

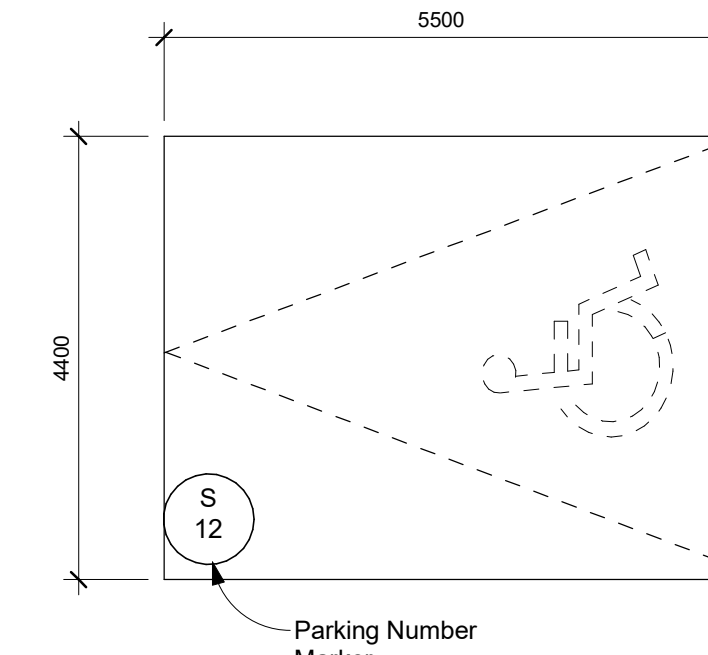
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Scale:	As indicated
Drawn by:	D.N
Checked by:	N.D
Project No.:	22125
Date:	Nov. 09,2023
Drawing No.:	



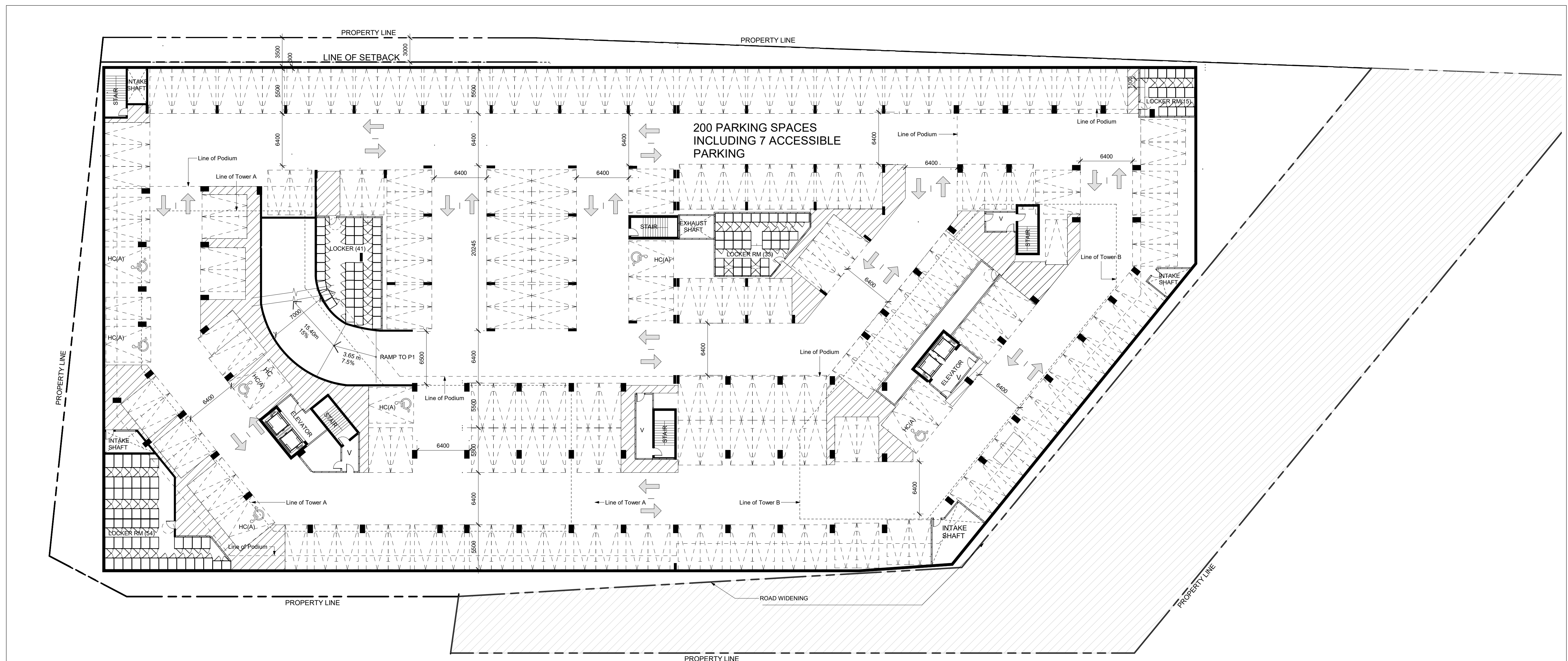
dA1.02

Diagram illustrating a 6400 Driveisle configuration. The diagram shows a rectangular area labeled "6400 DRIVEISLE". Dimensions are indicated: 5500 (width) and 2700 (height). A circular marker labeled "S 12" is shown in the bottom-left corner, with an arrow pointing to it labeled "Parking Number Marker". The diagram also shows a dashed line representing a diagonal path across the rectangle. Notes on the left side indicate "SEE NOTE: A" and "250".



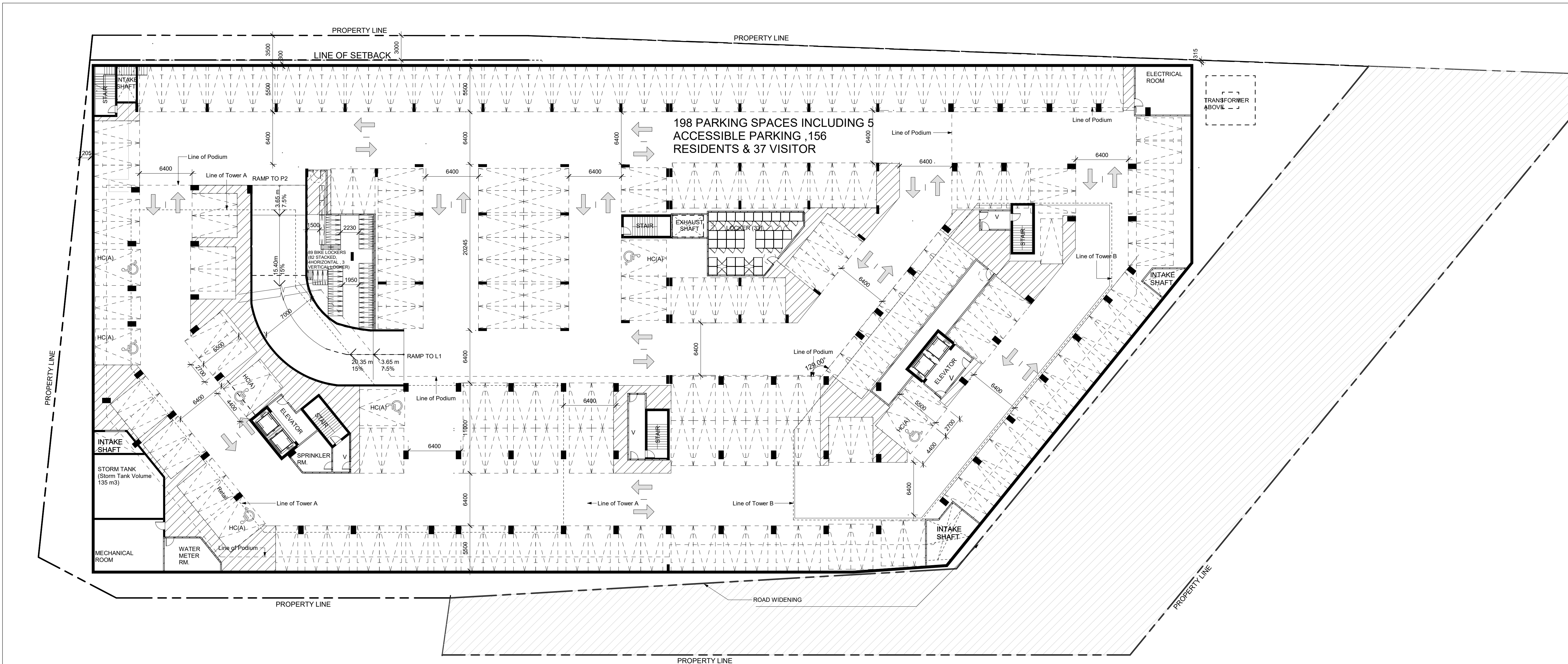
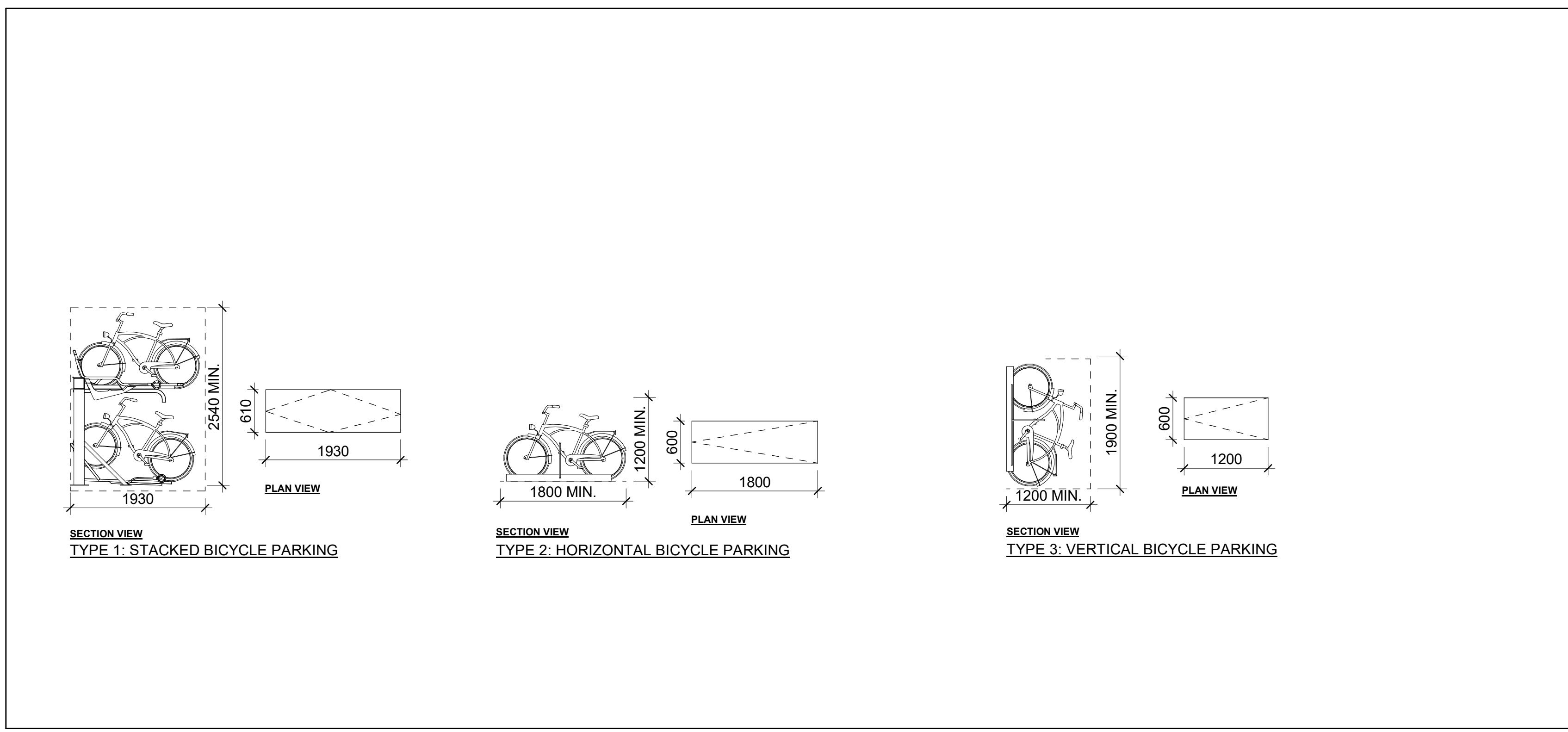
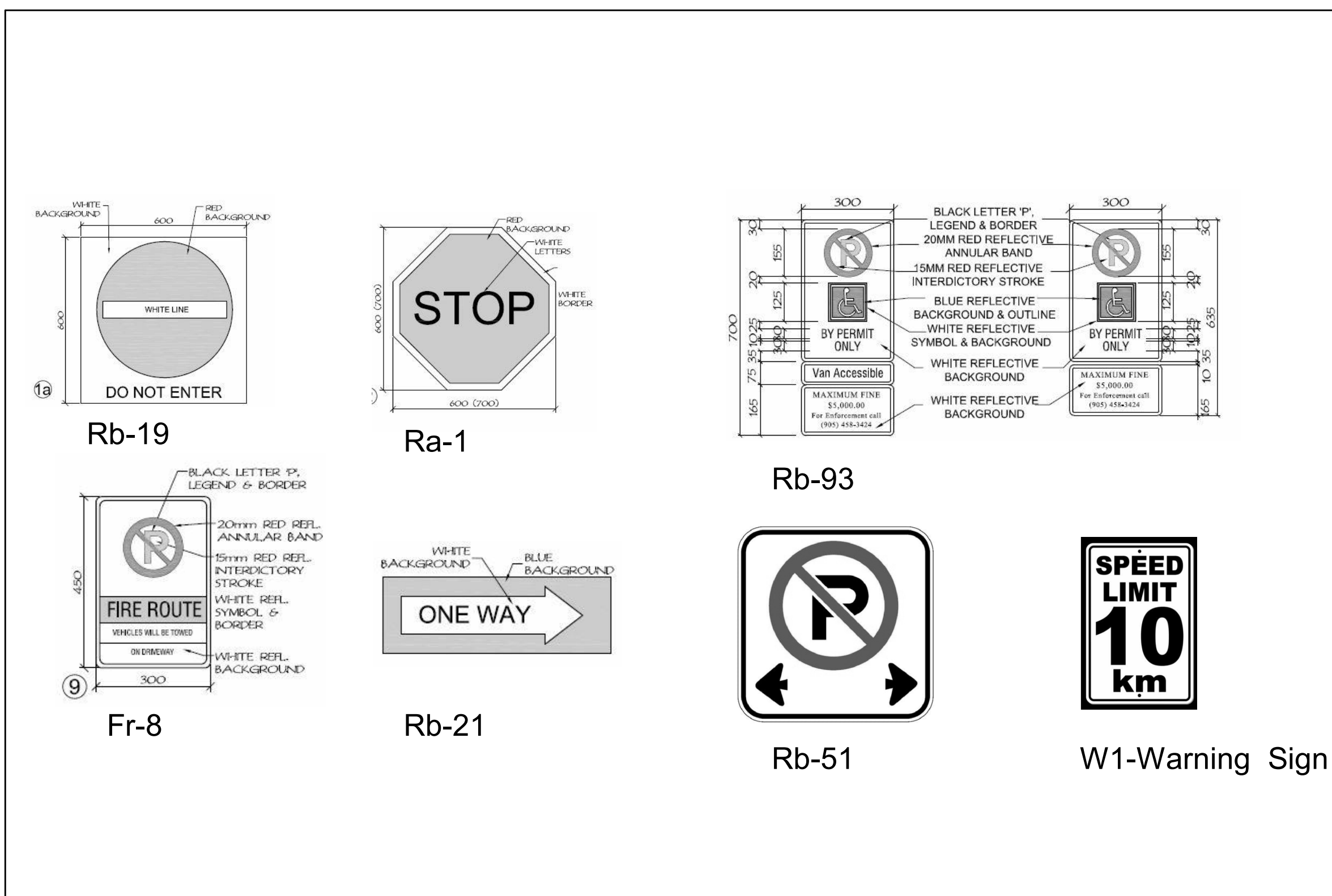
Traffic Legend

Parking Info 3
NTS dA2.1



Under Ground Parking Floor Plan - Level P2

dA2.1



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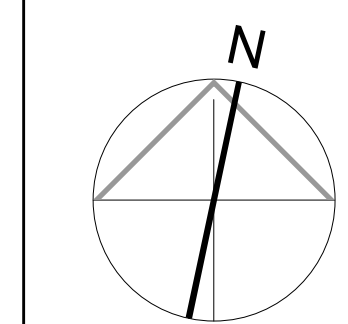
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No.: Revision: Date:

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Client:
ACE Development
901 Essa Road, BARRIE, ON
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Drawing Title:
LEVEL P1 FLOOR PLAN & PARKING LEGEND

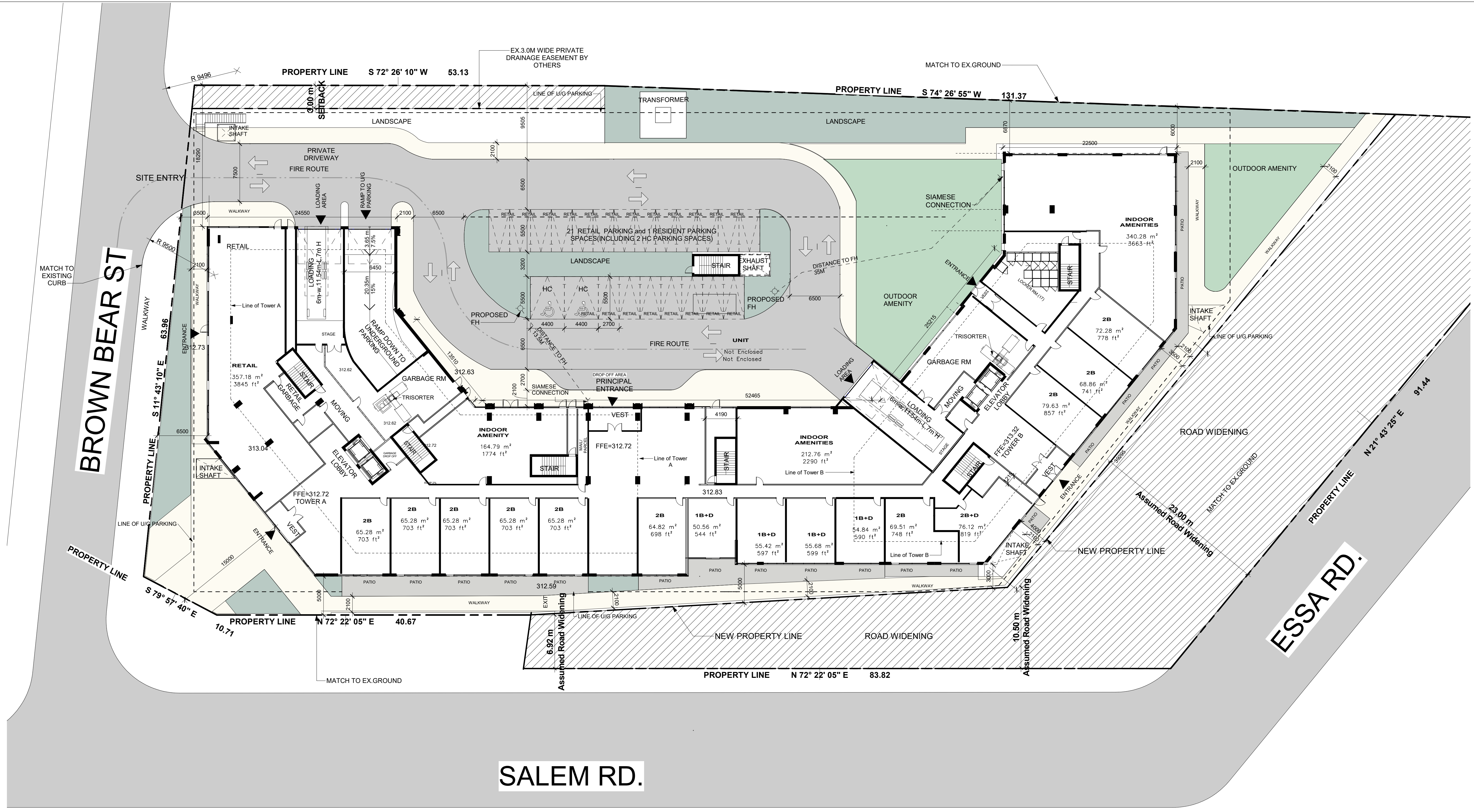
Scale:
As indicated
Drawn by:
D.N
Checked by:
N.D
Project No.:
22125
Date:
Nov. 09,2023
Drawing No.:



dA2.2

GENERAL NOTES:

1. Maximum Height Development Standards are measured are measured to the tallest point of the proposed buildings.
2. In Fire route,Load support will be sufficient to support the expected loads imposed by fire fighting equipment, meet the requirements of the Canadian Highway Bridge Design Code, CAN/CSA-S6, and will be surfaced in order to be accessible under all climatic conditions.
3. Trained onsite staff will be available to manoeuvre bins for the collection driver and a flagman when truck is reversing.
4. For landscape details please refer to MHBC Landscape Architects Inc. drawings.
5. For Grading and Site Servicing details please refer to IBI Group drawings .
6. For Traffic Signage plan other Traffic information please refer to Aecom Consulting Group drawings.



Floor Plan Level 1
1 : 250

1
dA2.3

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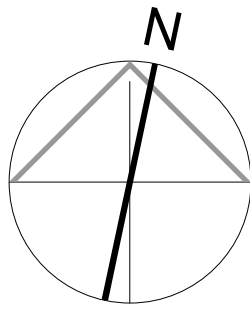
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Proposed Residential Development

Drawing Title:
LEVEL 1 FLOOR PLAN

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Date:
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Drawing No.:



dA2.3

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Floor Plan - Level 3

2

1 : 250

dA2.4

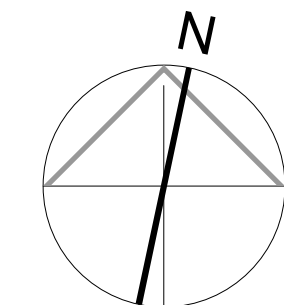


Floor Plan Level 2

1

1 : 250

dA2.4



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ACE Development

901 Essa Road, BARRIE, ON
Proposed Residential Development

Drawing Title:
LEVELS 2 & 3 FLOOR PLANS

Scale:
1 : 250
Drawn by:
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Checked by:
N.D.
Project No.:
22125
Date:
Nov. 09, 2023
Drawing No.:

dA2.4

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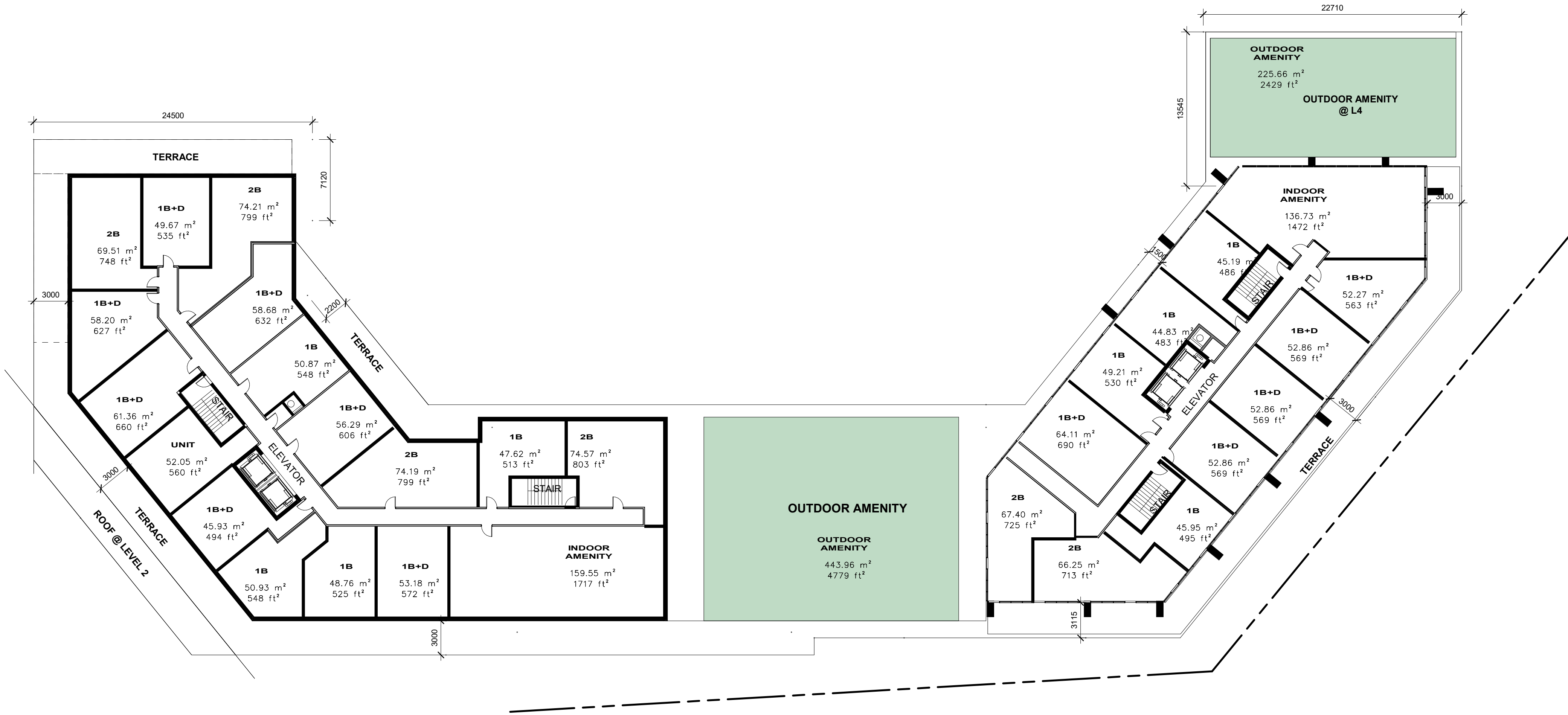
Revisions:

No.:	Revision:	Date:

Floor Plan - Level 5-6

2
dA2.5

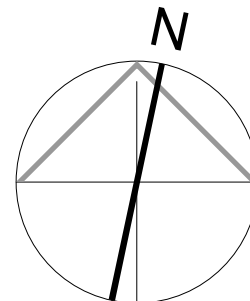
1 : 250



Floor Plan - Level 4

1
dA2.5

1 : 250



Client:
ACE Development

901 Essa Road, BARRIE, ON
Proposed Residential Development

Drawing Title:
LEVELS 4 & 5-6 FLOOR PLANS

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1 : 250
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N.D
Project No.:
22125
Date:
Nov. 09.2023
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dA2.5

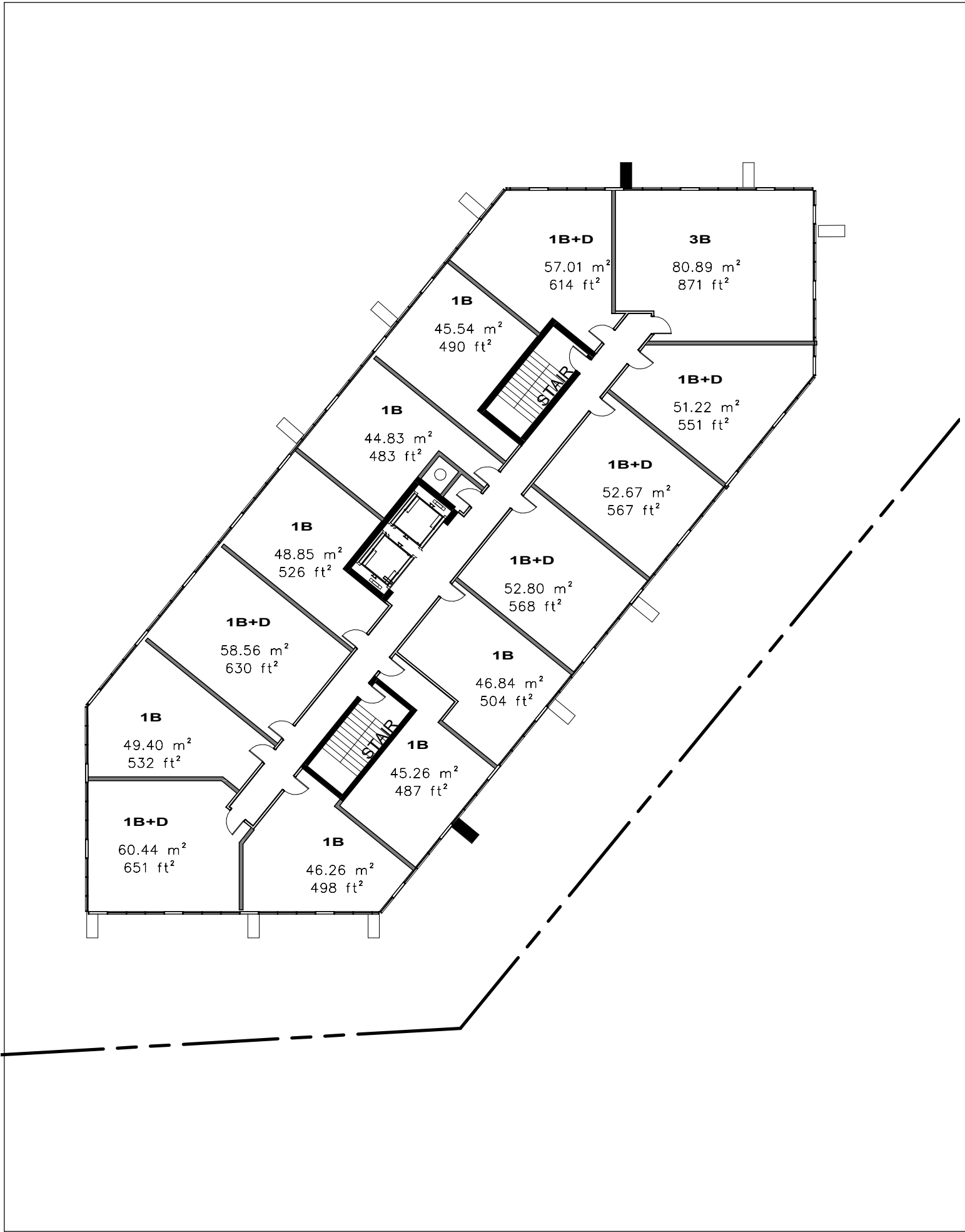


LEVEL 8-12

2

1 : 250

dA2.6

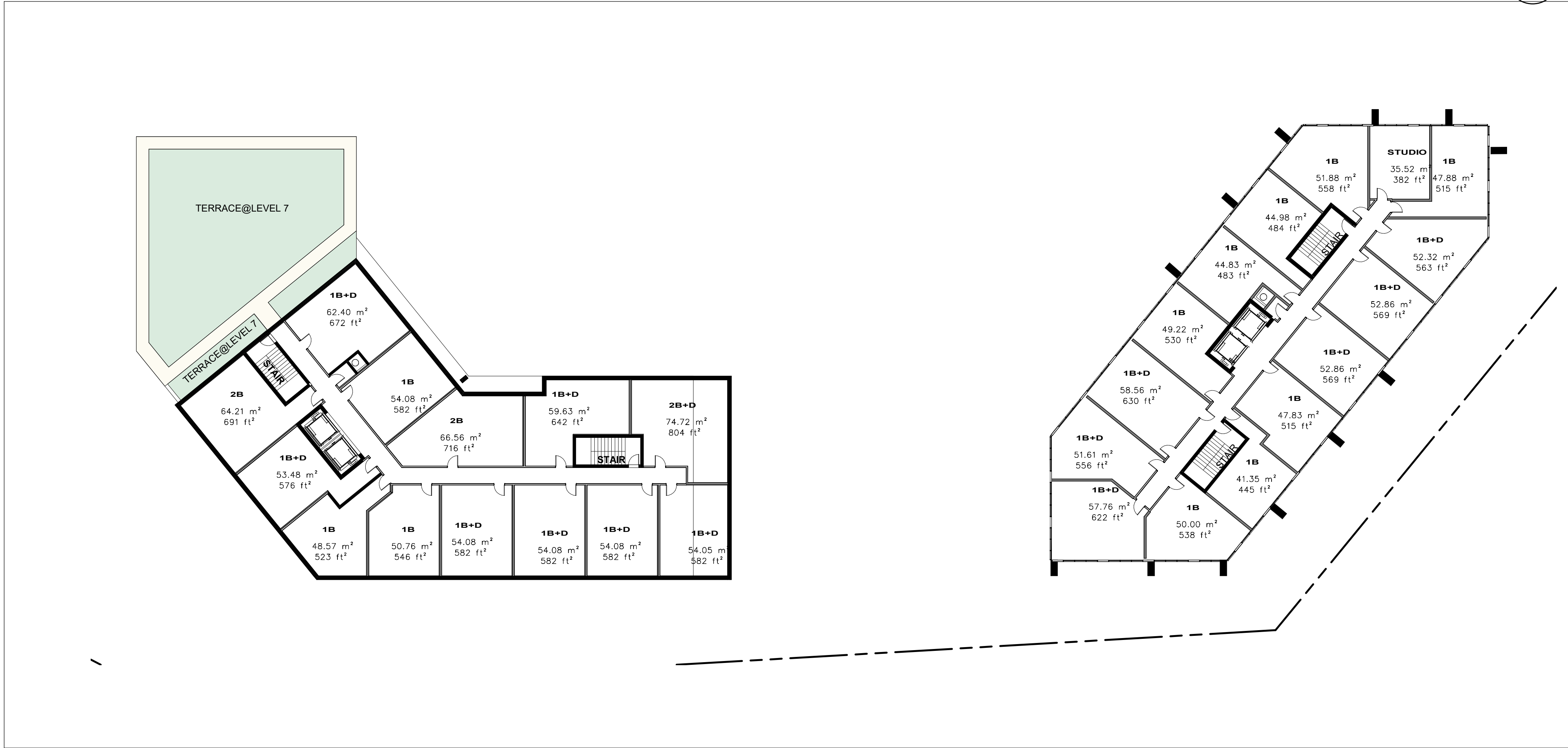


Level 13-15

3

1 : 250

dA2.6



LEVEL 7

1

1 : 250

dA2.6

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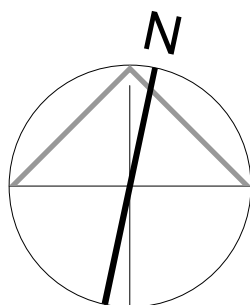
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Drawing Title:
**Floor Plans -Level
7-9,10-12,13-15**

Scale:
1 : 250
Drawn by:
Author
Checked by:
Checker
Project No.:
22125
Date:
Nov. 09,2023
Drawing No.:



dA2.6

Project Statistics

November 9, 2023

PARKING RATIO RESIDENTIAL	0.91
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Appendix B – Traffic Analysis Results

B.1 Existing Conditions

HCM Unsignalized Intersection Capacity Analysis

1: Salem Rd & County Road 27

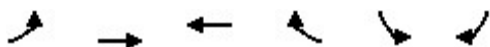
11-28-2023

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	0	1	0	8	0	4	0	160	11	16	205	0
Future Volume (Veh/h)	0	1	0	8	0	4	0	160	11	16	205	0
Sign Control		Stop			Stop			Free			Free	
Grade		0%			0%			0%			0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	0	1	0	9	0	4	0	174	12	17	223	0
Pedestrians												
Lane Width (m)												
Walking Speed (m/s)												
Percent Blockage												
Right turn flare (veh)												
Median type	None								None			
Median storage veh												
Upstream signal (m)												
pX, platoon unblocked												
vC, conflicting volume	441	443	223	438	437	180	223	186				
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	441	443	223	438	437	180	223	186				
tC, single (s)	7.1	6.5	6.2	7.1	6.5	6.2	4.1	4.1				
tC, 2 stage (s)												
tF (s)	3.5	4.0	3.3	3.5	4.0	3.3	2.2	2.2				
p0 queue free %	100	100	100	98	100	100	100	99				
cM capacity (veh/h)	519	503	817	524	507	863	1346	1388				
Direction, Lane #	EB 1	WB 1	NB 1	SB 1								
Volume Total	1	13	186	240								
Volume Left	0	9	0	17								
Volume Right	0	4	12	0								
cSH	503	596	1346	1388								
Volume to Capacity	0.00	0.02	0.00	0.01								
Queue Length 95th (m)	0.0	0.5	0.0	0.3								
Control Delay (s)	12.2	11.2	0.0	0.6								
Lane LOS	B	B		A								
Approach Delay (s)	12.2	11.2	0.0	0.6								
Approach LOS	B	B										
Intersection Summary												
Average Delay	0.7											
Intersection Capacity Utilization	38.0%			ICU Level of Service					A			
Analysis Period (min)	15											

HCM Unsignalized Intersection Capacity Analysis

2: Salem Rd & Brown Bear St

11-28-2023



Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Volume (veh/h)	0	24	8	13	4	1
Future Volume (Veh/h)	0	24	8	13	4	1
Sign Control		Free	Free		Stop	
Grade		0%	0%		0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	0	26	9	14	4	1
Pedestrians						
Lane Width (m)						
Walking Speed (m/s)						
Percent Blockage						
Right turn flare (veh)						
Median type		None	None			
Median storage veh						
Upstream signal (m)						
pX, platoon unblocked						
vC, conflicting volume	23				42	16
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	23				42	16
tC, single (s)	4.1				6.4	6.2
tC, 2 stage (s)						
tF (s)	2.2				3.5	3.3
p0 queue free %	100				100	100
cM capacity (veh/h)	1592				969	1063
Direction, Lane #	EB 1	WB 1	SB 1			
Volume Total	26	23	5			
Volume Left	0	0	4			
Volume Right	0	14	1			
cSH	1592	1700	987			
Volume to Capacity	0.00	0.01	0.01			
Queue Length 95th (m)	0.0	0.0	0.1			
Control Delay (s)	0.0	0.0	8.7			
Lane LOS			A			
Approach Delay (s)	0.0	0.0	8.7			
Approach LOS			A			
Intersection Summary						
Average Delay			0.8			
Intersection Capacity Utilization			13.3%	ICU Level of Service		A
Analysis Period (min)			15			

HCM Unsignalized Intersection Capacity Analysis

3: Essa Rd

11-28-2023

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	3	22	3	13	9	8	5	137	28	18	176	6
Future Volume (Veh/h)	3	22	3	13	9	8	5	137	28	18	176	6
Sign Control		Stop			Stop			Free			Free	
Grade		0%			0%			0%			0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	3	24	3	14	10	9	5	149	30	20	191	7
Pedestrians												
Lane Width (m)												
Walking Speed (m/s)												
Percent Blockage												
Right turn flare (veh)												
Median type								None			None	
Median storage veh												
Upstream signal (m)												
pX, platoon unblocked												
vC, conflicting volume	408	424	194	420	412	164	198			179		
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	408	424	194	420	412	164	198			179		
tC, single (s)	7.1	6.5	6.2	7.1	6.5	6.2	4.1			4.1		
tC, 2 stage (s)												
tF (s)	3.5	4.0	3.3	3.5	4.0	3.3	2.2			2.2		
p0 queue free %	99	95	100	97	98	99	100			99		
cM capacity (veh/h)	533	513	847	515	520	881	1375			1397		
Direction, Lane #	EB 1	WB 1	NB 1	NB 2	SB 1	SB 2						
Volume Total	30	33	5	179	20	198						
Volume Left	3	14	5	0	20	0						
Volume Right	3	9	0	30	0	7						
cSH	536	583	1375	1700	1397	1700						
Volume to Capacity	0.06	0.06	0.00	0.11	0.01	0.12						
Queue Length 95th (m)	1.4	1.4	0.1	0.0	0.3	0.0						
Control Delay (s)	12.1	11.5	7.6	0.0	7.6	0.0						
Lane LOS	B	B	A		A							
Approach Delay (s)	12.1	11.5	0.2		0.7							
Approach LOS	B	B										
Intersection Summary												
Average Delay			2.0									
Intersection Capacity Utilization			26.3%		ICU Level of Service				A			
Analysis Period (min)			15									

HCM Unsignalized Intersection Capacity Analysis

4: Koda St & Essa Rd

11-28-2023

						
Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Traffic Volume (veh/h)	23	10	6	142	191	7
Future Volume (Veh/h)	23	10	6	142	191	7
Sign Control	Stop			Free	Free	
Grade	0%			0%	0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	25	11	7	154	208	8
Pedestrians						
Lane Width (m)						
Walking Speed (m/s)						
Percent Blockage						
Right turn flare (veh)						
Median type				None	None	
Median storage veh						
Upstream signal (m)						
pX, platoon unblocked						
vC, conflicting volume	380	212	216			
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	380	212	216			
tC, single (s)	6.4	6.2	4.1			
tC, 2 stage (s)						
tF (s)	3.5	3.3	2.2			
p0 queue free %	96	99	99			
cM capacity (veh/h)	619	828	1354			
Direction, Lane #	EB 1	NB 1	SB 1			
Volume Total	36	161	216			
Volume Left	25	7	0			
Volume Right	11	0	8			
cSH	671	1354	1700			
Volume to Capacity	0.05	0.01	0.13			
Queue Length 95th (m)	1.4	0.1	0.0			
Control Delay (s)	10.7	0.4	0.0			
Lane LOS	B	A				
Approach Delay (s)	10.7	0.4	0.0			
Approach LOS	B					
Intersection Summary						
Average Delay		1.1				
Intersection Capacity Utilization		22.3%		ICU Level of Service		A
Analysis Period (min)		15				

HCM Unsignalized Intersection Capacity Analysis

5: Essa Rd & Mabern St

11-28-2023

						
Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Traffic Volume (veh/h)	132	81	25	140	117	38
Future Volume (Veh/h)	132	81	25	140	117	38
Sign Control	Stop			Free	Free	
Grade	0%			0%	0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	143	88	27	152	127	41
Pedestrians						
Lane Width (m)						
Walking Speed (m/s)						
Percent Blockage						
Right turn flare (veh)						
Median type				None	None	
Median storage veh						
Upstream signal (m)						
pX, platoon unblocked						
vC, conflicting volume	354	148	168			
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	354	148	168			
tC, single (s)	6.4	6.2	4.1			
tC, 2 stage (s)						
tF (s)	3.5	3.3	2.2			
p0 queue free %	77	90	98			
cM capacity (veh/h)	632	899	1410			
Direction, Lane #	EB 1	NB 1	NB 2	SB 1		
Volume Total	231	27	152	168		
Volume Left	143	27	0	0		
Volume Right	88	0	0	41		
cSH	713	1410	1700	1700		
Volume to Capacity	0.32	0.02	0.09	0.10		
Queue Length 95th (m)	11.2	0.5	0.0	0.0		
Control Delay (s)	12.5	7.6	0.0	0.0		
Lane LOS	B	A				
Approach Delay (s)	12.5	1.1		0.0		
Approach LOS	B					
Intersection Summary						
Average Delay			5.3			
Intersection Capacity Utilization			34.1%	ICU Level of Service		A
Analysis Period (min)			15			

HCM Unsignalized Intersection Capacity Analysis

6: Essa Rd & Athabaska Rd

11-28-2023

						
Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Traffic Volume (veh/h)	81	39	11	257	112	21
Future Volume (Veh/h)	81	39	11	257	112	21
Sign Control	Stop			Free	Free	
Grade	0%			0%	0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	88	42	12	279	122	23
Pedestrians						
Lane Width (m)						
Walking Speed (m/s)						
Percent Blockage						
Right turn flare (veh)						
Median type				None	None	
Median storage veh						
Upstream signal (m)						
pX, platoon unblocked						
vC, conflicting volume	425	122	145			
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	425	122	145			
tC, single (s)	6.4	6.2	4.1			
tC, 2 stage (s)						
tF (s)	3.5	3.3	2.2			
p0 queue free %	85	95	99			
cM capacity (veh/h)	581	929	1437			
Direction, Lane #	EB 1	NB 1	NB 2	SB 1	SB 2	
Volume Total	130	12	279	122	23	
Volume Left	88	12	0	0	0	
Volume Right	42	0	0	0	23	
cSH	661	1437	1700	1700	1700	
Volume to Capacity	0.20	0.01	0.16	0.07	0.01	
Queue Length 95th (m)	5.8	0.2	0.0	0.0	0.0	
Control Delay (s)	11.8	7.5	0.0	0.0	0.0	
Lane LOS	B	A				
Approach Delay (s)	11.8	0.3		0.0		
Approach LOS	B					
Intersection Summary						
Average Delay			2.9			
Intersection Capacity Utilization			27.1%	ICU Level of Service		A
Analysis Period (min)			15			

HCM Unsignalized Intersection Capacity Analysis

1: Salem Rd & County Road 27

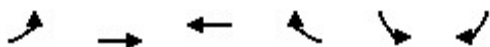
11-28-2023

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	0	0	1	3	0	66	0	323	34	13	159	0
Future Volume (Veh/h)	0	0	1	3	0	66	0	323	34	13	159	0
Sign Control		Stop			Stop			Free			Free	
Grade		0%			0%			0%			0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	0	0	1	3	0	72	0	351	37	14	173	0
Pedestrians												
Lane Width (m)												
Walking Speed (m/s)												
Percent Blockage												
Right turn flare (veh)												
Median type								None			None	
Median storage (veh)												
Upstream signal (m)												
pX, platoon unblocked												
vC, conflicting volume	642	589	173	572	570	370	173			388		
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	642	589	173	572	570	370	173			388		
tC, single (s)	7.1	6.5	6.2	7.1	6.5	6.2	4.1			4.1		
tC, 2 stage (s)												
tF (s)	3.5	4.0	3.3	3.5	4.0	3.3	2.2			2.2		
p0 queue free %	100	100	100	99	100	89	100			99		
cM capacity (veh/h)	342	416	871	427	426	676	1404			1170		
Direction, Lane #	EB 1	WB 1	NB 1	SB 1								
Volume Total	1	75	388	187								
Volume Left	0	3	0	14								
Volume Right	1	72	37	0								
cSH	871	661	1404	1170								
Volume to Capacity	0.00	0.11	0.00	0.01								
Queue Length 95th (m)	0.0	3.1	0.0	0.3								
Control Delay (s)	9.1	11.1	0.0	0.7								
Lane LOS	A	B		A								
Approach Delay (s)	9.1	11.1	0.0	0.7								
Approach LOS	A	B										
Intersection Summary												
Average Delay			1.5									
Intersection Capacity Utilization			32.7%		ICU Level of Service					A		
Analysis Period (min)			15									

HCM Unsignalized Intersection Capacity Analysis

2: Salem Rd & Brown Bear St

11-28-2023



Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations		↕	↕		↕	
Traffic Volume (veh/h)	0	44	64	53	4	1
Future Volume (Veh/h)	0	44	64	53	4	1
Sign Control		Free	Free		Stop	
Grade		0%	0%		0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	0	48	70	58	4	1
Pedestrians						
Lane Width (m)						
Walking Speed (m/s)						
Percent Blockage						
Right turn flare (veh)						
Median type		None	None			
Median storage veh						
Upstream signal (m)						
pX, platoon unblocked						
vC, conflicting volume	128				147	99
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	128				147	99
tC, single (s)	4.1				6.4	6.2
tC, 2 stage (s)						
tF (s)	2.2				3.5	3.3
p0 queue free %	100				100	100
cM capacity (veh/h)	1458				845	957
Direction, Lane #	EB 1	WB 1	SB 1			
Volume Total	48	128	5			
Volume Left	0	0	4			
Volume Right	0	58	1			
cSH	1458	1700	865			
Volume to Capacity	0.00	0.08	0.01			
Queue Length 95th (m)	0.0	0.0	0.1			
Control Delay (s)	0.0	0.0	9.2			
Lane LOS			A			
Approach Delay (s)	0.0	0.0	9.2			
Approach LOS			A			
Intersection Summary						
Average Delay			0.3			
Intersection Capacity Utilization			16.6%	ICU Level of Service		A
Analysis Period (min)			15			

HCM Unsignalized Intersection Capacity Analysis

3: Essa Rd & Salem Rd

11-28-2023

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	5	40	3	23	106	30	3	290	24	18	237	8
Future Volume (Veh/h)	5	40	3	23	106	30	3	290	24	18	237	8
Sign Control	Stop			Stop			Free			Free		
Grade	0%			0%			0%			0%		
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	5	43	3	25	115	33	3	315	26	20	258	9
Pedestrians												
Lane Width (m)												
Walking Speed (m/s)												
Percent Blockage												
Right turn flare (veh)												
Median type	None						None					
Median storage veh												
Upstream signal (m)												
pX, platoon unblocked												
vC, conflicting volume	714	650	262	656	641	328	267	341				
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	714	650	262	656	641	328	267	341				
tC, single (s)	7.1	6.5	6.2	7.1	6.5	6.2	4.1	4.1				
tC, 2 stage (s)												
tF (s)	3.5	4.0	3.3	3.5	4.0	3.3	2.2	2.2				
p0 queue free %	98	89	100	93	70	95	100	98				
cM capacity (veh/h)	251	381	776	340	386	713	1297	1218				
Direction, Lane #	EB 1	WB 1	NB 1	NB 2	SB 1	SB 2						
Volume Total	51	173	3	341	20	267						
Volume Left	5	25	3	0	20	0						
Volume Right	3	33	0	26	0	9						
cSH	373	414	1297	1700	1218	1700						
Volume to Capacity	0.14	0.42	0.00	0.20	0.02	0.16						
Queue Length 95th (m)	3.8	16.2	0.1	0.0	0.4	0.0						
Control Delay (s)	16.2	19.8	7.8	0.0	8.0	0.0						
Lane LOS	C	C	A	A								
Approach Delay (s)	16.2	19.8	0.1	0.6								
Approach LOS	C	C										
Intersection Summary												
Average Delay	5.2											
Intersection Capacity Utilization	36.2%			ICU Level of Service					A			
Analysis Period (min)	15											

HCM Unsignalized Intersection Capacity Analysis

4: Koda St & Essa Rd

11-28-2023

						
Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Traffic Volume (veh/h)	17	7	20	306	256	32
Future Volume (Veh/h)	17	7	20	306	256	32
Sign Control	Stop			Free	Free	
Grade	0%			0%	0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	18	8	22	333	278	35
Pedestrians						
Lane Width (m)						
Walking Speed (m/s)						
Percent Blockage						
Right turn flare (veh)						
Median type				None	None	
Median storage veh						
Upstream signal (m)						
pX, platoon unblocked						
vC, conflicting volume	672	296	313			
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	672	296	313			
tC, single (s)	6.4	6.2	4.1			
tC, 2 stage (s)						
tF (s)	3.5	3.3	2.2			
p0 queue free %	96	99	98			
cM capacity (veh/h)	413	744	1247			
Direction, Lane #	EB 1	NB 1	SB 1			
Volume Total	26	355	313			
Volume Left	18	22	0			
Volume Right	8	0	35			
cSH	479	1247	1700			
Volume to Capacity	0.05	0.02	0.18			
Queue Length 95th (m)	1.4	0.4	0.0			
Control Delay (s)	12.9	0.7	0.0			
Lane LOS	B	A				
Approach Delay (s)	12.9	0.7	0.0			
Approach LOS	B					
Intersection Summary						
Average Delay		0.8				
Intersection Capacity Utilization		42.5%		ICU Level of Service		A
Analysis Period (min)		15				

HCM Unsignalized Intersection Capacity Analysis

5: Essa Rd & Mabern St

11-28-2023

						
Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Traffic Volume (veh/h)	87	59	84	239	229	136
Future Volume (Veh/h)	87	59	84	239	229	136
Sign Control	Stop			Free	Free	
Grade	0%			0%	0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	95	64	91	260	249	148
Pedestrians						
Lane Width (m)						
Walking Speed (m/s)						
Percent Blockage						
Right turn flare (veh)						
Median type				None	None	
Median storage veh						
Upstream signal (m)						
pX, platoon unblocked						
vC, conflicting volume	765	323	397			
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	765	323	397			
tC, single (s)	6.4	6.2	4.1			
tC, 2 stage (s)						
tF (s)	3.5	3.3	2.2			
p0 queue free %	72	91	92			
cM capacity (veh/h)	342	718	1162			
Direction, Lane #	EB 1	NB 1	NB 2	SB 1		
Volume Total	159	91	260	397		
Volume Left	95	91	0	0		
Volume Right	64	0	0	148		
cSH	434	1162	1700	1700		
Volume to Capacity	0.37	0.08	0.15	0.23		
Queue Length 95th (m)	13.3	2.0	0.0	0.0		
Control Delay (s)	18.0	8.4	0.0	0.0		
Lane LOS	C	A				
Approach Delay (s)	18.0	2.2		0.0		
Approach LOS	C					
Intersection Summary						
Average Delay			4.0			
Intersection Capacity Utilization			43.4%		ICU Level of Service	A
Analysis Period (min)			15			

HCM Unsignalized Intersection Capacity Analysis

6: Essa Rd & Athabaska Rd

11-28-2023

						
Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Traffic Volume (veh/h)	61	20	53	269	341	112
Future Volume (Veh/h)	61	20	53	269	341	112
Sign Control	Stop			Free	Free	
Grade	0%			0%	0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	66	22	58	292	371	122
Pedestrians						
Lane Width (m)						
Walking Speed (m/s)						
Percent Blockage						
Right turn flare (veh)						
Median type				None	None	
Median storage veh						
Upstream signal (m)						
pX, platoon unblocked						
vC, conflicting volume	779	371	493			
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	779	371	493			
tC, single (s)	6.4	6.2	4.1			
tC, 2 stage (s)						
tF (s)	3.5	3.3	2.2			
p0 queue free %	81	97	95			
cM capacity (veh/h)	345	675	1071			
Direction, Lane #	EB 1	NB 1	NB 2	SB 1	SB 2	
Volume Total	88	58	292	371	122	
Volume Left	66	58	0	0	0	
Volume Right	22	0	0	0	122	
cSH	393	1071	1700	1700	1700	
Volume to Capacity	0.22	0.05	0.17	0.22	0.07	
Queue Length 95th (m)	6.8	1.4	0.0	0.0	0.0	
Control Delay (s)	16.8	8.6	0.0	0.0	0.0	
Lane LOS	C	A				
Approach Delay (s)	16.8	1.4		0.0		
Approach LOS	C					
Intersection Summary						
Average Delay			2.1			
Intersection Capacity Utilization			35.9%		ICU Level of Service	
					A	
Analysis Period (min)			15			

Summary of All Intervals

Run Number	1	2	3	4	5	Avg
Start Time	6:30	6:30	6:30	6:30	6:30	6:30
End Time	8:00	8:00	8:00	8:00	8:00	8:00
Total Time (min)	90	90	90	90	90	90
Time Recorded (min)	60	60	60	60	60	60
# of Intervals	2	2	2	2	2	2
# of Recorded Intervals	1	1	1	1	1	1
Vehs Entered	1053	1103	1121	1079	1135	1099
Vehs Exited	1049	1099	1126	1081	1130	1097
Starting Vehs	17	19	29	22	17	20
Ending Vehs	21	23	24	20	22	17
Travel Distance (km)	1156	1201	1224	1188	1244	1203
Travel Time (hr)	21.5	22.3	22.8	22.3	23.2	22.4
Total Delay (hr)	1.2	1.4	1.4	1.3	1.4	1.3
Total Stops	455	475	493	455	475	471
Fuel Used (l)	83.5	88.0	88.7	86.7	89.8	87.3

Interval #0 Information Seeding

Start Time	6:30
End Time	7:00
Total Time (min)	30
Volumes adjusted by Growth Factors.	
No data recorded this interval.	

Interval #1 Information Recording

Start Time	7:00
End Time	8:00
Total Time (min)	60
Volumes adjusted by Growth Factors.	

Run Number	1	2	3	4	5	Avg
Vehs Entered	1053	1103	1121	1079	1135	1099
Vehs Exited	1049	1099	1126	1081	1130	1097
Starting Vehs	17	19	29	22	17	20
Ending Vehs	21	23	24	20	22	17
Travel Distance (km)	1156	1201	1224	1188	1244	1203
Travel Time (hr)	21.5	22.3	22.8	22.3	23.2	22.4
Total Delay (hr)	1.2	1.4	1.4	1.3	1.4	1.3
Total Stops	455	475	493	455	475	471
Fuel Used (l)	83.5	88.0	88.7	86.7	89.8	87.3

Intersection: 1: Salem Rd & County Road 27

Movement	EB	WB	SB
Directions Served	LTR	LTR	LTR
Maximum Queue (m)	3.5	9.3	6.5
Average Queue (m)	0.2	2.3	0.3
95th Queue (m)	2.2	8.0	2.8
Link Distance (m)	95.4	608.8	326.4
Upstream Blk Time (%)			
Queuing Penalty (veh)			
Storage Bay Dist (m)			
Storage Blk Time (%)			
Queuing Penalty (veh)			

Intersection: 2: Salem Rd & Brown Bear St

Movement	SB
Directions Served	LR
Maximum Queue (m)	10.5
Average Queue (m)	1.6
95th Queue (m)	7.5
Link Distance (m)	19.4
Upstream Blk Time (%)	0
Queuing Penalty (veh)	0
Storage Bay Dist (m)	
Storage Blk Time (%)	
Queuing Penalty (veh)	

Intersection: 3: Essa Rd

Movement	EB	WB	NB	SB
Directions Served	LTR	LTR	L	L
Maximum Queue (m)	7.2	11.2	1.6	3.7
Average Queue (m)	4.0	4.7	0.1	0.3
95th Queue (m)	9.1	10.2	0.7	2.0
Link Distance (m)	152.6	662.2		
Upstream Blk Time (%)				
Queuing Penalty (veh)				
Storage Bay Dist (m)			74.0	74.0
Storage Blk Time (%)				
Queuing Penalty (veh)				

Intersection: 4: Koda St & Essa Rd

Movement	EB	NB
Directions Served	LR	LT
Maximum Queue (m)	11.7	5.0
Average Queue (m)	6.3	0.2
95th Queue (m)	13.4	2.1
Link Distance (m)	67.4	100.4
Upstream Blk Time (%)		
Queuing Penalty (veh)		
Storage Bay Dist (m)		
Storage Blk Time (%)		
Queuing Penalty (veh)		

Intersection: 5: Essa Rd & Mabern St

Movement	EB	NB	SB
Directions Served	LR	L	TR
Maximum Queue (m)	30.3	10.0	1.2
Average Queue (m)	15.6	1.0	0.0
95th Queue (m)	24.8	5.7	0.8
Link Distance (m)	69.7		493.2
Upstream Blk Time (%)			
Queuing Penalty (veh)			
Storage Bay Dist (m)		88.0	
Storage Blk Time (%)			
Queuing Penalty (veh)			

Intersection: 6: Essa Rd & Athabaska Rd

Movement	EB	NB	SB
Directions Served	LR	L	T
Maximum Queue (m)	20.5	7.3	1.4
Average Queue (m)	9.4	0.4	0.0
95th Queue (m)	16.0	3.6	0.9
Link Distance (m)	132.1		319.0
Upstream Blk Time (%)			
Queuing Penalty (veh)			
Storage Bay Dist (m)		77.0	
Storage Blk Time (%)			
Queuing Penalty (veh)			

Network Summary

Network wide Queuing Penalty: 0

Summary of All Intervals

Run Number	1	2	3	4	5	Avg
Start Time	4:30	4:30	4:30	4:30	4:30	4:30
End Time	6:00	6:00	6:00	6:00	6:00	6:00
Total Time (min)	90	90	90	90	90	90
Time Recorded (min)	60	60	60	60	60	60
# of Intervals	2	2	2	2	2	2
# of Recorded Intervals	1	1	1	1	1	1
Vehs Entered	1687	1784	1623	1633	1662	1678
Vehs Exited	1676	1788	1617	1632	1669	1676
Starting Vehs	37	36	35	35	42	38
Ending Vehs	48	32	41	36	35	40
Travel Distance (km)	1936	2092	1910	1917	1924	1956
Travel Time (hr)	37.5	40.3	36.2	36.8	37.0	37.6
Total Delay (hr)	3.1	3.5	2.8	3.0	3.0	3.1
Total Stops	643	629	545	538	582	587
Fuel Used (l)	143.1	156.3	142.0	142.6	142.6	145.3

Interval #0 Information Seeding

Start Time	4:30
End Time	5:00
Total Time (min)	30
Volumes adjusted by Growth Factors.	
No data recorded this interval.	

Interval #1 Information Recording

Start Time	5:00
End Time	6:00
Total Time (min)	60
Volumes adjusted by Growth Factors.	

Run Number	1	2	3	4	5	Avg
Vehs Entered	1687	1784	1623	1633	1662	1678
Vehs Exited	1676	1788	1617	1632	1669	1676
Starting Vehs	37	36	35	35	42	38
Ending Vehs	48	32	41	36	35	40
Travel Distance (km)	1936	2092	1910	1917	1924	1956
Travel Time (hr)	37.5	40.3	36.2	36.8	37.0	37.6
Total Delay (hr)	3.1	3.5	2.8	3.0	3.0	3.1
Total Stops	643	629	545	538	582	587
Fuel Used (l)	143.1	156.3	142.0	142.6	142.6	145.3

Queuing and Blocking Report

Baseline

11-28-2023

Intersection: 1: Salem Rd & County Road 27

Movement	EB	WB	SB
Directions Served	LTR	LTR	LTR
Maximum Queue (m)	3.5	14.3	6.7
Average Queue (m)	0.3	7.1	0.7
95th Queue (m)	2.8	12.3	4.1
Link Distance (m)	95.4	608.8	326.4
Upstream Blk Time (%)			
Queuing Penalty (veh)			
Storage Bay Dist (m)			
Storage Blk Time (%)			
Queuing Penalty (veh)			

Intersection: 2: Salem Rd & Brown Bear St

Movement	SB
Directions Served	LR
Maximum Queue (m)	8.8
Average Queue (m)	1.2
95th Queue (m)	6.3
Link Distance (m)	19.4
Upstream Blk Time (%)	
Queuing Penalty (veh)	
Storage Bay Dist (m)	
Storage Blk Time (%)	
Queuing Penalty (veh)	

Intersection: 3: Essa Rd

Movement	EB	WB	NB	SB	SB
Directions Served	LTR	LTR	L	L	TR
Maximum Queue (m)	20.4	31.7	0.8	5.3	1.2
Average Queue (m)	6.1	12.8	0.0	0.8	0.0
95th Queue (m)	13.4	23.8	0.5	3.6	0.8
Link Distance (m)	152.6	662.2			100.4
Upstream Blk Time (%)					
Queuing Penalty (veh)					
Storage Bay Dist (m)			74.0	74.0	
Storage Blk Time (%)					
Queuing Penalty (veh)					

Queuing and Blocking Report

Baseline

11-28-2023

Intersection: 4: Koda St & Essa Rd

Movement	EB	NB
Directions Served	LR	LT
Maximum Queue (m)	10.6	15.6
Average Queue (m)	5.1	1.6
95th Queue (m)	12.6	8.3
Link Distance (m)	67.4	100.4
Upstream Blk Time (%)		
Queuing Penalty (veh)		
Storage Bay Dist (m)		
Storage Blk Time (%)		
Queuing Penalty (veh)		

Intersection: 5: Essa Rd & Mabern St

Movement	EB	NB	SB
Directions Served	LR	L	TR
Maximum Queue (m)	26.4	16.8	3.0
Average Queue (m)	13.1	5.8	0.2
95th Queue (m)	21.2	14.2	2.1
Link Distance (m)	69.7		493.2
Upstream Blk Time (%)			
Queuing Penalty (veh)			
Storage Bay Dist (m)		88.0	
Storage Blk Time (%)			
Queuing Penalty (veh)			

Intersection: 6: Essa Rd & Athabaska Rd

Movement	EB	NB	SB
Directions Served	LR	L	R
Maximum Queue (m)	18.1	15.7	1.3
Average Queue (m)	8.0	4.6	0.0
95th Queue (m)	15.0	13.2	0.9
Link Distance (m)	132.1		
Upstream Blk Time (%)			
Queuing Penalty (veh)			
Storage Bay Dist (m)		77.0	27.0
Storage Blk Time (%)			
Queuing Penalty (veh)			

Network Summary

Network wide Queuing Penalty: 0

B.2 Background Traffic

HCM Unsignalized Intersection Capacity Analysis

1: Salem Rd & County Road 27

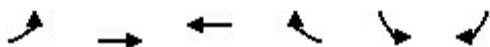
11-27-2023

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	0	1	0	12	0	6	0	177	20	18	226	0
Future Volume (Veh/h)	0	1	0	12	0	6	0	177	20	18	226	0
Sign Control	Stop			Stop			Free			Free		
Grade	0%			0%			0%			0%		
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	0	1	0	13	0	7	0	192	22	20	246	0
Pedestrians												
Lane Width (m)												
Walking Speed (m/s)												
Percent Blockage												
Right turn flare (veh)												
Median type							None			None		
Median storage veh												
Upstream signal (m)												
pX, platoon unblocked												
vC, conflicting volume	496	500	246	490	489	203	246				214	
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	496	500	246	490	489	203	246				214	
tC, single (s)	7.1	6.5	6.2	7.1	6.5	6.2	4.1				4.1	
tC, 2 stage (s)												
tF (s)	3.5	4.0	3.3	3.5	4.0	3.3	2.2				2.2	
p0 queue free %	100	100	100	97	100	99	100				99	
cM capacity (veh/h)	475	466	793	483	472	838	1320				1356	
Direction, Lane #	EB 1	WB 1	NB 1	SB 1								
Volume Total	1	20	214	266								
Volume Left	0	13	0	20								
Volume Right	0	7	22	0								
cSH	466	567	1320	1356								
Volume to Capacity	0.00	0.04	0.00	0.01								
Queue Length 95th (m)	0.1	0.9	0.0	0.4								
Control Delay (s)	12.7	11.6	0.0	0.7								
Lane LOS	B	B		A								
Approach Delay (s)	12.7	11.6	0.0	0.7								
Approach LOS	B	B										
Intersection Summary												
Average Delay				0.9								
Intersection Capacity Utilization				41.1%	ICU Level of Service				A			
Analysis Period (min)				15								

HCM Unsignalized Intersection Capacity Analysis

2: Salem Rd & Brown Bear St

11-27-2023



Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Volume (veh/h)	0	36	12	15	4	1
Future Volume (Veh/h)	0	36	12	15	4	1
Sign Control		Free	Free		Stop	
Grade		0%	0%		0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	0	39	13	16	4	1
Pedestrians						
Lane Width (m)						
Walking Speed (m/s)						
Percent Blockage						
Right turn flare (veh)						
Median type		None	None			
Median storage veh						
Upstream signal (m)						
pX, platoon unblocked						
vC, conflicting volume	29				60	21
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	29				60	21
tC, single (s)	4.1				6.4	6.2
tC, 2 stage (s)						
tF (s)	2.2				3.5	3.3
p0 queue free %	100				100	100
cM capacity (veh/h)	1584				947	1056
Direction, Lane #	EB 1	WB 1	SB 1			
Volume Total	39	29	5			
Volume Left	0	0	4			
Volume Right	0	16	1			
cSH	1584	1700	967			
Volume to Capacity	0.00	0.02	0.01			
Queue Length 95th (m)	0.0	0.0	0.1			
Control Delay (s)	0.0	0.0	8.7			
Lane LOS			A			
Approach Delay (s)	0.0	0.0	8.7			
Approach LOS			A			
Intersection Summary						
Average Delay			0.6			
Intersection Capacity Utilization		13.3%		ICU Level of Service		A
Analysis Period (min)		15				

HCM Unsignalized Intersection Capacity Analysis

3: Essa Rd & Salem Rd

11-27-2023

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	4	32	4	14	14	8	6	152	31	20	195	7
Future Volume (Veh/h)	4	32	4	14	14	8	6	152	31	20	195	7
Sign Control		Stop			Stop			Free			Free	
Grade		0%			0%			0%			0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	4	35	4	15	15	9	7	165	34	22	212	8
Pedestrians												
Lane Width (m)												
Walking Speed (m/s)												
Percent Blockage												
Right turn flare (veh)												
Median type	None								None			
Median storage veh												
Upstream signal (m)												
pX, platoon unblocked												
vC, conflicting volume	456	473	216	474	460	182	220	199				
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	456	473	216	474	460	182	220	199				
tC, single (s)	7.1	6.5	6.2	7.1	6.5	6.2	4.1	4.1				
tC, 2 stage (s)												
tF (s)	3.5	4.0	3.3	3.5	4.0	3.3	2.2	2.2				
p0 queue free %	99	93	100	97	97	99	99	98				
cM capacity (veh/h)	490	479	824	463	487	861	1349	1373				
Direction, Lane #	EB 1	WB 1	NB 1	NB 2	SB 1	SB 2						
Volume Total	43	39	7	199	22	220						
Volume Left	4	15	7	0	22	0						
Volume Right	4	9	0	34	0	8						
cSH	500	530	1349	1700	1373	1700						
Volume to Capacity	0.09	0.07	0.01	0.12	0.02	0.13						
Queue Length 95th (m)	2.2	1.9	0.1	0.0	0.4	0.0						
Control Delay (s)	12.9	12.3	7.7	0.0	7.7	0.0						
Lane LOS	B	B	A		A							
Approach Delay (s)	12.9	12.3	0.3		0.7							
Approach LOS	B	B										
Intersection Summary												
Average Delay			2.4									
Intersection Capacity Utilization			28.6%	ICU Level of Service				A				
Analysis Period (min)			15									

HCM Unsignalized Intersection Capacity Analysis

4: Koda St & Essa Rd

11-27-2023

						
Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Traffic Volume (veh/h)	26	11	7	157	211	8
Future Volume (Veh/h)	26	11	7	157	211	8
Sign Control	Stop			Free	Free	
Grade	0%			0%	0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	28	12	8	171	229	9
Pedestrians						
Lane Width (m)						
Walking Speed (m/s)						
Percent Blockage						
Right turn flare (veh)						
Median type				None	None	
Median storage (veh)						
Upstream signal (m)						
pX, platoon unblocked						
vC, conflicting volume	420	234	238			
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	420	234	238			
tC, single (s)	6.4	6.2	4.1			
tC, 2 stage (s)						
tF (s)	3.5	3.3	2.2			
p0 queue free %	95	99	99			
cM capacity (veh/h)	586	806	1329			
Direction, Lane #	EB 1	NB 1	SB 1			
Volume Total	40	179	238			
Volume Left	28	8	0			
Volume Right	12	0	9			
cSH	638	1329	1700			
Volume to Capacity	0.06	0.01	0.14			
Queue Length 95th (m)	1.6	0.1	0.0			
Control Delay (s)	11.0	0.4	0.0			
Lane LOS	B	A				
Approach Delay (s)	11.0	0.4	0.0			
Approach LOS	B					
Intersection Summary						
Average Delay		1.1				
Intersection Capacity Utilization		23.9%		ICU Level of Service		A
Analysis Period (min)		15				

HCM Unsignalized Intersection Capacity Analysis

5: Essa Rd & Mabern St

11-27-2023

						
Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Traffic Volume (veh/h)	146	89	28	155	130	42
Future Volume (Veh/h)	146	89	28	155	130	42
Sign Control	Stop			Free	Free	
Grade	0%			0%	0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	159	97	30	168	141	46
Pedestrians						
Lane Width (m)						
Walking Speed (m/s)						
Percent Blockage						
Right turn flare (veh)						
Median type				None	None	
Median storage veh						
Upstream signal (m)						
pX, platoon unblocked						
vC, conflicting volume	392	164	187			
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	392	164	187			
tC, single (s)	6.4	6.2	4.1			
tC, 2 stage (s)						
tF (s)	3.5	3.3	2.2			
p0 queue free %	73	89	98			
cM capacity (veh/h)	599	881	1387			
Direction, Lane #	EB 1	NB 1	NB 2	SB 1		
Volume Total	256	30	168	187		
Volume Left	159	30	0	0		
Volume Right	97	0	0	46		
cSH	682	1387	1700	1700		
Volume to Capacity	0.38	0.02	0.10	0.11		
Queue Length 95th (m)	14.0	0.5	0.0	0.0		
Control Delay (s)	13.4	7.7	0.0	0.0		
Lane LOS	B	A				
Approach Delay (s)	13.4	1.2		0.0		
Approach LOS	B					
Intersection Summary						
Average Delay			5.7			
Intersection Capacity Utilization			36.3%	ICU Level of Service		A
Analysis Period (min)			15			

HCM Unsignalized Intersection Capacity Analysis

6: Essa Rd & Athabaska Rd

11-27-2023

						
Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Traffic Volume (veh/h)	89	43	12	284	124	23
Future Volume (Veh/h)	89	43	12	284	124	23
Sign Control	Stop			Free	Free	
Grade	0%			0%	0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	97	47	13	309	135	25
Pedestrians						
Lane Width (m)						
Walking Speed (m/s)						
Percent Blockage						
Right turn flare (veh)						
Median type				None	None	
Median storage veh						
Upstream signal (m)						
pX, platoon unblocked						
vC, conflicting volume	470	135	160			
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	470	135	160			
tC, single (s)	6.4	6.2	4.1			
tC, 2 stage (s)						
tF (s)	3.5	3.3	2.2			
p0 queue free %	82	95	99			
cM capacity (veh/h)	547	914	1419			
Direction, Lane #	EB 1	NB 1	NB 2	SB 1	SB 2	
Volume Total	144	13	309	135	25	
Volume Left	97	13	0	0	0	
Volume Right	47	0	0	0	25	
cSH	629	1419	1700	1700	1700	
Volume to Capacity	0.23	0.01	0.18	0.08	0.01	
Queue Length 95th (m)	7.0	0.2	0.0	0.0	0.0	
Control Delay (s)	12.4	7.6	0.0	0.0	0.0	
Lane LOS	B	A				
Approach Delay (s)	12.4	0.3		0.0		
Approach LOS	B					
Intersection Summary						
Average Delay			3.0			
Intersection Capacity Utilization			29.2%		ICU Level of Service	
					A	
Analysis Period (min)			15			

HCM Unsignalized Intersection Capacity Analysis

1: Salem Rd & County Road 27

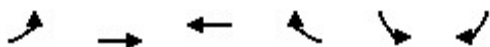
11-27-2023

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	0	0	1	11	0	103	0	357	53	15	176	0
Future Volume (Veh/h)	0	0	1	11	0	103	0	357	53	15	176	0
Sign Control	Stop			Stop			Free			Free		
Grade	0%			0%			0%			0%		
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	0	0	1	12	0	112	0	388	58	16	191	0
Pedestrians												
Lane Width (m)												
Walking Speed (m/s)												
Percent Blockage												
Right turn flare (veh)												
Median type							None			None		
Median storage veh												
Upstream signal (m)												
pX, platoon unblocked												
vC, conflicting volume	752	669	191	641	640	417	191				446	
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	752	669	191	641	640	417	191				446	
tC, single (s)	7.1	6.5	6.2	7.1	6.5	6.2	4.1				4.1	
tC, 2 stage (s)												
tF (s)	3.5	4.0	3.3	3.5	4.0	3.3	2.2				2.2	
p0 queue free %	100	100	100	97	100	82	100				99	
cM capacity (veh/h)	266	373	851	383	388	636	1383				1114	
Direction, Lane #	EB 1	WB 1	NB 1	SB 1								
Volume Total	1	124	446	207								
Volume Left	0	12	0	16								
Volume Right	1	112	58	0								
cSH	851	598	1383	1114								
Volume to Capacity	0.00	0.21	0.00	0.01								
Queue Length 95th (m)	0.0	6.2	0.0	0.3								
Control Delay (s)	9.2	12.6	0.0	0.8								
Lane LOS	A	B		A								
Approach Delay (s)	9.2	12.6	0.0	0.8								
Approach LOS	A	B										
Intersection Summary												
Average Delay				2.2								
Intersection Capacity Utilization				42.3%	ICU Level of Service				A			
Analysis Period (min)				15								

HCM Unsignalized Intersection Capacity Analysis

2: Salem Rd & Brown Bear St

11-27-2023



Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Volume (veh/h)	0	65	109	59	4	1
Future Volume (Veh/h)	0	65	109	59	4	1
Sign Control		Free	Free		Stop	
Grade		0%	0%		0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	0	71	118	64	4	1
Pedestrians						
Lane Width (m)						
Walking Speed (m/s)						
Percent Blockage						
Right turn flare (veh)						
Median type		None	None			
Median storage veh						
Upstream signal (m)						
pX, platoon unblocked						
vC, conflicting volume	182				221	150
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	182				221	150
tC, single (s)	4.1				6.4	6.2
tC, 2 stage (s)						
tF (s)	2.2				3.5	3.3
p0 queue free %	100				99	100
cM capacity (veh/h)	1393				767	896
Direction, Lane #	EB 1	WB 1	SB 1			
Volume Total	71	182	5			
Volume Left	0	0	4			
Volume Right	0	64	1			
cSH	1393	1700	790			
Volume to Capacity	0.00	0.11	0.01			
Queue Length 95th (m)	0.0	0.0	0.2			
Control Delay (s)	0.0	0.0	9.6			
Lane LOS			A			
Approach Delay (s)	0.0	0.0	9.6			
Approach LOS			A			
Intersection Summary						
Average Delay			0.2			
Intersection Capacity Utilization			19.3%		ICU Level of Service	
Analysis Period (min)			15		A	

HCM Unsignalized Intersection Capacity Analysis

3: Essa Rd & Salem Rd

11-27-2023

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	6	59	4	25	156	33	4	322	26	20	262	8
Future Volume (Veh/h)	6	59	4	25	156	33	4	322	26	20	262	8
Sign Control		Stop			Stop			Free			Free	
Grade		0%			0%			0%			0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	7	64	4	27	170	36	4	350	28	22	285	9
Pedestrians												
Lane Width (m)												
Walking Speed (m/s)												
Percent Blockage												
Right turn flare (veh)												
Median type	None								None			
Median storage veh												
Upstream signal (m)												
pX, platoon unblocked												
vC, conflicting volume	812	720	290	737	710	364	294	378				
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	812	720	290	737	710	364	294	378				
tC, single (s)	7.1	6.5	6.2	7.1	6.5	6.2	4.1	4.1				
tC, 2 stage (s)												
tF (s)	3.5	4.0	3.3	3.5	4.0	3.3	2.2	2.2				
p0 queue free %	96	82	99	90	52	95	100	98				
cM capacity (veh/h)	172	346	750	281	351	681	1268	1180				
Direction, Lane #	EB 1	WB 1	NB 1	NB 2	SB 1	SB 2						
Volume Total	75	233	4	378	22	294						
Volume Left	7	27	4	0	22	0						
Volume Right	4	36	0	28	0	9						
cSH	325	368	1268	1700	1180	1700						
Volume to Capacity	0.23	0.63	0.00	0.22	0.02	0.17						
Queue Length 95th (m)	7.0	33.3	0.1	0.0	0.5	0.0						
Control Delay (s)	19.4	30.3	7.8	0.0	8.1	0.0						
Lane LOS	C	D	A		A							
Approach Delay (s)	19.4	30.3	0.1		0.6							
Approach LOS	C	D										
Intersection Summary												
Average Delay	8.7											
Intersection Capacity Utilization	41.9%			ICU Level of Service				A				
Analysis Period (min)	15											

HCM Unsignalized Intersection Capacity Analysis

4: Koda St & Essa Rd

11-27-2023

						
Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Traffic Volume (veh/h)	18	7	22	339	283	35
Future Volume (Veh/h)	18	7	22	339	283	35
Sign Control	Stop			Free	Free	
Grade	0%			0%	0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	20	8	24	368	308	38
Pedestrians						
Lane Width (m)						
Walking Speed (m/s)						
Percent Blockage						
Right turn flare (veh)						
Median type				None	None	
Median storage veh						
Upstream signal (m)						
pX, platoon unblocked						
vC, conflicting volume	743	327	346			
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	743	327	346			
tC, single (s)	6.4	6.2	4.1			
tC, 2 stage (s)						
tF (s)	3.5	3.3	2.2			
p0 queue free %	95	99	98			
cM capacity (veh/h)	375	714	1213			
Direction, Lane #	EB 1	NB 1	SB 1			
Volume Total	28	392	346			
Volume Left	20	24	0			
Volume Right	8	0	38			
cSH	434	1213	1700			
Volume to Capacity	0.06	0.02	0.20			
Queue Length 95th (m)	1.6	0.5	0.0			
Control Delay (s)	13.9	0.7	0.0			
Lane LOS	B	A				
Approach Delay (s)	13.9	0.7	0.0			
Approach LOS	B					
Intersection Summary						
Average Delay		0.9				
Intersection Capacity Utilization		45.9%		ICU Level of Service		A
Analysis Period (min)		15				

HCM Unsignalized Intersection Capacity Analysis

5: Essa Rd & Mabern St

11-27-2023

						
Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Traffic Volume (veh/h)	96	65	93	264	253	150
Future Volume (Veh/h)	96	65	93	264	253	150
Sign Control	Stop			Free	Free	
Grade	0%			0%	0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	104	71	101	287	275	163
Pedestrians						
Lane Width (m)						
Walking Speed (m/s)						
Percent Blockage						
Right turn flare (veh)						
Median type				None	None	
Median storage veh						
Upstream signal (m)						
pX, platoon unblocked						
vC, conflicting volume	846	356	438			
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	846	356	438			
tC, single (s)	6.4	6.2	4.1			
tC, 2 stage (s)						
tF (s)	3.5	3.3	2.2			
p0 queue free %	66	90	91			
cM capacity (veh/h)	303	688	1122			
Direction, Lane #	EB 1	NB 1	NB 2	SB 1		
Volume Total	175	101	287	438		
Volume Left	104	101	0	0		
Volume Right	71	0	0	163		
cSH	392	1122	1700	1700		
Volume to Capacity	0.45	0.09	0.17	0.26		
Queue Length 95th (m)	17.9	2.4	0.0	0.0		
Control Delay (s)	21.4	8.5	0.0	0.0		
Lane LOS	C	A				
Approach Delay (s)	21.4	2.2		0.0		
Approach LOS	C					
Intersection Summary						
Average Delay			4.6			
Intersection Capacity Utilization			46.9%	ICU Level of Service		A
Analysis Period (min)			15			

HCM Unsignalized Intersection Capacity Analysis

6: Essa Rd & Athabaska Rd

11-27-2023

						
Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Traffic Volume (veh/h)	67	22	59	297	376	124
Future Volume (Veh/h)	67	22	59	297	376	124
Sign Control	Stop			Free	Free	
Grade	0%			0%	0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	73	24	64	323	409	135
Pedestrians						
Lane Width (m)						
Walking Speed (m/s)						
Percent Blockage						
Right turn flare (veh)						
Median type				None	None	
Median storage veh						
Upstream signal (m)						
pX, platoon unblocked						
vC, conflicting volume	860	409	544			
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	860	409	544			
tC, single (s)	6.4	6.2	4.1			
tC, 2 stage (s)						
tF (s)	3.5	3.3	2.2			
p0 queue free %	76	96	94			
cM capacity (veh/h)	306	642	1025			
Direction, Lane #	EB 1	NB 1	NB 2	SB 1	SB 2	
Volume Total	97	64	323	409	135	
Volume Left	73	64	0	0	0	
Volume Right	24	0	0	0	135	
cSH	352	1025	1700	1700	1700	
Volume to Capacity	0.28	0.06	0.19	0.24	0.08	
Queue Length 95th (m)	8.8	1.6	0.0	0.0	0.0	
Control Delay (s)	19.1	8.7	0.0	0.0	0.0	
Lane LOS	C	A				
Approach Delay (s)	19.1	1.4		0.0		
Approach LOS	C					
Intersection Summary						
Average Delay			2.3			
Intersection Capacity Utilization			38.2%	ICU Level of Service		A
Analysis Period (min)			15			

HCM Unsignalized Intersection Capacity Analysis

1: Salem Rd & County Road 27

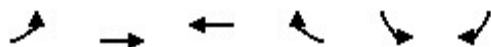
11-27-2023

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	0	1	0	13	0	25	0	218	22	40	277	0
Future Volume (Veh/h)	0	1	0	13	0	25	0	218	22	40	277	0
Sign Control	Stop			Stop			Free			Free		
Grade	0%			0%			0%			0%		
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	0	1	0	14	0	27	0	237	24	43	301	0
Pedestrians												
Lane Width (m)												
Walking Speed (m/s)												
Percent Blockage												
Right turn flare (veh)												
Median type							None			None		
Median storage (veh)												
Upstream signal (m)												
pX, platoon unblocked												
vC, conflicting volume	663	648	301	636	636	249	301				261	
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	663	648	301	636	636	249	301				261	
tC, single (s)	7.1	6.5	6.2	7.1	6.5	6.2	4.1				4.1	
tC, 2 stage (s)												
tF (s)	3.5	4.0	3.3	3.5	4.0	3.3	2.2				2.2	
p0 queue free %	100	100	100	96	100	97	100				97	
cM capacity (veh/h)	353	376	739	380	382	790	1260				1303	
Direction, Lane #	EB 1	WB 1	NB 1	SB 1								
Volume Total	1	41	261	344								
Volume Left	0	14	0	43								
Volume Right	0	27	24	0								
cSH	376	577	1260	1303								
Volume to Capacity	0.00	0.07	0.00	0.03								
Queue Length 95th (m)	0.1	1.8	0.0	0.8								
Control Delay (s)	14.6	11.7	0.0	1.3								
Lane LOS	B	B		A								
Approach Delay (s)	14.6	11.7	0.0	1.3								
Approach LOS	B	B										
Intersection Summary												
Average Delay				1.4								
Intersection Capacity Utilization				48.5%	ICU Level of Service				A			
Analysis Period (min)				15								

HCM Unsignalized Intersection Capacity Analysis

2: Salem Rd & Brown Bear St

11-27-2023



Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations		↩	↩		↩	
Traffic Volume (veh/h)	0	60	31	17	4	1
Future Volume (Veh/h)	0	60	31	17	4	1
Sign Control		Free	Free		Stop	
Grade		0%	0%		0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	0	65	34	18	4	1
Pedestrians						
Lane Width (m)						
Walking Speed (m/s)						
Percent Blockage						
Right turn flare (veh)						
Median type		None	None			
Median storage (veh)						
Upstream signal (m)						
pX, platoon unblocked						
vC, conflicting volume	52				108	43
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	52				108	43
tC, single (s)	4.1				6.4	6.2
tC, 2 stage (s)						
tF (s)	2.2				3.5	3.3
p0 queue free %	100				100	100
cM capacity (veh/h)	1554				889	1027
Direction, Lane #	EB 1	WB 1	SB 1			
Volume Total	65	52	5			
Volume Left	0	0	4			
Volume Right	0	18	1			
cSH	1554	1700	914			
Volume to Capacity	0.00	0.03	0.01			
Queue Length 95th (m)	0.0	0.0	0.1			
Control Delay (s)	0.0	0.0	9.0			
Lane LOS			A			
Approach Delay (s)	0.0	0.0	9.0			
Approach LOS			A			
Intersection Summary						
Average Delay			0.4			
Intersection Capacity Utilization			13.3%	ICU Level of Service		A
Analysis Period (min)			15			

HCM Unsignalized Intersection Capacity Analysis

3: Essa Rd & Salem Rd

11-27-2023

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	4	56	4	15	33	9	7	274	34	31	516	8
Future Volume (Veh/h)	4	56	4	15	33	9	7	274	34	31	516	8
Sign Control		Stop			Stop			Free			Free	
Grade		0%			0%			0%			0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	4	61	4	16	36	10	8	298	37	34	561	9
Pedestrians												
Lane Width (m)												
Walking Speed (m/s)												
Percent Blockage												
Right turn flare (veh)												
Median type								None			None	
Median storage veh												
Upstream signal (m)												
pX, platoon unblocked												
vC, conflicting volume	976	984	566	996	970	316	570			335		
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	976	984	566	996	970	316	570			335		
tC, single (s)	7.1	6.5	6.2	7.1	6.5	6.2	4.1			4.1		
tC, 2 stage (s)												
tF (s)	3.5	4.0	3.3	3.5	4.0	3.3	2.2			2.2		
p0 queue free %	98	75	99	91	85	99	99			97		
cM capacity (veh/h)	196	239	524	173	244	724	1002			1224		
Direction, Lane #	EB 1	WB 1	NB 1	NB 2	SB 1	SB 2						
Volume Total	69	62	8	335	34	570						
Volume Left	4	16	8	0	34	0						
Volume Right	4	10	0	37	0	9						
cSH	244	244	1002	1700	1224	1700						
Volume to Capacity	0.28	0.25	0.01	0.20	0.03	0.34						
Queue Length 95th (m)	9.0	7.8	0.2	0.0	0.7	0.0						
Control Delay (s)	25.5	24.7	8.6	0.0	8.0	0.0						
Lane LOS	D	C	A		A							
Approach Delay (s)	25.5	24.7	0.2		0.5							
Approach LOS	D	C										
Intersection Summary												
Average Delay			3.4									
Intersection Capacity Utilization			42.0%		ICU Level of Service					A		
Analysis Period (min)			15									

HCM Unsignalized Intersection Capacity Analysis

4: Koda St & Essa Rd

11-27-2023

						
Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Traffic Volume (veh/h)	29	12	8	279	543	9
Future Volume (Veh/h)	29	12	8	279	543	9
Sign Control	Stop			Free	Free	
Grade	0%			0%	0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	32	13	9	303	590	10
Pedestrians						
Lane Width (m)						
Walking Speed (m/s)						
Percent Blockage						
Right turn flare (veh)						
Median type				None	None	
Median storage (veh)						
Upstream signal (m)						
pX, platoon unblocked						
vC, conflicting volume	916	595	600			
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	916	595	600			
tC, single (s)	6.4	6.2	4.1			
tC, 2 stage (s)						
tF (s)	3.5	3.3	2.2			
p0 queue free %	89	97	99			
cM capacity (veh/h)	300	504	977			
Direction, Lane #	EB 1	NB 1	SB 1			
Volume Total	45	312	600			
Volume Left	32	9	0			
Volume Right	13	0	10			
cSH	339	977	1700			
Volume to Capacity	0.13	0.01	0.35			
Queue Length 95th (m)	3.6	0.2	0.0			
Control Delay (s)	17.2	0.3	0.0			
Lane LOS	C	A				
Approach Delay (s)	17.2	0.3	0.0			
Approach LOS	C					
Intersection Summary						
Average Delay			0.9			
Intersection Capacity Utilization		39.1%		ICU Level of Service		A
Analysis Period (min)		15				

HCM Unsignalized Intersection Capacity Analysis

5: Essa Rd & Mabern St

11-27-2023

						
Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Traffic Volume (veh/h)	222	129	38	270	423	71
Future Volume (Veh/h)	222	129	38	270	423	71
Sign Control	Stop			Free	Free	
Grade	0%			0%	0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	241	140	41	293	460	77
Pedestrians						
Lane Width (m)						
Walking Speed (m/s)						
Percent Blockage						
Right turn flare (veh)						
Median type				None	None	
Median storage veh						
Upstream signal (m)						
pX, platoon unblocked						
vC, conflicting volume	874	498	537			
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	874	498	537			
tC, single (s)	6.4	6.2	4.1			
tC, 2 stage (s)						
tF (s)	3.5	3.3	2.2			
p0 queue free %	22	76	96			
cM capacity (veh/h)	308	572	1031			
Direction, Lane #	EB 1	NB 1	NB 2	SB 1		
Volume Total	381	41	293	537		
Volume Left	241	41	0	0		
Volume Right	140	0	0	77		
cSH	371	1031	1700	1700		
Volume to Capacity	1.03	0.04	0.17	0.32		
Queue Length 95th (m)	101.0	1.0	0.0	0.0		
Control Delay (s)	88.4	8.6	0.0	0.0		
Lane LOS	F	A				
Approach Delay (s)	88.4	1.1		0.0		
Approach LOS	F					
Intersection Summary						
Average Delay		27.2				
Intersection Capacity Utilization		58.4%		ICU Level of Service		B
Analysis Period (min)		15				

HCM Unsignalized Intersection Capacity Analysis

6: Essa Rd & Athabaska Rd

11-27-2023

						
Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Traffic Volume (veh/h)	98	47	13	474	441	25
Future Volume (Veh/h)	98	47	13	474	441	25
Sign Control	Stop			Free	Free	
Grade	0%			0%	0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	107	51	14	515	479	27
Pedestrians						
Lane Width (m)						
Walking Speed (m/s)						
Percent Blockage						
Right turn flare (veh)						
Median type				None	None	
Median storage veh						
Upstream signal (m)						
pX, platoon unblocked						
vC, conflicting volume	1022	479	506			
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	1022	479	506			
tC, single (s)	6.4	6.2	4.1			
tC, 2 stage (s)						
tF (s)	3.5	3.3	2.2			
p0 queue free %	59	91	99			
cM capacity (veh/h)	258	587	1059			
Direction, Lane #	EB 1	NB 1	NB 2	SB 1	SB 2	
Volume Total	158	14	515	479	27	
Volume Left	107	14	0	0	0	
Volume Right	51	0	0	0	27	
cSH	315	1059	1700	1700	1700	
Volume to Capacity	0.50	0.01	0.30	0.28	0.02	
Queue Length 95th (m)	21.3	0.3	0.0	0.0	0.0	
Control Delay (s)	27.4	8.4	0.0	0.0	0.0	
Lane LOS	D	A				
Approach Delay (s)	27.4	0.2		0.0		
Approach LOS	D					
Intersection Summary						
Average Delay			3.7			
Intersection Capacity Utilization			39.9%		ICU Level of Service	
					A	
Analysis Period (min)			15			

HCM Unsignalized Intersection Capacity Analysis

1: Salem Rd & County Road 27

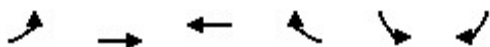
11-27-2023

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	0	0	1	12	0	134	0	434	59	27	211	0
Future Volume (Veh/h)	0	0	1	12	0	134	0	434	59	27	211	0
Sign Control	Stop			Stop			Free			Free		
Grade	0%			0%			0%			0%		
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	0	0	1	13	0	146	0	472	64	29	229	0
Pedestrians												
Lane Width (m)												
Walking Speed (m/s)												
Percent Blockage												
Right turn flare (veh)												
Median type							None			None		
Median storage (veh)												
Upstream signal (m)												
pX, platoon unblocked												
vC, conflicting volume	937	823	229	792	791	504	229				536	
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	937	823	229	792	791	504	229				536	
tC, single (s)	7.1	6.5	6.2	7.1	6.5	6.2	4.1				4.1	
tC, 2 stage (s)												
tF (s)	3.5	4.0	3.3	3.5	4.0	3.3	2.2				2.2	
p0 queue free %	100	100	100	96	100	74	100				97	
cM capacity (veh/h)	178	300	810	300	313	568	1339				1032	
Direction, Lane #	EB 1	WB 1	NB 1	SB 1								
Volume Total	1	159	536	258								
Volume Left	0	13	0	29								
Volume Right	1	146	64	0								
cSH	810	529	1339	1032								
Volume to Capacity	0.00	0.30	0.00	0.03								
Queue Length 95th (m)	0.0	10.0	0.0	0.7								
Control Delay (s)	9.4	14.7	0.0	1.2								
Lane LOS	A	B		A								
Approach Delay (s)	9.4	14.7	0.0	1.2								
Approach LOS	A	B										
Intersection Summary												
Average Delay				2.8								
Intersection Capacity Utilization				56.0%	ICU Level of Service				B			
Analysis Period (min)				15								

HCM Unsignalized Intersection Capacity Analysis

2: Salem Rd & Brown Bear St

11-27-2023



Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations		↩	↩		↩	
Traffic Volume (veh/h)	0	82	140	65	4	1
Future Volume (Veh/h)	0	82	140	65	4	1
Sign Control		Free	Free		Stop	
Grade		0%	0%		0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	0	89	152	71	4	1
Pedestrians						
Lane Width (m)						
Walking Speed (m/s)						
Percent Blockage						
Right turn flare (veh)						
Median type		None	None			
Median storage veh						
Upstream signal (m)						
pX, platoon unblocked						
vC, conflicting volume	223				276	188
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	223				276	188
tC, single (s)	4.1				6.4	6.2
tC, 2 stage (s)						
tF (s)	2.2				3.5	3.3
p0 queue free %	100				99	100
cM capacity (veh/h)	1346				713	855
Direction, Lane #	EB 1	WB 1	SB 1			
Volume Total	89	223	5			
Volume Left	0	0	4			
Volume Right	0	71	1			
cSH	1346	1700	738			
Volume to Capacity	0.00	0.13	0.01			
Queue Length 95th (m)	0.0	0.0	0.2			
Control Delay (s)	0.0	0.0	9.9			
Lane LOS			A			
Approach Delay (s)	0.0	0.0	9.9			
Approach LOS			A			
Intersection Summary						
Average Delay			0.2			
Intersection Capacity Utilization			21.3%	ICU Level of Service		A
Analysis Period (min)			15			

HCM Unsignalized Intersection Capacity Analysis

3: Essa Rd & Salem Rd

11-27-2023

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	7	75	4	28	192	36	4	551	29	28	410	9
Future Volume (Veh/h)	7	75	4	28	192	36	4	551	29	28	410	9
Sign Control		Stop			Stop			Free			Free	
Grade		0%			0%			0%			0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	8	82	4	30	209	39	4	599	32	30	446	10
Pedestrians												
Lane Width (m)												
Walking Speed (m/s)												
Percent Blockage												
Right turn flare (veh)												
Median type	None								None			
Median storage veh												
Upstream signal (m)												
pX, platoon unblocked												
vC, conflicting volume	1262	1150	451	1174	1139	615	456	631				
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	1262	1150	451	1174	1139	615	456	631				
tC, single (s)	7.1	6.5	6.2	7.1	6.5	6.2	4.1	4.1				
tC, 2 stage (s)												
tF (s)	3.5	4.0	3.3	3.5	4.0	3.3	2.2	2.2				
p0 queue free %	0	57	99	72	0	92	100	97				
cM capacity (veh/h)	0	191	608	109	194	491	1105	951				
Direction, Lane #	EB 1	WB 1	NB 1	NB 2	SB 1	SB 2						
Volume Total	94	278	4	631	30	456						
Volume Left	8	30	4	0	30	0						
Volume Right	4	39	0	32	0	10						
cSH	0	194	1105	1700	951	1700						
Volume to Capacity	Err	1.43	0.00	0.37	0.03	0.27						
Queue Length 95th (m)	Err	133.7	0.1	0.0	0.8	0.0						
Control Delay (s)	Err	267.0	8.3	0.0	8.9	0.0						
Lane LOS	F	F	A	A								
Approach Delay (s)	Err	267.0	0.1	0.5								
Approach LOS	F	F										
Intersection Summary												
Average Delay			Err									
Intersection Capacity Utilization			57.2%	ICU Level of Service					B			
Analysis Period (min)			15									

HCM Unsignalized Intersection Capacity Analysis

4: Koda St & Essa Rd

11-27-2023

						
Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Traffic Volume (veh/h)	20	8	24	570	439	39
Future Volume (Veh/h)	20	8	24	570	439	39
Sign Control	Stop			Free	Free	
Grade	0%			0%	0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	22	9	26	620	477	42
Pedestrians						
Lane Width (m)						
Walking Speed (m/s)						
Percent Blockage						
Right turn flare (veh)						
Median type				None	None	
Median storage (veh)						
Upstream signal (m)						
pX, platoon unblocked						
vC, conflicting volume	1170	498	519			
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	1170	498	519			
tC, single (s)	6.4	6.2	4.1			
tC, 2 stage (s)						
tF (s)	3.5	3.3	2.2			
p0 queue free %	89	98	98			
cM capacity (veh/h)	208	572	1047			
Direction, Lane #	EB 1	NB 1	SB 1			
Volume Total	31	646	519			
Volume Left	22	26	0			
Volume Right	9	0	42			
cSH	255	1047	1700			
Volume to Capacity	0.12	0.02	0.31			
Queue Length 95th (m)	3.3	0.6	0.0			
Control Delay (s)	21.1	0.7	0.0			
Lane LOS	C	A				
Approach Delay (s)	21.1	0.7	0.0			
Approach LOS	C					
Intersection Summary						
Average Delay		0.9				
Intersection Capacity Utilization		59.5%		ICU Level of Service		B
Analysis Period (min)		15				

HCM Unsignalized Intersection Capacity Analysis

5: Essa Rd & Mabern St

11-27-2023

						
Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Traffic Volume (veh/h)	144	92	125	465	386	208
Future Volume (Veh/h)	144	92	125	465	386	208
Sign Control	Stop			Free	Free	
Grade	0%			0%	0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	157	100	136	505	420	226
Pedestrians						
Lane Width (m)						
Walking Speed (m/s)						
Percent Blockage						
Right turn flare (veh)						
Median type				None	None	
Median storage veh						
Upstream signal (m)						
pX, platoon unblocked						
vC, conflicting volume	1310	533	646			
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	1310	533	646			
tC, single (s)	6.4	6.2	4.1			
tC, 2 stage (s)						
tF (s)	3.5	3.3	2.2			
p0 queue free %	0	82	86			
cM capacity (veh/h)	150	547	939			
Direction, Lane #	EB 1	NB 1	NB 2	SB 1		
Volume Total	257	136	505	646		
Volume Left	157	136	0	0		
Volume Right	100	0	0	226		
cSH	209	939	1700	1700		
Volume to Capacity	1.23	0.14	0.30	0.38		
Queue Length 95th (m)	106.1	4.0	0.0	0.0		
Control Delay (s)	184.2	9.5	0.0	0.0		
Lane LOS	F	A				
Approach Delay (s)	184.2	2.0		0.0		
Approach LOS	F					
Intersection Summary						
Average Delay				31.5		
Intersection Capacity Utilization				63.5%	ICU Level of Service	B
Analysis Period (min)				15		

HCM Unsignalized Intersection Capacity Analysis

6: Essa Rd & Athabaska Rd

11-27-2023

						
Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Traffic Volume (veh/h)	74	24	65	540	564	137
Future Volume (Veh/h)	74	24	65	540	564	137
Sign Control	Stop			Free	Free	
Grade	0%			0%	0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	80	26	71	587	613	149
Pedestrians						
Lane Width (m)						
Walking Speed (m/s)						
Percent Blockage						
Right turn flare (veh)						
Median type				None	None	
Median storage veh						
Upstream signal (m)						
pX, platoon unblocked						
vC, conflicting volume	1342	613	762			
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	1342	613	762			
tC, single (s)	6.4	6.2	4.1			
tC, 2 stage (s)						
tF (s)	3.5	3.3	2.2			
p0 queue free %	48	95	92			
cM capacity (veh/h)	154	492	850			
Direction, Lane #	EB 1	NB 1	NB 2	SB 1	SB 2	
Volume Total	106	71	587	613	149	
Volume Left	80	71	0	0	0	
Volume Right	26	0	0	0	149	
cSH	185	850	1700	1700	1700	
Volume to Capacity	0.57	0.08	0.35	0.36	0.09	
Queue Length 95th (m)	24.6	2.2	0.0	0.0	0.0	
Control Delay (s)	47.8	9.6	0.0	0.0	0.0	
Lane LOS	E	A				
Approach Delay (s)	47.8	1.0		0.0		
Approach LOS	E					
Intersection Summary						
Average Delay			3.8			
Intersection Capacity Utilization			48.9%		ICU Level of Service	
					A	
Analysis Period (min)			15			

Summary of All Intervals

Run Number	1	2	3	4	5	Avg
Start Time	6:30	6:30	6:30	6:30	6:30	6:30
End Time	8:00	8:00	8:00	8:00	8:00	8:00
Total Time (min)	90	90	90	90	90	90
Time Recorded (min)	60	60	60	60	60	60
# of Intervals	2	2	2	2	2	2
# of Recorded Intervals	1	1	1	1	1	1
Vehs Entered	1917	2030	1934	1977	1889	1949
Vehs Exited	1927	2037	1945	1963	1901	1956
Starting Vehs	56	56	50	45	56	51
Ending Vehs	46	49	39	59	44	46
Travel Distance (km)	2371	2540	2422	2459	2341	2427
Travel Time (hr)	47.4	52.9	48.7	49.1	48.2	49.3
Total Delay (hr)	5.4	7.7	5.7	5.4	6.7	6.2
Total Stops	712	751	708	754	708	727
Fuel Used (l)	176.0	193.3	180.1	183.1	174.4	181.4

Interval #0 Information Seeding

Start Time	6:30
End Time	7:00
Total Time (min)	30
Volumes adjusted by Growth Factors.	
No data recorded this interval.	

Interval #1 Information Recording

Start Time	7:00					
End Time	8:00					
Total Time (min)	60					
Volumes adjusted by Growth Factors.						
Run Number	1	2	3	4	5	Avg
Vehs Entered	1917	2030	1934	1977	1889	1949
Vehs Exited	1927	2037	1945	1963	1901	1956
Starting Vehs	56	56	50	45	56	51
Ending Vehs	46	49	39	59	44	46
Travel Distance (km)	2371	2540	2422	2459	2341	2427
Travel Time (hr)	47.4	52.9	48.7	49.1	48.2	49.3
Total Delay (hr)	5.4	7.7	5.7	5.4	6.7	6.2
Total Stops	712	751	708	754	708	727
Fuel Used (l)	176.0	193.3	180.1	183.1	174.4	181.4

Intersection: 1: Salem Rd & County Road 27

Movement	EB	WB	SB
Directions Served	LTR	LTR	LTR
Maximum Queue (m)	5.4	14.9	8.6
Average Queue (m)	0.2	5.7	1.4
95th Queue (m)	2.6	12.8	6.2
Link Distance (m)	95.4	608.8	326.4
Upstream Blk Time (%)			
Queuing Penalty (veh)			
Storage Bay Dist (m)			
Storage Blk Time (%)			
Queuing Penalty (veh)			

Intersection: 2: Salem Rd & Brown Bear St

Movement	SB
Directions Served	LR
Maximum Queue (m)	7.0
Average Queue (m)	1.2
95th Queue (m)	6.0
Link Distance (m)	19.4
Upstream Blk Time (%)	
Queuing Penalty (veh)	
Storage Bay Dist (m)	
Storage Blk Time (%)	
Queuing Penalty (veh)	

Intersection: 3: Essa Rd & Salem Rd

Movement	EB	WB	NB	SB
Directions Served	LTR	LTR	L	L
Maximum Queue (m)	22.2	22.2	2.7	5.2
Average Queue (m)	7.6	7.9	0.2	1.2
95th Queue (m)	15.0	16.0	1.6	4.4
Link Distance (m)	152.6	662.2		
Upstream Blk Time (%)				
Queuing Penalty (veh)				
Storage Bay Dist (m)			74.0	74.0
Storage Blk Time (%)				
Queuing Penalty (veh)				

Intersection: 4: Koda St & Essa Rd

Movement	EB	NB
Directions Served	LR	LT
Maximum Queue (m)	17.9	13.2
Average Queue (m)	7.5	1.6
95th Queue (m)	15.8	8.2
Link Distance (m)	67.4	100.4
Upstream Blk Time (%)		
Queuing Penalty (veh)		
Storage Bay Dist (m)		
Storage Blk Time (%)		
Queuing Penalty (veh)		

Intersection: 5: Essa Rd & Mabern St

Movement	EB	NB
Directions Served	LR	L
Maximum Queue (m)	76.6	12.9
Average Queue (m)	40.6	3.6
95th Queue (m)	71.9	10.9
Link Distance (m)	69.7	
Upstream Blk Time (%)	6	
Queuing Penalty (veh)	0	
Storage Bay Dist (m)		88.0
Storage Blk Time (%)		
Queuing Penalty (veh)		

Intersection: 6: Essa Rd & Athabaska Rd

Movement	EB	NB
Directions Served	LR	L
Maximum Queue (m)	33.0	9.3
Average Queue (m)	12.7	1.5
95th Queue (m)	23.7	6.9
Link Distance (m)	132.1	
Upstream Blk Time (%)		
Queuing Penalty (veh)		
Storage Bay Dist (m)		77.0
Storage Blk Time (%)		
Queuing Penalty (veh)		

Network Summary

Network wide Queuing Penalty: 0

Summary of All Intervals

Run Number	1	2	3	4	5	Avg
Start Time	4:30	4:30	4:30	4:30	4:30	4:30
End Time	6:00	6:00	6:00	6:00	6:00	6:00
Total Time (min)	90	90	90	90	90	90
Time Recorded (min)	60	60	60	60	60	60
# of Intervals	2	2	2	2	2	2
# of Recorded Intervals	1	1	1	1	1	1
Vehs Entered	2635	2695	2602	2613	2582	2623
Vehs Exited	2667	2708	2611	2617	2575	2635
Starting Vehs	80	75	77	74	58	72
Ending Vehs	48	62	68	70	65	62
Travel Distance (km)	3290	3363	3243	3244	3224	3273
Travel Time (hr)	74.8	79.3	69.9	67.6	67.5	71.8
Total Delay (hr)	16.5	20.1	12.8	10.3	10.5	14.0
Total Stops	1007	1026	1046	941	967	996
Fuel Used (l)	255.2	264.9	251.1	246.6	244.6	252.5

Interval #0 Information Seeding

Start Time	4:30
End Time	5:00
Total Time (min)	30
Volumes adjusted by Growth Factors.	
No data recorded this interval.	

Interval #1 Information Recording

Start Time	5:00
End Time	6:00
Total Time (min)	60
Volumes adjusted by Growth Factors.	

Run Number	1	2	3	4	5	Avg
Vehs Entered	2635	2695	2602	2613	2582	2623
Vehs Exited	2667	2708	2611	2617	2575	2635
Starting Vehs	80	75	77	74	58	72
Ending Vehs	48	62	68	70	65	62
Travel Distance (km)	3290	3363	3243	3244	3224	3273
Travel Time (hr)	74.8	79.3	69.9	67.6	67.5	71.8
Total Delay (hr)	16.5	20.1	12.8	10.3	10.5	14.0
Total Stops	1007	1026	1046	941	967	996
Fuel Used (l)	255.2	264.9	251.1	246.6	244.6	252.5

Queuing and Blocking Report

Baseline

11-27-2023

Intersection: 1: Salem Rd & County Road 27

Movement	EB	WB	SB
Directions Served	LTR	LTR	LTR
Maximum Queue (m)	8.5	21.7	15.0
Average Queue (m)	0.4	10.5	3.0
95th Queue (m)	3.3	17.7	10.7
Link Distance (m)	95.4	608.8	326.4
Upstream Blk Time (%)			
Queuing Penalty (veh)			
Storage Bay Dist (m)			
Storage Blk Time (%)			
Queuing Penalty (veh)			

Intersection: 2: Salem Rd & Brown Bear St

Movement	SB
Directions Served	LR
Maximum Queue (m)	8.8
Average Queue (m)	0.6
95th Queue (m)	4.1
Link Distance (m)	19.4
Upstream Blk Time (%)	
Queuing Penalty (veh)	
Storage Bay Dist (m)	
Storage Blk Time (%)	
Queuing Penalty (veh)	

Intersection: 3: Essa Rd & Salem Rd

Movement	EB	WB	NB	NB	SB	SB
Directions Served	LTR	LTR	L	TR	L	TR
Maximum Queue (m)	27.1	111.6	2.0	2.2	9.2	2.7
Average Queue (m)	10.7	54.2	0.1	0.1	1.8	0.1
95th Queue (m)	21.3	115.5	1.3	1.2	5.8	1.9
Link Distance (m)	152.6	662.2		556.0		100.4
Upstream Blk Time (%)						
Queuing Penalty (veh)						
Storage Bay Dist (m)			74.0		74.0	
Storage Blk Time (%)						
Queuing Penalty (veh)						

Queuing and Blocking Report

Baseline

11-27-2023

Intersection: 4: Koda St & Essa Rd

Movement	EB	NB	SB
Directions Served	LR	LT	TR
Maximum Queue (m)	18.6	36.3	1.3
Average Queue (m)	6.0	4.8	0.0
95th Queue (m)	14.9	20.2	0.9
Link Distance (m)	67.4	100.4	227.2
Upstream Blk Time (%)			
Queuing Penalty (veh)			
Storage Bay Dist (m)			
Storage Blk Time (%)			
Queuing Penalty (veh)			

Intersection: 5: Essa Rd & Mabern St

Movement	EB	NB	SB
Directions Served	LR	L	TR
Maximum Queue (m)	70.3	24.2	9.8
Average Queue (m)	33.7	10.8	0.8
95th Queue (m)	63.2	20.6	4.8
Link Distance (m)	69.7		493.2
Upstream Blk Time (%)	4		
Queuing Penalty (veh)	0		
Storage Bay Dist (m)		88.0	
Storage Blk Time (%)			
Queuing Penalty (veh)			

Intersection: 6: Essa Rd & Athabaska Rd

Movement	EB	NB	SB
Directions Served	LR	L	R
Maximum Queue (m)	32.2	15.9	4.0
Average Queue (m)	11.6	7.3	0.2
95th Queue (m)	22.8	15.1	1.9
Link Distance (m)	132.1		
Upstream Blk Time (%)			
Queuing Penalty (veh)			
Storage Bay Dist (m)		77.0	27.0
Storage Blk Time (%)			
Queuing Penalty (veh)			

Network Summary

Network wide Queuing Penalty: 0

HCM Unsignalized Intersection Capacity Analysis

1: Salem Rd & County Road 27

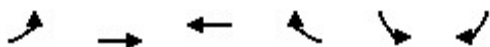
11-29-2023

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	0	1	0	14	0	26	0	238	24	42	303	0
Future Volume (Veh/h)	0	1	0	14	0	26	0	238	24	42	303	0
Sign Control	Stop			Stop			Free			Free		
Grade	0%			0%			0%			0%		
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	0	1	0	15	0	28	0	259	26	46	329	0
Pedestrians												
Lane Width (m)												
Walking Speed (m/s)												
Percent Blockage												
Right turn flare (veh)												
Median type							None			None		
Median storage (veh)												
Upstream signal (m)												
pX, platoon unblocked												
vC, conflicting volume	721	706	329	694	693	272	329				285	
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	721	706	329	694	693	272	329				285	
tC, single (s)	7.1	6.5	6.2	7.1	6.5	6.2	4.1				4.1	
tC, 2 stage (s)												
tF (s)	3.5	4.0	3.3	3.5	4.0	3.3	2.2				2.2	
p0 queue free %	100	100	100	96	100	96	100				96	
cM capacity (veh/h)	321	348	712	347	354	767	1231				1277	
Direction, Lane #	EB 1	WB 1	NB 1	SB 1								
Volume Total	1	43	285	375								
Volume Left	0	15	0	46								
Volume Right	0	28	26	0								
cSH	348	539	1231	1277								
Volume to Capacity	0.00	0.08	0.00	0.04								
Queue Length 95th (m)	0.1	2.1	0.0	0.9								
Control Delay (s)	15.4	12.3	0.0	1.3								
Lane LOS	C	B		A								
Approach Delay (s)	15.4	12.3	0.0	1.3								
Approach LOS	C	B										
Intersection Summary												
Average Delay				1.5								
Intersection Capacity Utilization				51.3%	ICU Level of Service				A			
Analysis Period (min)				15								

HCM Unsignalized Intersection Capacity Analysis

2: Salem Rd & Brown Bear St

11-29-2023



Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Volume (veh/h)	0	64	33	19	4	1
Future Volume (Veh/h)	0	64	33	19	4	1
Sign Control		Free	Free		Stop	
Grade		0%	0%		0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	0	70	36	21	4	1
Pedestrians						
Lane Width (m)						
Walking Speed (m/s)						
Percent Blockage						
Right turn flare (veh)						
Median type		None	None			
Median storage veh						
Upstream signal (m)						
pX, platoon unblocked						
vC, conflicting volume	57				116	46
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	57				116	46
tC, single (s)	4.1				6.4	6.2
tC, 2 stage (s)						
tF (s)	2.2				3.5	3.3
p0 queue free %	100				100	100
cM capacity (veh/h)	1547				880	1023
Direction, Lane #	EB 1	WB 1	SB 1			
Volume Total	70	57	5			
Volume Left	0	0	4			
Volume Right	0	21	1			
cSH	1547	1700	905			
Volume to Capacity	0.00	0.03	0.01			
Queue Length 95th (m)	0.0	0.0	0.1			
Control Delay (s)	0.0	0.0	9.0			
Lane LOS			A			
Approach Delay (s)	0.0	0.0	9.0			
Approach LOS			A			
Intersection Summary						
Average Delay			0.3			
Intersection Capacity Utilization			13.4%		ICU Level of Service	
Analysis Period (min)			15			
			A			

HCM Unsignalized Intersection Capacity Analysis

3: Essa Rd & Salem Rd

11-29-2023

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	4	60	4	17	35	10	8	292	38	33	538	9
Future Volume (Veh/h)	4	60	4	17	35	10	8	292	38	33	538	9
Sign Control		Stop			Stop			Free			Free	
Grade		0%			0%			0%			0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	4	65	4	18	38	11	9	317	41	36	585	10
Pedestrians												
Lane Width (m)												
Walking Speed (m/s)												
Percent Blockage												
Right turn flare (veh)												
Median type	None								None			
Median storage veh												
Upstream signal (m)												
pX, platoon unblocked												
vC, conflicting volume	1027	1038	590	1049	1022	338	595	358				
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	1027	1038	590	1049	1022	338	595	358				
tC, single (s)	7.1	6.5	6.2	7.1	6.5	6.2	4.1	4.1				
tC, 2 stage (s)												
tF (s)	3.5	4.0	3.3	3.5	4.0	3.3	2.2	2.2				
p0 queue free %	98	71	99	88	83	98	99	97				
cM capacity (veh/h)	177	222	508	153	227	705	981	1201				
Direction, Lane #	EB 1	WB 1	NB 1	NB 2	SB 1	SB 2						
Volume Total	73	67	9	358	36	595						
Volume Left	4	18	9	0	36	0						
Volume Right	4	11	0	41	0	10						
cSH	226	223	981	1700	1201	1700						
Volume to Capacity	0.32	0.30	0.01	0.21	0.03	0.35						
Queue Length 95th (m)	10.7	9.7	0.2	0.0	0.7	0.0						
Control Delay (s)	28.4	28.0	8.7	0.0	8.1	0.0						
Lane LOS	D	D	A		A							
Approach Delay (s)	28.4	28.0	0.2		0.5							
Approach LOS	D	D										
Intersection Summary												
Average Delay			3.8									
Intersection Capacity Utilization			44.4%	ICU Level of Service					A			
Analysis Period (min)			15									

HCM Unsignalized Intersection Capacity Analysis

4: Koda St & Essa Rd

11-29-2023

						
Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Traffic Volume (veh/h)	32	13	9	297	567	10
Future Volume (Veh/h)	32	13	9	297	567	10
Sign Control	Stop			Free	Free	
Grade	0%			0%	0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	35	14	10	323	616	11
Pedestrians						
Lane Width (m)						
Walking Speed (m/s)						
Percent Blockage						
Right turn flare (veh)						
Median type				None	None	
Median storage veh						
Upstream signal (m)						
pX, platoon unblocked						
vC, conflicting volume	964	622	627			
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	964	622	627			
tC, single (s)	6.4	6.2	4.1			
tC, 2 stage (s)						
tF (s)	3.5	3.3	2.2			
p0 queue free %	87	97	99			
cM capacity (veh/h)	280	487	955			
Direction, Lane #	EB 1	NB 1	SB 1			
Volume Total	49	333	627			
Volume Left	35	10	0			
Volume Right	14	0	11			
cSH	319	955	1700			
Volume to Capacity	0.15	0.01	0.37			
Queue Length 95th (m)	4.3	0.3	0.0			
Control Delay (s)	18.3	0.4	0.0			
Lane LOS	C	A				
Approach Delay (s)	18.3	0.4	0.0			
Approach LOS	C					
Intersection Summary						
Average Delay		1.0				
Intersection Capacity Utilization		40.4%		ICU Level of Service		A
Analysis Period (min)		15				

HCM Unsignalized Intersection Capacity Analysis

5: Essa Rd & Mabern St

11-29-2023

						
Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Traffic Volume (veh/h)	239	139	41	288	438	76
Future Volume (Veh/h)	239	139	41	288	438	76
Sign Control	Stop			Free	Free	
Grade	0%			0%	0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	260	151	45	313	476	83
Pedestrians						
Lane Width (m)						
Walking Speed (m/s)						
Percent Blockage						
Right turn flare (veh)						
Median type				None	None	
Median storage veh						
Upstream signal (m)						
pX, platoon unblocked						
vC, conflicting volume	920	518	559			
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	920	518	559			
tC, single (s)	6.4	6.2	4.1			
tC, 2 stage (s)						
tF (s)	3.5	3.3	2.2			
p0 queue free %	9	73	96			
cM capacity (veh/h)	287	558	1012			
Direction, Lane #	EB 1	NB 1	NB 2	SB 1		
Volume Total	411	45	313	559		
Volume Left	260	45	0	0		
Volume Right	151	0	0	83		
cSH	349	1012	1700	1700		
Volume to Capacity	1.18	0.04	0.18	0.33		
Queue Length 95th (m)	134.7	1.1	0.0	0.0		
Control Delay (s)	138.7	8.7	0.0	0.0		
Lane LOS	F	A				
Approach Delay (s)	138.7	1.1		0.0		
Approach LOS	F					
Intersection Summary						
Average Delay			43.2			
Intersection Capacity Utilization			62.5%	ICU Level of Service		B
Analysis Period (min)			15			

HCM Unsignalized Intersection Capacity Analysis

6: Essa Rd & Athabaska Rd

11-29-2023

						
Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Traffic Volume (veh/h)	108	52	14	507	455	28
Future Volume (Veh/h)	108	52	14	507	455	28
Sign Control	Stop			Free	Free	
Grade	0%			0%	0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	117	57	15	551	495	30
Pedestrians						
Lane Width (m)						
Walking Speed (m/s)						
Percent Blockage						
Right turn flare (veh)						
Median type				None	None	
Median storage veh						
Upstream signal (m)						
pX, platoon unblocked						
vC, conflicting volume	1076	495	525			
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	1076	495	525			
tC, single (s)	6.4	6.2	4.1			
tC, 2 stage (s)						
tF (s)	3.5	3.3	2.2			
p0 queue free %	51	90	99			
cM capacity (veh/h)	239	575	1042			
Direction, Lane #	EB 1	NB 1	NB 2	SB 1	SB 2	
Volume Total	174	15	551	495	30	
Volume Left	117	15	0	0	0	
Volume Right	57	0	0	0	30	
cSH	296	1042	1700	1700	1700	
Volume to Capacity	0.59	0.01	0.32	0.29	0.02	
Queue Length 95th (m)	27.9	0.4	0.0	0.0	0.0	
Control Delay (s)	33.2	8.5	0.0	0.0	0.0	
Lane LOS	D	A				
Approach Delay (s)	33.2	0.2		0.0		
Approach LOS	D					
Intersection Summary						
Average Delay			4.7			
Intersection Capacity Utilization			42.5%	ICU Level of Service		A
Analysis Period (min)			15			

HCM Unsignalized Intersection Capacity Analysis

1: Salem Rd & County Road 27

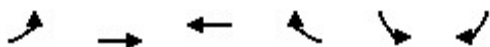
11-29-2023

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	0	0	1	13	0	146	0	475	65	29	231	0
Future Volume (Veh/h)	0	0	1	13	0	146	0	475	65	29	231	0
Sign Control	Stop			Stop			Free			Free		
Grade	0%			0%			0%			0%		
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	0	0	1	14	0	159	0	516	71	32	251	0
Pedestrians												
Lane Width (m)												
Walking Speed (m/s)												
Percent Blockage												
Right turn flare (veh)												
Median type							None			None		
Median storage (veh)												
Upstream signal (m)												
pX, platoon unblocked												
vC, conflicting volume	1026	902	251	868	866	552	251				587	
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	1026	902	251	868	866	552	251				587	
tC, single (s)	7.1	6.5	6.2	7.1	6.5	6.2	4.1				4.1	
tC, 2 stage (s)												
tF (s)	3.5	4.0	3.3	3.5	4.0	3.3	2.2				2.2	
p0 queue free %	100	100	100	95	100	70	100				97	
cM capacity (veh/h)	146	268	788	266	282	534	1314				988	
Direction, Lane #	EB 1	WB 1	NB 1	SB 1								
Volume Total	1	173	587	283								
Volume Left	0	14	0	32								
Volume Right	1	159	71	0								
cSH	788	493	1314	988								
Volume to Capacity	0.00	0.35	0.00	0.03								
Queue Length 95th (m)	0.0	12.5	0.0	0.8								
Control Delay (s)	9.6	16.2	0.0	1.3								
Lane LOS	A	C		A								
Approach Delay (s)	9.6	16.2	0.0	1.3								
Approach LOS	A	C										
Intersection Summary												
Average Delay				3.0								
Intersection Capacity Utilization				59.6%	ICU Level of Service				B			
Analysis Period (min)				15								

HCM Unsignalized Intersection Capacity Analysis

2: Salem Rd & Brown Bear St

11-29-2023



Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Volume (veh/h)	0	90	152	72	4	1
Future Volume (Veh/h)	0	90	152	72	4	1
Sign Control		Free	Free		Stop	
Grade		0%	0%		0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	0	98	165	78	4	1
Pedestrians						
Lane Width (m)						
Walking Speed (m/s)						
Percent Blockage						
Right turn flare (veh)						
Median type		None	None			
Median storage veh						
Upstream signal (m)						
pX, platoon unblocked						
vC, conflicting volume	243				302	204
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	243				302	204
tC, single (s)	4.1				6.4	6.2
tC, 2 stage (s)						
tF (s)	2.2				3.5	3.3
p0 queue free %	100				99	100
cM capacity (veh/h)	1323				690	837
Direction, Lane #	EB 1	WB 1	SB 1			
Volume Total	98	243	5			
Volume Left	0	0	4			
Volume Right	0	78	1			
cSH	1323	1700	715			
Volume to Capacity	0.00	0.14	0.01			
Queue Length 95th (m)	0.0	0.0	0.2			
Control Delay (s)	0.0	0.0	10.1			
Lane LOS			B			
Approach Delay (s)	0.0	0.0	10.1			
Approach LOS			B			
Intersection Summary						
Average Delay			0.1			
Intersection Capacity Utilization		22.4%		ICU Level of Service		A
Analysis Period (min)		15				

HCM Unsignalized Intersection Capacity Analysis

3: Essa Rd

11-29-2023

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	8	82	4	31	210	40	4	588	32	30	440	10
Future Volume (Veh/h)	8	82	4	31	210	40	4	588	32	30	440	10
Sign Control		Stop			Stop			Free			Free	
Grade		0%			0%			0%			0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	9	89	4	34	228	43	4	639	35	33	478	11
Pedestrians												
Lane Width (m)												
Walking Speed (m/s)												
Percent Blockage												
Right turn flare (veh)												
Median type								None			None	
Median storage veh												
Upstream signal (m)												
pX, platoon unblocked												
vC, conflicting volume	1354	1232	484	1257	1220	656	489			674		
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	1354	1232	484	1257	1220	656	489			674		
tC, single (s)	7.1	6.5	6.2	7.1	6.5	6.2	4.1			4.1		
tC, 2 stage (s)												
tF (s)	3.5	4.0	3.3	3.5	4.0	3.3	2.2			2.2		
p0 queue free %	0	48	99	60	0	91	100			96		
cM capacity (veh/h)	0	170	583	84	173	465	1074			917		
Direction, Lane #	EB 1	WB 1	NB 1	NB 2	SB 1	SB 2						
Volume Total	102	305	4	674	33	489						
Volume Left	9	34	4	0	33	0						
Volume Right	4	43	0	35	0	11						
cSH	0	168	1074	1700	917	1700						
Volume to Capacity	Err	1.82	0.00	0.40	0.04	0.29						
Queue Length 95th (m)	Err	178.1	0.1	0.0	0.9	0.0						
Control Delay (s)	Err	436.0	8.4	0.0	9.1	0.0						
Lane LOS	F	F	A		A							
Approach Delay (s)	Err	436.0	0.0		0.6							
Approach LOS	F	F										
Intersection Summary												
Average Delay			Err									
Intersection Capacity Utilization			61.1%		ICU Level of Service					B		
Analysis Period (min)			15									

HCM Unsignalized Intersection Capacity Analysis

4: Koda St & Essa Rd

11-29-2023

						
Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Traffic Volume (veh/h)	22	9	26	610	471	43
Future Volume (Veh/h)	22	9	26	610	471	43
Sign Control	Stop			Free	Free	
Grade	0%			0%	0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	24	10	28	663	512	47
Pedestrians						
Lane Width (m)						
Walking Speed (m/s)						
Percent Blockage						
Right turn flare (veh)						
Median type				None	None	
Median storage veh						
Upstream signal (m)						
pX, platoon unblocked						
vC, conflicting volume	1254	536	559			
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	1254	536	559			
tC, single (s)	6.4	6.2	4.1			
tC, 2 stage (s)						
tF (s)	3.5	3.3	2.2			
p0 queue free %	87	98	97			
cM capacity (veh/h)	184	545	1012			
Direction, Lane #	EB 1	NB 1	SB 1			
Volume Total	34	691	559			
Volume Left	24	28	0			
Volume Right	10	0	47			
cSH	229	1012	1700			
Volume to Capacity	0.15	0.03	0.33			
Queue Length 95th (m)	4.1	0.7	0.0			
Control Delay (s)	23.5	0.7	0.0			
Lane LOS	C	A				
Approach Delay (s)	23.5	0.7	0.0			
Approach LOS	C					
Intersection Summary						
Average Delay		1.0				
Intersection Capacity Utilization		63.2%		ICU Level of Service		B
Analysis Period (min)		15				

HCM Unsignalized Intersection Capacity Analysis

5: Essa Rd & Mabern St

11-29-2023

						
Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Traffic Volume (veh/h)	155	99	136	496	415	225
Future Volume (Veh/h)	155	99	136	496	415	225
Sign Control	Stop			Free	Free	
Grade	0%			0%	0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	168	108	148	539	451	245
Pedestrians						
Lane Width (m)						
Walking Speed (m/s)						
Percent Blockage						
Right turn flare (veh)						
Median type				None	None	
Median storage veh						
Upstream signal (m)						
pX, platoon unblocked						
vC, conflicting volume	1408	574	696			
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	1408	574	696			
tC, single (s)	6.4	6.2	4.1			
tC, 2 stage (s)						
tF (s)	3.5	3.3	2.2			
p0 queue free %	0	79	84			
cM capacity (veh/h)	128	519	900			
Direction, Lane #	EB 1	NB 1	NB 2	SB 1		
Volume Total	276	148	539	696		
Volume Left	168	148	0	0		
Volume Right	108	0	0	245		
cSH	181	900	1700	1700		
Volume to Capacity	1.52	0.16	0.32	0.41		
Queue Length 95th (m)	141.6	4.7	0.0	0.0		
Control Delay (s)	308.6	9.8	0.0	0.0		
Lane LOS	F	A				
Approach Delay (s)	308.6	2.1		0.0		
Approach LOS	F					
Intersection Summary						
Average Delay			52.2			
Intersection Capacity Utilization			67.7%	ICU Level of Service		C
Analysis Period (min)			15			

HCM Unsignalized Intersection Capacity Analysis

6: Essa Rd & Athabaska Rd

11-29-2023

						
Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Traffic Volume (veh/h)	82	26	72	575	607	151
Future Volume (Veh/h)	82	26	72	575	607	151
Sign Control	Stop			Free	Free	
Grade	0%			0%	0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	89	28	78	625	660	164
Pedestrians						
Lane Width (m)						
Walking Speed (m/s)						
Percent Blockage						
Right turn flare (veh)						
Median type				None	None	
Median storage veh						
Upstream signal (m)						
pX, platoon unblocked						
vC, conflicting volume	1441	660	824			
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	1441	660	824			
tC, single (s)	6.4	6.2	4.1			
tC, 2 stage (s)						
tF (s)	3.5	3.3	2.2			
p0 queue free %	33	94	90			
cM capacity (veh/h)	132	463	806			
Direction, Lane #	EB 1	NB 1	NB 2	SB 1	SB 2	
Volume Total	117	78	625	660	164	
Volume Left	89	78	0	0	0	
Volume Right	28	0	0	0	164	
cSH	159	806	1700	1700	1700	
Volume to Capacity	0.74	0.10	0.37	0.39	0.10	
Queue Length 95th (m)	36.0	2.6	0.0	0.0	0.0	
Control Delay (s)	73.1	9.9	0.0	0.0	0.0	
Lane LOS	F	A				
Approach Delay (s)	73.1	1.1		0.0		
Approach LOS	F					
Intersection Summary						
Average Delay			5.7			
Intersection Capacity Utilization			52.1%	ICU Level of Service		A
Analysis Period (min)			15			

Summary of All Intervals

Run Number	1	2	3	4	5	Avg
Start Time	6:30	6:30	6:30	6:30	6:30	6:30
End Time	8:00	8:00	8:00	8:00	8:00	8:00
Total Time (min)	90	90	90	90	90	90
Time Recorded (min)	60	60	60	60	60	60
# of Intervals	2	2	2	2	2	2
# of Recorded Intervals	1	1	1	1	1	1
Vehs Entered	2042	2182	2082	2028	2082	2085
Vehs Exited	2047	2168	2097	2023	2080	2084
Starting Vehs	49	43	60	50	38	44
Ending Vehs	44	57	45	55	40	46
Travel Distance (km)	2523	2676	2615	2520	2583	2583
Travel Time (hr)	51.5	57.5	55.3	51.1	53.0	53.7
Total Delay (hr)	6.5	10.0	8.4	6.2	7.1	7.7
Total Stops	773	731	729	721	746	740
Fuel Used (l)	188.7	204.4	195.8	187.6	193.3	193.9

Interval #0 Information Seeding

Start Time	6:30
End Time	7:00
Total Time (min)	30
Volumes adjusted by Growth Factors.	
No data recorded this interval.	

Interval #1 Information Recording

Start Time	7:00
End Time	8:00
Total Time (min)	60
Volumes adjusted by Growth Factors.	

Run Number	1	2	3	4	5	Avg
Vehs Entered	2042	2182	2082	2028	2082	2085
Vehs Exited	2047	2168	2097	2023	2080	2084
Starting Vehs	49	43	60	50	38	44
Ending Vehs	44	57	45	55	40	46
Travel Distance (km)	2523	2676	2615	2520	2583	2583
Travel Time (hr)	51.5	57.5	55.3	51.1	53.0	53.7
Total Delay (hr)	6.5	10.0	8.4	6.2	7.1	7.7
Total Stops	773	731	729	721	746	740
Fuel Used (l)	188.7	204.4	195.8	187.6	193.3	193.9

Intersection: 1: Salem Rd & County Road 27

Movement	EB	WB	SB
Directions Served	LTR	LTR	LTR
Maximum Queue (m)	7.2	18.2	9.2
Average Queue (m)	0.3	5.9	2.2
95th Queue (m)	3.0	12.8	8.1
Link Distance (m)	95.4	608.8	326.4
Upstream Blk Time (%)			
Queuing Penalty (veh)			
Storage Bay Dist (m)			
Storage Blk Time (%)			
Queuing Penalty (veh)			

Intersection: 2: Salem Rd & Brown Bear St

Movement	SB
Directions Served	LR
Maximum Queue (m)	8.8
Average Queue (m)	1.7
95th Queue (m)	7.4
Link Distance (m)	19.4
Upstream Blk Time (%)	
Queuing Penalty (veh)	
Storage Bay Dist (m)	
Storage Blk Time (%)	
Queuing Penalty (veh)	

Intersection: 3: Essa Rd & Salem Rd

Movement	EB	WB	NB	SB
Directions Served	LTR	LTR	L	L
Maximum Queue (m)	18.9	21.7	3.4	7.9
Average Queue (m)	7.8	8.3	0.4	1.6
95th Queue (m)	15.0	16.0	2.0	5.9
Link Distance (m)	152.6	662.2		
Upstream Blk Time (%)				
Queuing Penalty (veh)				
Storage Bay Dist (m)			74.0	74.0
Storage Blk Time (%)				
Queuing Penalty (veh)				

Intersection: 4: Koda St & Essa Rd

Movement	EB	NB
Directions Served	LR	LT
Maximum Queue (m)	17.3	15.2
Average Queue (m)	7.7	1.4
95th Queue (m)	16.0	9.2
Link Distance (m)	67.4	100.4
Upstream Blk Time (%)		
Queuing Penalty (veh)		
Storage Bay Dist (m)		
Storage Blk Time (%)		
Queuing Penalty (veh)		

Intersection: 5: Essa Rd & Mabern St

Movement	EB	NB
Directions Served	LR	L
Maximum Queue (m)	79.2	12.9
Average Queue (m)	45.7	4.5
95th Queue (m)	79.7	11.9
Link Distance (m)	69.7	
Upstream Blk Time (%)	10	
Queuing Penalty (veh)	0	
Storage Bay Dist (m)		88.0
Storage Blk Time (%)		
Queuing Penalty (veh)		

Intersection: 6: Essa Rd & Athabaska Rd

Movement	EB	NB	SB	SB
Directions Served	LR	L	T	R
Maximum Queue (m)	33.8	10.5	1.4	1.3
Average Queue (m)	13.3	1.7	0.0	0.0
95th Queue (m)	25.4	7.7	0.9	0.9
Link Distance (m)	132.1		319.0	
Upstream Blk Time (%)				
Queuing Penalty (veh)				
Storage Bay Dist (m)		77.0		27.0
Storage Blk Time (%)				
Queuing Penalty (veh)				

Network Summary

Network wide Queuing Penalty: 0

Summary of All Intervals

Run Number	1	2	3	4	5	Avg
Start Time	4:30	4:30	4:30	4:30	4:30	4:30
End Time	6:00	6:00	6:00	6:00	6:00	6:00
Total Time (min)	90	90	90	90	90	90
Time Recorded (min)	60	60	60	60	60	60
# of Intervals	2	2	2	2	2	2
# of Recorded Intervals	1	1	1	1	1	1
Vehs Entered	2812	2804	2829	2870	2866	2834
Vehs Exited	2810	2792	2792	2872	2883	2830
Starting Vehs	106	92	70	96	104	93
Ending Vehs	108	104	107	94	87	102
Travel Distance (km)	3485	3457	3449	3537	3521	3490
Travel Time (hr)	100.4	103.6	80.2	99.7	88.3	94.5
Total Delay (hr)	38.9	42.7	19.5	37.1	26.1	32.9
Total Stops	1088	1071	1114	948	1008	1042
Fuel Used (l)	289.7	294.0	271.5	291.6	281.0	285.6

Interval #0 Information Seeding

Start Time	4:30
End Time	5:00
Total Time (min)	30
Volumes adjusted by Growth Factors.	
No data recorded this interval.	

Interval #1 Information Recording

Start Time	5:00
End Time	6:00
Total Time (min)	60
Volumes adjusted by Growth Factors.	

Run Number	1	2	3	4	5	Avg
Vehs Entered	2812	2804	2829	2870	2866	2834
Vehs Exited	2810	2792	2792	2872	2883	2830
Starting Vehs	106	92	70	96	104	93
Ending Vehs	108	104	107	94	87	102
Travel Distance (km)	3485	3457	3449	3537	3521	3490
Travel Time (hr)	100.4	103.6	80.2	99.7	88.3	94.5
Total Delay (hr)	38.9	42.7	19.5	37.1	26.1	32.9
Total Stops	1088	1071	1114	948	1008	1042
Fuel Used (l)	289.7	294.0	271.5	291.6	281.0	285.6

Queuing and Blocking Report

Baseline

11-29-2023

Intersection: 1: Salem Rd & County Road 27

Movement	EB	WB	SB
Directions Served	LTR	LTR	LTR
Maximum Queue (m)	5.3	25.4	15.5
Average Queue (m)	0.2	11.5	2.8
95th Queue (m)	2.5	19.5	10.3
Link Distance (m)	95.4	608.8	326.4
Upstream Blk Time (%)			
Queuing Penalty (veh)			
Storage Bay Dist (m)			
Storage Blk Time (%)			
Queuing Penalty (veh)			

Intersection: 2: Salem Rd & Brown Bear St

Movement	SB
Directions Served	LR
Maximum Queue (m)	7.0
Average Queue (m)	1.7
95th Queue (m)	7.3
Link Distance (m)	19.4
Upstream Blk Time (%)	
Queuing Penalty (veh)	
Storage Bay Dist (m)	
Storage Blk Time (%)	
Queuing Penalty (veh)	

Intersection: 3: Essa Rd & Salem Rd

Movement	EB	WB	NB	NB	SB	SB
Directions Served	LTR	LTR	L	TR	L	TR
Maximum Queue (m)	31.1	239.8	2.5	2.6	6.7	1.3
Average Queue (m)	11.5	158.5	0.1	0.1	2.0	0.0
95th Queue (m)	22.5	285.7	1.1	1.3	5.7	0.9
Link Distance (m)	152.6	662.2		556.0		100.4
Upstream Blk Time (%)						
Queuing Penalty (veh)						
Storage Bay Dist (m)			74.0		74.0	
Storage Blk Time (%)						
Queuing Penalty (veh)						

Queuing and Blocking Report

Baseline

11-29-2023

Intersection: 4: Koda St & Essa Rd

Movement	EB	NB	SB
Directions Served	LR	LT	TR
Maximum Queue (m)	15.6	40.0	1.3
Average Queue (m)	6.6	5.5	0.0
95th Queue (m)	14.0	23.5	0.9
Link Distance (m)	67.4	100.4	227.2
Upstream Blk Time (%)			
Queuing Penalty (veh)			
Storage Bay Dist (m)			
Storage Blk Time (%)			
Queuing Penalty (veh)			

Intersection: 5: Essa Rd & Mabern St

Movement	EB	NB	SB
Directions Served	LR	L	TR
Maximum Queue (m)	79.9	27.7	9.4
Average Queue (m)	50.1	13.0	1.2
95th Queue (m)	87.4	23.9	5.6
Link Distance (m)	69.7		493.2
Upstream Blk Time (%)	24		
Queuing Penalty (veh)	0		
Storage Bay Dist (m)		88.0	
Storage Blk Time (%)			
Queuing Penalty (veh)			

Intersection: 6: Essa Rd & Athabaska Rd

Movement	EB	NB	SB	SB
Directions Served	LR	L	T	R
Maximum Queue (m)	34.6	18.3	1.4	5.4
Average Queue (m)	13.5	8.1	0.1	0.3
95th Queue (m)	27.2	16.0	1.4	2.9
Link Distance (m)	132.1		319.0	
Upstream Blk Time (%)				
Queuing Penalty (veh)				
Storage Bay Dist (m)		77.0		27.0
Storage Blk Time (%)				
Queuing Penalty (veh)				

Network Summary

Network wide Queuing Penalty: 0

B.2 Do-nothing Total Traffic

HCM Unsignalized Intersection Capacity Analysis

1: Salem Rd & County Road 27

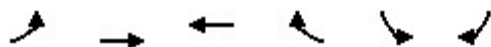
11-27-2023

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	0	0	1	13	0	106	0	357	56	19	176	0
Future Volume (Veh/h)	0	0	1	13	0	106	0	357	56	19	176	0
Sign Control		Stop			Stop			Free			Free	
Grade		0%			0%			0%			0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	0	0	1	14	0	115	0	388	61	21	191	0
Pedestrians												
Lane Width (m)												
Walking Speed (m/s)												
Percent Blockage												
Right turn flare (veh)												
Median type								None			None	
Median storage veh												
Upstream signal (m)												
pX, platoon unblocked												
vC, conflicting volume	766	682	191	652	652	418	191			449		
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	766	682	191	652	652	418	191			449		
tC, single (s)	7.1	6.5	6.2	7.1	6.5	6.2	4.1			4.1		
tC, 2 stage (s)												
tF (s)	3.5	4.0	3.3	3.5	4.0	3.3	2.2			2.2		
p0 queue free %	100	100	100	96	100	82	100			98		
cM capacity (veh/h)	258	365	851	375	380	635	1383			1111		
Direction, Lane #	EB 1	WB 1	NB 1	SB 1								
Volume Total	1	129	449	212								
Volume Left	0	14	0	21								
Volume Right	1	115	61	0								
cSH	851	590	1383	1111								
Volume to Capacity	0.00	0.22	0.00	0.02								
Queue Length 95th (m)	0.0	6.6	0.0	0.5								
Control Delay (s)	9.2	12.8	0.0	1.0								
Lane LOS	A	B		A								
Approach Delay (s)	9.2	12.8	0.0	1.0								
Approach LOS	A	B										
Intersection Summary												
Average Delay			2.4									
Intersection Capacity Utilization			45.7%		ICU Level of Service				A			
Analysis Period (min)			15									

HCM Unsignalized Intersection Capacity Analysis

2: Salem Rd & Brown Bear St

11-27-2023



Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Volume (veh/h)	7	65	109	122	44	5
Future Volume (Veh/h)	7	65	109	122	44	5
Sign Control		Free	Free		Stop	
Grade		0%	0%		0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	8	71	118	133	48	5
Pedestrians						
Lane Width (m)						
Walking Speed (m/s)						
Percent Blockage						
Right turn flare (veh)						
Median type		None	None			
Median storage veh						
Upstream signal (m)						
pX, platoon unblocked						
vC, conflicting volume	251				272	184
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	251				272	184
tC, single (s)	4.1				6.4	6.2
tC, 2 stage (s)						
tF (s)	2.2				3.5	3.3
p0 queue free %	99				93	99
cM capacity (veh/h)	1314				714	858
Direction, Lane #	EB 1	WB 1	SB 1			
Volume Total	79	251	53			
Volume Left	8	0	48			
Volume Right	0	133	5			
cSH	1314	1700	725			
Volume to Capacity	0.01	0.15	0.07			
Queue Length 95th (m)	0.1	0.0	1.9			
Control Delay (s)	0.8	0.0	10.4			
Lane LOS	A		B			
Approach Delay (s)	0.8	0.0	10.4			
Approach LOS			B			
Intersection Summary						
Average Delay			1.6			
Intersection Capacity Utilization			23.2%		ICU Level of Service	
Analysis Period (min)			15			
			A			

HCM Unsignalized Intersection Capacity Analysis

3: Essa Rd & Salem Rd

11-27-2023

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	30	71	8	25	175	40	10	324	26	25	263	46
Future Volume (Veh/h)	30	71	8	25	175	40	10	324	26	25	263	46
Sign Control		Stop			Stop			Free			Free	
Grade		0%			0%			0%			0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	33	77	9	27	190	43	11	352	28	27	286	50
Pedestrians												
Lane Width (m)												
Walking Speed (m/s)												
Percent Blockage												
Right turn flare (veh)												
Median type								None			None	
Median storage veh												
Upstream signal (m)												
pX, platoon unblocked												
vC, conflicting volume	877	767	311	776	778	366	336			380		
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	877	767	311	776	778	366	336			380		
tC, single (s)	7.1	6.5	6.2	7.1	6.5	6.2	4.1			4.1		
tC, 2 stage (s)												
tF (s)	3.5	4.0	3.3	3.5	4.0	3.3	2.2			2.2		
p0 queue free %	74	76	99	89	40	94	99			98		
cM capacity (veh/h)	129	322	729	248	317	679	1223			1178		
Direction, Lane #	EB 1	WB 1	NB 1	NB 2	SB 1	SB 2						
Volume Total	119	260	11	380	27	336						
Volume Left	33	27	11	0	27	0						
Volume Right	9	43	0	28	0	50						
cSH	234	337	1223	1700	1178	1700						
Volume to Capacity	0.51	0.77	0.01	0.22	0.02	0.20						
Queue Length 95th (m)	20.9	49.3	0.2	0.0	0.6	0.0						
Control Delay (s)	35.2	43.9	8.0	0.0	8.1	0.0						
Lane LOS	E	E	A		A							
Approach Delay (s)	35.2	43.9	0.2		0.6							
Approach LOS	E	E										
Intersection Summary												
Average Delay			14.0									
Intersection Capacity Utilization			41.6%		ICU Level of Service				A			
Analysis Period (min)			15									

HCM Unsignalized Intersection Capacity Analysis

4: Koda St & Essa Rd

11-27-2023

						
Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Traffic Volume (veh/h)	27	11	28	366	323	49
Future Volume (Veh/h)	27	11	28	366	323	49
Sign Control	Stop			Free	Free	
Grade	0%			0%	0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	29	12	30	398	351	53
Pedestrians						
Lane Width (m)						
Walking Speed (m/s)						
Percent Blockage						
Right turn flare (veh)						
Median type				None	None	
Median storage veh						
Upstream signal (m)						
pX, platoon unblocked						
vC, conflicting volume	836	378	404			
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	836	378	404			
tC, single (s)	6.4	6.2	4.1			
tC, 2 stage (s)						
tF (s)	3.5	3.3	2.2			
p0 queue free %	91	98	97			
cM capacity (veh/h)	329	669	1155			
Direction, Lane #	EB 1	NB 1	SB 1			
Volume Total	41	428	404			
Volume Left	29	30	0			
Volume Right	12	0	53			
cSH	386	1155	1700			
Volume to Capacity	0.11	0.03	0.24			
Queue Length 95th (m)	2.8	0.6	0.0			
Control Delay (s)	15.4	0.8	0.0			
Lane LOS	C	A				
Approach Delay (s)	15.4	0.8	0.0			
Approach LOS	C					
Intersection Summary						
Average Delay		1.1				
Intersection Capacity Utilization		52.3%		ICU Level of Service		A
Analysis Period (min)		15				

HCM Unsignalized Intersection Capacity Analysis

5: Essa Rd & Mabern St

11-27-2023

						
Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Traffic Volume (veh/h)	100	67	96	297	305	157
Future Volume (Veh/h)	100	67	96	297	305	157
Sign Control	Stop			Free	Free	
Grade	0%			0%	0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	109	73	104	323	332	171
Pedestrians						
Lane Width (m)						
Walking Speed (m/s)						
Percent Blockage						
Right turn flare (veh)						
Median type				None	None	
Median storage veh						
Upstream signal (m)						
pX, platoon unblocked						
vC, conflicting volume	948	418	503			
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	948	418	503			
tC, single (s)	6.4	6.2	4.1			
tC, 2 stage (s)						
tF (s)	3.5	3.3	2.2			
p0 queue free %	58	89	90			
cM capacity (veh/h)	261	635	1061			
Direction, Lane #	EB 1	NB 1	NB 2	SB 1		
Volume Total	182	104	323	503		
Volume Left	109	104	0	0		
Volume Right	73	0	0	171		
cSH	342	1061	1700	1700		
Volume to Capacity	0.53	0.10	0.19	0.30		
Queue Length 95th (m)	23.8	2.6	0.0	0.0		
Control Delay (s)	26.9	8.8	0.0	0.0		
Lane LOS	D	A				
Approach Delay (s)	26.9	2.1		0.0		
Approach LOS	D					
Intersection Summary						
Average Delay	5.2					
Intersection Capacity Utilization	50.6%			ICU Level of Service	A	
Analysis Period (min)	15					

HCM Unsignalized Intersection Capacity Analysis

6: Essa Rd & Athabaska Rd

11-27-2023

						
Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Traffic Volume (veh/h)	67	22	59	335	435	124
Future Volume (Veh/h)	67	22	59	335	435	124
Sign Control	Stop			Free	Free	
Grade	0%			0%	0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	73	24	64	364	473	135
Pedestrians						
Lane Width (m)						
Walking Speed (m/s)						
Percent Blockage						
Right turn flare (veh)						
Median type				None	None	
Median storage veh						
Upstream signal (m)						
pX, platoon unblocked						
vC, conflicting volume	965	473	608			
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	965	473	608			
tC, single (s)	6.4	6.2	4.1			
tC, 2 stage (s)						
tF (s)	3.5	3.3	2.2			
p0 queue free %	72	96	93			
cM capacity (veh/h)	264	591	970			
Direction, Lane #	EB 1	NB 1	NB 2	SB 1	SB 2	
Volume Total	97	64	364	473	135	
Volume Left	73	64	0	0	0	
Volume Right	24	0	0	0	135	
cSH	306	970	1700	1700	1700	
Volume to Capacity	0.32	0.07	0.21	0.28	0.08	
Queue Length 95th (m)	10.6	1.7	0.0	0.0	0.0	
Control Delay (s)	22.1	9.0	0.0	0.0	0.0	
Lane LOS	C	A				
Approach Delay (s)	22.1	1.3		0.0		
Approach LOS	C					
Intersection Summary						
Average Delay			2.4			
Intersection Capacity Utilization			41.3%	ICU Level of Service		A
Analysis Period (min)			15			

HCM Unsignalized Intersection Capacity Analysis

1: Salem Rd & County Road 27

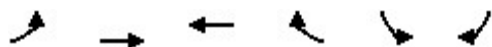
11-27-2023

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	0	1	0	15	0	11	0	177	21	20	226	0
Future Volume (Veh/h)	0	1	0	15	0	11	0	177	21	20	226	0
Sign Control	Stop			Stop			Free			Free		
Grade	0%			0%			0%			0%		
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	0	1	0	16	0	12	0	192	23	22	246	0
Pedestrians												
Lane Width (m)												
Walking Speed (m/s)												
Percent Blockage												
Right turn flare (veh)												
Median type							None			None		
Median storage veh												
Upstream signal (m)												
pX, platoon unblocked												
vC, conflicting volume	506	505	246	494	494	204	246				215	
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	506	505	246	494	494	204	246				215	
tC, single (s)	7.1	6.5	6.2	7.1	6.5	6.2	4.1				4.1	
tC, 2 stage (s)												
tF (s)	3.5	4.0	3.3	3.5	4.0	3.3	2.2				2.2	
p0 queue free %	100	100	100	97	100	99	100				98	
cM capacity (veh/h)	465	462	793	479	469	837	1320				1355	
Direction, Lane #	EB 1	WB 1	NB 1	SB 1								
Volume Total	1	28	215	268								
Volume Left	0	16	0	22								
Volume Right	0	12	23	0								
cSH	462	586	1320	1355								
Volume to Capacity	0.00	0.05	0.00	0.02								
Queue Length 95th (m)	0.1	1.2	0.0	0.4								
Control Delay (s)	12.8	11.4	0.0	0.8								
Lane LOS	B	B		A								
Approach Delay (s)	12.8	11.4	0.0	0.8								
Approach LOS	B	B										
Intersection Summary												
Average Delay				1.1								
Intersection Capacity Utilization				41.8%	ICU Level of Service				A			
Analysis Period (min)				15								

HCM Unsignalized Intersection Capacity Analysis

2: Salem Rd & Brown Bear St

11-27-2023



Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Volume (veh/h)	3	36	12	38	76	9
Future Volume (Veh/h)	3	36	12	38	76	9
Sign Control		Free	Free		Stop	
Grade		0%	0%		0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	3	39	13	41	83	10
Pedestrians						
Lane Width (m)						
Walking Speed (m/s)						
Percent Blockage						
Right turn flare (veh)						
Median type		None	None			
Median storage veh						
Upstream signal (m)						
pX, platoon unblocked						
vC, conflicting volume	54				78	34
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	54				78	34
tC, single (s)	4.1				6.4	6.2
tC, 2 stage (s)						
tF (s)	2.2				3.5	3.3
p0 queue free %	100				91	99
cM capacity (veh/h)	1551				922	1040
Direction, Lane #	EB 1	WB 1	SB 1			
Volume Total	42	54	93			
Volume Left	3	0	83			
Volume Right	0	41	10			
cSH	1551	1700	934			
Volume to Capacity	0.00	0.03	0.10			
Queue Length 95th (m)	0.0	0.0	2.6			
Control Delay (s)	0.5	0.0	9.3			
Lane LOS	A		A			
Approach Delay (s)	0.5	0.0	9.3			
Approach LOS			A			
Intersection Summary						
Average Delay			4.7			
Intersection Capacity Utilization			15.8%		ICU Level of Service	
Analysis Period (min)			15			
			A			

HCM Unsignalized Intersection Capacity Analysis

3: Essa Rd & Salem Rd

11-27-2023

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	47	53	11	14	21	11	8	153	31	28	197	21
Future Volume (Veh/h)	47	53	11	14	21	11	8	153	31	28	197	21
Sign Control		Stop			Stop			Free			Free	
Grade		0%			0%			0%			0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	51	58	12	15	23	12	9	166	34	30	214	23
Pedestrians												
Lane Width (m)												
Walking Speed (m/s)												
Percent Blockage												
Right turn flare (veh)												
Median type								None			None	
Median storage veh												
Upstream signal (m)												
pX, platoon unblocked												
vC, conflicting volume	493	504	226	516	498	183	237			200		
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	493	504	226	516	498	183	237			200		
tC, single (s)	7.1	6.5	6.2	7.1	6.5	6.2	4.1			4.1		
tC, 2 stage (s)												
tF (s)	3.5	4.0	3.3	3.5	4.0	3.3	2.2			2.2		
p0 queue free %	89	87	99	96	95	99	99			98		
cM capacity (veh/h)	451	457	814	409	460	859	1330			1372		
Direction, Lane #	EB 1	WB 1	NB 1	NB 2	SB 1	SB 2						
Volume Total	121	50	9	200	30	237						
Volume Left	51	15	9	0	30	0						
Volume Right	12	12	0	34	0	23						
cSH	475	497	1330	1700	1372	1700						
Volume to Capacity	0.25	0.10	0.01	0.12	0.02	0.14						
Queue Length 95th (m)	8.0	2.7	0.2	0.0	0.5	0.0						
Control Delay (s)	15.1	13.1	7.7	0.0	7.7	0.0						
Lane LOS	C	B	A		A							
Approach Delay (s)	15.1	13.1	0.3		0.9							
Approach LOS	C	B										
Intersection Summary												
Average Delay			4.3									
Intersection Capacity Utilization			34.2%	ICU Level of Service					A			
Analysis Period (min)			15									

HCM Unsignalized Intersection Capacity Analysis

4: Koda St & Essa Rd

11-27-2023

						
Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Traffic Volume (veh/h)	42	18	9	201	228	13
Future Volume (Veh/h)	42	18	9	201	228	13
Sign Control	Stop			Free	Free	
Grade	0%			0%	0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	46	20	10	218	248	14
Pedestrians						
Lane Width (m)						
Walking Speed (m/s)						
Percent Blockage						
Right turn flare (veh)						
Median type				None	None	
Median storage (veh)						
Upstream signal (m)						
pX, platoon unblocked						
vC, conflicting volume	493	255	262			
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	493	255	262			
tC, single (s)	6.4	6.2	4.1			
tC, 2 stage (s)						
tF (s)	3.5	3.3	2.2			
p0 queue free %	91	97	99			
cM capacity (veh/h)	531	784	1302			
Direction, Lane #	EB 1	NB 1	SB 1			
Volume Total	66	228	262			
Volume Left	46	10	0			
Volume Right	20	0	14			
cSH	589	1302	1700			
Volume to Capacity	0.11	0.01	0.15			
Queue Length 95th (m)	3.0	0.2	0.0			
Control Delay (s)	11.9	0.4	0.0			
Lane LOS	B	A				
Approach Delay (s)	11.9	0.4	0.0			
Approach LOS	B					
Intersection Summary						
Average Delay		1.6				
Intersection Capacity Utilization		28.0%		ICU Level of Service		A
Analysis Period (min)		15				

HCM Unsignalized Intersection Capacity Analysis

5: Essa Rd & Mabern St

11-27-2023



Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations	🛑		🛑	📶	📶	
Traffic Volume (veh/h)	154	92	29	214	149	45
Future Volume (Veh/h)	154	92	29	214	149	45
Sign Control	Stop			Free	Free	
Grade	0%			0%	0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	167	100	32	233	162	49
Pedestrians						
Lane Width (m)						
Walking Speed (m/s)						
Percent Blockage						
Right turn flare (veh)						
Median type				None	None	
Median storage veh						
Upstream signal (m)						
pX, platoon unblocked						
vC, conflicting volume	484	186	211			
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	484	186	211			
tC, single (s)	6.4	6.2	4.1			
tC, 2 stage (s)						
tF (s)	3.5	3.3	2.2			
p0 queue free %	68	88	98			
cM capacity (veh/h)	529	856	1360			
Direction, Lane #	EB 1	NB 1	NB 2	SB 1		
Volume Total	267	32	233	211		
Volume Left	167	32	0	0		
Volume Right	100	0	0	49		
cSH	618	1360	1700	1700		
Volume to Capacity	0.43	0.02	0.14	0.12		
Queue Length 95th (m)	17.4	0.6	0.0	0.0		
Control Delay (s)	15.2	7.7	0.0	0.0		
Lane LOS	C	A				
Approach Delay (s)	15.2	0.9	0.0			
Approach LOS	C					
Intersection Summary						
Average Delay			5.8			
Intersection Capacity Utilization			38.1%	ICU Level of Service		A
Analysis Period (min)			15			

HCM Unsignalized Intersection Capacity Analysis

6: Essa Rd & Athabaska Rd

11-27-2023

						
Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Traffic Volume (veh/h)	89	43	12	351	145	23
Future Volume (Veh/h)	89	43	12	351	145	23
Sign Control	Stop			Free	Free	
Grade	0%			0%	0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	97	47	13	382	158	25
Pedestrians						
Lane Width (m)						
Walking Speed (m/s)						
Percent Blockage						
Right turn flare (veh)						
Median type				None	None	
Median storage veh						
Upstream signal (m)						
pX, platoon unblocked						
vC, conflicting volume	566	158	183			
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	566	158	183			
tC, single (s)	6.4	6.2	4.1			
tC, 2 stage (s)						
tF (s)	3.5	3.3	2.2			
p0 queue free %	80	95	99			
cM capacity (veh/h)	481	887	1392			
Direction, Lane #	EB 1	NB 1	NB 2	SB 1	SB 2	
Volume Total	144	13	382	158	25	
Volume Left	97	13	0	0	0	
Volume Right	47	0	0	0	25	
cSH	566	1392	1700	1700	1700	
Volume to Capacity	0.25	0.01	0.22	0.09	0.01	
Queue Length 95th (m)	8.0	0.2	0.0	0.0	0.0	
Control Delay (s)	13.5	7.6	0.0	0.0	0.0	
Lane LOS	B	A				
Approach Delay (s)	13.5	0.3		0.0		
Approach LOS	B					
Intersection Summary						
Average Delay			2.8			
Intersection Capacity Utilization			32.7%		ICU Level of Service	
					A	
Analysis Period (min)			15			

Summary of All Intervals

Run Number	1	2	3	4	5	Avg
Start Time	6:30	6:30	6:30	6:30	6:30	6:30
End Time	8:00	8:00	8:00	8:00	8:00	8:00
Total Time (min)	90	90	90	90	90	90
Time Recorded (min)	60	60	60	60	60	60
# of Intervals	2	2	2	2	2	2
# of Recorded Intervals	1	1	1	1	1	1
Vehs Entered	1384	1399	1328	1343	1403	1374
Vehs Exited	1377	1388	1332	1331	1398	1366
Starting Vehs	40	30	34	17	23	27
Ending Vehs	47	41	30	29	28	33
Travel Distance (km)	1515	1559	1470	1499	1572	1523
Travel Time (hr)	29.2	30.3	28.3	28.8	30.6	29.4
Total Delay (hr)	2.3	2.4	2.2	2.2	2.6	2.4
Total Stops	702	748	690	676	748	710
Fuel Used (l)	112.4	117.7	110.1	110.9	118.3	113.9

Interval #0 Information Seeding

Start Time	6:30
End Time	7:00
Total Time (min)	30
Volumes adjusted by Growth Factors.	
No data recorded this interval.	

Interval #1 Information Recording

Start Time	7:00					
End Time	8:00					
Total Time (min)	60					
Volumes adjusted by Growth Factors.						
Run Number	1	2	3	4	5	Avg
Vehs Entered	1384	1399	1328	1343	1403	1374
Vehs Exited	1377	1388	1332	1331	1398	1366
Starting Vehs	40	30	34	17	23	27
Ending Vehs	47	41	30	29	28	33
Travel Distance (km)	1515	1559	1470	1499	1572	1523
Travel Time (hr)	29.2	30.3	28.3	28.8	30.6	29.4
Total Delay (hr)	2.3	2.4	2.2	2.2	2.6	2.4
Total Stops	702	748	690	676	748	710
Fuel Used (l)	112.4	117.7	110.1	110.9	118.3	113.9

Intersection: 1: Salem Rd & County Road 27

Movement	EB	WB	SB
Directions Served	LTR	LTR	LTR
Maximum Queue (m)	5.2	8.4	8.5
Average Queue (m)	0.2	4.1	1.1
95th Queue (m)	2.2	10.0	5.6
Link Distance (m)	95.4	608.8	326.4
Upstream Blk Time (%)			
Queuing Penalty (veh)			
Storage Bay Dist (m)			
Storage Blk Time (%)			
Queuing Penalty (veh)			

Intersection: 2: Salem Rd & Brown Bear St

Movement	EB	SB
Directions Served	LT	LR
Maximum Queue (m)	1.5	20.0
Average Queue (m)	0.0	10.1
95th Queue (m)	1.0	17.6
Link Distance (m)	608.8	19.4
Upstream Blk Time (%)		0
Queuing Penalty (veh)		0
Storage Bay Dist (m)		
Storage Blk Time (%)		
Queuing Penalty (veh)		

Intersection: 3: Essa Rd & Salem Rd

Movement	EB	WB	NB	NB	SB
Directions Served	LTR	LTR	L	TR	L
Maximum Queue (m)	18.3	14.8	3.3	0.0	7.4
Average Queue (m)	8.9	6.0	0.2	0.0	0.7
95th Queue (m)	15.6	12.5	1.4	0.0	3.9
Link Distance (m)	152.6	662.2		556.0	
Upstream Blk Time (%)					
Queuing Penalty (veh)					
Storage Bay Dist (m)			74.0		74.0
Storage Blk Time (%)					
Queuing Penalty (veh)					

Intersection: 4: Koda St & Essa Rd

Movement	EB	NB
Directions Served	LR	LT
Maximum Queue (m)	15.0	5.5
Average Queue (m)	8.6	0.3
95th Queue (m)	15.1	3.0
Link Distance (m)	67.4	100.4
Upstream Blk Time (%)		
Queuing Penalty (veh)		
Storage Bay Dist (m)		
Storage Blk Time (%)		
Queuing Penalty (veh)		

Intersection: 5: Essa Rd & Mabern St

Movement	EB	NB
Directions Served	LR	L
Maximum Queue (m)	41.0	8.8
Average Queue (m)	18.2	1.0
95th Queue (m)	31.6	5.5
Link Distance (m)	69.7	
Upstream Blk Time (%)		
Queuing Penalty (veh)		
Storage Bay Dist (m)		88.0
Storage Blk Time (%)		
Queuing Penalty (veh)		

Intersection: 6: Essa Rd & Athabaska Rd

Movement	EB	NB
Directions Served	LR	L
Maximum Queue (m)	26.8	7.3
Average Queue (m)	10.0	0.6
95th Queue (m)	19.3	4.3
Link Distance (m)	132.1	
Upstream Blk Time (%)		
Queuing Penalty (veh)		
Storage Bay Dist (m)		77.0
Storage Blk Time (%)		
Queuing Penalty (veh)		

Network Summary

Network wide Queuing Penalty: 0

Summary of All Intervals

Run Number	1	2	3	4	5	Avg
Start Time	4:30	4:30	4:30	4:30	4:30	4:30
End Time	6:00	6:00	6:00	6:00	6:00	6:00
Total Time (min)	90	90	90	90	90	90
Time Recorded (min)	60	60	60	60	60	60
# of Intervals	2	2	2	2	2	2
# of Recorded Intervals	1	1	1	1	1	1
Vehs Entered	2086	2031	2061	2103	2058	2065
Vehs Exited	2102	2032	2061	2100	2051	2067
Starting Vehs	54	45	51	53	46	50
Ending Vehs	38	44	51	56	53	45
Travel Distance (km)	2510	2424	2414	2497	2439	2457
Travel Time (hr)	50.3	48.5	48.6	50.0	49.1	49.3
Total Delay (hr)	5.7	5.4	5.7	5.7	5.7	5.7
Total Stops	894	875	855	898	874	879
Fuel Used (l)	192.7	186.8	184.0	191.8	188.6	188.8

Interval #0 Information Seeding

Start Time	4:30
End Time	5:00
Total Time (min)	30
Volumes adjusted by Growth Factors.	
No data recorded this interval.	

Interval #1 Information Recording

Start Time	5:00
End Time	6:00
Total Time (min)	60
Volumes adjusted by Growth Factors.	

Run Number	1	2	3	4	5	Avg
Vehs Entered	2086	2031	2061	2103	2058	2065
Vehs Exited	2102	2032	2061	2100	2051	2067
Starting Vehs	54	45	51	53	46	50
Ending Vehs	38	44	51	56	53	45
Travel Distance (km)	2510	2424	2414	2497	2439	2457
Travel Time (hr)	50.3	48.5	48.6	50.0	49.1	49.3
Total Delay (hr)	5.7	5.4	5.7	5.7	5.7	5.7
Total Stops	894	875	855	898	874	879
Fuel Used (l)	192.7	186.8	184.0	191.8	188.6	188.8

Queuing and Blocking Report

Baseline

11-27-2023

Intersection: 1: Salem Rd & County Road 27

Movement	EB	WB	SB
Directions Served	LTR	LTR	LTR
Maximum Queue (m)	5.0	18.7	11.3
Average Queue (m)	0.2	9.0	1.3
95th Queue (m)	2.1	14.1	6.2
Link Distance (m)	95.4	608.8	326.4
Upstream Blk Time (%)			
Queuing Penalty (veh)			
Storage Bay Dist (m)			
Storage Blk Time (%)			
Queuing Penalty (veh)			

Intersection: 2: Salem Rd & Brown Bear St

Movement	EB	SB
Directions Served	LT	LR
Maximum Queue (m)	5.9	21.0
Average Queue (m)	0.4	8.1
95th Queue (m)	3.0	16.6
Link Distance (m)	608.8	19.4
Upstream Blk Time (%)		0
Queuing Penalty (veh)		0
Storage Bay Dist (m)		
Storage Blk Time (%)		
Queuing Penalty (veh)		

Intersection: 3: Essa Rd & Salem Rd

Movement	EB	WB	NB	SB	SB
Directions Served	LTR	LTR	L	L	TR
Maximum Queue (m)	26.7	61.6	2.7	9.0	1.8
Average Queue (m)	11.2	23.6	0.3	1.3	0.1
95th Queue (m)	21.2	47.3	1.6	5.2	0.9
Link Distance (m)	152.6	662.2			100.4
Upstream Blk Time (%)					
Queuing Penalty (veh)					
Storage Bay Dist (m)			74.0	74.0	
Storage Blk Time (%)					
Queuing Penalty (veh)					

Queuing and Blocking Report

Baseline

11-27-2023

Intersection: 4: Koda St & Essa Rd

Movement	EB	NB	SB
Directions Served	LR	LT	TR
Maximum Queue (m)	17.9	20.5	1.3
Average Queue (m)	7.2	2.4	0.0
95th Queue (m)	15.3	10.5	0.9
Link Distance (m)	67.4	100.4	227.2
Upstream Blk Time (%)			
Queuing Penalty (veh)			
Storage Bay Dist (m)			
Storage Blk Time (%)			
Queuing Penalty (veh)			

Intersection: 5: Essa Rd & Mabern St

Movement	EB	NB	SB
Directions Served	LR	L	TR
Maximum Queue (m)	34.1	22.7	5.2
Average Queue (m)	16.9	7.8	0.2
95th Queue (m)	28.2	17.7	2.2
Link Distance (m)	69.7		493.2
Upstream Blk Time (%)			
Queuing Penalty (veh)			
Storage Bay Dist (m)		88.0	
Storage Blk Time (%)			
Queuing Penalty (veh)			

Intersection: 6: Essa Rd & Athabaska Rd

Movement	EB	NB	SB
Directions Served	LR	L	R
Maximum Queue (m)	21.1	15.5	2.6
Average Queue (m)	8.9	5.3	0.1
95th Queue (m)	16.4	13.4	1.3
Link Distance (m)	132.1		
Upstream Blk Time (%)			
Queuing Penalty (veh)			
Storage Bay Dist (m)		77.0	27.0
Storage Blk Time (%)			
Queuing Penalty (veh)			

Network Summary

Network wide Queuing Penalty: 0

HCM Unsignalized Intersection Capacity Analysis

1: Salem Rd & County Road 27

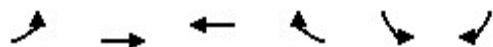
11-27-2023

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	0	1	0	16	0	30	0	218	23	42	277	0
Future Volume (Veh/h)	0	1	0	16	0	30	0	218	23	42	277	0
Sign Control		Stop			Stop			Free			Free	
Grade		0%			0%			0%			0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	0	1	0	17	0	33	0	237	25	46	301	0
Pedestrians												
Lane Width (m)												
Walking Speed (m/s)												
Percent Blockage												
Right turn flare (veh)												
Median type								None			None	
Median storage veh												
Upstream signal (m)												
pX, platoon unblocked												
vC, conflicting volume	676	655	301	643	642	250	301			262		
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	676	655	301	643	642	250	301			262		
tC, single (s)	7.1	6.5	6.2	7.1	6.5	6.2	4.1			4.1		
tC, 2 stage (s)												
tF (s)	3.5	4.0	3.3	3.5	4.0	3.3	2.2			2.2		
p0 queue free %	100	100	100	95	100	96	100			96		
cM capacity (veh/h)	343	372	739	375	378	789	1260			1302		
Direction, Lane #	EB 1	WB 1	NB 1	SB 1								
Volume Total	1	50	262	347								
Volume Left	0	17	0	46								
Volume Right	0	33	25	0								
cSH	372	574	1260	1302								
Volume to Capacity	0.00	0.09	0.00	0.04								
Queue Length 95th (m)	0.1	2.3	0.0	0.9								
Control Delay (s)	14.7	11.9	0.0	1.3								
Lane LOS	B	B		A								
Approach Delay (s)	14.7	11.9	0.0	1.3								
Approach LOS	B	B										
Intersection Summary												
Average Delay			1.6									
Intersection Capacity Utilization			49.2%	ICU Level of Service						A		
Analysis Period (min)			15									

HCM Unsignalized Intersection Capacity Analysis

2: Salem Rd & Brown Bear St

11-27-2023



Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Volume (veh/h)	3	60	31	40	76	9
Future Volume (Veh/h)	3	60	31	40	76	9
Sign Control		Free	Free		Stop	
Grade		0%	0%		0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	3	65	34	43	83	10
Pedestrians						
Lane Width (m)						
Walking Speed (m/s)						
Percent Blockage						
Right turn flare (veh)						
Median type		None	None			
Median storage veh						
Upstream signal (m)						
pX, platoon unblocked						
vC, conflicting volume	77				126	56
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	77				126	56
tC, single (s)	4.1				6.4	6.2
tC, 2 stage (s)						
tF (s)	2.2				3.5	3.3
p0 queue free %	100				90	99
cM capacity (veh/h)	1522				866	1011
Direction, Lane #	EB 1	WB 1	SB 1			
Volume Total	68	77	93			
Volume Left	3	0	83			
Volume Right	0	43	10			
cSH	1522	1700	880			
Volume to Capacity	0.00	0.05	0.11			
Queue Length 95th (m)	0.0	0.0	2.8			
Control Delay (s)	0.3	0.0	9.6			
Lane LOS	A		A			
Approach Delay (s)	0.3	0.0	9.6			
Approach LOS			A			
Intersection Summary						
Average Delay			3.8			
Intersection Capacity Utilization		17.0%		ICU Level of Service		A
Analysis Period (min)		15				

HCM Unsignalized Intersection Capacity Analysis

3: Essa Rd & Salem Rd

11-27-2023

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	47	77	11	15	40	12	9	275	34	39	518	22
Future Volume (Veh/h)	47	77	11	15	40	12	9	275	34	39	518	22
Sign Control		Stop			Stop			Free			Free	
Grade		0%			0%			0%			0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	51	84	12	16	43	13	10	299	37	42	563	24
Pedestrians												
Lane Width (m)												
Walking Speed (m/s)												
Percent Blockage												
Right turn flare (veh)												
Median type								None			None	
Median storage veh												
Upstream signal (m)												
pX, platoon unblocked												
vC, conflicting volume	1012	1015	575	1038	1008	318	587			336		
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	1012	1015	575	1038	1008	318	587			336		
tC, single (s)	7.1	6.5	6.2	7.1	6.5	6.2	4.1			4.1		
tC, 2 stage (s)												
tF (s)	3.5	4.0	3.3	3.5	4.0	3.3	2.2			2.2		
p0 queue free %	71	63	98	89	81	98	99			97		
cM capacity (veh/h)	177	228	518	141	230	723	988			1223		
Direction, Lane #	EB 1	WB 1	NB 1	NB 2	SB 1	SB 2						
Volume Total	147	72	10	336	42	587						
Volume Left	51	16	10	0	42	0						
Volume Right	12	13	0	37	0	24						
cSH	216	226	988	1700	1223	1700						
Volume to Capacity	0.68	0.32	0.01	0.20	0.03	0.35						
Queue Length 95th (m)	34.2	10.5	0.2	0.0	0.9	0.0						
Control Delay (s)	51.1	28.2	8.7	0.0	8.0	0.0						
Lane LOS	F	D	A		A							
Approach Delay (s)	51.1	28.2	0.3		0.5							
Approach LOS	F	D										
Intersection Summary												
Average Delay			8.3									
Intersection Capacity Utilization			50.9%	ICU Level of Service					A			
Analysis Period (min)			15									

HCM Unsignalized Intersection Capacity Analysis

4: Koda St & Essa Rd

11-27-2023

						
Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Traffic Volume (veh/h)	45	19	10	323	560	14
Future Volume (Veh/h)	45	19	10	323	560	14
Sign Control	Stop			Free	Free	
Grade	0%			0%	0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	49	21	11	351	609	15
Pedestrians						
Lane Width (m)						
Walking Speed (m/s)						
Percent Blockage						
Right turn flare (veh)						
Median type				None	None	
Median storage (veh)						
Upstream signal (m)						
pX, platoon unblocked						
vC, conflicting volume	990	616	624			
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	990	616	624			
tC, single (s)	6.4	6.2	4.1			
tC, 2 stage (s)						
tF (s)	3.5	3.3	2.2			
p0 queue free %	82	96	99			
cM capacity (veh/h)	270	490	957			
Direction, Lane #	EB 1	NB 1	SB 1			
Volume Total	70	362	624			
Volume Left	49	11	0			
Volume Right	21	0	15			
cSH	312	957	1700			
Volume to Capacity	0.22	0.01	0.37			
Queue Length 95th (m)	6.7	0.3	0.0			
Control Delay (s)	19.8	0.4	0.0			
Lane LOS	C	A				
Approach Delay (s)	19.8	0.4	0.0			
Approach LOS	C					
Intersection Summary						
Average Delay		1.4				
Intersection Capacity Utilization		40.6%		ICU Level of Service		A
Analysis Period (min)		15				

HCM Unsignalized Intersection Capacity Analysis

5: Essa Rd & Mabern St

11-27-2023

						
Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Traffic Volume (veh/h)	230	132	39	329	442	74
Future Volume (Veh/h)	230	132	39	329	442	74
Sign Control	Stop			Free	Free	
Grade	0%			0%	0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	250	143	42	358	480	80
Pedestrians						
Lane Width (m)						
Walking Speed (m/s)						
Percent Blockage						
Right turn flare (veh)						
Median type				None	None	
Median storage veh						
Upstream signal (m)						
pX, platoon unblocked						
vC, conflicting volume	962	520	560			
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	962	520	560			
tC, single (s)	6.4	6.2	4.1			
tC, 2 stage (s)						
tF (s)	3.5	3.3	2.2			
p0 queue free %	8	74	96			
cM capacity (veh/h)	272	556	1011			
Direction, Lane #	EB 1	NB 1	NB 2	SB 1		
Volume Total	393	42	358	560		
Volume Left	250	42	0	0		
Volume Right	143	0	0	80		
cSH	334	1011	1700	1700		
Volume to Capacity	1.18	0.04	0.21	0.33		
Queue Length 95th (m)	130.8	1.0	0.0	0.0		
Control Delay (s)	140.6	8.7	0.0	0.0		
Lane LOS	F	A				
Approach Delay (s)	140.6	0.9		0.0		
Approach LOS	F					
Intersection Summary						
Average Delay		41.1				
Intersection Capacity Utilization		59.9%		ICU Level of Service		B
Analysis Period (min)		15				

HCM Unsignalized Intersection Capacity Analysis

6: Essa Rd & Athabaska Rd

11-27-2023

						
Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Traffic Volume (veh/h)	98	47	13	541	462	25
Future Volume (Veh/h)	98	47	13	541	462	25
Sign Control	Stop			Free	Free	
Grade	0%			0%	0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	107	51	14	588	502	27
Pedestrians						
Lane Width (m)						
Walking Speed (m/s)						
Percent Blockage						
Right turn flare (veh)						
Median type				None	None	
Median storage veh						
Upstream signal (m)						
pX, platoon unblocked						
vC, conflicting volume	1118	502	529			
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	1118	502	529			
tC, single (s)	6.4	6.2	4.1			
tC, 2 stage (s)						
tF (s)	3.5	3.3	2.2			
p0 queue free %	53	91	99			
cM capacity (veh/h)	226	569	1038			
Direction, Lane #	EB 1	NB 1	NB 2	SB 1	SB 2	
Volume Total	158	14	588	502	27	
Volume Left	107	14	0	0	0	
Volume Right	51	0	0	0	27	
cSH	281	1038	1700	1700	1700	
Volume to Capacity	0.56	0.01	0.35	0.30	0.02	
Queue Length 95th (m)	25.6	0.3	0.0	0.0	0.0	
Control Delay (s)	33.2	8.5	0.0	0.0	0.0	
Lane LOS	D	A				
Approach Delay (s)	33.2	0.2		0.0		
Approach LOS	D					
Intersection Summary						
Average Delay			4.2			
Intersection Capacity Utilization			43.4%		ICU Level of Service	
					A	
Analysis Period (min)			15			

HCM Unsignalized Intersection Capacity Analysis

1: Salem Rd & County Road 27

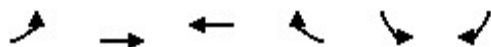
11-27-2023

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	0	0	1	14	0	137	0	434	62	31	211	0
Future Volume (Veh/h)	0	0	1	14	0	137	0	434	62	31	211	0
Sign Control	Stop			Stop			Free			Free		
Grade	0%			0%			0%			0%		
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	0	0	1	15	0	149	0	472	67	34	229	0
Pedestrians												
Lane Width (m)												
Walking Speed (m/s)												
Percent Blockage												
Right turn flare (veh)												
Median type							None			None		
Median storage veh												
Upstream signal (m)												
pX, platoon unblocked												
vC, conflicting volume	952	836	229	804	802	506	229				539	
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	952	836	229	804	802	506	229				539	
tC, single (s)	7.1	6.5	6.2	7.1	6.5	6.2	4.1				4.1	
tC, 2 stage (s)												
tF (s)	3.5	4.0	3.3	3.5	4.0	3.3	2.2				2.2	
p0 queue free %	100	100	100	95	100	74	100				97	
cM capacity (veh/h)	172	293	810	294	307	567	1339				1029	
Direction, Lane #	EB 1	WB 1	NB 1	SB 1								
Volume Total	1	164	539	263								
Volume Left	0	15	0	34								
Volume Right	1	149	67	0								
cSH	810	522	1339	1029								
Volume to Capacity	0.00	0.31	0.00	0.03								
Queue Length 95th (m)	0.0	10.7	0.0	0.8								
Control Delay (s)	9.4	15.0	0.0	1.4								
Lane LOS	A	C		A								
Approach Delay (s)	9.4	15.0	0.0	1.4								
Approach LOS	A	C										
Intersection Summary												
Average Delay				2.9								
Intersection Capacity Utilization				59.8%	ICU Level of Service				B			
Analysis Period (min)				15								

HCM Unsignalized Intersection Capacity Analysis

2: Salem Rd & Brown Bear St

11-27-2023



Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Volume (veh/h)	7	82	140	128	44	5
Future Volume (Veh/h)	7	82	140	128	44	5
Sign Control		Free	Free		Stop	
Grade		0%	0%		0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	8	89	152	139	48	5
Pedestrians						
Lane Width (m)						
Walking Speed (m/s)						
Percent Blockage						
Right turn flare (veh)						
Median type		None	None			
Median storage veh						
Upstream signal (m)						
pX, platoon unblocked						
vC, conflicting volume	291				326	222
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	291				326	222
tC, single (s)	4.1				6.4	6.2
tC, 2 stage (s)						
tF (s)	2.2				3.5	3.3
p0 queue free %	99				93	99
cM capacity (veh/h)	1271				663	818
Direction, Lane #	EB 1	WB 1	SB 1			
Volume Total	97	291	53			
Volume Left	8	0	48			
Volume Right	0	139	5			
cSH	1271	1700	676			
Volume to Capacity	0.01	0.17	0.08			
Queue Length 95th (m)	0.2	0.0	2.0			
Control Delay (s)	0.7	0.0	10.8			
Lane LOS	A		B			
Approach Delay (s)	0.7	0.0	10.8			
Approach LOS			B			
Intersection Summary						
Average Delay			1.4			
Intersection Capacity Utilization		25.2%		ICU Level of Service		A
Analysis Period (min)			15			

HCM Unsignalized Intersection Capacity Analysis

3: Essa Rd & Salem Rd

11-27-2023

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	31	87	8	28	211	43	10	553	29	33	411	47
Future Volume (Veh/h)	31	87	8	28	211	43	10	553	29	33	411	47
Sign Control		Stop			Stop			Free			Free	
Grade		0%			0%			0%			0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	34	95	9	30	229	47	11	601	32	36	447	51
Pedestrians												
Lane Width (m)												
Walking Speed (m/s)												
Percent Blockage												
Right turn flare (veh)												
Median type								None			None	
Median storage veh												
Upstream signal (m)												
pX, platoon unblocked												
vC, conflicting volume	1329	1200	472	1214	1209	617	498			633		
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	1329	1200	472	1214	1209	617	498			633		
tC, single (s)	7.1	6.5	6.2	7.1	6.5	6.2	4.1			4.1		
tC, 2 stage (s)												
tF (s)	3.5	4.0	3.3	3.5	4.0	3.3	2.2			2.2		
p0 queue free %	0	46	98	65	0	90	99			96		
cM capacity (veh/h)	0	176	592	87	174	490	1066			950		
Direction, Lane #	EB 1	WB 1	NB 1	NB 2	SB 1	SB 2						
Volume Total	138	306	11	633	36	498						
Volume Left	34	30	11	0	36	0						
Volume Right	9	47	0	32	0	51						
cSH	0	174	1066	1700	950	1700						
Volume to Capacity	Err	1.76	0.01	0.37	0.04	0.29						
Queue Length 95th (m)	Err	174.2	0.3	0.0	0.9	0.0						
Control Delay (s)	Err	409.6	8.4	0.0	8.9	0.0						
Lane LOS	F	F	A		A							
Approach Delay (s)	Err	409.6	0.1		0.6							
Approach LOS	F	F										
Intersection Summary												
Average Delay			Err									
Intersection Capacity Utilization			54.4%	ICU Level of Service					A			
Analysis Period (min)			15									

HCM Unsignalized Intersection Capacity Analysis

4: Koda St & Essa Rd

11-27-2023

						
Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Traffic Volume (veh/h)	29	12	30	597	479	53
Future Volume (Veh/h)	29	12	30	597	479	53
Sign Control	Stop			Free	Free	
Grade	0%			0%	0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	32	13	33	649	521	58
Pedestrians						
Lane Width (m)						
Walking Speed (m/s)						
Percent Blockage						
Right turn flare (veh)						
Median type				None	None	
Median storage veh						
Upstream signal (m)						
pX, platoon unblocked						
vC, conflicting volume	1265	550	579			
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	1265	550	579			
tC, single (s)	6.4	6.2	4.1			
tC, 2 stage (s)						
tF (s)	3.5	3.3	2.2			
p0 queue free %	82	98	97			
cM capacity (veh/h)	181	535	995			
Direction, Lane #	EB 1	NB 1	SB 1			
Volume Total	45	682	579			
Volume Left	32	33	0			
Volume Right	13	0	58			
cSH	223	995	1700			
Volume to Capacity	0.20	0.03	0.34			
Queue Length 95th (m)	5.9	0.8	0.0			
Control Delay (s)	25.1	0.9	0.0			
Lane LOS	D	A				
Approach Delay (s)	25.1	0.9	0.0			
Approach LOS	D					
Intersection Summary						
Average Delay		1.3				
Intersection Capacity Utilization		65.9%		ICU Level of Service		C
Analysis Period (min)		15				

HCM Unsignalized Intersection Capacity Analysis

5: Essa Rd & Mabern St

11-27-2023

						
Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Traffic Volume (veh/h)	148	94	128	498	438	215
Future Volume (Veh/h)	148	94	128	498	438	215
Sign Control	Stop			Free	Free	
Grade	0%			0%	0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	161	102	139	541	476	234
Pedestrians						
Lane Width (m)						
Walking Speed (m/s)						
Percent Blockage						
Right turn flare (veh)						
Median type				None	None	
Median storage veh						
Upstream signal (m)						
pX, platoon unblocked						
vC, conflicting volume	1412	593	710			
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	1412	593	710			
tC, single (s)	6.4	6.2	4.1			
tC, 2 stage (s)						
tF (s)	3.5	3.3	2.2			
p0 queue free %	0	80	84			
cM capacity (veh/h)	128	506	889			
Direction, Lane #	EB 1	NB 1	NB 2	SB 1		
Volume Total	263	139	541	710		
Volume Left	161	139	0	0		
Volume Right	102	0	0	234		
cSH	181	889	1700	1700		
Volume to Capacity	1.46	0.16	0.32	0.42		
Queue Length 95th (m)	130.7	4.4	0.0	0.0		
Control Delay (s)	281.3	9.8	0.0	0.0		
Lane LOS	F	A				
Approach Delay (s)	281.3	2.0		0.0		
Approach LOS	F					
Intersection Summary						
Average Delay			45.6			
Intersection Capacity Utilization			67.2%	ICU Level of Service		C
Analysis Period (min)			15			

HCM Unsignalized Intersection Capacity Analysis

6: Essa Rd & Athabaska Rd

11-27-2023

						
Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Traffic Volume (veh/h)	74	24	65	578	623	137
Future Volume (Veh/h)	74	24	65	578	623	137
Sign Control	Stop			Free	Free	
Grade	0%			0%	0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	80	26	71	628	677	149
Pedestrians						
Lane Width (m)						
Walking Speed (m/s)						
Percent Blockage						
Right turn flare (veh)						
Median type				None	None	
Median storage veh						
Upstream signal (m)						
pX, platoon unblocked						
vC, conflicting volume	1447	677	826			
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	1447	677	826			
tC, single (s)	6.4	6.2	4.1			
tC, 2 stage (s)						
tF (s)	3.5	3.3	2.2			
p0 queue free %	39	94	91			
cM capacity (veh/h)	132	453	805			
Direction, Lane #	EB 1	NB 1	NB 2	SB 1	SB 2	
Volume Total	106	71	628	677	149	
Volume Left	80	71	0	0	0	
Volume Right	26	0	0	0	149	
cSH	160	805	1700	1700	1700	
Volume to Capacity	0.66	0.09	0.37	0.40	0.09	
Queue Length 95th (m)	30.3	2.3	0.0	0.0	0.0	
Control Delay (s)	63.4	9.9	0.0	0.0	0.0	
Lane LOS	F	A				
Approach Delay (s)	63.4	1.0		0.0		
Approach LOS	F					
Intersection Summary						
Average Delay			4.6			
Intersection Capacity Utilization			52.0%	ICU Level of Service		A
Analysis Period (min)			15			

Summary of All Intervals

Run Number	1	2	3	4	5	Avg
Start Time	6:30	6:30	6:30	6:30	6:30	6:30
End Time	8:00	8:00	8:00	8:00	8:00	8:00
Total Time (min)	90	90	90	90	90	90
Time Recorded (min)	60	60	60	60	60	60
# of Intervals	2	2	2	2	2	2
# of Recorded Intervals	1	1	1	1	1	1
Vehs Entered	2093	2170	2064	2162	2145	2128
Vehs Exited	2091	2172	2080	2150	2145	2128
Starting Vehs	62	59	64	59	49	57
Ending Vehs	64	57	48	71	49	56
Travel Distance (km)	2612	2679	2565	2663	2648	2633
Travel Time (hr)	56.3	57.8	52.2	55.4	55.4	55.4
Total Delay (hr)	9.3	9.7	6.5	7.7	7.9	8.2
Total Stops	887	962	884	922	969	924
Fuel Used (l)	200.1	207.1	193.0	203.1	200.1	200.7

Interval #0 Information Seeding

Start Time	6:30
End Time	7:00
Total Time (min)	30
Volumes adjusted by Growth Factors.	
No data recorded this interval.	

Interval #1 Information Recording

Start Time	7:00					
End Time	8:00					
Total Time (min)	60					
Volumes adjusted by Growth Factors.						
Run Number	1	2	3	4	5	Avg
Vehs Entered	2093	2170	2064	2162	2145	2128
Vehs Exited	2091	2172	2080	2150	2145	2128
Starting Vehs	62	59	64	59	49	57
Ending Vehs	64	57	48	71	49	56
Travel Distance (km)	2612	2679	2565	2663	2648	2633
Travel Time (hr)	56.3	57.8	52.2	55.4	55.4	55.4
Total Delay (hr)	9.3	9.7	6.5	7.7	7.9	8.2
Total Stops	887	962	884	922	969	924
Fuel Used (l)	200.1	207.1	193.0	203.1	200.1	200.7

Intersection: 1: Salem Rd & County Road 27

Movement	EB	WB	SB
Directions Served	LTR	LTR	LTR
Maximum Queue (m)	3.6	13.3	13.3
Average Queue (m)	0.2	6.0	2.0
95th Queue (m)	2.6	12.1	8.1
Link Distance (m)	95.4	608.8	326.4
Upstream Blk Time (%)			
Queuing Penalty (veh)			
Storage Bay Dist (m)			
Storage Blk Time (%)			
Queuing Penalty (veh)			

Intersection: 2: Salem Rd & Brown Bear St

Movement	SB
Directions Served	LR
Maximum Queue (m)	25.2
Average Queue (m)	10.7
95th Queue (m)	18.4
Link Distance (m)	19.4
Upstream Blk Time (%)	0
Queuing Penalty (veh)	0
Storage Bay Dist (m)	
Storage Blk Time (%)	
Queuing Penalty (veh)	

Intersection: 3: Essa Rd & Salem Rd

Movement	EB	WB	NB	SB
Directions Served	LTR	LTR	L	L
Maximum Queue (m)	38.3	23.5	4.4	6.6
Average Queue (m)	16.0	8.9	0.4	1.7
95th Queue (m)	30.7	17.9	2.3	5.6
Link Distance (m)	152.6	662.2		
Upstream Blk Time (%)				
Queuing Penalty (veh)				
Storage Bay Dist (m)			74.0	74.0
Storage Blk Time (%)				
Queuing Penalty (veh)				

Intersection: 4: Koda St & Essa Rd

Movement	EB	NB
Directions Served	LR	LT
Maximum Queue (m)	25.5	16.7
Average Queue (m)	9.7	1.9
95th Queue (m)	19.1	9.1
Link Distance (m)	67.4	100.4
Upstream Blk Time (%)		
Queuing Penalty (veh)		
Storage Bay Dist (m)		
Storage Blk Time (%)		
Queuing Penalty (veh)		

Intersection: 5: Essa Rd & Mabern St

Movement	EB	NB	SB
Directions Served	LR	L	TR
Maximum Queue (m)	74.9	17.4	3.1
Average Queue (m)	43.8	4.1	0.1
95th Queue (m)	76.6	12.3	1.6
Link Distance (m)	69.7		493.2
Upstream Blk Time (%)	6		
Queuing Penalty (veh)	0		
Storage Bay Dist (m)		88.0	
Storage Blk Time (%)			
Queuing Penalty (veh)			

Intersection: 6: Essa Rd & Athabaska Rd

Movement	EB	NB
Directions Served	LR	L
Maximum Queue (m)	39.9	9.3
Average Queue (m)	14.8	1.3
95th Queue (m)	29.2	6.4
Link Distance (m)	132.1	
Upstream Blk Time (%)		
Queuing Penalty (veh)		
Storage Bay Dist (m)		77.0
Storage Blk Time (%)		
Queuing Penalty (veh)		

Network Summary

Network wide Queuing Penalty: 0

Summary of All Intervals

Run Number	1	2	3	4	5	Avg
Start Time	4:30	4:30	4:30	4:30	4:30	4:30
End Time	6:00	6:00	6:00	6:00	6:00	6:00
Total Time (min)	90	90	90	90	90	90
Time Recorded (min)	60	60	60	60	60	60
# of Intervals	2	2	2	2	2	2
# of Recorded Intervals	1	1	1	1	1	1
Vehs Entered	2815	2848	2820	2748	2715	2789
Vehs Exited	2781	2776	2765	2718	2674	2742
Starting Vehs	131	103	118	138	91	114
Ending Vehs	165	175	173	168	132	161
Travel Distance (km)	3446	3438	3439	3339	3341	3400
Travel Time (hr)	130.3	138.6	136.8	144.0	96.6	129.3
Total Delay (hr)	69.1	77.1	75.5	84.5	37.4	68.7
Total Stops	1169	1064	1160	1116	1155	1133
Fuel Used (l)	315.9	319.0	317.6	318.5	280.8	310.4

Interval #0 Information Seeding

Start Time	4:30
End Time	5:00
Total Time (min)	30
Volumes adjusted by Growth Factors.	
No data recorded this interval.	

Interval #1 Information Recording

Start Time	5:00
End Time	6:00
Total Time (min)	60
Volumes adjusted by Growth Factors.	

Run Number	1	2	3	4	5	Avg
Vehs Entered	2815	2848	2820	2748	2715	2789
Vehs Exited	2781	2776	2765	2718	2674	2742
Starting Vehs	131	103	118	138	91	114
Ending Vehs	165	175	173	168	132	161
Travel Distance (km)	3446	3438	3439	3339	3341	3400
Travel Time (hr)	130.3	138.6	136.8	144.0	96.6	129.3
Total Delay (hr)	69.1	77.1	75.5	84.5	37.4	68.7
Total Stops	1169	1064	1160	1116	1155	1133
Fuel Used (l)	315.9	319.0	317.6	318.5	280.8	310.4

Queuing and Blocking Report

Baseline

11-27-2023

Intersection: 1: Salem Rd & County Road 27

Movement	EB	WB	SB
Directions Served	LTR	LTR	LTR
Maximum Queue (m)	5.0	20.2	15.3
Average Queue (m)	0.2	10.3	2.9
95th Queue (m)	2.4	17.4	10.1
Link Distance (m)	95.4	608.8	326.4
Upstream Blk Time (%)			
Queuing Penalty (veh)			
Storage Bay Dist (m)			
Storage Blk Time (%)			
Queuing Penalty (veh)			

Intersection: 2: Salem Rd & Brown Bear St

Movement	EB	SB
Directions Served	LT	LR
Maximum Queue (m)	4.6	18.8
Average Queue (m)	0.2	7.7
95th Queue (m)	2.4	14.5
Link Distance (m)	608.8	19.4
Upstream Blk Time (%)		0
Queuing Penalty (veh)		0
Storage Bay Dist (m)		
Storage Blk Time (%)		
Queuing Penalty (veh)		

Intersection: 3: Essa Rd & Salem Rd

Movement	EB	WB	NB	NB	SB	SB
Directions Served	LTR	LTR	L	TR	L	TR
Maximum Queue (m)	42.5	577.1	4.8	4.7	9.4	0.8
Average Queue (m)	17.2	417.2	0.5	0.2	2.3	0.0
95th Queue (m)	32.8	642.1	2.6	3.3	6.3	0.5
Link Distance (m)	152.6	662.2		556.0		100.4
Upstream Blk Time (%)						
Queuing Penalty (veh)						
Storage Bay Dist (m)			74.0		74.0	
Storage Blk Time (%)						
Queuing Penalty (veh)						

Queuing and Blocking Report

Baseline

11-27-2023

Intersection: 4: Koda St & Essa Rd

Movement	EB	NB
Directions Served	LR	LT
Maximum Queue (m)	19.4	26.3
Average Queue (m)	7.8	5.9
95th Queue (m)	16.3	19.6
Link Distance (m)	67.4	100.4
Upstream Blk Time (%)		
Queuing Penalty (veh)		
Storage Bay Dist (m)		
Storage Blk Time (%)		
Queuing Penalty (veh)		

Intersection: 5: Essa Rd & Mabern St

Movement	EB	NB	SB
Directions Served	LR	L	TR
Maximum Queue (m)	74.5	30.8	9.6
Average Queue (m)	40.0	12.3	1.0
95th Queue (m)	75.1	22.7	5.5
Link Distance (m)	69.7		493.2
Upstream Blk Time (%)	7		
Queuing Penalty (veh)	0		
Storage Bay Dist (m)		88.0	
Storage Blk Time (%)			
Queuing Penalty (veh)			

Intersection: 6: Essa Rd & Athabaska Rd

Movement	EB	NB	SB
Directions Served	LR	L	R
Maximum Queue (m)	27.0	17.5	2.6
Average Queue (m)	11.4	7.7	0.1
95th Queue (m)	21.2	15.7	1.3
Link Distance (m)	132.1		
Upstream Blk Time (%)			
Queuing Penalty (veh)			
Storage Bay Dist (m)		77.0	27.0
Storage Blk Time (%)			
Queuing Penalty (veh)			

Network Summary

Network wide Queuing Penalty: 0

HCM Unsignalized Intersection Capacity Analysis

1: Salem Rd & County Road 27

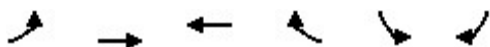
11-27-2023

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	0	1	0	17	0	31	0	238	25	44	303	0
Future Volume (Veh/h)	0	1	0	17	0	31	0	238	25	44	303	0
Sign Control	Stop			Stop			Free			Free		
Grade	0%			0%			0%			0%		
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	0	1	0	18	0	34	0	259	27	48	329	0
Pedestrians												
Lane Width (m)												
Walking Speed (m/s)												
Percent Blockage												
Right turn flare (veh)												
Median type							None			None		
Median storage (veh)												
Upstream signal (m)												
pX, platoon unblocked												
vC, conflicting volume	732	711	329	698	698	272	329				286	
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	732	711	329	698	698	272	329				286	
tC, single (s)	7.1	6.5	6.2	7.1	6.5	6.2	4.1				4.1	
tC, 2 stage (s)												
tF (s)	3.5	4.0	3.3	3.5	4.0	3.3	2.2				2.2	
p0 queue free %	100	100	100	95	100	96	100				96	
cM capacity (veh/h)	313	345	712	344	351	766	1231				1276	
Direction, Lane #	EB 1	WB 1	NB 1	SB 1								
Volume Total	1	52	286	377								
Volume Left	0	18	0	48								
Volume Right	0	34	27	0								
cSH	345	538	1231	1276								
Volume to Capacity	0.00	0.10	0.00	0.04								
Queue Length 95th (m)	0.1	2.6	0.0	0.9								
Control Delay (s)	15.5	12.4	0.0	1.3								
Lane LOS	C	B		A								
Approach Delay (s)	15.5	12.4	0.0	1.3								
Approach LOS	C	B										
Intersection Summary												
Average Delay				1.6								
Intersection Capacity Utilization				51.9%	ICU Level of Service				A			
Analysis Period (min)				15								

HCM Unsignalized Intersection Capacity Analysis

2: Salem Rd & Brown Bear St

11-27-2023



Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Volume (veh/h)	3	64	33	42	76	9
Future Volume (Veh/h)	3	64	33	42	76	9
Sign Control		Free	Free		Stop	
Grade		0%	0%		0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	3	70	36	46	83	10
Pedestrians						
Lane Width (m)						
Walking Speed (m/s)						
Percent Blockage						
Right turn flare (veh)						
Median type		None	None			
Median storage veh						
Upstream signal (m)						
pX, platoon unblocked						
vC, conflicting volume	82				135	59
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	82				135	59
tC, single (s)	4.1				6.4	6.2
tC, 2 stage (s)						
tF (s)	2.2				3.5	3.3
p0 queue free %	100				90	99
cM capacity (veh/h)	1515				857	1007
Direction, Lane #	EB 1	WB 1	SB 1			
Volume Total	73	82	93			
Volume Left	3	0	83			
Volume Right	0	46	10			
cSH	1515	1700	871			
Volume to Capacity	0.00	0.05	0.11			
Queue Length 95th (m)	0.0	0.0	2.9			
Control Delay (s)	0.3	0.0	9.6			
Lane LOS	A		A			
Approach Delay (s)	0.3	0.0	9.6			
Approach LOS			A			
Intersection Summary						
Average Delay			3.7			
Intersection Capacity Utilization			17.2%	ICU Level of Service		A
Analysis Period (min)			15			

HCM Unsignalized Intersection Capacity Analysis

3: Essa Rd & Salem Rd

11-27-2023

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	47	81	11	17	42	13	10	293	38	41	540	23
Future Volume (Veh/h)	47	81	11	17	42	13	10	293	38	41	540	23
Sign Control		Stop			Stop			Free			Free	
Grade		0%			0%			0%			0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	51	88	12	18	46	14	11	318	41	45	587	25
Pedestrians												
Lane Width (m)												
Walking Speed (m/s)												
Percent Blockage												
Right turn flare (veh)												
Median type	None						None					
Median storage veh												
Upstream signal (m)												
pX, platoon unblocked												
vC, conflicting volume	1066	1070	600	1094	1062	338	612			359		
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	1066	1070	600	1094	1062	338	612			359		
tC, single (s)	7.1	6.5	6.2	7.1	6.5	6.2	4.1			4.1		
tC, 2 stage (s)												
tF (s)	3.5	4.0	3.3	3.5	4.0	3.3	2.2			2.2		
p0 queue free %	68	58	98	85	78	98	99			96		
cM capacity (veh/h)	157	210	501	122	212	704	967			1200		
Direction, Lane #	EB 1	WB 1	NB 1	NB 2	SB 1	SB 2						
Volume Total	151	78	11	359	45	612						
Volume Left	51	18	11	0	45	0						
Volume Right	12	14	0	41	0	25						
cSH	197	203	967	1700	1200	1700						
Volume to Capacity	0.77	0.38	0.01	0.21	0.04	0.36						
Queue Length 95th (m)	41.4	13.5	0.3	0.0	0.9	0.0						
Control Delay (s)	65.9	33.4	8.8	0.0	8.1	0.0						
Lane LOS	F	D	A		A							
Approach Delay (s)	65.9	33.4	0.3		0.6							
Approach LOS	F	D										
Intersection Summary												
Average Delay	10.4											
Intersection Capacity Utilization	52.4%			ICU Level of Service					A			
Analysis Period (min)	15											

HCM Unsignalized Intersection Capacity Analysis

4: Koda St & Essa Rd

11-27-2023

						
Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Traffic Volume (veh/h)	48	20	11	341	584	15
Future Volume (Veh/h)	48	20	11	341	584	15
Sign Control	Stop			Free	Free	
Grade	0%			0%	0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	52	22	12	371	635	16
Pedestrians						
Lane Width (m)						
Walking Speed (m/s)						
Percent Blockage						
Right turn flare (veh)						
Median type				None	None	
Median storage veh						
Upstream signal (m)						
pX, platoon unblocked						
vC, conflicting volume	1038	643	651			
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	1038	643	651			
tC, single (s)	6.4	6.2	4.1			
tC, 2 stage (s)						
tF (s)	3.5	3.3	2.2			
p0 queue free %	79	95	99			
cM capacity (veh/h)	253	473	935			
Direction, Lane #	EB 1	NB 1	SB 1			
Volume Total	74	383	651			
Volume Left	52	12	0			
Volume Right	22	0	16			
cSH	293	935	1700			
Volume to Capacity	0.25	0.01	0.38			
Queue Length 95th (m)	7.8	0.3	0.0			
Control Delay (s)	21.4	0.4	0.0			
Lane LOS	C	A				
Approach Delay (s)	21.4	0.4	0.0			
Approach LOS	C					
Intersection Summary						
Average Delay			1.6			
Intersection Capacity Utilization		42.2%		ICU Level of Service		A
Analysis Period (min)			15			

HCM Unsignalized Intersection Capacity Analysis

5: Essa Rd & Mabern St

11-27-2023

						
Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Traffic Volume (veh/h)	247	142	42	347	457	79
Future Volume (Veh/h)	247	142	42	347	457	79
Sign Control	Stop			Free	Free	
Grade	0%			0%	0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	268	154	46	377	497	86
Pedestrians						
Lane Width (m)						
Walking Speed (m/s)						
Percent Blockage						
Right turn flare (veh)						
Median type				None	None	
Median storage veh						
Upstream signal (m)						
pX, platoon unblocked						
vC, conflicting volume	1009	540	583			
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	1009	540	583			
tC, single (s)	6.4	6.2	4.1			
tC, 2 stage (s)						
tF (s)	3.5	3.3	2.2			
p0 queue free %	0	72	95			
cM capacity (veh/h)	254	542	991			
Direction, Lane #	EB 1	NB 1	NB 2	SB 1		
Volume Total	422	46	377	583		
Volume Left	268	46	0	0		
Volume Right	154	0	0	86		
cSH	315	991	1700	1700		
Volume to Capacity	1.34	0.05	0.22	0.34		
Queue Length 95th (m)	167.5	1.2	0.0	0.0		
Control Delay (s)	205.8	8.8	0.0	0.0		
Lane LOS	F	A				
Approach Delay (s)	205.8	1.0		0.0		
Approach LOS	F					
Intersection Summary						
Average Delay			61.1			
Intersection Capacity Utilization			63.9%	ICU Level of Service		B
Analysis Period (min)			15			

HCM Unsignalized Intersection Capacity Analysis

6: Essa Rd & Athabaska Rd

11-27-2023

						
Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Traffic Volume (veh/h)	108	52	14	574	476	28
Future Volume (Veh/h)	108	52	14	574	476	28
Sign Control	Stop			Free	Free	
Grade	0%			0%	0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	117	57	15	624	517	30
Pedestrians						
Lane Width (m)						
Walking Speed (m/s)						
Percent Blockage						
Right turn flare (veh)						
Median type				None	None	
Median storage veh						
Upstream signal (m)						
pX, platoon unblocked						
vC, conflicting volume	1171	517	547			
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	1171	517	547			
tC, single (s)	6.4	6.2	4.1			
tC, 2 stage (s)						
tF (s)	3.5	3.3	2.2			
p0 queue free %	44	90	99			
cM capacity (veh/h)	210	558	1022			
Direction, Lane #	EB 1	NB 1	NB 2	SB 1	SB 2	
Volume Total	174	15	624	517	30	
Volume Left	117	15	0	0	0	
Volume Right	57	0	0	0	30	
cSH	264	1022	1700	1700	1700	
Volume to Capacity	0.66	0.01	0.37	0.30	0.02	
Queue Length 95th (m)	33.8	0.4	0.0	0.0	0.0	
Control Delay (s)	41.7	8.6	0.0	0.0	0.0	
Lane LOS	E	A				
Approach Delay (s)	41.7	0.2		0.0		
Approach LOS	E					
Intersection Summary						
Average Delay			5.4			
Intersection Capacity Utilization			46.0%	ICU Level of Service		A
Analysis Period (min)			15			

HCM Unsignalized Intersection Capacity Analysis

1: Salem Rd & County Road 27

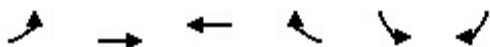
11-27-2023

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	0	0	1	15	0	149	0	475	68	33	231	0
Future Volume (Veh/h)	0	0	1	15	0	149	0	475	68	33	231	0
Sign Control	Stop			Stop			Free			Free		
Grade	0%			0%			0%			0%		
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	0	0	1	16	0	162	0	516	74	36	251	0
Pedestrians												
Lane Width (m)												
Walking Speed (m/s)												
Percent Blockage												
Right turn flare (veh)												
Median type							None			None		
Median storage (veh)												
Upstream signal (m)												
pX, platoon unblocked												
vC, conflicting volume	1038	913	251	877	876	553	251				590	
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	1038	913	251	877	876	553	251				590	
tC, single (s)	7.1	6.5	6.2	7.1	6.5	6.2	4.1				4.1	
tC, 2 stage (s)												
tF (s)	3.5	4.0	3.3	3.5	4.0	3.3	2.2				2.2	
p0 queue free %	100	100	100	94	100	70	100				96	
cM capacity (veh/h)	141	263	788	261	277	533	1314				985	
Direction, Lane #	EB 1	WB 1	NB 1	SB 1								
Volume Total	1	178	590	287								
Volume Left	0	16	0	36								
Volume Right	1	162	74	0								
cSH	788	487	1314	985								
Volume to Capacity	0.00	0.37	0.00	0.04								
Queue Length 95th (m)	0.0	13.3	0.0	0.9								
Control Delay (s)	9.6	16.6	0.0	1.4								
Lane LOS	A	C		A								
Approach Delay (s)	9.6	16.6	0.0	1.4								
Approach LOS	A	C										
Intersection Summary												
Average Delay				3.2								
Intersection Capacity Utilization				63.4%	ICU Level of Service				B			
Analysis Period (min)				15								

HCM Unsignalized Intersection Capacity Analysis

2: Salem Rd & Brown Bear St

11-27-2023



Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Volume (veh/h)	7	90	152	135	44	5
Future Volume (Veh/h)	7	90	152	135	44	5
Sign Control		Free	Free		Stop	
Grade		0%	0%		0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	8	98	165	147	48	5
Pedestrians						
Lane Width (m)						
Walking Speed (m/s)						
Percent Blockage						
Right turn flare (veh)						
Median type		None	None			
Median storage veh						
Upstream signal (m)						
pX, platoon unblocked						
vC, conflicting volume	312				352	238
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	312				352	238
tC, single (s)	4.1				6.4	6.2
tC, 2 stage (s)						
tF (s)	2.2				3.5	3.3
p0 queue free %	99				93	99
cM capacity (veh/h)	1248				641	800
Direction, Lane #	EB 1	WB 1	SB 1			
Volume Total	106	312	53			
Volume Left	8	0	48			
Volume Right	0	147	5			
cSH	1248	1700	653			
Volume to Capacity	0.01	0.18	0.08			
Queue Length 95th (m)	0.2	0.0	2.1			
Control Delay (s)	0.6	0.0	11.0			
Lane LOS	A		B			
Approach Delay (s)	0.6	0.0	11.0			
Approach LOS			B			
Intersection Summary						
Average Delay			1.4			
Intersection Capacity Utilization			26.3%	ICU Level of Service		A
Analysis Period (min)			15			

HCM Unsignalized Intersection Capacity Analysis

3: Essa Rd & Salem Rd

11-27-2023

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	32	94	8	31	229	47	10	590	32	35	441	48
Future Volume (Veh/h)	32	94	8	31	229	47	10	590	32	35	441	48
Sign Control		Stop			Stop			Free			Free	
Grade		0%			0%			0%			0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	35	102	9	34	249	51	11	641	35	38	479	52
Pedestrians												
Lane Width (m)												
Walking Speed (m/s)												
Percent Blockage												
Right turn flare (veh)												
Median type	None								None			
Median storage veh												
Upstream signal (m)												
pX, platoon unblocked												
vC, conflicting volume	1420	1279	505	1296	1288	658	531	676				
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	1420	1279	505	1296	1288	658	531	676				
tC, single (s)	7.1	6.5	6.2	7.1	6.5	6.2	4.1	4.1				
tC, 2 stage (s)												
tF (s)	3.5	4.0	3.3	3.5	4.0	3.3	2.2	2.2				
p0 queue free %	0	35	98	46	0	89	99	96				
cM capacity (veh/h)	0	157	567	63	156	464	1036	915				
Direction, Lane #	EB 1	WB 1	NB 1	NB 2	SB 1	SB 2						
Volume Total	146	334	11	676	38	531						
Volume Left	35	34	11	0	38	0						
Volume Right	9	51	0	35	0	52						
cSH	0	149	1036	1700	915	1700						
Volume to Capacity	Err	2.25	0.01	0.40	0.04	0.31						
Queue Length 95th (m)	Err	221.5	0.3	0.0	1.0	0.0						
Control Delay (s)	Err	630.8	8.5	0.0	9.1	0.0						
Lane LOS	F	F	A		A							
Approach Delay (s)	Err	630.8	0.1		0.6							
Approach LOS	F	F										
Intersection Summary												
Average Delay			Err									
Intersection Capacity Utilization			58.1%	ICU Level of Service					B			
Analysis Period (min)			15									

HCM Unsignalized Intersection Capacity Analysis

4: Koda St & Essa Rd

11-27-2023

						
Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Traffic Volume (veh/h)	31	13	32	637	511	57
Future Volume (Veh/h)	31	13	32	637	511	57
Sign Control	Stop			Free	Free	
Grade	0%			0%	0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	34	14	35	692	555	62
Pedestrians						
Lane Width (m)						
Walking Speed (m/s)						
Percent Blockage						
Right turn flare (veh)						
Median type				None	None	
Median storage veh						
Upstream signal (m)						
pX, platoon unblocked						
vC, conflicting volume	1348	586	617			
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	1348	586	617			
tC, single (s)	6.4	6.2	4.1			
tC, 2 stage (s)						
tF (s)	3.5	3.3	2.2			
p0 queue free %	79	97	96			
cM capacity (veh/h)	160	510	963			
Direction, Lane #	EB 1	NB 1	SB 1			
Volume Total	48	727	617			
Volume Left	34	35	0			
Volume Right	14	0	62			
cSH	200	963	1700			
Volume to Capacity	0.24	0.04	0.36			
Queue Length 95th (m)	7.2	0.9	0.0			
Control Delay (s)	28.5	0.9	0.0			
Lane LOS	D	A				
Approach Delay (s)	28.5	0.9	0.0			
Approach LOS	D					
Intersection Summary						
Average Delay		1.5				
Intersection Capacity Utilization		69.6%		ICU Level of Service		C
Analysis Period (min)		15				

HCM Unsignalized Intersection Capacity Analysis

5: Essa Rd & Mabern St

11-27-2023

						
Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Traffic Volume (veh/h)	159	101	139	529	467	232
Future Volume (Veh/h)	159	101	139	529	467	232
Sign Control	Stop			Free	Free	
Grade	0%			0%	0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	173	110	151	575	508	252
Pedestrians						
Lane Width (m)						
Walking Speed (m/s)						
Percent Blockage						
Right turn flare (veh)						
Median type				None	None	
Median storage veh						
Upstream signal (m)						
pX, platoon unblocked						
vC, conflicting volume	1511	634	760			
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	1511	634	760			
tC, single (s)	6.4	6.2	4.1			
tC, 2 stage (s)						
tF (s)	3.5	3.3	2.2			
p0 queue free %	0	77	82			
cM capacity (veh/h)	109	479	852			
Direction, Lane #	EB 1	NB 1	NB 2	SB 1		
Volume Total	283	151	575	760		
Volume Left	173	151	0	0		
Volume Right	110	0	0	252		
cSH	156	852	1700	1700		
Volume to Capacity	1.82	0.18	0.34	0.45		
Queue Length 95th (m)	167.9	5.1	0.0	0.0		
Control Delay (s)	442.3	10.1	0.0	0.0		
Lane LOS	F	B				
Approach Delay (s)	442.3	2.1		0.0		
Approach LOS	F					
Intersection Summary						
Average Delay	71.6					
Intersection Capacity Utilization	71.4%			ICU Level of Service	C	
Analysis Period (min)	15					

HCM Unsignalized Intersection Capacity Analysis

6: Essa Rd & Athabaska Rd

11-27-2023

						
Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Traffic Volume (veh/h)	82	26	72	613	666	151
Future Volume (Veh/h)	82	26	72	613	666	151
Sign Control	Stop			Free	Free	
Grade	0%			0%	0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	89	28	78	666	724	164
Pedestrians						
Lane Width (m)						
Walking Speed (m/s)						
Percent Blockage						
Right turn flare (veh)						
Median type				None	None	
Median storage veh						
Upstream signal (m)						
pX, platoon unblocked						
vC, conflicting volume	1546	724	888			
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	1546	724	888			
tC, single (s)	6.4	6.2	4.1			
tC, 2 stage (s)						
tF (s)	3.5	3.3	2.2			
p0 queue free %	21	93	90			
cM capacity (veh/h)	113	426	763			
Direction, Lane #	EB 1	NB 1	NB 2	SB 1	SB 2	
Volume Total	117	78	666	724	164	
Volume Left	89	78	0	0	0	
Volume Right	28	0	0	0	164	
cSH	137	763	1700	1700	1700	
Volume to Capacity	0.85	0.10	0.39	0.43	0.10	
Queue Length 95th (m)	43.9	2.7	0.0	0.0	0.0	
Control Delay (s)	103.8	10.3	0.0	0.0	0.0	
Lane LOS	F	B				
Approach Delay (s)	103.8	1.1		0.0		
Approach LOS	F					
Intersection Summary						
Average Delay			7.4			
Intersection Capacity Utilization			55.2%		ICU Level of Service	
					B	
Analysis Period (min)			15			

Summary of All Intervals

Run Number	1	2	3	4	5	Avg
Start Time	6:30	6:30	6:30	6:30	6:30	6:30
End Time	8:00	8:00	8:00	8:00	8:00	8:00
Total Time (min)	90	90	90	90	90	90
Time Recorded (min)	60	60	60	60	60	60
# of Intervals	2	2	2	2	2	2
# of Recorded Intervals	1	1	1	1	1	1
Vehs Entered	2198	2340	2247	2194	2157	2225
Vehs Exited	2211	2328	2238	2180	2170	2225
Starting Vehs	71	50	51	49	72	57
Ending Vehs	58	62	60	63	59	56
Travel Distance (km)	2728	2831	2778	2670	2648	2731
Travel Time (hr)	64.3	61.6	60.5	61.5	60.5	61.7
Total Delay (hr)	15.1	10.8	10.8	13.6	12.7	12.6
Total Stops	834	959	992	809	801	878
Fuel Used (l)	213.7	219.3	213.6	207.6	205.0	211.8

Interval #0 Information Seeding

Start Time	6:30
End Time	7:00
Total Time (min)	30
Volumes adjusted by Growth Factors.	
No data recorded this interval.	

Interval #1 Information Recording

Start Time	7:00
End Time	8:00
Total Time (min)	60
Volumes adjusted by Growth Factors.	

Run Number	1	2	3	4	5	Avg
Vehs Entered	2198	2340	2247	2194	2157	2225
Vehs Exited	2211	2328	2238	2180	2170	2225
Starting Vehs	71	50	51	49	72	57
Ending Vehs	58	62	60	63	59	56
Travel Distance (km)	2728	2831	2778	2670	2648	2731
Travel Time (hr)	64.3	61.6	60.5	61.5	60.5	61.7
Total Delay (hr)	15.1	10.8	10.8	13.6	12.7	12.6
Total Stops	834	959	992	809	801	878
Fuel Used (l)	213.7	219.3	213.6	207.6	205.0	211.8

Intersection: 1: Salem Rd & County Road 27

Movement	EB	WB	SB
Directions Served	LTR	LTR	LTR
Maximum Queue (m)	7.1	11.4	12.7
Average Queue (m)	0.4	5.6	2.1
95th Queue (m)	3.3	11.3	8.3
Link Distance (m)	95.4	608.8	326.4
Upstream Blk Time (%)			
Queuing Penalty (veh)			
Storage Bay Dist (m)			
Storage Blk Time (%)			
Queuing Penalty (veh)			

Intersection: 2: Salem Rd & Brown Bear St

Movement	EB	SB
Directions Served	LT	LR
Maximum Queue (m)	1.4	21.2
Average Queue (m)	0.0	9.6
95th Queue (m)	1.0	17.4
Link Distance (m)	608.8	19.4
Upstream Blk Time (%)		0
Queuing Penalty (veh)		0
Storage Bay Dist (m)		
Storage Blk Time (%)		
Queuing Penalty (veh)		

Intersection: 3: Essa Rd & Salem Rd

Movement	EB	WB	NB	SB
Directions Served	LTR	LTR	L	L
Maximum Queue (m)	56.4	25.2	3.3	6.4
Average Queue (m)	17.6	9.7	0.4	1.5
95th Queue (m)	39.8	20.2	2.1	5.1
Link Distance (m)	152.6	662.2		
Upstream Blk Time (%)				
Queuing Penalty (veh)				
Storage Bay Dist (m)			74.0	74.0
Storage Blk Time (%)				
Queuing Penalty (veh)				

Intersection: 4: Koda St & Essa Rd

Movement	EB	NB
Directions Served	LR	LT
Maximum Queue (m)	25.8	12.7
Average Queue (m)	10.5	1.5
95th Queue (m)	19.6	8.4
Link Distance (m)	67.4	100.4
Upstream Blk Time (%)		
Queuing Penalty (veh)		
Storage Bay Dist (m)		
Storage Blk Time (%)		
Queuing Penalty (veh)		

Intersection: 5: Essa Rd & Mabern St

Movement	EB	NB	SB
Directions Served	LR	L	TR
Maximum Queue (m)	81.9	12.7	2.7
Average Queue (m)	59.0	4.5	0.1
95th Queue (m)	89.4	11.8	1.6
Link Distance (m)	69.7		493.2
Upstream Blk Time (%)	30		
Queuing Penalty (veh)	0		
Storage Bay Dist (m)		88.0	
Storage Blk Time (%)			
Queuing Penalty (veh)			

Intersection: 6: Essa Rd & Athabaska Rd

Movement	EB	NB
Directions Served	LR	L
Maximum Queue (m)	38.6	9.1
Average Queue (m)	15.3	1.5
95th Queue (m)	28.5	7.1
Link Distance (m)	132.1	
Upstream Blk Time (%)		
Queuing Penalty (veh)		
Storage Bay Dist (m)		77.0
Storage Blk Time (%)		
Queuing Penalty (veh)		

Network Summary

Network wide Queuing Penalty: 0

Summary of All Intervals

Run Number	1	2	3	4	5	Avg
Start Time	4:30	4:30	4:30	4:30	4:30	4:30
End Time	6:00	6:00	6:00	6:00	6:00	6:00
Total Time (min)	90	90	90	90	90	90
Time Recorded (min)	60	60	60	60	60	60
# of Intervals	2	2	2	2	2	2
# of Recorded Intervals	1	1	1	1	1	1
Vehs Entered	2902	2972	2981	2923	2968	2947
Vehs Exited	2913	2900	2934	2904	2912	2914
Starting Vehs	189	129	122	148	120	139
Ending Vehs	178	201	169	167	176	178
Travel Distance (km)	3631	3601	3611	3565	3557	3593
Travel Time (hr)	229.1	202.4	147.0	190.2	174.9	188.7
Total Delay (hr)	164.3	137.9	82.6	126.7	111.2	124.5
Total Stops	779	838	991	814	934	872
Fuel Used (l)	407.8	382.2	338.5	370.2	356.2	371.0

Interval #0 Information Seeding

Start Time	4:30
End Time	5:00
Total Time (min)	30
Volumes adjusted by Growth Factors.	
No data recorded this interval.	

Interval #1 Information Recording

Start Time	5:00
End Time	6:00
Total Time (min)	60
Volumes adjusted by Growth Factors.	

Run Number	1	2	3	4	5	Avg
Vehs Entered	2902	2972	2981	2923	2968	2947
Vehs Exited	2913	2900	2934	2904	2912	2914
Starting Vehs	189	129	122	148	120	139
Ending Vehs	178	201	169	167	176	178
Travel Distance (km)	3631	3601	3611	3565	3557	3593
Travel Time (hr)	229.1	202.4	147.0	190.2	174.9	188.7
Total Delay (hr)	164.3	137.9	82.6	126.7	111.2	124.5
Total Stops	779	838	991	814	934	872
Fuel Used (l)	407.8	382.2	338.5	370.2	356.2	371.0

Queuing and Blocking Report

Baseline

11-27-2023

Intersection: 1: Salem Rd & County Road 27

Movement	EB	WB	NB	SB
Directions Served	LTR	LTR	LTR	LTR
Maximum Queue (m)	6.7	19.3	1.2	18.2
Average Queue (m)	0.3	9.9	0.0	3.2
95th Queue (m)	2.7	16.5	0.8	11.3
Link Distance (m)	95.4	608.8	623.9	326.4
Upstream Blk Time (%)				
Queuing Penalty (veh)				
Storage Bay Dist (m)				
Storage Blk Time (%)				
Queuing Penalty (veh)				

Intersection: 2: Salem Rd & Brown Bear St

Movement	EB	SB
Directions Served	LT	LR
Maximum Queue (m)	7.4	16.1
Average Queue (m)	0.3	7.5
95th Queue (m)	2.9	15.4
Link Distance (m)	608.8	19.4
Upstream Blk Time (%)		0
Queuing Penalty (veh)		0
Storage Bay Dist (m)		
Storage Blk Time (%)		
Queuing Penalty (veh)		

Intersection: 3: Essa Rd & Salem Rd

Movement	EB	WB	NB	SB	SB
Directions Served	LTR	LTR	L	L	TR
Maximum Queue (m)	84.5	671.6	3.2	9.3	3.3
Average Queue (m)	31.7	546.5	0.4	2.3	0.1
95th Queue (m)	77.0	781.4	1.9	6.9	2.3
Link Distance (m)	152.6	662.2			100.4
Upstream Blk Time (%)		44			
Queuing Penalty (veh)		0			
Storage Bay Dist (m)			74.0	74.0	
Storage Blk Time (%)					
Queuing Penalty (veh)					

Queuing and Blocking Report

Baseline

11-27-2023

Intersection: 4: Koda St & Essa Rd

Movement	EB	NB	SB
Directions Served	LR	LT	TR
Maximum Queue (m)	22.5	33.4	1.3
Average Queue (m)	8.8	5.3	0.0
95th Queue (m)	18.5	19.2	0.9
Link Distance (m)	67.4	100.4	227.2
Upstream Blk Time (%)			
Queuing Penalty (veh)			
Storage Bay Dist (m)			
Storage Blk Time (%)			
Queuing Penalty (veh)			

Intersection: 5: Essa Rd & Mabern St

Movement	EB	NB	SB
Directions Served	LR	L	TR
Maximum Queue (m)	85.3	33.6	11.9
Average Queue (m)	71.6	13.9	1.3
95th Queue (m)	92.4	26.3	6.6
Link Distance (m)	69.7		493.2
Upstream Blk Time (%)	80		
Queuing Penalty (veh)	0		
Storage Bay Dist (m)		88.0	
Storage Blk Time (%)			
Queuing Penalty (veh)			

Intersection: 6: Essa Rd & Athabaska Rd

Movement	EB	NB	SB
Directions Served	LR	L	R
Maximum Queue (m)	44.1	16.4	5.3
Average Queue (m)	14.2	7.3	0.3
95th Queue (m)	28.9	15.3	2.8
Link Distance (m)	132.1		
Upstream Blk Time (%)			
Queuing Penalty (veh)			
Storage Bay Dist (m)		77.0	27.0
Storage Blk Time (%)			
Queuing Penalty (veh)			

Network Summary

Network wide Queuing Penalty: 0

B.3 Optimized Total Traffic

HCM Unsignalized Intersection Capacity Analysis

1: Salem Rd & County Road 27

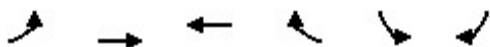
11-29-2023

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	0	1	0	16	0	30	0	218	23	42	277	0
Future Volume (Veh/h)	0	1	0	16	0	30	0	218	23	42	277	0
Sign Control	Stop			Stop			Free			Free		
Grade	0%			0%			0%			0%		
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	0	1	0	17	0	33	0	237	25	46	301	0
Pedestrians												
Lane Width (m)												
Walking Speed (m/s)												
Percent Blockage												
Right turn flare (veh)												
Median type							None			None		
Median storage veh												
Upstream signal (m)												
pX, platoon unblocked												
vC, conflicting volume	676	655	301	643	642	250	301				262	
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	676	655	301	643	642	250	301				262	
tC, single (s)	7.1	6.5	6.2	7.1	6.5	6.2	4.1				4.1	
tC, 2 stage (s)												
tF (s)	3.5	4.0	3.3	3.5	4.0	3.3	2.2				2.2	
p0 queue free %	100	100	100	95	100	96	100				96	
cM capacity (veh/h)	343	372	739	375	378	789	1260				1302	
Direction, Lane #	EB 1	WB 1	NB 1	SB 1								
Volume Total	1	50	262	347								
Volume Left	0	17	0	46								
Volume Right	0	33	25	0								
cSH	372	574	1260	1302								
Volume to Capacity	0.00	0.09	0.00	0.04								
Queue Length 95th (m)	0.1	2.3	0.0	0.9								
Control Delay (s)	14.7	11.9	0.0	1.3								
Lane LOS	B	B		A								
Approach Delay (s)	14.7	11.9	0.0	1.3								
Approach LOS	B	B										
Intersection Summary												
Average Delay				1.6								
Intersection Capacity Utilization				49.2%	ICU Level of Service				A			
Analysis Period (min)				15								

HCM Unsignalized Intersection Capacity Analysis

2: Salem Rd & Brown Bear St

11-29-2023



Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Volume (veh/h)	3	60	31	40	76	9
Future Volume (Veh/h)	3	60	31	40	76	9
Sign Control		Free	Free		Stop	
Grade		0%	0%		0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	3	65	34	43	83	10
Pedestrians						
Lane Width (m)						
Walking Speed (m/s)						
Percent Blockage						
Right turn flare (veh)						
Median type		None	None			
Median storage veh						
Upstream signal (m)			182			
pX, platoon unblocked						
vC, conflicting volume	77				126	56
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	77				126	56
tC, single (s)	4.1				6.4	6.2
tC, 2 stage (s)						
tF (s)	2.2				3.5	3.3
p0 queue free %	100				90	99
cM capacity (veh/h)	1522				866	1011
Direction, Lane #	EB 1	WB 1	SB 1			
Volume Total	68	77	93			
Volume Left	3	0	83			
Volume Right	0	43	10			
cSH	1522	1700	880			
Volume to Capacity	0.00	0.05	0.11			
Queue Length 95th (m)	0.0	0.0	2.8			
Control Delay (s)	0.3	0.0	9.6			
Lane LOS	A		A			
Approach Delay (s)	0.3	0.0	9.6			
Approach LOS			A			
Intersection Summary						
Average Delay			3.8			
Intersection Capacity Utilization		17.0%		ICU Level of Service		A
Analysis Period (min)			15			

HCM Signalized Intersection Capacity Analysis

3: Essa Rd & Salem Rd

11-29-2023

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	47	77	11	15	40	12	9	275	34	39	518	22
Future Volume (vph)	47	77	11	15	40	12	9	275	34	39	518	22
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.5	4.5		4.5	4.5		4.5	4.5		4.5	4.5	
Lane Util. Factor	1.00	1.00		1.00	1.00		1.00	1.00		1.00	1.00	
Frt	1.00	0.98		1.00	0.97		1.00	0.98		1.00	0.99	
Flt Protected	0.95	1.00		0.95	1.00		0.95	1.00		0.95	1.00	
Satd. Flow (prot)	1711	1767		1711	1738		1711	1771		1711	1790	
Flt Permitted	0.58	1.00		0.69	1.00		0.36	1.00		0.48	1.00	
Satd. Flow (perm)	1050	1767		1251	1738		646	1771		865	1790	
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	51	84	12	16	43	13	10	299	37	42	563	24
RTOR Reduction (vph)	0	8	0	0	11	0	0	5	0	0	1	0
Lane Group Flow (vph)	51	88	0	16	45	0	10	331	0	42	586	0
Turn Type	pm+pt	NA		pm+pt	NA		pm+pt	NA		pm+pt	NA	
Protected Phases	7	4		3	8		5	2		1	6	
Permitted Phases	4			8			2			6		
Actuated Green, G (s)	14.1	11.0		9.9	8.9		42.2	41.0		47.8	43.8	
Effective Green, g (s)	14.1	11.0		9.9	8.9		42.2	41.0		47.8	43.8	
Actuated g/C Ratio	0.19	0.15		0.13	0.12		0.56	0.55		0.64	0.58	
Clearance Time (s)	4.5	4.5		4.5	4.5		4.5	4.5		4.5	4.5	
Vehicle Extension (s)	3.0	3.0		3.0	3.0		3.0	3.0		3.0	3.0	
Lane Grp Cap (vph)	224	259		171	206		380	968		596	1045	
v/s Ratio Prot	c0.01	c0.05		0.00	0.03		0.00	0.19		c0.00	c0.33	
v/s Ratio Perm	0.03			0.01			0.01			0.04		
v/c Ratio	0.23	0.34		0.09	0.22		0.03	0.34		0.07	0.56	
Uniform Delay, d1	25.5	28.7		28.5	29.9		7.6	9.5		5.3	9.6	
Progression Factor	1.00	1.00		1.00	1.00		1.00	1.00		1.00	1.00	
Incremental Delay, d2	0.5	0.8		0.2	0.5		0.0	1.0		0.1	2.2	
Delay (s)	26.0	29.5		28.8	30.4		7.7	10.4		5.4	11.8	
Level of Service	C	C		C	C		A	B		A	B	
Approach Delay (s)		28.3			30.1			10.4			11.4	
Approach LOS		C			C			B			B	
Intersection Summary												
HCM 2000 Control Delay			14.3				HCM 2000 Level of Service			B		
HCM 2000 Volume to Capacity ratio			0.51									
Actuated Cycle Length (s)			75.0				Sum of lost time (s)			18.0		
Intersection Capacity Utilization			49.2%				ICU Level of Service			A		
Analysis Period (min)			15									
c Critical Lane Group												

HCM Unsignalized Intersection Capacity Analysis

4: Koda St & Essa Rd

11-29-2023

						
Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Traffic Volume (veh/h)	45	19	10	323	560	14
Future Volume (Veh/h)	45	19	10	323	560	14
Sign Control	Stop			Free	Free	
Grade	0%			0%	0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	49	21	11	351	609	15
Pedestrians						
Lane Width (m)						
Walking Speed (m/s)						
Percent Blockage						
Right turn flare (veh)						
Median type				None	None	
Median storage veh						
Upstream signal (m)				125	244	
pX, platoon unblocked	0.88	0.84	0.84			
vC, conflicting volume	990	616	624			
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	693	445	454			
tC, single (s)	6.4	6.2	4.1			
tC, 2 stage (s)						
tF (s)	3.5	3.3	2.2			
p0 queue free %	86	96	99			
cM capacity (veh/h)	357	513	927			
Direction, Lane #	EB 1	NB 1	SB 1			
Volume Total	70	362	624			
Volume Left	49	11	0			
Volume Right	21	0	15			
cSH	393	927	1700			
Volume to Capacity	0.18	0.01	0.37			
Queue Length 95th (m)	5.1	0.3	0.0			
Control Delay (s)	16.1	0.4	0.0			
Lane LOS	C	A				
Approach Delay (s)	16.1	0.4	0.0			
Approach LOS	C					
Intersection Summary						
Average Delay		1.2				
Intersection Capacity Utilization		40.6%		ICU Level of Service		A
Analysis Period (min)		15				

HCM Signalized Intersection Capacity Analysis

5: Essa Rd & Mabern St

11-29-2023



Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Traffic Volume (vph)	230	132	39	329	442	74
Future Volume (vph)	230	132	39	329	442	74
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.5		4.5	4.5	4.5	
Lane Util. Factor	1.00		1.00	1.00	1.00	
Frt	0.95		1.00	1.00	0.98	
Flt Protected	0.97		0.95	1.00	1.00	
Satd. Flow (prot)	1659		1711	1801	1766	
Flt Permitted	0.97		0.36	1.00	1.00	
Satd. Flow (perm)	1659		642	1801	1766	
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	250	143	42	358	480	80
RTOR Reduction (vph)	38	0	0	0	9	0
Lane Group Flow (vph)	355	0	42	358	551	0
Turn Type	Prot		Perm	NA	NA	
Protected Phases	4			2	6	
Permitted Phases			2			
Actuated Green, G (s)	17.1		33.9	33.9	33.9	
Effective Green, g (s)	17.1		33.9	33.9	33.9	
Actuated g/C Ratio	0.29		0.56	0.56	0.56	
Clearance Time (s)	4.5		4.5	4.5	4.5	
Vehicle Extension (s)	3.0		3.0	3.0	3.0	
Lane Grp Cap (vph)	472		362	1017	997	
v/s Ratio Prot	c0.21			0.20	c0.31	
v/s Ratio Perm			0.07			
v/c Ratio	0.75		0.12	0.35	0.55	
Uniform Delay, d1	19.5		6.1	7.1	8.3	
Progression Factor	1.00		1.00	1.00	1.77	
Incremental Delay, d2	6.7		0.7	1.0	2.1	
Delay (s)	26.2		6.7	8.0	16.7	
Level of Service	C		A	A	B	
Approach Delay (s)	26.2			7.9	16.7	
Approach LOS	C			A	B	

Intersection Summary

HCM 2000 Control Delay	16.8	HCM 2000 Level of Service	B
HCM 2000 Volume to Capacity ratio	0.62		
Actuated Cycle Length (s)	60.0	Sum of lost time (s)	9.0
Intersection Capacity Utilization	60.7%	ICU Level of Service	B
Analysis Period (min)	15		

c Critical Lane Group

HCM Signalized Intersection Capacity Analysis

6: Essa Rd & Athabaska Rd

11-29-2023

						
Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Traffic Volume (vph)	98	47	13	541	462	25
Future Volume (vph)	98	47	13	541	462	25
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.5		4.5	4.5	4.5	4.5
Lane Util. Factor	1.00		1.00	1.00	1.00	1.00
Frt	0.96		1.00	1.00	1.00	0.85
Flt Protected	0.97		0.95	1.00	1.00	1.00
Satd. Flow (prot)	1666		1711	1801	1801	1531
Flt Permitted	0.97		0.45	1.00	1.00	1.00
Satd. Flow (perm)	1666		816	1801	1801	1531
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	107	51	14	588	502	27
RTOR Reduction (vph)	35	0	0	0	0	8
Lane Group Flow (vph)	123	0	14	588	502	19
Turn Type	Prot		Perm	NA	NA	Perm
Protected Phases	4			2	6	
Permitted Phases			2			6
Actuated Green, G (s)	8.6		42.4	42.4	42.4	42.4
Effective Green, g (s)	8.6		42.4	42.4	42.4	42.4
Actuated g/C Ratio	0.14		0.71	0.71	0.71	0.71
Clearance Time (s)	4.5		4.5	4.5	4.5	4.5
Vehicle Extension (s)	3.0		3.0	3.0	3.0	3.0
Lane Grp Cap (vph)	238		576	1272	1272	1081
v/s Ratio Prot	c0.07			c0.33	0.28	
v/s Ratio Perm			0.02			0.01
v/c Ratio	0.52		0.02	0.46	0.39	0.02
Uniform Delay, d1	23.8		2.6	3.8	3.6	2.6
Progression Factor	1.00		1.50	1.47	1.00	1.00
Incremental Delay, d2	1.9		0.1	1.1	0.9	0.0
Delay (s)	25.7		4.0	6.7	4.5	2.6
Level of Service	C		A	A	A	A
Approach Delay (s)	25.7			6.7	4.4	
Approach LOS	C			A	A	
Intersection Summary						
HCM 2000 Control Delay			8.1	HCM 2000 Level of Service		A
HCM 2000 Volume to Capacity ratio			0.47			
Actuated Cycle Length (s)			60.0	Sum of lost time (s)		9.0
Intersection Capacity Utilization			44.3%	ICU Level of Service		A
Analysis Period (min)			15			
c Critical Lane Group						

HCM Unsignalized Intersection Capacity Analysis

1: Salem Rd & County Road 27

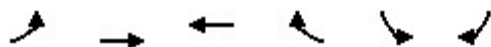
11-29-2023

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	0	0	1	14	0	137	0	434	62	31	211	0
Future Volume (Veh/h)	0	0	1	14	0	137	0	434	62	31	211	0
Sign Control	Stop			Stop			Free			Free		
Grade	0%			0%			0%			0%		
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	0	0	1	15	0	149	0	472	67	34	229	0
Pedestrians												
Lane Width (m)												
Walking Speed (m/s)												
Percent Blockage												
Right turn flare (veh)												
Median type							None			None		
Median storage (veh)												
Upstream signal (m)												
pX, platoon unblocked												
vC, conflicting volume	952	836	229	804	802	506	229				539	
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	952	836	229	804	802	506	229				539	
tC, single (s)	7.1	6.5	6.2	7.1	6.5	6.2	4.1				4.1	
tC, 2 stage (s)												
tF (s)	3.5	4.0	3.3	3.5	4.0	3.3	2.2				2.2	
p0 queue free %	100	100	100	95	100	74	100				97	
cM capacity (veh/h)	172	293	810	294	307	567	1339				1029	
Direction, Lane #	EB 1	WB 1	NB 1	SB 1								
Volume Total	1	164	539	263								
Volume Left	0	15	0	34								
Volume Right	1	149	67	0								
cSH	810	522	1339	1029								
Volume to Capacity	0.00	0.31	0.00	0.03								
Queue Length 95th (m)	0.0	10.7	0.0	0.8								
Control Delay (s)	9.4	15.0	0.0	1.4								
Lane LOS	A	C		A								
Approach Delay (s)	9.4	15.0	0.0	1.4								
Approach LOS	A	C										
Intersection Summary												
Average Delay				2.9								
Intersection Capacity Utilization				59.8%	ICU Level of Service				B			
Analysis Period (min)				15								

HCM Unsignalized Intersection Capacity Analysis

2: Salem Rd & Brown Bear St

11-29-2023



Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations		↩	↩		↩	↩
Traffic Volume (veh/h)	7	82	140	128	44	5
Future Volume (Veh/h)	7	82	140	128	44	5
Sign Control		Free	Free		Stop	
Grade		0%	0%		0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	8	89	152	139	48	5
Pedestrians						
Lane Width (m)						
Walking Speed (m/s)						
Percent Blockage						
Right turn flare (veh)						
Median type		None	None			
Median storage veh						
Upstream signal (m)			182			
pX, platoon unblocked	0.88				0.88	0.88
vC, conflicting volume	291				326	222
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	124				164	45
tC, single (s)	4.1				6.4	6.2
tC, 2 stage (s)						
tF (s)	2.2				3.5	3.3
p0 queue free %	99				93	99
cM capacity (veh/h)	1285				722	901
Direction, Lane #	EB 1	WB 1	SB 1			
Volume Total	97	291	53			
Volume Left	8	0	48			
Volume Right	0	139	5			
cSH	1285	1700	735			
Volume to Capacity	0.01	0.17	0.07			
Queue Length 95th (m)	0.2	0.0	1.9			
Control Delay (s)	0.7	0.0	10.3			
Lane LOS	A		B			
Approach Delay (s)	0.7	0.0	10.3			
Approach LOS			B			
Intersection Summary						
Average Delay		1.4				
Intersection Capacity Utilization		25.2%		ICU Level of Service		A
Analysis Period (min)		15				

HCM Signalized Intersection Capacity Analysis

3: Essa Rd

11-29-2023

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	31	87	8	28	211	43	10	553	29	33	411	47
Future Volume (vph)	31	87	8	28	211	43	10	553	29	33	411	47
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.5	4.5		4.5	4.5		4.5	4.5		4.5	4.5	
Lane Util. Factor	1.00	1.00		1.00	1.00		1.00	1.00		1.00	1.00	
Frt	1.00	0.99		1.00	0.97		1.00	0.99		1.00	0.98	
Flt Protected	0.95	1.00		0.95	1.00		0.95	1.00		0.95	1.00	
Satd. Flow (prot)	1711	1777		1711	1755		1711	1787		1711	1773	
Flt Permitted	0.35	1.00		0.69	1.00		0.39	1.00		0.22	1.00	
Satd. Flow (perm)	624	1777		1242	1755		696	1787		397	1773	
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	34	95	9	30	229	47	11	601	32	36	447	51
RTOR Reduction (vph)	0	5	0	0	10	0	0	2	0	0	4	0
Lane Group Flow (vph)	34	99	0	30	266	0	11	631	0	36	494	0
Turn Type	pm+pt	NA		pm+pt	NA		pm+pt	NA		pm+pt	NA	
Protected Phases	7	4		3	8		5	2		1	6	
Permitted Phases	4			8			2			6		
Actuated Green, G (s)	17.3	15.3		17.3	15.3		37.5	36.5		41.9	38.7	
Effective Green, g (s)	17.3	15.3		17.3	15.3		37.5	36.5		41.9	38.7	
Actuated g/C Ratio	0.23	0.20		0.23	0.20		0.50	0.49		0.56	0.52	
Clearance Time (s)	4.5	4.5		4.5	4.5		4.5	4.5		4.5	4.5	
Vehicle Extension (s)	3.0	3.0		3.0	3.0		3.0	3.0		3.0	3.0	
Lane Grp Cap (vph)	172	362		298	358		361	869		277	914	
v/s Ratio Prot	c0.01	0.06		0.00	c0.15		0.00	c0.35		c0.01	0.28	
v/s Ratio Perm	0.04			0.02			0.01			0.07		
v/c Ratio	0.20	0.27		0.10	0.74		0.03	0.73		0.13	0.54	
Uniform Delay, d1	22.9	25.2		22.6	28.0		9.8	15.3		9.9	12.2	
Progression Factor	1.00	1.00		1.00	1.00		1.00	1.00		1.00	1.00	
Incremental Delay, d2	0.6	0.4		0.1	8.1		0.0	5.3		0.2	2.3	
Delay (s)	23.5	25.6		22.7	36.1		9.8	20.5		10.1	14.5	
Level of Service	C	C		C	D		A	C		B	B	
Approach Delay (s)		25.1			34.8			20.4			14.2	
Approach LOS		C			C			C			B	
Intersection Summary												
HCM 2000 Control Delay	21.4			HCM 2000 Level of Service			C					
HCM 2000 Volume to Capacity ratio	0.68											
Actuated Cycle Length (s)	75.0			Sum of lost time (s)			18.0					
Intersection Capacity Utilization	60.0%			ICU Level of Service			B					
Analysis Period (min)	15											
c Critical Lane Group												

HCM Unsignalized Intersection Capacity Analysis

4: Koda St & Essa Rd

11-29-2023

						
Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Traffic Volume (veh/h)	29	12	30	597	479	53
Future Volume (Veh/h)	29	12	30	597	479	53
Sign Control	Stop			Free	Free	
Grade	0%			0%	0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	32	13	33	649	521	58
Pedestrians						
Lane Width (m)						
Walking Speed (m/s)						
Percent Blockage						
Right turn flare (veh)						
Median type				None	None	
Median storage veh						
Upstream signal (m)				125	244	
pX, platoon unblocked	0.77	0.89	0.89			
vC, conflicting volume	1265	550	579			
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	860	427	459			
tC, single (s)	6.4	6.2	4.1			
tC, 2 stage (s)						
tF (s)	3.5	3.3	2.2			
p0 queue free %	87	98	97			
cM capacity (veh/h)	243	556	975			
Direction, Lane #	EB 1	NB 1	SB 1			
Volume Total	45	682	579			
Volume Left	32	33	0			
Volume Right	13	0	58			
cSH	290	975	1700			
Volume to Capacity	0.15	0.03	0.34			
Queue Length 95th (m)	4.3	0.8	0.0			
Control Delay (s)	19.7	0.9	0.0			
Lane LOS	C	A				
Approach Delay (s)	19.7	0.9	0.0			
Approach LOS	C					
Intersection Summary						
Average Delay		1.1				
Intersection Capacity Utilization		65.9%		ICU Level of Service		C
Analysis Period (min)		15				

HCM Signalized Intersection Capacity Analysis

5: Essa Rd & Mabern St

11-29-2023



Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Traffic Volume (vph)	148	94	128	498	438	215
Future Volume (vph)	148	94	128	498	438	215
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.5		4.5	4.5	4.5	
Lane Util. Factor	1.00		1.00	1.00	1.00	
Frt	0.95		1.00	1.00	0.96	
Flt Protected	0.97		0.95	1.00	1.00	
Satd. Flow (prot)	1656		1711	1801	1721	
Flt Permitted	0.97		0.29	1.00	1.00	
Satd. Flow (perm)	1656		529	1801	1721	
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	161	102	139	541	476	234
RTOR Reduction (vph)	46	0	0	0	21	0
Lane Group Flow (vph)	217	0	139	541	689	0
Turn Type	Prot		Perm	NA	NA	
Protected Phases	4			2	6	
Permitted Phases			2			
Actuated Green, G (s)	12.9		38.1	38.1	38.1	
Effective Green, g (s)	12.9		38.1	38.1	38.1	
Actuated g/C Ratio	0.22		0.64	0.64	0.64	
Clearance Time (s)	4.5		4.5	4.5	4.5	
Vehicle Extension (s)	3.0		3.0	3.0	3.0	
Lane Grp Cap (vph)	356		335	1143	1092	
v/s Ratio Prot	c0.13			0.30	c0.40	
v/s Ratio Perm			0.26			
v/c Ratio	0.61		0.41	0.47	0.63	
Uniform Delay, d1	21.3		5.4	5.7	6.7	
Progression Factor	1.00		1.00	1.00	1.97	
Incremental Delay, d2	2.9		3.8	1.4	2.5	
Delay (s)	24.2		9.2	7.1	15.6	
Level of Service	C		A	A	B	
Approach Delay (s)	24.2			7.5	15.6	
Approach LOS	C			A	B	

Intersection Summary

HCM 2000 Control Delay	13.7	HCM 2000 Level of Service	B
HCM 2000 Volume to Capacity ratio	0.62		
Actuated Cycle Length (s)	60.0	Sum of lost time (s)	9.0
Intersection Capacity Utilization	68.4%	ICU Level of Service	C
Analysis Period (min)	15		

c Critical Lane Group

HCM Signalized Intersection Capacity Analysis

6: Essa Rd & Athabaska Rd

11-29-2023

						
Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Traffic Volume (vph)	74	24	65	578	623	137
Future Volume (vph)	74	24	65	578	623	137
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.5		4.5	4.5	4.5	4.5
Lane Util. Factor	1.00		1.00	1.00	1.00	1.00
Frt	0.97		1.00	1.00	1.00	0.85
Flt Protected	0.96		0.95	1.00	1.00	1.00
Satd. Flow (prot)	1678		1711	1801	1801	1531
Flt Permitted	0.96		0.36	1.00	1.00	1.00
Satd. Flow (perm)	1678		644	1801	1801	1531
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	80	26	71	628	677	149
RTOR Reduction (vph)	23	0	0	0	0	35
Lane Group Flow (vph)	83	0	71	628	677	114
Turn Type	Prot		Perm	NA	NA	Perm
Protected Phases	4			2	6	
Permitted Phases			2			6
Actuated Green, G (s)	7.3		43.7	43.7	43.7	43.7
Effective Green, g (s)	7.3		43.7	43.7	43.7	43.7
Actuated g/C Ratio	0.12		0.73	0.73	0.73	0.73
Clearance Time (s)	4.5		4.5	4.5	4.5	4.5
Vehicle Extension (s)	3.0		3.0	3.0	3.0	3.0
Lane Grp Cap (vph)	204		469	1311	1311	1115
v/s Ratio Prot	c0.05			0.35	c0.38	
v/s Ratio Perm			0.11			0.07
v/c Ratio	0.41		0.15	0.48	0.52	0.10
Uniform Delay, d1	24.4		2.5	3.4	3.5	2.4
Progression Factor	1.00		1.91	1.86	1.00	1.00
Incremental Delay, d2	1.3		0.6	1.1	1.5	0.2
Delay (s)	25.7		5.4	7.5	5.0	2.6
Level of Service	C		A	A	A	A
Approach Delay (s)	25.7			7.3	4.6	
Approach LOS	C			A	A	
Intersection Summary						
HCM 2000 Control Delay			7.1	HCM 2000 Level of Service		A
HCM 2000 Volume to Capacity ratio			0.50			
Actuated Cycle Length (s)			60.0	Sum of lost time (s)		9.0
Intersection Capacity Utilization			53.8%	ICU Level of Service		A
Analysis Period (min)			15			
c Critical Lane Group						

Summary of All Intervals

Run Number	1	2	3	4	5	Avg
Start Time	6:30	6:30	6:30	6:30	6:30	6:30
End Time	8:00	8:00	8:00	8:00	8:00	8:00
Total Time (min)	90	90	90	90	90	90
Time Recorded (min)	60	60	60	60	60	60
# of Intervals	2	2	2	2	2	2
# of Recorded Intervals	1	1	1	1	1	1
Vehs Entered	2091	2170	2064	2162	2145	2127
Vehs Exited	2079	2181	2079	2151	2150	2128
Starting Vehs	54	68	68	66	59	60
Ending Vehs	66	57	53	77	54	61
Travel Distance (km)	2604	2686	2563	2667	2650	2634
Travel Time (hr)	60.1	61.8	57.6	60.5	61.2	60.2
Total Delay (hr)	13.3	13.6	11.9	12.6	13.7	13.0
Total Stops	1684	1717	1491	1554	1589	1605
Fuel Used (l)	208.2	216.1	202.2	212.9	210.4	210.0

Interval #0 Information Seeding

Start Time	6:30
End Time	7:00
Total Time (min)	30
Volumes adjusted by Growth Factors.	
No data recorded this interval.	

Interval #1 Information Recording

Start Time	7:00
End Time	8:00
Total Time (min)	60
Volumes adjusted by Growth Factors.	

Run Number	1	2	3	4	5	Avg
Vehs Entered	2091	2170	2064	2162	2145	2127
Vehs Exited	2079	2181	2079	2151	2150	2128
Starting Vehs	54	68	68	66	59	60
Ending Vehs	66	57	53	77	54	61
Travel Distance (km)	2604	2686	2563	2667	2650	2634
Travel Time (hr)	60.1	61.8	57.6	60.5	61.2	60.2
Total Delay (hr)	13.3	13.6	11.9	12.6	13.7	13.0
Total Stops	1684	1717	1491	1554	1589	1605
Fuel Used (l)	208.2	216.1	202.2	212.9	210.4	210.0

Intersection: 1: Salem Rd & County Road 27

Movement	EB	WB	SB
Directions Served	LTR	LTR	LTR
Maximum Queue (m)	3.6	14.8	13.3
Average Queue (m)	0.2	6.2	2.1
95th Queue (m)	2.6	12.4	8.2
Link Distance (m)	95.4	608.8	326.4
Upstream Blk Time (%)			
Queuing Penalty (veh)			
Storage Bay Dist (m)			
Storage Blk Time (%)			
Queuing Penalty (veh)			

Intersection: 2: Salem Rd & Brown Bear St

Movement	EB	SB
Directions Served	LT	LR
Maximum Queue (m)	1.6	25.2
Average Queue (m)	0.1	10.8
95th Queue (m)	1.1	18.5
Link Distance (m)	608.8	19.4
Upstream Blk Time (%)		0
Queuing Penalty (veh)		0
Storage Bay Dist (m)		
Storage Blk Time (%)		
Queuing Penalty (veh)		

Intersection: 3: Essa Rd & Salem Rd

Movement	EB	EB	WB	WB	NB	NB	SB	SB
Directions Served	L	TR	L	TR	L	TR	L	TR
Maximum Queue (m)	24.2	36.2	11.1	25.1	3.2	28.3	15.1	71.2
Average Queue (m)	5.1	14.8	1.7	8.9	0.4	6.7	2.7	18.6
95th Queue (m)	14.5	29.1	6.0	19.7	2.1	19.7	8.8	48.5
Link Distance (m)	151.6	151.6	661.3	661.3		553.7		98.2
Upstream Blk Time (%)								0
Queuing Penalty (veh)								0
Storage Bay Dist (m)					74.0		74.0	
Storage Blk Time (%)								0
Queuing Penalty (veh)								0

Intersection: 4: Koda St & Essa Rd

Movement	EB	NB	SB
Directions Served	LR	LT	TR
Maximum Queue (m)	23.0	19.3	1.3
Average Queue (m)	9.3	2.5	0.0
95th Queue (m)	18.0	11.0	0.9
Link Distance (m)	67.4	98.2	227.2
Upstream Blk Time (%)			
Queuing Penalty (veh)			
Storage Bay Dist (m)			
Storage Blk Time (%)			
Queuing Penalty (veh)			

Intersection: 5: Essa Rd & Mabern St

Movement	EB	NB	NB	SB
Directions Served	LR	L	T	TR
Maximum Queue (m)	75.2	21.6	43.0	86.5
Average Queue (m)	42.4	7.0	19.4	42.3
95th Queue (m)	69.9	16.6	37.2	73.7
Link Distance (m)	69.7		227.2	493.2
Upstream Blk Time (%)	2			
Queuing Penalty (veh)	0			
Storage Bay Dist (m)		88.0		
Storage Blk Time (%)				
Queuing Penalty (veh)				

Intersection: 6: Essa Rd & Athabaska Rd

Movement	EB	NB	NB	SB	SB
Directions Served	LR	L	T	T	R
Maximum Queue (m)	48.4	9.3	62.2	52.8	10.1
Average Queue (m)	21.1	2.0	25.9	18.9	0.8
95th Queue (m)	38.8	8.0	50.8	40.2	5.1
Link Distance (m)	132.1		493.2	319.0	
Upstream Blk Time (%)					
Queuing Penalty (veh)					
Storage Bay Dist (m)		77.0			27.0
Storage Blk Time (%)			0	2	
Queuing Penalty (veh)			0	0	

Network Summary

Network wide Queuing Penalty: 1

Summary of All Intervals

Run Number	1	2	3	4	5	Avg
Start Time	4:30	4:30	4:30	4:30	4:30	4:30
End Time	6:00	6:00	6:00	6:00	6:00	6:00
Total Time (min)	90	90	90	90	90	90
Time Recorded (min)	60	60	60	60	60	60
# of Intervals	2	2	2	2	2	2
# of Recorded Intervals	1	1	1	1	1	1
Vehs Entered	2817	2848	2820	2761	2715	2790
Vehs Exited	2832	2816	2809	2744	2701	2782
Starting Vehs	103	64	77	83	70	74
Ending Vehs	88	96	88	100	84	88
Travel Distance (km)	3482	3496	3497	3379	3365	3444
Travel Time (hr)	79.8	81.2	81.0	77.0	77.0	79.2
Total Delay (hr)	18.0	18.7	18.7	16.7	17.3	17.9
Total Stops	1983	2054	2062	1958	1960	2003
Fuel Used (l)	280.4	280.3	279.8	269.1	271.7	276.3

Interval #0 Information Seeding

Start Time	4:30
End Time	5:00
Total Time (min)	30
Volumes adjusted by Growth Factors.	
No data recorded this interval.	

Interval #1 Information Recording

Start Time	5:00
End Time	6:00
Total Time (min)	60
Volumes adjusted by Growth Factors.	

Run Number	1	2	3	4	5	Avg
Vehs Entered	2817	2848	2820	2761	2715	2790
Vehs Exited	2832	2816	2809	2744	2701	2782
Starting Vehs	103	64	77	83	70	74
Ending Vehs	88	96	88	100	84	88
Travel Distance (km)	3482	3496	3497	3379	3365	3444
Travel Time (hr)	79.8	81.2	81.0	77.0	77.0	79.2
Total Delay (hr)	18.0	18.7	18.7	16.7	17.3	17.9
Total Stops	1983	2054	2062	1958	1960	2003
Fuel Used (l)	280.4	280.3	279.8	269.1	271.7	276.3

Queuing and Blocking Report

Baseline

11-29-2023

Intersection: 1: Salem Rd & County Road 27

Movement	EB	WB	SB
Directions Served	LTR	LTR	LTR
Maximum Queue (m)	5.0	29.8	17.2
Average Queue (m)	0.2	13.3	3.2
95th Queue (m)	2.4	23.5	11.0
Link Distance (m)	95.4	608.8	326.4
Upstream Blk Time (%)			
Queuing Penalty (veh)			
Storage Bay Dist (m)			
Storage Blk Time (%)			
Queuing Penalty (veh)			

Intersection: 2: Salem Rd & Brown Bear St

Movement	EB	SB
Directions Served	LT	LR
Maximum Queue (m)	6.2	18.8
Average Queue (m)	0.4	7.9
95th Queue (m)	3.1	15.0
Link Distance (m)	608.8	19.4
Upstream Blk Time (%)		0
Queuing Penalty (veh)		0
Storage Bay Dist (m)		
Storage Blk Time (%)		
Queuing Penalty (veh)		

Intersection: 3: Essa Rd & Salem Rd

Movement	EB	EB	WB	WB	NB	NB	SB	SB
Directions Served	L	TR	L	TR	L	TR	L	TR
Maximum Queue (m)	15.2	29.2	12.9	65.8	4.8	70.2	11.7	56.8
Average Queue (m)	2.6	14.2	2.7	33.8	0.8	29.0	3.0	22.0
95th Queue (m)	8.7	25.6	8.4	56.3	3.2	57.7	8.4	49.2
Link Distance (m)	151.6	151.6	661.3	661.3		553.7		98.2
Upstream Blk Time (%)								
Queuing Penalty (veh)								
Storage Bay Dist (m)					74.0		74.0	
Storage Blk Time (%)						0		0
Queuing Penalty (veh)						0		0

Queuing and Blocking Report

Baseline

11-29-2023

Intersection: 4: Koda St & Essa Rd

Movement	EB	NB
Directions Served	LR	LT
Maximum Queue (m)	20.9	51.2
Average Queue (m)	8.2	7.1
95th Queue (m)	17.4	28.9
Link Distance (m)	67.4	98.2
Upstream Blk Time (%)		
Queuing Penalty (veh)		
Storage Bay Dist (m)		
Storage Blk Time (%)		
Queuing Penalty (veh)		

Intersection: 5: Essa Rd & Mabern St

Movement	EB	NB	NB	SB
Directions Served	LR	L	T	TR
Maximum Queue (m)	64.4	43.2	65.7	70.6
Average Queue (m)	30.1	18.7	22.5	41.3
95th Queue (m)	50.5	35.5	49.7	65.8
Link Distance (m)	69.7		227.2	493.2
Upstream Blk Time (%)	0			
Queuing Penalty (veh)	0			
Storage Bay Dist (m)		88.0		
Storage Blk Time (%)			0	
Queuing Penalty (veh)			0	

Intersection: 6: Essa Rd & Athabaska Rd

Movement	EB	NB	NB	SB	SB
Directions Served	LR	L	T	T	R
Maximum Queue (m)	35.8	21.3	61.4	48.0	18.2
Average Queue (m)	15.2	9.2	24.3	18.5	5.2
95th Queue (m)	27.9	18.3	53.1	40.9	14.1
Link Distance (m)	132.1		493.2	319.0	
Upstream Blk Time (%)					
Queuing Penalty (veh)					
Storage Bay Dist (m)		77.0			27.0
Storage Blk Time (%)			0	2	0
Queuing Penalty (veh)			0	3	0

Network Summary

Network wide Queuing Penalty: 3

HCM Unsignalized Intersection Capacity Analysis

1: Salem Rd & County Road 27

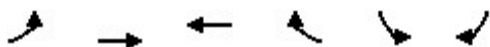
11-29-2023

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	0	1	0	17	0	31	0	238	25	44	303	0
Future Volume (Veh/h)	0	1	0	17	0	31	0	238	25	44	303	0
Sign Control	Stop			Stop			Free			Free		
Grade	0%			0%			0%			0%		
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	0	1	0	18	0	34	0	259	27	48	329	0
Pedestrians												
Lane Width (m)												
Walking Speed (m/s)												
Percent Blockage												
Right turn flare (veh)												
Median type							None			None		
Median storage (veh)												
Upstream signal (m)												
pX, platoon unblocked												
vC, conflicting volume	732	711	329	698	698	272	329				286	
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	732	711	329	698	698	272	329				286	
tC, single (s)	7.1	6.5	6.2	7.1	6.5	6.2	4.1				4.1	
tC, 2 stage (s)												
tF (s)	3.5	4.0	3.3	3.5	4.0	3.3	2.2				2.2	
p0 queue free %	100	100	100	95	100	96	100				96	
cM capacity (veh/h)	313	345	712	344	351	766	1231				1276	
Direction, Lane #	EB 1	WB 1	NB 1	SB 1								
Volume Total	1	52	286	377								
Volume Left	0	18	0	48								
Volume Right	0	34	27	0								
cSH	345	538	1231	1276								
Volume to Capacity	0.00	0.10	0.00	0.04								
Queue Length 95th (m)	0.1	2.6	0.0	0.9								
Control Delay (s)	15.5	12.4	0.0	1.3								
Lane LOS	C	B		A								
Approach Delay (s)	15.5	12.4	0.0	1.3								
Approach LOS	C	B										
Intersection Summary												
Average Delay				1.6								
Intersection Capacity Utilization				51.9%	ICU Level of Service				A			
Analysis Period (min)				15								

HCM Unsignalized Intersection Capacity Analysis

2: Salem Rd & Brown Bear St

11-29-2023



Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Volume (veh/h)	3	64	33	42	76	9
Future Volume (Veh/h)	3	64	33	42	76	9
Sign Control		Free	Free		Stop	
Grade		0%	0%		0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	3	70	36	46	83	10
Pedestrians						
Lane Width (m)						
Walking Speed (m/s)						
Percent Blockage						
Right turn flare (veh)						
Median type		None	None			
Median storage veh						
Upstream signal (m)			182			
pX, platoon unblocked						
vC, conflicting volume	82				135	59
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	82				135	59
tC, single (s)	4.1				6.4	6.2
tC, 2 stage (s)						
tF (s)	2.2				3.5	3.3
p0 queue free %	100				90	99
cM capacity (veh/h)	1515				857	1007
Direction, Lane #	EB 1	WB 1	SB 1			
Volume Total	73	82	93			
Volume Left	3	0	83			
Volume Right	0	46	10			
cSH	1515	1700	871			
Volume to Capacity	0.00	0.05	0.11			
Queue Length 95th (m)	0.0	0.0	2.9			
Control Delay (s)	0.3	0.0	9.6			
Lane LOS	A		A			
Approach Delay (s)	0.3	0.0	9.6			
Approach LOS			A			
Intersection Summary						
Average Delay			3.7			
Intersection Capacity Utilization			17.2%	ICU Level of Service		A
Analysis Period (min)			15			

HCM Signalized Intersection Capacity Analysis

3: Essa Rd & Salem Rd

11-29-2023

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	47	81	11	17	42	13	10	293	38	41	540	23
Future Volume (vph)	47	81	11	17	42	13	10	293	38	41	540	23
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.5	4.5		4.5	4.5		4.5	4.5		4.5	4.5	
Lane Util. Factor	0.95	0.95		1.00	1.00		1.00	1.00		1.00	1.00	
Frt	1.00	0.98		1.00	0.96		1.00	0.98		1.00	0.99	
Flt Protected	0.95	1.00		0.95	1.00		0.95	1.00		0.95	1.00	
Satd. Flow (prot)	1625	1677		1711	1738		1711	1770		1711	1790	
Flt Permitted	0.58	0.99		0.69	1.00		0.34	1.00		0.46	1.00	
Satd. Flow (perm)	987	1668		1235	1738		617	1770		835	1790	
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	51	88	12	18	46	14	11	318	41	45	587	25
RTOR Reduction (vph)	0	7	0	0	12	0	0	4	0	0	1	0
Lane Group Flow (vph)	46	98	0	18	48	0	11	355	0	45	611	0
Turn Type	pm+pt	NA		pm+pt	NA		pm+pt	NA		pm+pt	NA	
Protected Phases	7	4		3	8		5	2		1	6	
Permitted Phases	4			8			2			6		
Actuated Green, G (s)	13.8	13.8		9.6	8.6		42.5	41.3		48.1	44.1	
Effective Green, g (s)	13.8	13.8		9.6	8.6		42.5	41.3		48.1	44.1	
Actuated g/C Ratio	0.18	0.18		0.13	0.11		0.57	0.55		0.64	0.59	
Clearance Time (s)	4.5	4.5		4.5	4.5		4.5	4.5		4.5	4.5	
Vehicle Extension (s)	3.0	3.0		3.0	3.0		3.0	3.0		3.0	3.0	
Lane Grp Cap (vph)	207	307		164	199		367	974		582	1052	
v/s Ratio Prot	0.01	c0.01		0.00	0.03		0.00	0.20		c0.00	c0.34	
v/s Ratio Perm	0.03	c0.05		0.01			0.02			0.05		
v/c Ratio	0.22	0.32		0.11	0.24		0.03	0.36		0.08	0.58	
Uniform Delay, d1	25.7	26.5		28.8	30.2		7.6	9.5		5.3	9.7	
Progression Factor	1.00	1.00		1.00	1.00		1.00	1.00		1.00	1.00	
Incremental Delay, d2	0.5	0.6		0.3	0.6		0.0	1.1		0.1	2.3	
Delay (s)	26.3	27.1		29.1	30.8		7.6	10.5		5.3	12.0	
Level of Service	C	C		C	C		A	B		A	B	
Approach Delay (s)		26.9			30.4			10.4			11.5	
Approach LOS		C			C			B			B	
Intersection Summary												
HCM 2000 Control Delay			14.2			HCM 2000 Level of Service				B		
HCM 2000 Volume to Capacity ratio			0.53									
Actuated Cycle Length (s)			75.0			Sum of lost time (s)				18.0		
Intersection Capacity Utilization			52.0%			ICU Level of Service				A		
Analysis Period (min)			15									
c Critical Lane Group												

HCM Unsignalized Intersection Capacity Analysis

4: Koda St & Essa Rd

11-29-2023

						
Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Traffic Volume (veh/h)	48	20	11	341	584	15
Future Volume (Veh/h)	48	20	11	341	584	15
Sign Control	Stop			Free	Free	
Grade	0%			0%	0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	52	22	12	371	635	16
Pedestrians						
Lane Width (m)						
Walking Speed (m/s)						
Percent Blockage						
Right turn flare (veh)						
Median type				None	None	
Median storage (veh)						
Upstream signal (m)				125	244	
pX, platoon unblocked	0.87	0.82	0.82			
vC, conflicting volume	1038	643	651			
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	712	452	462			
tC, single (s)	6.4	6.2	4.1			
tC, 2 stage (s)						
tF (s)	3.5	3.3	2.2			
p0 queue free %	85	96	99			
cM capacity (veh/h)	341	497	899			
Direction, Lane #	EB 1	NB 1	SB 1			
Volume Total	74	383	651			
Volume Left	52	12	0			
Volume Right	22	0	16			
cSH	376	899	1700			
Volume to Capacity	0.20	0.01	0.38			
Queue Length 95th (m)	5.8	0.3	0.0			
Control Delay (s)	16.9	0.4	0.0			
Lane LOS	C	A				
Approach Delay (s)	16.9	0.4	0.0			
Approach LOS	C					
Intersection Summary						
Average Delay			1.3			
Intersection Capacity Utilization		42.2%		ICU Level of Service		A
Analysis Period (min)			15			

HCM Signalized Intersection Capacity Analysis

5: Essa Rd & Mabern St

11-29-2023



Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Traffic Volume (vph)	247	142	42	347	457	79
Future Volume (vph)	247	142	42	347	457	79
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.5		4.5	4.5	4.5	
Lane Util. Factor	1.00		1.00	1.00	1.00	
Frt	0.95		1.00	1.00	0.98	
Flt Protected	0.97		0.95	1.00	1.00	
Satd. Flow (prot)	1659		1711	1801	1765	
Flt Permitted	0.97		0.33	1.00	1.00	
Satd. Flow (perm)	1659		600	1801	1765	
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	268	154	46	377	497	86
RTOR Reduction (vph)	38	0	0	0	9	0
Lane Group Flow (vph)	384	0	46	377	574	0
Turn Type	Prot		Perm	NA	NA	
Protected Phases	4			2	6	
Permitted Phases			2			
Actuated Green, G (s)	17.8		33.2	33.2	33.2	
Effective Green, g (s)	17.8		33.2	33.2	33.2	
Actuated g/C Ratio	0.30		0.55	0.55	0.55	
Clearance Time (s)	4.5		4.5	4.5	4.5	
Vehicle Extension (s)	3.0		3.0	3.0	3.0	
Lane Grp Cap (vph)	492		332	996	976	
v/s Ratio Prot	c0.23			0.21	c0.33	
v/s Ratio Perm			0.08			
v/c Ratio	0.78		0.14	0.38	0.59	
Uniform Delay, d1	19.3		6.5	7.6	8.9	
Progression Factor	1.00		1.00	1.00	1.73	
Incremental Delay, d2	7.9		0.9	1.1	2.4	
Delay (s)	27.2		7.4	8.7	17.8	
Level of Service	C		A	A	B	
Approach Delay (s)	27.2			8.5	17.8	
Approach LOS	C			A	B	

Intersection Summary

HCM 2000 Control Delay	17.8	HCM 2000 Level of Service	B
HCM 2000 Volume to Capacity ratio	0.65		
Actuated Cycle Length (s)	60.0	Sum of lost time (s)	9.0
Intersection Capacity Utilization	64.8%	ICU Level of Service	C
Analysis Period (min)	15		

c Critical Lane Group

HCM Signalized Intersection Capacity Analysis

6: Essa Rd & Athabaska Rd

11-29-2023

						
Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Traffic Volume (vph)	108	52	14	574	476	28
Future Volume (vph)	108	52	14	574	476	28
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.5		4.5	4.5	4.5	4.5
Lane Util. Factor	1.00		1.00	1.00	1.00	1.00
Frt	0.96		1.00	1.00	1.00	0.85
Flt Protected	0.97		0.95	1.00	1.00	1.00
Satd. Flow (prot)	1665		1711	1801	1801	1531
Flt Permitted	0.97		0.44	1.00	1.00	1.00
Satd. Flow (perm)	1665		794	1801	1801	1531
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	117	57	15	624	517	30
RTOR Reduction (vph)	36	0	0	0	0	9
Lane Group Flow (vph)	138	0	15	624	517	21
Turn Type	Prot		Perm	NA	NA	Perm
Protected Phases	4			2	6	
Permitted Phases			2			6
Actuated Green, G (s)	9.1		41.9	41.9	41.9	41.9
Effective Green, g (s)	9.1		41.9	41.9	41.9	41.9
Actuated g/C Ratio	0.15		0.70	0.70	0.70	0.70
Clearance Time (s)	4.5		4.5	4.5	4.5	4.5
Vehicle Extension (s)	3.0		3.0	3.0	3.0	3.0
Lane Grp Cap (vph)	252		554	1257	1257	1069
v/s Ratio Prot	c0.08			c0.35	0.29	
v/s Ratio Perm			0.02			0.01
v/c Ratio	0.55		0.03	0.50	0.41	0.02
Uniform Delay, d1	23.6		2.8	4.2	3.8	2.8
Progression Factor	1.00		1.43	1.41	1.00	1.00
Incremental Delay, d2	2.4		0.1	1.2	1.0	0.0
Delay (s)	26.0		4.1	7.1	4.8	2.8
Level of Service	C		A	A	A	A
Approach Delay (s)	26.0			7.1	4.7	
Approach LOS	C			A	A	
Intersection Summary						
HCM 2000 Control Delay			8.5	HCM 2000 Level of Service		A
HCM 2000 Volume to Capacity ratio			0.51			
Actuated Cycle Length (s)			60.0	Sum of lost time (s)		9.0
Intersection Capacity Utilization			46.9%	ICU Level of Service		A
Analysis Period (min)			15			
c Critical Lane Group						

HCM Unsignalized Intersection Capacity Analysis

1: Salem Rd & County Road 27

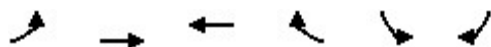
11-29-2023

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	0	0	1	15	0	149	0	475	68	33	231	0
Future Volume (Veh/h)	0	0	1	15	0	149	0	475	68	33	231	0
Sign Control		Stop			Stop			Free			Free	
Grade		0%			0%			0%			0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	0	0	1	16	0	162	0	516	74	36	251	0
Pedestrians												
Lane Width (m)												
Walking Speed (m/s)												
Percent Blockage												
Right turn flare (veh)												
Median type	None								None			
Median storage veh												
Upstream signal (m)												
pX, platoon unblocked												
vC, conflicting volume	1038	913	251	877	876	553	251	590				
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	1038	913	251	877	876	553	251	590				
tC, single (s)	7.1	6.5	6.2	7.1	6.5	6.2	4.1	4.1				
tC, 2 stage (s)												
tF (s)	3.5	4.0	3.3	3.5	4.0	3.3	2.2	2.2				
p0 queue free %	100	100	100	94	100	70	100	96				
cM capacity (veh/h)	141	263	788	261	277	533	1314	985				
Direction, Lane #	EB 1	WB 1	NB 1	SB 1								
Volume Total	1	178	590	287								
Volume Left	0	16	0	36								
Volume Right	1	162	74	0								
cSH	788	487	1314	985								
Volume to Capacity	0.00	0.37	0.00	0.04								
Queue Length 95th (m)	0.0	13.3	0.0	0.9								
Control Delay (s)	9.6	16.6	0.0	1.4								
Lane LOS	A	C		A								
Approach Delay (s)	9.6	16.6	0.0	1.4								
Approach LOS	A	C										
Intersection Summary												
Average Delay	3.2											
Intersection Capacity Utilization	63.4%			ICU Level of Service					B			
Analysis Period (min)	15											

HCM Unsignalized Intersection Capacity Analysis

2: Salem Rd & Brown Bear St

11-29-2023



Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Volume (veh/h)	7	90	152	135	44	5
Future Volume (Veh/h)	7	90	152	135	44	5
Sign Control		Free	Free		Stop	
Grade		0%	0%		0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	8	98	165	147	48	5
Pedestrians						
Lane Width (m)						
Walking Speed (m/s)						
Percent Blockage						
Right turn flare (veh)						
Median type		None	None			
Median storage veh						
Upstream signal (m)			182			
pX, platoon unblocked	0.86				0.86	0.86
vC, conflicting volume	312				352	238
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	125				172	40
tC, single (s)	4.1				6.4	6.2
tC, 2 stage (s)						
tF (s)	2.2				3.5	3.3
p0 queue free %	99				93	99
cM capacity (veh/h)	1263				702	891
Direction, Lane #	EB 1	WB 1	SB 1			
Volume Total	106	312	53			
Volume Left	8	0	48			
Volume Right	0	147	5			
cSH	1263	1700	717			
Volume to Capacity	0.01	0.18	0.07			
Queue Length 95th (m)	0.2	0.0	1.9			
Control Delay (s)	0.6	0.0	10.4			
Lane LOS	A		B			
Approach Delay (s)	0.6	0.0	10.4			
Approach LOS			B			
Intersection Summary						
Average Delay			1.3			
Intersection Capacity Utilization			26.3%	ICU Level of Service		A
Analysis Period (min)			15			

HCM Signalized Intersection Capacity Analysis

3: Essa Rd & Salem Rd

11-29-2023

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	32	94	8	31	229	47	10	590	32	35	441	48
Future Volume (vph)	32	94	8	31	229	47	10	590	32	35	441	48
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.5	4.5		4.5	4.5		4.5	4.5		4.5	4.5	
Lane Util. Factor	0.95	0.95		1.00	1.00		1.00	1.00		1.00	1.00	
Frt	1.00	0.99		1.00	0.97		1.00	0.99		1.00	0.99	
Flt Protected	0.95	1.00		0.95	1.00		0.95	1.00		0.95	1.00	
Satd. Flow (prot)	1625	1688		1711	1755		1711	1787		1711	1774	
Flt Permitted	0.31	0.99		0.68	1.00		0.35	1.00		0.18	1.00	
Satd. Flow (perm)	537	1673		1223	1755		636	1787		320	1774	
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	35	102	9	34	249	51	11	641	35	38	479	52
RTOR Reduction (vph)	0	5	0	0	10	0	0	2	0	0	4	0
Lane Group Flow (vph)	31	110	0	34	290	0	11	674	0	38	527	0
Turn Type	pm+pt	NA		pm+pt	NA		pm+pt	NA		pm+pt	NA	
Protected Phases	7	4		3	8		5	2		1	6	
Permitted Phases	4			8			2			6		
Actuated Green, G (s)	18.0	18.0		18.0	16.0		36.7	35.7		41.3	38.0	
Effective Green, g (s)	18.0	18.0		18.0	16.0		36.7	35.7		41.3	38.0	
Actuated g/C Ratio	0.24	0.24		0.24	0.21		0.49	0.48		0.55	0.51	
Clearance Time (s)	4.5	4.5		4.5	4.5		4.5	4.5		4.5	4.5	
Vehicle Extension (s)	3.0	3.0		3.0	3.0		3.0	3.0		3.0	3.0	
Lane Grp Cap (vph)	157	401		306	374		325	850		237	898	
v/s Ratio Prot	0.01	c0.01		0.00	c0.17		0.00	c0.38		c0.01	0.30	
v/s Ratio Perm	0.04	0.06		0.02			0.02			0.08		
v/c Ratio	0.20	0.28		0.11	0.77		0.03	0.79		0.16	0.59	
Uniform Delay, d1	22.4	23.2		22.1	27.8		10.4	16.5		11.0	13.0	
Progression Factor	1.00	1.00		1.00	1.00		1.00	1.00		1.00	1.00	
Incremental Delay, d2	0.6	0.4		0.2	9.6		0.0	7.5		0.3	2.8	
Delay (s)	23.1	23.6		22.3	37.4		10.4	24.0		11.3	15.8	
Level of Service	C	C		C	D		B	C		B	B	
Approach Delay (s)		23.5			35.9			23.8			15.5	
Approach LOS		C			D			C			B	
Intersection Summary												
HCM 2000 Control Delay	23.4			HCM 2000 Level of Service			C					
HCM 2000 Volume to Capacity ratio	0.73											
Actuated Cycle Length (s)	75.0			Sum of lost time (s)			18.0					
Intersection Capacity Utilization	57.3%			ICU Level of Service			B					
Analysis Period (min)	15											
c Critical Lane Group												

HCM Unsignalized Intersection Capacity Analysis

4: Koda St & Essa Rd

11-29-2023

						
Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Traffic Volume (veh/h)	31	13	32	637	511	57
Future Volume (Veh/h)	31	13	32	637	511	57
Sign Control	Stop			Free	Free	
Grade	0%			0%	0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	34	14	35	692	555	62
Pedestrians						
Lane Width (m)						
Walking Speed (m/s)						
Percent Blockage						
Right turn flare (veh)						
Median type				None	None	
Median storage veh						
Upstream signal (m)				125	244	
pX, platoon unblocked	0.75	0.84	0.84			
vC, conflicting volume	1348	586	617			
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	830	416	453			
tC, single (s)	6.4	6.2	4.1			
tC, 2 stage (s)						
tF (s)	3.5	3.3	2.2			
p0 queue free %	86	97	96			
cM capacity (veh/h)	246	537	934			
Direction, Lane #	EB 1	NB 1	SB 1			
Volume Total	48	727	617			
Volume Left	34	35	0			
Volume Right	14	0	62			
cSH	292	934	1700			
Volume to Capacity	0.16	0.04	0.36			
Queue Length 95th (m)	4.6	0.9	0.0			
Control Delay (s)	19.7	1.0	0.0			
Lane LOS	C	A				
Approach Delay (s)	19.7	1.0	0.0			
Approach LOS	C					
Intersection Summary						
Average Delay		1.2				
Intersection Capacity Utilization		69.6%		ICU Level of Service		C
Analysis Period (min)		15				

HCM Signalized Intersection Capacity Analysis

5: Essa Rd & Mabern St

11-29-2023



Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Traffic Volume (vph)	159	101	139	529	467	232
Future Volume (vph)	159	101	139	529	467	232
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.5		4.5	4.5	4.5	
Lane Util. Factor	1.00		1.00	1.00	1.00	
Frt	0.95		1.00	1.00	0.96	
Flt Protected	0.97		0.95	1.00	1.00	
Satd. Flow (prot)	1656		1711	1801	1720	
Flt Permitted	0.97		0.26	1.00	1.00	
Satd. Flow (perm)	1656		461	1801	1720	
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	173	110	151	575	508	252
RTOR Reduction (vph)	46	0	0	0	22	0
Lane Group Flow (vph)	237	0	151	575	738	0
Turn Type	Prot		Perm	NA	NA	
Protected Phases	4			2	6	
Permitted Phases			2			
Actuated Green, G (s)	13.6		37.4	37.4	37.4	
Effective Green, g (s)	13.6		37.4	37.4	37.4	
Actuated g/C Ratio	0.23		0.62	0.62	0.62	
Clearance Time (s)	4.5		4.5	4.5	4.5	
Vehicle Extension (s)	3.0		3.0	3.0	3.0	
Lane Grp Cap (vph)	375		287	1122	1072	
v/s Ratio Prot	c0.14			0.32	c0.43	
v/s Ratio Perm			0.33			
v/c Ratio	0.63		0.53	0.51	0.69	
Uniform Delay, d1	20.9		6.3	6.3	7.5	
Progression Factor	1.00		1.00	1.00	1.94	
Incremental Delay, d2	3.5		6.7	1.7	3.1	
Delay (s)	24.4		13.1	7.9	17.6	
Level of Service	C		B	A	B	
Approach Delay (s)	24.4			9.0	17.6	
Approach LOS	C			A	B	

Intersection Summary

HCM 2000 Control Delay	15.2	HCM 2000 Level of Service	B
HCM 2000 Volume to Capacity ratio	0.67		
Actuated Cycle Length (s)	60.0	Sum of lost time (s)	9.0
Intersection Capacity Utilization	72.7%	ICU Level of Service	C
Analysis Period (min)	15		

c Critical Lane Group

HCM Signalized Intersection Capacity Analysis

6: Essa Rd & Athabaska Rd

11-29-2023



Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations	W		W	W	W	W
Traffic Volume (vph)	82	26	72	613	666	151
Future Volume (vph)	82	26	72	613	666	151
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.5		4.5	4.5	4.5	4.5
Lane Util. Factor	1.00		1.00	1.00	1.00	1.00
Frt	0.97		1.00	1.00	1.00	0.85
Flt Protected	0.96		0.95	1.00	1.00	1.00
Satd. Flow (prot)	1679		1711	1801	1801	1531
Flt Permitted	0.96		0.33	1.00	1.00	1.00
Satd. Flow (perm)	1679		594	1801	1801	1531
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	89	28	78	666	724	164
RTOR Reduction (vph)	24	0	0	0	0	37
Lane Group Flow (vph)	93	0	78	666	724	127
Turn Type	Prot		Perm	NA	NA	Perm
Protected Phases	4			2	6	
Permitted Phases			2			6
Actuated Green, G (s)	7.6		43.4	43.4	43.4	43.4
Effective Green, g (s)	7.6		43.4	43.4	43.4	43.4
Actuated g/C Ratio	0.13		0.72	0.72	0.72	0.72
Clearance Time (s)	4.5		4.5	4.5	4.5	4.5
Vehicle Extension (s)	3.0		3.0	3.0	3.0	3.0
Lane Grp Cap (vph)	212		429	1302	1302	1107
v/s Ratio Prot	c0.06			0.37	c0.40	
v/s Ratio Perm			0.13			0.08
v/c Ratio	0.44		0.18	0.51	0.56	0.12
Uniform Delay, d1	24.2		2.6	3.6	3.8	2.5
Progression Factor	1.00		1.86	1.85	1.00	1.00
Incremental Delay, d2	1.5		0.8	1.3	1.7	0.2
Delay (s)	25.7		5.7	8.0	5.6	2.7
Level of Service	C		A	A	A	A
Approach Delay (s)	25.7			7.8	5.0	
Approach LOS	C			A	A	

Intersection Summary

HCM 2000 Control Delay	7.6	HCM 2000 Level of Service	A
HCM 2000 Volume to Capacity ratio	0.54		
Actuated Cycle Length (s)	60.0	Sum of lost time (s)	9.0
Intersection Capacity Utilization	56.6%	ICU Level of Service	B
Analysis Period (min)	15		

c Critical Lane Group

Summary of All Intervals

Run Number	1	2	3	4	5	Avg
Start Time	6:30	6:30	6:30	6:30	6:30	6:30
End Time	8:00	8:00	8:00	8:00	8:00	8:00
Total Time (min)	90	90	90	90	90	90
Time Recorded (min)	60	60	60	60	60	60
# of Intervals	2	2	2	2	2	2
# of Recorded Intervals	1	1	1	1	1	1
Vehs Entered	2211	2337	2246	2196	2144	2227
Vehs Exited	2218	2325	2250	2184	2156	2228
Starting Vehs	72	58	60	52	74	63
Ending Vehs	65	70	56	64	62	62
Travel Distance (km)	2746	2830	2788	2667	2629	2732
Travel Time (hr)	63.3	65.6	65.1	62.5	61.5	63.6
Total Delay (hr)	14.0	14.9	15.3	14.5	14.0	14.5
Total Stops	1692	1853	1822	1692	1726	1756
Fuel Used (l)	219.2	228.3	223.7	213.4	210.5	219.0

Interval #0 Information Seeding

Start Time	6:30
End Time	7:00
Total Time (min)	30
Volumes adjusted by Growth Factors.	
No data recorded this interval.	

Interval #1 Information Recording

Start Time	7:00
End Time	8:00
Total Time (min)	60
Volumes adjusted by Growth Factors.	

Run Number	1	2	3	4	5	Avg
Vehs Entered	2211	2337	2246	2196	2144	2227
Vehs Exited	2218	2325	2250	2184	2156	2228
Starting Vehs	72	58	60	52	74	63
Ending Vehs	65	70	56	64	62	62
Travel Distance (km)	2746	2830	2788	2667	2629	2732
Travel Time (hr)	63.3	65.6	65.1	62.5	61.5	63.6
Total Delay (hr)	14.0	14.9	15.3	14.5	14.0	14.5
Total Stops	1692	1853	1822	1692	1726	1756
Fuel Used (l)	219.2	228.3	223.7	213.4	210.5	219.0

Intersection: 1: Salem Rd & County Road 27

Movement	EB	WB	SB
Directions Served	LTR	LTR	LTR
Maximum Queue (m)	7.1	13.8	11.2
Average Queue (m)	0.4	5.9	1.9
95th Queue (m)	3.5	12.2	7.9
Link Distance (m)	95.4	608.8	326.4
Upstream Blk Time (%)			
Queuing Penalty (veh)			
Storage Bay Dist (m)			
Storage Blk Time (%)			
Queuing Penalty (veh)			

Intersection: 2: Salem Rd & Brown Bear St

Movement	EB	SB
Directions Served	LT	LR
Maximum Queue (m)	1.3	20.9
Average Queue (m)	0.0	9.6
95th Queue (m)	0.9	17.2
Link Distance (m)	608.8	19.4
Upstream Blk Time (%)		0
Queuing Penalty (veh)		0
Storage Bay Dist (m)		
Storage Blk Time (%)		
Queuing Penalty (veh)		

Intersection: 3: Essa Rd & Salem Rd

Movement	EB	EB	WB	WB	NB	NB	SB	SB
Directions Served	L	LTR	L	TR	L	TR	L	TR
Maximum Queue (m)	14.2	30.9	9.9	23.8	4.3	30.6	10.4	66.5
Average Queue (m)	3.3	14.2	1.4	9.1	0.6	8.0	2.4	21.1
95th Queue (m)	9.3	26.7	5.2	19.2	2.8	22.3	7.3	50.6
Link Distance (m)	151.6	151.6	661.3	661.3		553.7		98.2
Upstream Blk Time (%)								
Queuing Penalty (veh)								
Storage Bay Dist (m)					74.0		74.0	
Storage Blk Time (%)								0
Queuing Penalty (veh)								0

Intersection: 4: Koda St & Essa Rd

Movement	EB	NB	SB
Directions Served	LR	LT	TR
Maximum Queue (m)	27.5	16.4	1.4
Average Queue (m)	10.7	1.5	0.0
95th Queue (m)	20.2	8.6	1.0
Link Distance (m)	67.4	98.2	227.2
Upstream Blk Time (%)			
Queuing Penalty (veh)			
Storage Bay Dist (m)			
Storage Blk Time (%)			
Queuing Penalty (veh)			

Intersection: 5: Essa Rd & Mabern St

Movement	EB	NB	NB	SB
Directions Served	LR	L	T	TR
Maximum Queue (m)	76.5	19.4	48.0	93.4
Average Queue (m)	48.9	7.8	21.2	47.6
95th Queue (m)	74.9	17.9	39.9	77.7
Link Distance (m)	69.7		227.2	493.2
Upstream Blk Time (%)	3			
Queuing Penalty (veh)	0			
Storage Bay Dist (m)		88.0		
Storage Blk Time (%)				
Queuing Penalty (veh)				

Intersection: 6: Essa Rd & Athabaska Rd

Movement	EB	NB	NB	SB	SB
Directions Served	LR	L	T	T	R
Maximum Queue (m)	52.5	10.5	59.2	43.1	14.6
Average Queue (m)	21.8	2.3	29.0	18.7	1.6
95th Queue (m)	39.2	8.8	53.8	37.0	8.3
Link Distance (m)	132.1		493.2	319.0	
Upstream Blk Time (%)					
Queuing Penalty (veh)					
Storage Bay Dist (m)		77.0			27.0
Storage Blk Time (%)				2	
Queuing Penalty (veh)				0	

Network Summary

Network wide Queuing Penalty: 1

Summary of All Intervals

Run Number	1	2	3	4	5	Avg
Start Time	4:30	4:30	4:30	4:30	4:30	4:30
End Time	6:00	6:00	6:00	6:00	6:00	6:00
Total Time (min)	90	90	90	90	90	90
Time Recorded (min)	60	60	60	60	60	60
# of Intervals	2	2	2	2	2	2
# of Recorded Intervals	1	1	1	1	1	1
Vehs Entered	3012	3057	2999	2963	2998	3006
Vehs Exited	3039	3038	3025	2985	3006	3020
Starting Vehs	118	90	112	93	89	98
Ending Vehs	91	109	86	71	81	84
Travel Distance (km)	3801	3758	3723	3662	3669	3723
Travel Time (hr)	89.7	90.1	90.0	86.1	87.1	88.6
Total Delay (hr)	21.9	22.9	23.6	20.7	21.3	22.1
Total Stops	2283	2293	2425	2270	2233	2302
Fuel Used (l)	308.2	305.6	305.1	294.5	294.7	301.6

Interval #0 Information Seeding

Start Time	4:30
End Time	5:00
Total Time (min)	30
Volumes adjusted by Growth Factors.	
No data recorded this interval.	

Interval #1 Information Recording

Start Time	5:00
End Time	6:00
Total Time (min)	60
Volumes adjusted by Growth Factors.	

Run Number	1	2	3	4	5	Avg
Vehs Entered	3012	3057	2999	2963	2998	3006
Vehs Exited	3039	3038	3025	2985	3006	3020
Starting Vehs	118	90	112	93	89	98
Ending Vehs	91	109	86	71	81	84
Travel Distance (km)	3801	3758	3723	3662	3669	3723
Travel Time (hr)	89.7	90.1	90.0	86.1	87.1	88.6
Total Delay (hr)	21.9	22.9	23.6	20.7	21.3	22.1
Total Stops	2283	2293	2425	2270	2233	2302
Fuel Used (l)	308.2	305.6	305.1	294.5	294.7	301.6

Queuing and Blocking Report

Baseline

11-29-2023

Intersection: 1: Salem Rd & County Road 27

Movement	EB	WB	NB	SB
Directions Served	LTR	LTR	LTR	LTR
Maximum Queue (m)	6.7	33.9	1.2	17.1
Average Queue (m)	0.3	14.5	0.0	3.3
95th Queue (m)	2.7	26.5	0.8	11.7
Link Distance (m)	95.4	608.8	623.9	326.4
Upstream Blk Time (%)				
Queuing Penalty (veh)				
Storage Bay Dist (m)				
Storage Blk Time (%)				
Queuing Penalty (veh)				

Intersection: 2: Salem Rd & Brown Bear St

Movement	EB	WB	SB
Directions Served	LT	TR	LR
Maximum Queue (m)	10.6	4.0	18.4
Average Queue (m)	0.8	0.1	7.6
95th Queue (m)	5.1	1.7	15.4
Link Distance (m)	608.8	151.6	19.4
Upstream Blk Time (%)			0
Queuing Penalty (veh)			0
Storage Bay Dist (m)			
Storage Blk Time (%)			
Queuing Penalty (veh)			

Intersection: 3: Essa Rd & Salem Rd

Movement	EB	EB	WB	WB	NB	NB	SB	SB
Directions Served	L	LTR	L	TR	L	TR	L	TR
Maximum Queue (m)	11.2	38.4	14.2	83.9	3.1	78.1	10.6	62.2
Average Queue (m)	2.2	15.0	3.1	35.1	0.5	37.2	3.1	25.6
95th Queue (m)	7.1	29.8	9.4	63.8	2.3	66.9	8.5	53.0
Link Distance (m)	151.6	151.6	661.3	661.3		553.7		98.2
Upstream Blk Time (%)								
Queuing Penalty (veh)								
Storage Bay Dist (m)					74.0		74.0	
Storage Blk Time (%)						0		0
Queuing Penalty (veh)						0		0

Queuing and Blocking Report

Baseline

11-29-2023

Intersection: 4: Koda St & Essa Rd

Movement	EB	NB
Directions Served	LR	LT
Maximum Queue (m)	25.9	57.5
Average Queue (m)	9.4	9.4
95th Queue (m)	20.3	33.9
Link Distance (m)	67.4	98.2
Upstream Blk Time (%)		
Queuing Penalty (veh)		
Storage Bay Dist (m)		
Storage Blk Time (%)		
Queuing Penalty (veh)		

Intersection: 5: Essa Rd & Mabern St

Movement	EB	NB	NB	SB
Directions Served	LR	L	T	TR
Maximum Queue (m)	71.0	67.1	60.4	97.7
Average Queue (m)	32.3	26.6	25.5	49.3
95th Queue (m)	57.4	54.7	51.0	86.1
Link Distance (m)	69.7		227.2	493.2
Upstream Blk Time (%)	1			
Queuing Penalty (veh)	0			
Storage Bay Dist (m)		88.0		
Storage Blk Time (%)		0		
Queuing Penalty (veh)		2		

Intersection: 6: Essa Rd & Athabaska Rd

Movement	EB	NB	NB	SB	SB
Directions Served	LR	L	T	T	R
Maximum Queue (m)	37.8	27.0	63.8	55.2	29.6
Average Queue (m)	15.7	10.7	25.3	20.7	6.4
95th Queue (m)	29.7	21.5	54.8	43.7	19.8
Link Distance (m)	132.1		493.2	319.0	
Upstream Blk Time (%)					
Queuing Penalty (veh)					
Storage Bay Dist (m)		77.0			27.0
Storage Blk Time (%)			0	2	
Queuing Penalty (veh)			0	4	

Network Summary

Network wide Queuing Penalty: 6

B.4 Roundabout Analysis

ARCADY 8

Version: 8.0.0.296 [27 Feb 2012]
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Tel: +44 (0)1344 770758 E-mail: software@trl.co.uk Web: <http://www.trlsoftware.co.uk>

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Filename: Essa Rd-Salem Rd Roundabout-2023-11-28.arc8
Report generation date: 11/28/2023 1:39:06 PM

- » 2032 - Scenario 3, AM Peak
- » 2032 - Scenario 3, PM Peak
- » 2037 - Scenario 4, AM Peak
- » 2037 - Scenario 4, PM Peak

Summary of intersection performance

	AM Peak						PM Peak					
	Queue (PCE)	Delay (s)	V/C Ratio	LOS	Intersection Delay (s)	Intersection LOS	Queue (PCE)	Delay (s)	V/C Ratio	LOS	Intersection Delay (s)	Intersection LOS
2032 - Scenario 3												
South Leg - Essa Rd	0.50	5.21	0.33	A	6.52	A	1.60	8.96	0.61	A	7.91	A
East Leg - Salem Rd	0.08	4.12	0.08	A			0.61	7.17	0.38	A		
North Leg - Essa Rd	1.37	7.79	0.58	A			1.17	7.84	0.54	A		
West Leg - Salem Rd	0.22	5.35	0.18	A			0.19	4.90	0.16	A		

	AM Peak						PM Peak					
	Queue (PCE)	Delay (s)	V/C Ratio	LOS	Intersection Delay (s)	Intersection LOS	Queue (PCE)	Delay (s)	V/C Ratio	LOS	Intersection Delay (s)	Intersection LOS
2037 - Scenario 4												
South Leg - Essa Rd	0.52	4.97	0.34	A	6.12	A	1.66	8.69	0.62	A	7.73	A
East Leg - Salem Rd	0.09	3.94	0.08	A			0.67	7.18	0.40	A		
North Leg - Essa Rd	1.33	7.26	0.57	A			1.22	7.66	0.55	A		
West Leg - Salem Rd	0.22	5.13	0.18	A			0.19	4.75	0.16	A		

Values shown are the maximum values over all time segments. Delay is the maximum value of average delay per arriving vehicle. Intersection LOS and Intersection Delay are demand-weighted averages.

"D1 - Scenario 3, AM Peak" model duration: 7:45 AM - 9:15 AM

"D2 - Scenario 3, PM Peak" model duration: 4:45 PM - 6:15 PM

"D3 - Scenario 4, AM Peak" model duration: 7:45 AM - 9:15 AM

"D4 - Scenario 4, PM Peak " model duration: 4:45 PM - 6:15 PM

Run using ARCADY 8.0.0.296 at 11/28/2023 1:38:54 PM

File summary

File Description

Title	Essa Rd-Salem Rd Roundabout Assessment
Location	
Site Number	
Date	11/28/2023
Version	
Status	

Identifier	
Client	
Jobnumber	
Analyst	NA\nayer.daher
Description	

Analysis Options

Vehicle Length (m)	Do Queue Variations	Calculate Residual Capacity	Residual Capacity Criteria Type	V/C Ratio Threshold	Average Delay Threshold (s)	Queue Threshold (PCE)
5.75	✓		N/A	0.85	36.00	20.00

Units

Distance Units	Speed Units	Traffic Units Input	Traffic Units Results	Flow Units	Average Delay Units	Total Delay Units	Rate Of Delay Units
m	kph	PCE	PCE	perHour	s	-Min	perMin

2032 - Scenario 3, AM Peak

Data Errors and Warnings

Severity	Area	Item	Description
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Warning	DemandSets	D1 - Scenario 3, AM Peak	Time results are shown for central hour only. (Model is run for a 90 minute period.)
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Analysis Set Details

Name	Roundabout Capacity Model	Description	Include In Report	Use Specific Demand Set(s)	Specific Demand Set(s)	Locked	Network Flow Scaling Factor (%)	Network Capacity Scaling Factor (%)	Reason For Scaling Factors
2032	ARCADY		✓	✓	D1,D2		100.000	85.000	

Demand Set Details

Name	Scenario Name	Time Period Name	Description	Traffic Profile Type	Model Start Time (HH:mm)	Model Finish Time (HH:mm)	Model Time Period Length (min)	Time Segment Length (min)	Results For Central Hour Only	Single Time Segment Only	Locked	Run Automatically	Use Relationship	Relationship
Scenario 3, AM Peak	Scenario 3	AM Peak		ONE HOUR	07:45	09:15	90	15	✓			✓		

Intersection Network

Intersections

Name	Intersection Type	Leg Order	Grade Separated	Large Roundabout	Do Geometric Delay	Intersection Delay (s)	Intersection LOS
Essa Road/Salem Road	Roundabout	1,2,3,4				6.52	A

Intersection Network Options

Driving Side	Lighting	Road Surface
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Right	Normal/unknown (Mini-roundabouts only)
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Legs

Legs

Name	Name	Description
South Leg - Essa Rd	South Leg - Essa Rd	
East Leg - Salem Rd	East Leg - Salem Rd	
North Leg - Essa Rd	North Leg - Essa Rd	
West Leg - Salem Rd	West Leg - Salem Rd	

Capacity Options

Name	Minimum Capacity (PCE/hr)	Maximum Capacity (PCE/hr)	Assume Flat Start Profile	Initial Queue (PCE)
South Leg - Essa Rd	0.00	99999.00		0.00
East Leg - Salem Rd	0.00	99999.00		0.00
North Leg - Essa Rd	0.00	99999.00		0.00
West Leg - Salem Rd	0.00	99999.00		0.00

Roundabout Geometry

Name	V - Approach road half-width (m)	E - Entry width (m)	I' - Effective flare length (m)	R - Entry radius (m)	D - Inscribed circle diameter (m)	PHI - Conflict (entry) angle (deg)	Exit Only
South Leg - Essa Rd	3.50	4.50	20.00	20.00	40.00	25.00	
East Leg - Salem Rd	3.50	4.50	20.00	20.00	40.00	25.00	
North Leg - Essa Rd	3.50	4.50	20.00	20.00	40.00	25.00	
West Leg - Salem Rd	3.50	4.50	20.00	20.00	40.00	25.00	

Geometries for Leg C are measured opposite Leg B. Geometries for Leg A (if relevant) are measured opposite Leg D.

Pedestrian Crossings

Name	Crossing Type
South Leg - Essa Rd	None
East Leg - Salem Rd	None
North Leg - Essa Rd	None
West Leg - Salem Rd	None

Slope / Intercept / Capacity

Roundabout Slope and Intercept used in model

Name	Enter slope and intercept directly	Entered slope	Entered intercept (PCE/hr)	Final Slope	Final Intercept (PCE/hr)
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South Leg - Essa Rd		(calculated)	(calculated)	0.576	1344.639
East Leg - Salem Rd		(calculated)	(calculated)	0.576	1344.639
North Leg - Essa Rd		(calculated)	(calculated)	0.576	1344.639
West Leg - Salem Rd		(calculated)	(calculated)	0.576	1344.639

The slope and intercept shown above include any corrections and adjustments.

Traffic Flows

Demand Set Data Options

Default Vehicle Mix	Vehicle Mix Varies Over Time	Vehicle Mix Varies Over Turn	Vehicle Mix Varies Over Entry	Vehicle Mix Source	PCE Factor for a Truck (PCE)	Default Turning Proportions	Estimate from entry/exit counts	Turning Proportions Vary Over Time	Turning Proportions Vary Over Turn	Turning Proportions Vary Over Entry
		✓	✓	Truck Percentages	2.00				✓	✓

Entry Flows

General Flows Data

Name	Profile Type	Use Turning Counts	Average Demand Flow (PCE/hr)	Flow Scaling Factor (%)
South Leg - Essa Rd	ONE HOUR	✓	318.00	100.000
East Leg - Salem Rd	ONE HOUR	✓	67.00	100.000

North Leg - Essa Rd	ONE HOUR	✓	579.00	100.000
West Leg - Salem Rd	ONE HOUR	✓	135.00	100.000

Turning Proportions

Turning Counts or Proportions (PCE/hr) - Essa Road/ Salem Road (for whole period)

		To			
From		1	2	3	4
	1	0.000	34.000	275.000	9.000
	2	15.000	0.000	12.000	40.000
	3	518.000	39.000	0.000	22.000
	4	11.000	77.000	47.000	0.000

Turning Proportions (PCE) - Essa Road/ Salem Road (for whole period)

		To			
From		1	2	3	4
	1	0.00	0.11	0.86	0.03
	2	0.22	0.00	0.18	0.60

	3	0.89	0.07	0.00	0.04
	4	0.08	0.57	0.35	0.00

Vehicle Mix

Average PCE Per Vehicle - Essa Road/ Salem Road (for whole period)

		To			
		1	2	3	4
From	1	1.000	1.020	1.020	1.020
	2	1.020	1.000	1.020	1.020
	3	1.020	1.020	1.000	1.020
	4	1.020	1.020	1.020	1.000

Truck Percentages - Essa Road/ Salem Road (for whole period)

		To			
		1	2	3	4
From	1	0.000	2.000	2.000	2.000
	2	2.000	0.000	2.000	2.000

	3	2.000	2.000	0.000	2.000
	4	2.000	2.000	2.000	0.000

Results

Results Summary for whole modelled period

Name	Max V/C Ratio	Max Delay (s)	Max Queue (PCE)	Max 95th percentile Queue (PCE)	Max LOS	Average Demand (PCE/hr)	Total Intersection Arrivals (PCE)	Total Queueing Delay (PCE-min)	Average Queueing Delay (s)	Rate Of Queueing Delay (PCE-min/min)	Inclusive Total Queueing Delay (PCE-min)	Inclusive Average Queueing Delay (s)
South Leg - Essa Rd	0.33	5.21	0.50	1.02	A	318.00	318.00	26.08	4.92	0.29	34.74	4.76
East Leg - Salem Rd	0.08	4.12	0.08	?	A	67.00	67.00	4.47	4.01	0.05	6.06	3.94
North Leg - Essa Rd	0.58	7.79	1.37	1.02	A	579.00	579.00	66.82	6.92	0.74	86.27	6.50
West Leg - Salem Rd	0.18	5.35	0.22	?	A	135.00	135.00	11.35	5.05	0.13	15.09	4.87

2032 - Scenario 3, PM Peak

Data Errors and Warnings

Severity	Area	Item	Description
Warning	DemandSets	D2 - Scenario 3, PM Peak	Time results are shown for central hour only. (Model is run for a 90 minute period.)

Analysis Set Details

Name	Roundabout Capacity Model	Description	Include In Report	Use Specific Demand Set(s)	Specific Demand Set(s)	Locked	Network Flow Scaling Factor (%)	Network Capacity Scaling Factor (%)	Reason For Scaling Factors
2032	ARCADY		✓	✓	D1,D2		100.000	85.000	

Demand Set Details

Name	Scenario Name	Time Period Name	Description	Traffic Profile Type	Model Start Time (HH:mm)	Model Finish Time (HH:mm)	Model Time Period Length (min)	Time Segment Length (min)	Results For Central Hour Only	Single Time Segment Only	Locked	Run Automatically	Use Relationship	Relationship
Scenario 3, PM Peak	Scenario 3	PM Peak		ONE HOUR	16:45	18:15	90	15	✓			✓		

Intersection Network

Intersections

Name	Intersection Type	Leg Order	Grade Separated	Large Roundabout	Do Geometric Delay	Intersection Delay (s)	Intersection LOS
Essa Road/Salem Road	Roundabout	1,2,3,4				7.91	A

Intersection Network Options

Driving Side	Lighting	Road Surface
Right	Normal/unknown	(Mini-roundabouts only)

Legs

Legs

Name	Name	Description
South Leg - Essa Rd	South Leg - Essa Rd	
East Leg - Salem Rd	East Leg - Salem Rd	
North Leg - Essa Rd	North Leg - Essa Rd	
West Leg - Salem Rd	West Leg - Salem Rd	

Capacity Options

Name	Minimum Capacity (PCE/hr)	Maximum Capacity (PCE/hr)	Assume Flat Start Profile	Initial Queue (PCE)
South Leg - Essa Rd	0.00	99999.00		0.00

East Leg - Salem Rd	0.00	99999.00		0.00
North Leg - Essa Rd	0.00	99999.00		0.00
West Leg - Salem Rd	0.00	99999.00		0.00

Roundabout Geometry

Name	V - Approach road half-width (m)	E - Entry width (m)	I' - Effective flare length (m)	R - Entry radius (m)	D - Inscribed circle diameter (m)	PHI - Conflict (entry) angle (deg)	Exit Only
South Leg - Essa Rd	3.50	4.50	20.00	20.00	40.00	25.00	
East Leg - Salem Rd	3.50	4.50	20.00	20.00	40.00	25.00	
North Leg - Essa Rd	3.50	4.50	20.00	20.00	40.00	25.00	
West Leg - Salem Rd	3.50	4.50	20.00	20.00	40.00	25.00	

Geometries for Leg C are measured opposite Leg B. Geometries for Leg A (if relevant) are measured opposite Leg D.

Pedestrian Crossings

Name	Crossing Type
South Leg - Essa Rd	None
East Leg - Salem Rd	None

North Leg - Essa Rd	None
West Leg - Salem Rd	None

Slope / Intercept / Capacity

Roundabout Slope and Intercept used in model

Name	Enter slope and intercept directly	Entered slope	Entered intercept (PCE/hr)	Final Slope	Final Intercept (PCE/hr)
South Leg - Essa Rd		(calculated)	(calculated)	0.576	1344.639
East Leg - Salem Rd		(calculated)	(calculated)	0.576	1344.639
North Leg - Essa Rd		(calculated)	(calculated)	0.576	1344.639
West Leg - Salem Rd		(calculated)	(calculated)	0.576	1344.639

The slope and intercept shown above include any corrections and adjustments.

Traffic Flows

Demand Set Data Options

Default Vehicle Mix	Vehicle Mix Varies Over Time	Vehicle Mix Varies Over Turn	Vehicle Mix Varies Over Entry	Vehicle Mix Source	PCE Factor for a Truck (PCE)	Default Turning Proportions	Estimate from entry/exit counts	Turning Proportions Vary Over Time	Turning Proportions Vary Over Turn	Turning Proportions Vary Over Entry
		✓	✓	Truck Percentages	2.00				✓	✓

Entry Flows

General Flows Data

Name	Profile Type	Use Turning Counts	Average Demand Flow (PCE/hr)	Flow Scaling Factor (%)
South Leg - Essa Rd	ONE HOUR	✓	592.00	100.000
East Leg - Salem Rd	ONE HOUR	✓	282.00	100.000
North Leg - Essa Rd	ONE HOUR	✓	491.00	100.000
West Leg - Salem Rd	ONE HOUR	✓	126.00	100.000

Turning Proportions

Turning Counts or Proportions (PCE/hr) - Essa Road/ Salem Road (for whole period)

	To				
From		1	2	3	4
	1	0.000	29.000	553.000	10.000
	2	28.000	0.000	43.000	211.000
	3	411.000	33.000	0.000	47.000
	4	8.000	87.000	31.000	0.000

Turning Proportions (PCE) - Essa Road/ Salem Road (for whole period)

	To				
		1	2	3	4
From	1	0.00	0.05	0.93	0.02
	2	0.10	0.00	0.15	0.75
	3	0.84	0.07	0.00	0.10
	4	0.06	0.69	0.25	0.00

Vehicle Mix

Average PCE Per Vehicle - Essa Road/ Salem Road (for whole period)

	To				
		1	2	3	4
From	1	1.000	1.020	1.020	1.020
	2	1.020	1.000	1.020	1.020
	3	1.020	1.020	1.000	1.020
	4	1.020	1.020	1.020	1.000

Truck Percentages - Essa Road/ Salem Road (for whole period)

	To				
From		1	2	3	4
	1	0.000	2.000	2.000	2.000
	2	2.000	0.000	2.000	2.000
	3	2.000	2.000	0.000	2.000
	4	2.000	2.000	2.000	0.000

Results

Results Summary for whole modelled period

Name	Max V/C Ratio	Max Delay (s)	Max Queue (PCE)	Max 95th percentile Queue (PCE)	Max LOS	Average Demand (PCE/hr)	Total Intersection Arrivals (PCE)	Total Queueing Delay (PCE-min)	Average Queueing Delay (s)	Rate Of Queueing Delay (PCE-min/min)	Inclusive Total Queueing Delay (PCE-min)	Inclusive Average Queueing Delay (s)
South Leg - Essa Rd	0.61	8.96	1.60	1.02	A	592.00	592.00	76.59	7.76	0.85	97.78	7.20
East Leg - Salem Rd	0.38	7.17	0.61	1.02	A	282.00	282.00	30.44	6.48	0.34	39.54	6.11

North Leg - Essa Rd	0.54	7.84	1.17	?	A	491.00	491.00	57.02	6.97	0.63	73.56	6.53
West Leg - Salem Rd	0.16	4.90	0.19	?	A	126.00	126.00	9.80	4.67	0.11	13.11	4.54

2037 - Scenario 4, AM Peak

Data Errors and Warnings

Severity	Area	Item	Description
Warning	DemandSets	D3 - Scenario 4, AM Peak	Time results are shown for central hour only. (Model is run for a 90 minute period.)

Analysis Set Details

Name	Roundabout Capacity Model	Description	Include In Report	Use Specific Demand Set(s)	Specific Demand Set(s)	Locked	Network Flow Scaling Factor (%)	Network Capacity Scaling Factor (%)	Reason For Scaling Factors
2037	ARCADY		✓	✓	D3,D4		100.000	90.000	

Demand Set Details

Name	Scenario Name	Time Period Name	Description	Traffic Profile Type	Model Start Time (HH:mm)	Model Finish Time (HH:mm)	Model Time Period Length (min)	Time Segment Length (min)	Results For Central Hour Only	Single Time Segment Only	Locked	Run Automatically	Use Relationship	Relationship
Scenario 4, AM Peak	Scenario 4	AM Peak		ONE HOUR	07:45	09:15	90	15	✓			✓		

Intersection Network

Intersections

Name	Intersection Type	Leg Order	Grade Separated	Large Roundabout	Do Geometric Delay	Intersection Delay (s)	Intersection LOS
Essa Road/Salem Road	Roundabout	1,2,3,4				6.12	A

Intersection Network Options

Driving Side	Lighting	Road Surface
Right	Normal/unknown	(Mini-roundabouts only)

Legs

Legs

Name	Name	Description
South Leg - Essa Rd	South Leg - Essa Rd	

East Leg - Salem Rd	East Leg - Salem Rd	
North Leg - Essa Rd	North Leg - Essa Rd	
West Leg - Salem Rd	West Leg - Salem Rd	

Capacity Options

Name	Minimum Capacity (PCE/hr)	Maximum Capacity (PCE/hr)	Assume Flat Start Profile	Initial Queue (PCE)
South Leg - Essa Rd	0.00	99999.00		0.00
East Leg - Salem Rd	0.00	99999.00		0.00
North Leg - Essa Rd	0.00	99999.00		0.00
West Leg - Salem Rd	0.00	99999.00		0.00

Roundabout Geometry

Name	V - Approach road half-width (m)	E - Entry width (m)	I' - Effective flare length (m)	R - Entry radius (m)	D - Inscribed circle diameter (m)	PHI - Conflict (entry) angle (deg)	Exit Only
South Leg - Essa Rd	3.50	4.50	20.00	20.00	40.00	25.00	
East Leg - Salem Rd	3.50	4.50	20.00	20.00	40.00	25.00	
North Leg - Essa Rd	3.50	4.50	20.00	20.00	40.00	25.00	

West Leg - Salem Rd	3.50	4.50	20.00	20.00	40.00	25.00	
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Geometries for Leg C are measured opposite Leg B. Geometries for Leg A (if relevant) are measured opposite Leg D.

Pedestrian Crossings

Name	Crossing Type
South Leg - Essa Rd	None
East Leg - Salem Rd	None
North Leg - Essa Rd	None
West Leg - Salem Rd	None

Slope / Intercept / Capacity

Roundabout Slope and Intercept used in model

Name	Enter slope and intercept directly	Entered slope	Entered intercept (PCE/hr)	Final Slope	Final Intercept (PCE/hr)
South Leg - Essa Rd		(calculated)	(calculated)	0.576	1344.639
East Leg - Salem Rd		(calculated)	(calculated)	0.576	1344.639
North Leg - Essa Rd		(calculated)	(calculated)	0.576	1344.639
West Leg - Salem Rd		(calculated)	(calculated)	0.576	1344.639

The slope and intercept shown above include any corrections and adjustments.

Traffic Flows

Demand Set Data Options

Default Vehicle Mix	Vehicle Mix Varies Over Time	Vehicle Mix Varies Over Turn	Vehicle Mix Varies Over Entry	Vehicle Mix Source	PCE Factor for a Truck (PCE)	Default Turning Proportions	Estimate from entry/exit counts	Turning Proportions Vary Over Time	Turning Proportions Vary Over Turn	Turning Proportions Vary Over Entry
		✓	✓	Truck Percentages	2.00				✓	✓

Entry Flows

General Flows Data

Name	Profile Type	Use Turning Counts	Average Demand Flow (PCE/hr)	Flow Scaling Factor (%)
South Leg - Essa Rd	ONE HOUR	✓	341.00	100.000
East Leg - Salem Rd	ONE HOUR	✓	72.00	100.000
North Leg - Essa Rd	ONE HOUR	✓	604.00	100.000
West Leg - Salem Rd	ONE HOUR	✓	139.00	100.000

Turning Proportions

Turning Counts or Proportions (PCE/hr) - Essa Road/ Salem Road (for whole period)

	To				
From		1	2	3	4
	1	0.000	38.000	293.000	10.000
	2	17.000	0.000	13.000	42.000
	3	540.000	41.000	0.000	23.000
	4	11.000	81.000	47.000	0.000

Turning Proportions (PCE) - Essa Road/ Salem Road (for whole period)

	To				
From		1	2	3	4
	1	0.00	0.11	0.86	0.03
	2	0.24	0.00	0.18	0.58
	3	0.89	0.07	0.00	0.04
	4	0.08	0.58	0.34	0.00

Vehicle Mix

Average PCE Per Vehicle - Essa Road/ Salem Road (for whole period)

	To				
From		1	2	3	4
	1	1.000	1.020	1.020	1.020
	2	1.020	1.000	1.020	1.020
	3	1.020	1.020	1.000	1.020
	4	1.020	1.020	1.020	1.000

Truck Percentages - Essa Road/ Salem Road (for whole period)

	To				
From		1	2	3	4
	1	0.000	2.000	2.000	2.000
	2	2.000	0.000	2.000	2.000
	3	2.000	2.000	0.000	2.000
	4	2.000	2.000	2.000	0.000

Results

Results Summary for whole modelled period

Name	Max V/C Ratio	Max Delay (s)	Max Queue (PCE)	Max 95th percentile Queue (PCE)	Max LOS	Average Demand (PCE/hr)	Total Intersection Arrivals (PCE)	Total Queueing Delay (PCE-min)	Average Queueing Delay (s)	Rate Of Queueing Delay (PCE-min/min)	Inclusive Total Queueing Delay (PCE-min)	Inclusive Average Queueing Delay (s)
South Leg - Essa Rd	0.34	4.97	0.52	1.02	A	341.00	341.00	26.68	4.69	0.30	35.50	4.54
East Leg - Salem Rd	0.08	3.94	0.09	?	A	72.00	72.00	4.59	3.83	0.05	6.22	3.76
North Leg - Essa Rd	0.57	7.26	1.33	1.02	A	604.00	604.00	65.12	6.47	0.72	84.16	6.07
West Leg - Salem Rd	0.18	5.13	0.22	?	A	139.00	139.00	11.19	4.83	0.12	14.85	4.66

2037 - Scenario 4, PM Peak

Data Errors and Warnings

Severity	Area	Item	Description
----------	------	------	-------------

Warning	DemandSets	D4 - Scenario 4, PM Peak	Time results are shown for central hour only. (Model is run for a 90 minute period.)
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Analysis Set Details

Name	Roundabout Capacity Model	Description	Include In Report	Use Specific Demand Set(s)	Specific Demand Set(s)	Locked	Network Flow Scaling Factor (%)	Network Capacity Scaling Factor (%)	Reason For Scaling Factors
2037	ARCADY		✓	✓	D3,D4		100.000	90.000	

Demand Set Details

Name	Scenario Name	Time Period Name	Description	Traffic Profile Type	Model Start Time (HH:mm)	Model Finish Time (HH:mm)	Model Time Period Length (min)	Time Segment Length (min)	Results For Central Hour Only	Single Time Segment Only	Locked	Run Automatically	Use Relationship	Relationship
Scenario 4, PM Peak	Scenario 4	PM Peak		ONE HOUR	16:45	18:15	90	15	✓			✓		

Intersection Network

Intersections

Name	Intersection Type	Leg Order	Grade Separated	Large Roundabout	Do Geometric Delay	Intersection Delay (s)	Intersection LOS
Essa Road/Salem Road	Roundabout	1,2,3,4				7.73	A

Intersection Network Options

Driving Side	Lighting	Road Surface
--------------	----------	--------------

Right	Normal/unknown (Mini-roundabouts only)
-------	--

Legs

Legs

Name	Name	Description
South Leg - Essa Rd	South Leg - Essa Rd	
East Leg - Salem Rd	East Leg - Salem Rd	
North Leg - Essa Rd	North Leg - Essa Rd	
West Leg - Salem Rd	West Leg - Salem Rd	

Capacity Options

Name	Minimum Capacity (PCE/hr)	Maximum Capacity (PCE/hr)	Assume Flat Start Profile	Initial Queue (PCE)
South Leg - Essa Rd	0.00	99999.00		0.00
East Leg - Salem Rd	0.00	99999.00		0.00
North Leg - Essa Rd	0.00	99999.00		0.00
West Leg - Salem Rd	0.00	99999.00		0.00

Roundabout Geometry

Name	V - Approach road half-width (m)	E - Entry width (m)	I' - Effective flare length (m)	R - Entry radius (m)	D - Inscribed circle diameter (m)	PHI - Conflict (entry) angle (deg)	Exit Only
South Leg - Essa Rd	3.50	4.50	20.00	20.00	40.00	25.00	
East Leg - Salem Rd	3.50	4.50	20.00	20.00	40.00	25.00	
North Leg - Essa Rd	3.50	4.50	20.00	20.00	40.00	25.00	
West Leg - Salem Rd	3.50	4.50	20.00	20.00	40.00	25.00	

Geometries for Leg C are measured opposite Leg B. Geometries for Leg A (if relevant) are measured opposite Leg D.

Pedestrian Crossings

Name	Crossing Type
South Leg - Essa Rd	None
East Leg - Salem Rd	None
North Leg - Essa Rd	None
West Leg - Salem Rd	None

Slope / Intercept / Capacity

Roundabout Slope and Intercept used in model

Name	Enter slope and intercept directly	Entered slope	Entered intercept (PCE/hr)	Final Slope	Final Intercept (PCE/hr)
------	------------------------------------	---------------	----------------------------	-------------	--------------------------

South Leg - Essa Rd		(calculated)	(calculated)	0.576	1344.639
East Leg - Salem Rd		(calculated)	(calculated)	0.576	1344.639
North Leg - Essa Rd		(calculated)	(calculated)	0.576	1344.639
West Leg - Salem Rd		(calculated)	(calculated)	0.576	1344.639

The slope and intercept shown above include any corrections and adjustments.

Traffic Flows

Demand Set Data Options

Default Vehicle Mix	Vehicle Mix Varies Over Time	Vehicle Mix Varies Over Turn	Vehicle Mix Varies Over Entry	Vehicle Mix Source	PCE Factor for a Truck (PCE)	Default Turning Proportions	Estimate from entry/exit counts	Turning Proportions Vary Over Time	Turning Proportions Vary Over Turn	Turning Proportions Vary Over Entry
		✓	✓	Truck Percentages	2.00				✓	✓

Entry Flows

General Flows Data

Name	Profile Type	Use Turning Counts	Average Demand Flow (PCE/hr)	Flow Scaling Factor (%)
South Leg - Essa Rd	ONE HOUR	✓	632.00	100.000
East Leg - Salem Rd	ONE HOUR	✓	307.00	100.000

North Leg - Essa Rd	ONE HOUR	✓	524.00	100.000
West Leg - Salem Rd	ONE HOUR	✓	134.00	100.000

Turning Proportions

Turning Counts or Proportions (PCE/hr) - Essa Road/ Salem Road (for whole period)

	To				
		1	2	3	4
From	1	0.000	32.000	590.000	10.000
	2	31.000	0.000	47.000	229.000
	3	441.000	35.000	0.000	48.000
	4	8.000	94.000	32.000	0.000

Turning Proportions (PCE) - Essa Road/ Salem Road (for whole period)

	To				
		1	2	3	4
From	1	0.00	0.05	0.93	0.02
	2	0.10	0.00	0.15	0.75

	3	0.84	0.07	0.00	0.09
	4	0.06	0.70	0.24	0.00

Vehicle Mix

Average PCE Per Vehicle - Essa Road/ Salem Road (for whole period)

		To			
		1	2	3	4
From	1	1.000	1.020	1.020	1.020
	2	1.020	1.000	1.020	1.020
	3	1.020	1.020	1.000	1.020
	4	1.020	1.020	1.020	1.000

Truck Percentages - Essa Road/ Salem Road (for whole period)

		To			
		1	2	3	4
From	1	0.000	2.000	2.000	2.000
	2	2.000	0.000	2.000	2.000

	3	2.000	2.000	0.000	2.000
	4	2.000	2.000	2.000	0.000

Results

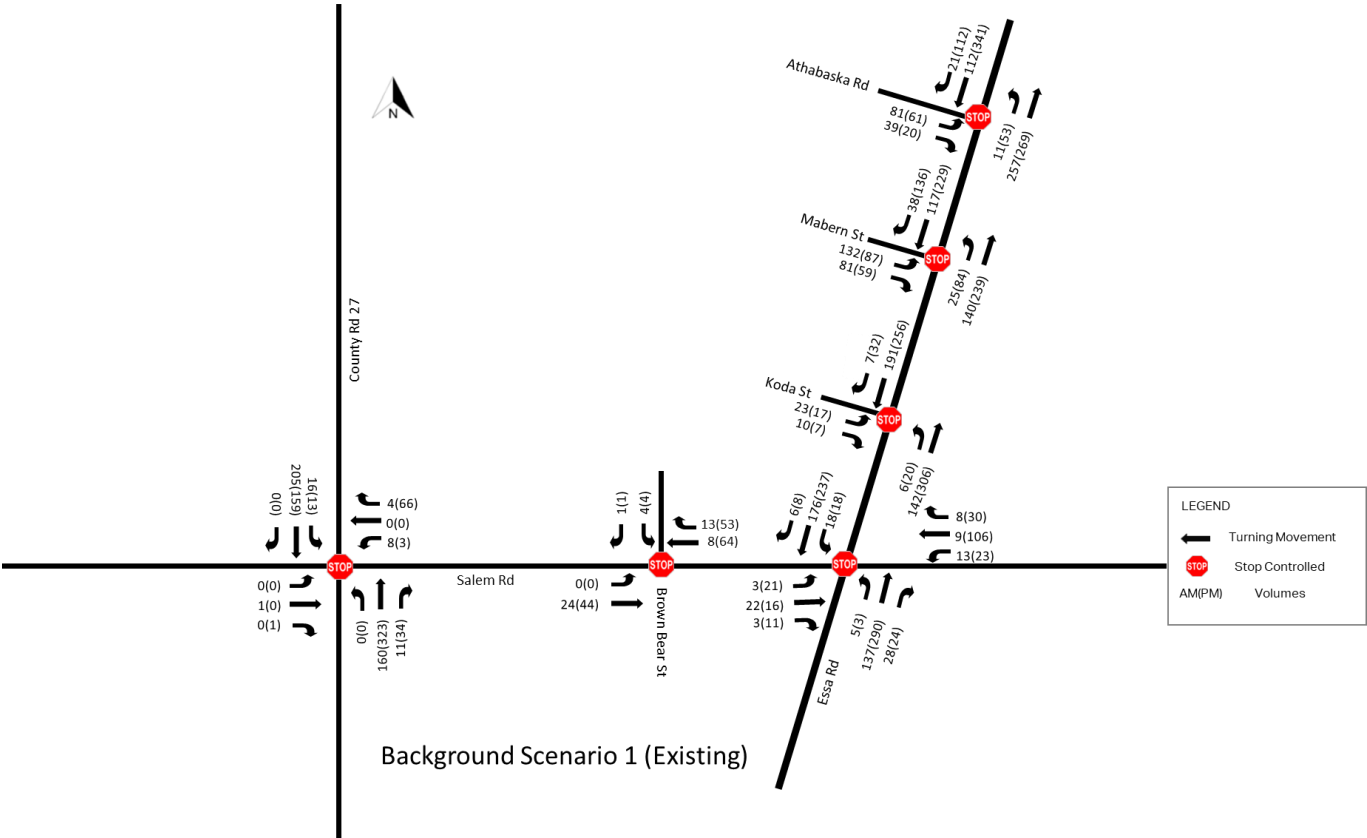
Results Summary for whole modelled period

Name	Max V/C Ratio	Max Delay (s)	Max Queue (PCE)	Max 95th percentile Queue (PCE)	Max LOS	Average Demand (PCE/hr)	Total Intersection Arrivals (PCE)	Total Queueing Delay (PCE-min)	Average Queueing Delay (s)	Rate Of Queueing Delay (PCE-min/min)	Inclusive Total Queueing Delay (PCE-min)	Inclusive Average Queueing Delay (s)
South Leg - Essa Rd	0.62	8.69	1.66	1.02	A	632.00	632.00	78.99	7.50	0.88	100.61	6.94
East Leg - Salem Rd	0.40	7.18	0.67	1.02	A	307.00	307.00	32.91	6.43	0.37	42.54	6.04
North Leg - Essa Rd	0.55	7.66	1.22	?	A	524.00	524.00	59.15	6.77	0.66	76.10	6.33
West Leg - Salem Rd	0.16	4.75	0.19	?	A	134.00	134.00	10.08	4.51	0.11	13.46	4.38

Appendix C – Traffic Volume Figures

C.1 Existing Conditions

Figure 8-1: Scenario 1 2022 Background Traffic Operations Analysis Graphic



C.2 Future Traffic Conditions

Figure 8-2: Adjacent Developments Traffic Operations Analysis Graphic

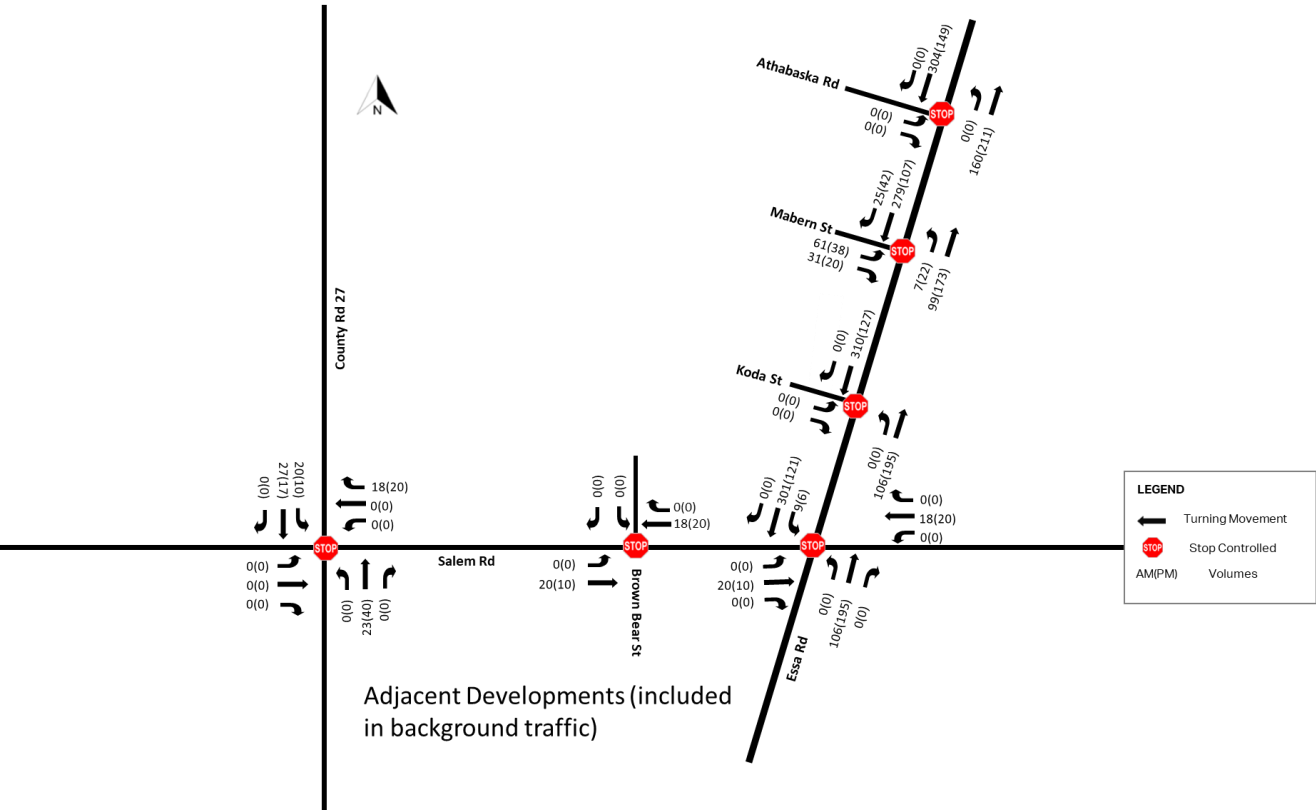


Figure 8-3: Full Build-Out Site Generated Traffic Operations Analysis Graphic

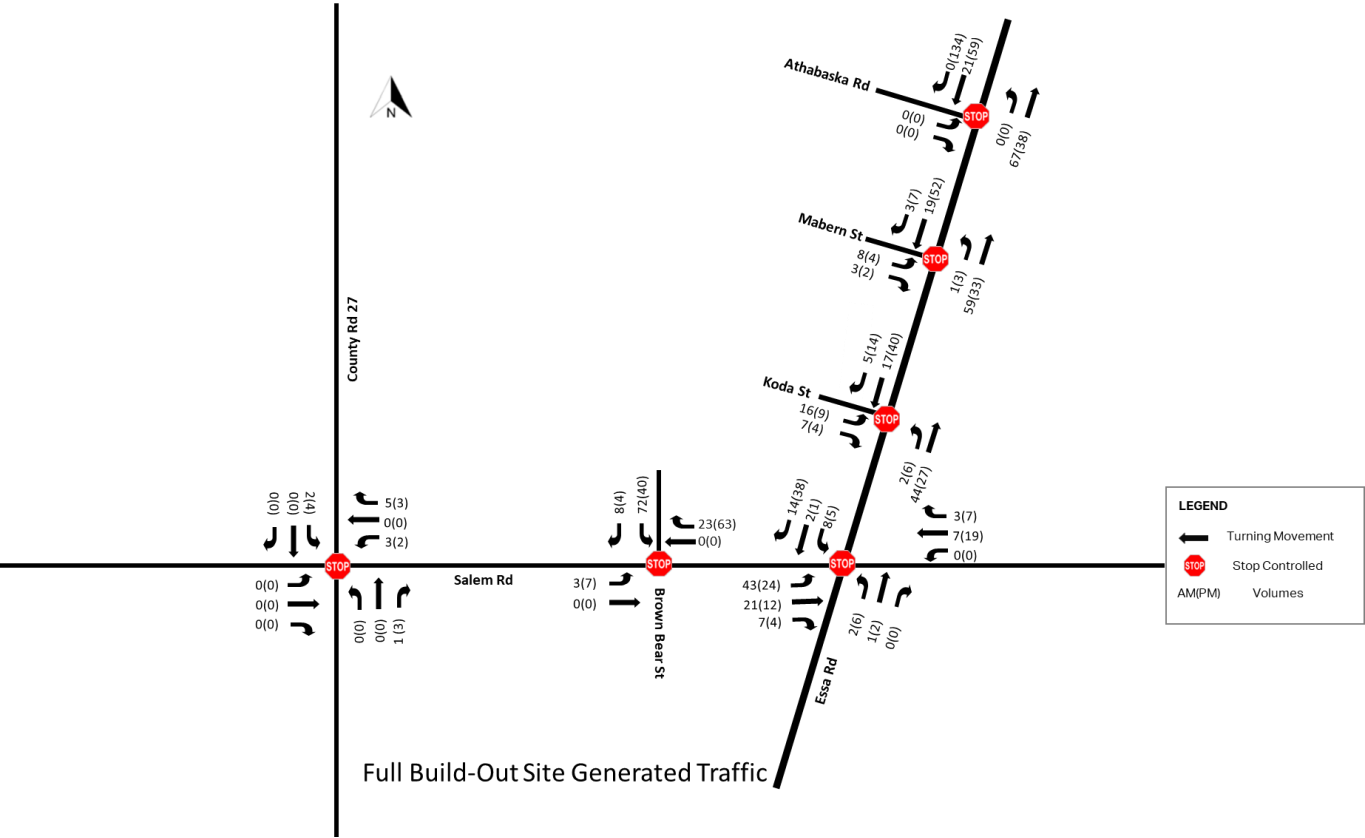


Figure 8-4: Scenario 2 2027 Background Traffic Operations Analysis Graphic

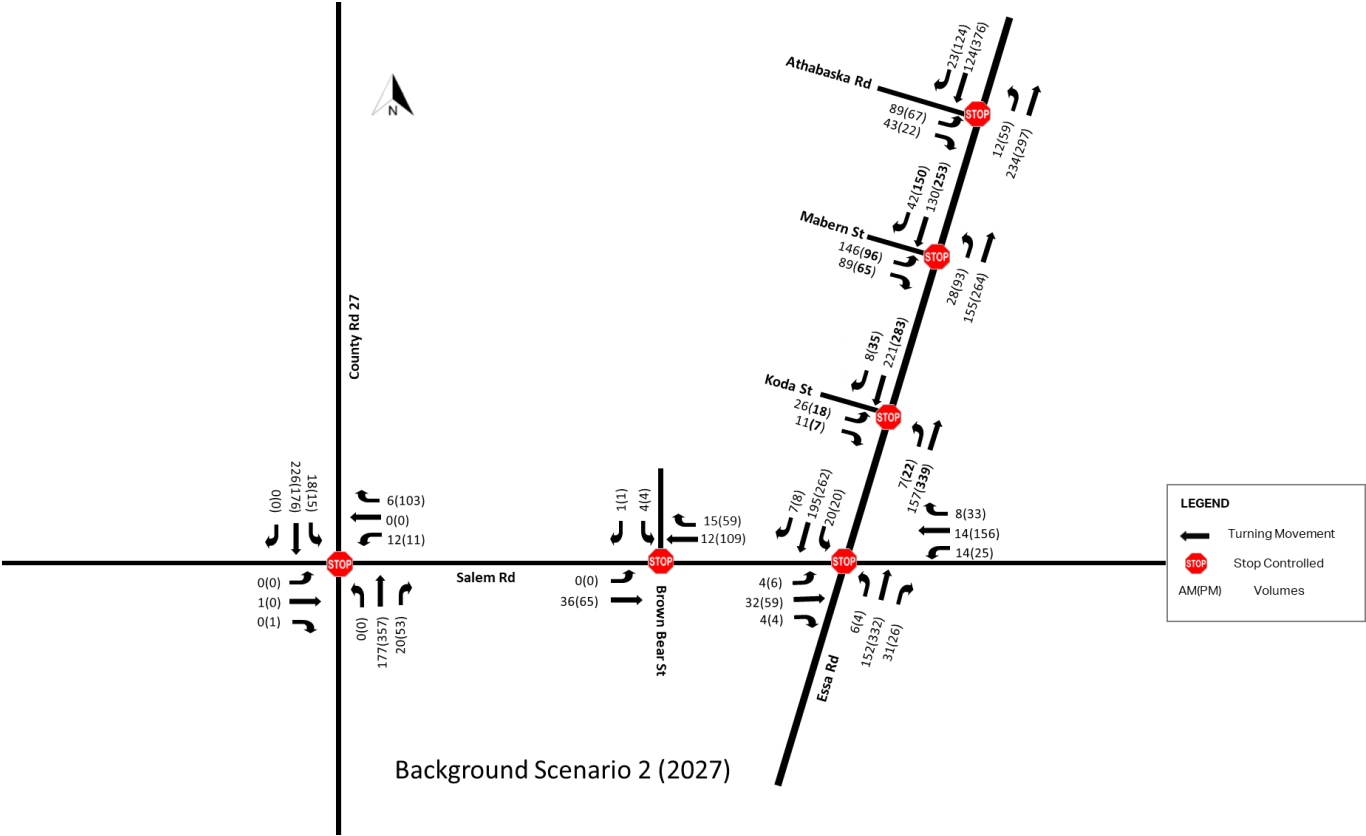


Figure 8-5: Scenario 2 2027 Do-nothing Total Traffic Operations Analysis Graphic

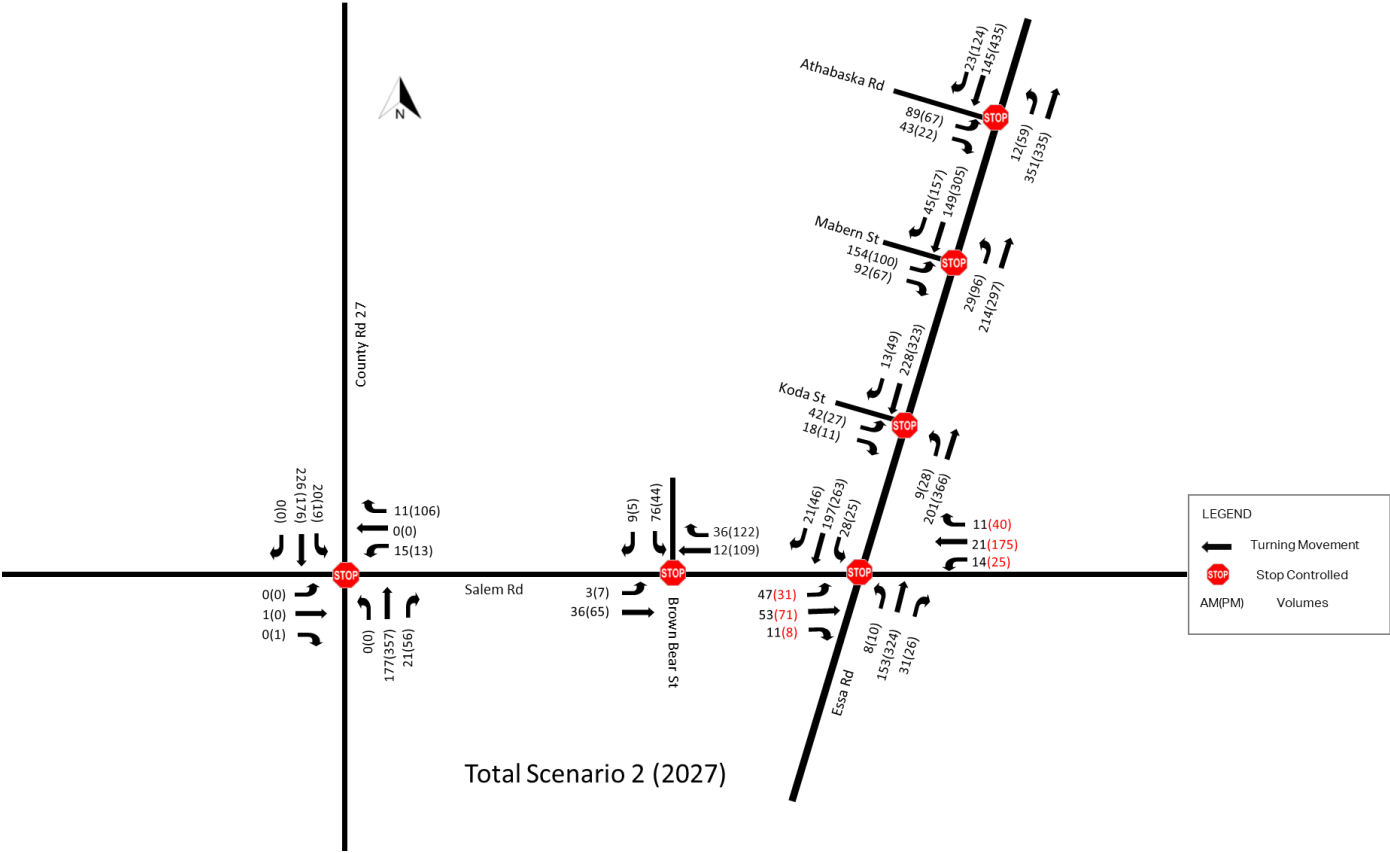


Figure 8-6: Scenario 3 2032 Background Traffic Operations Analysis Graphic

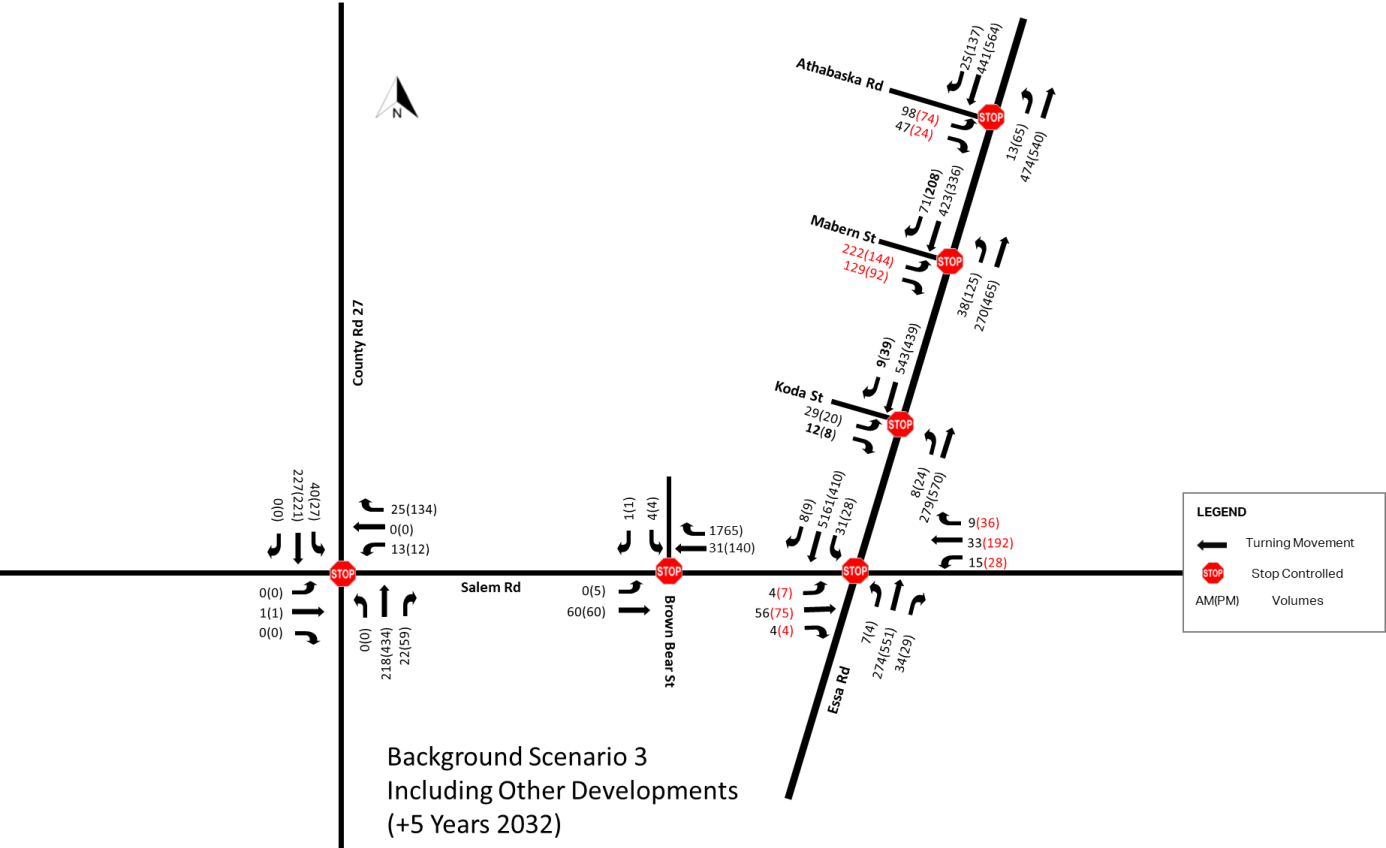


Figure 8-7: Scenario 3 2032 Do-nothing Total Traffic Operations Analysis Graphic

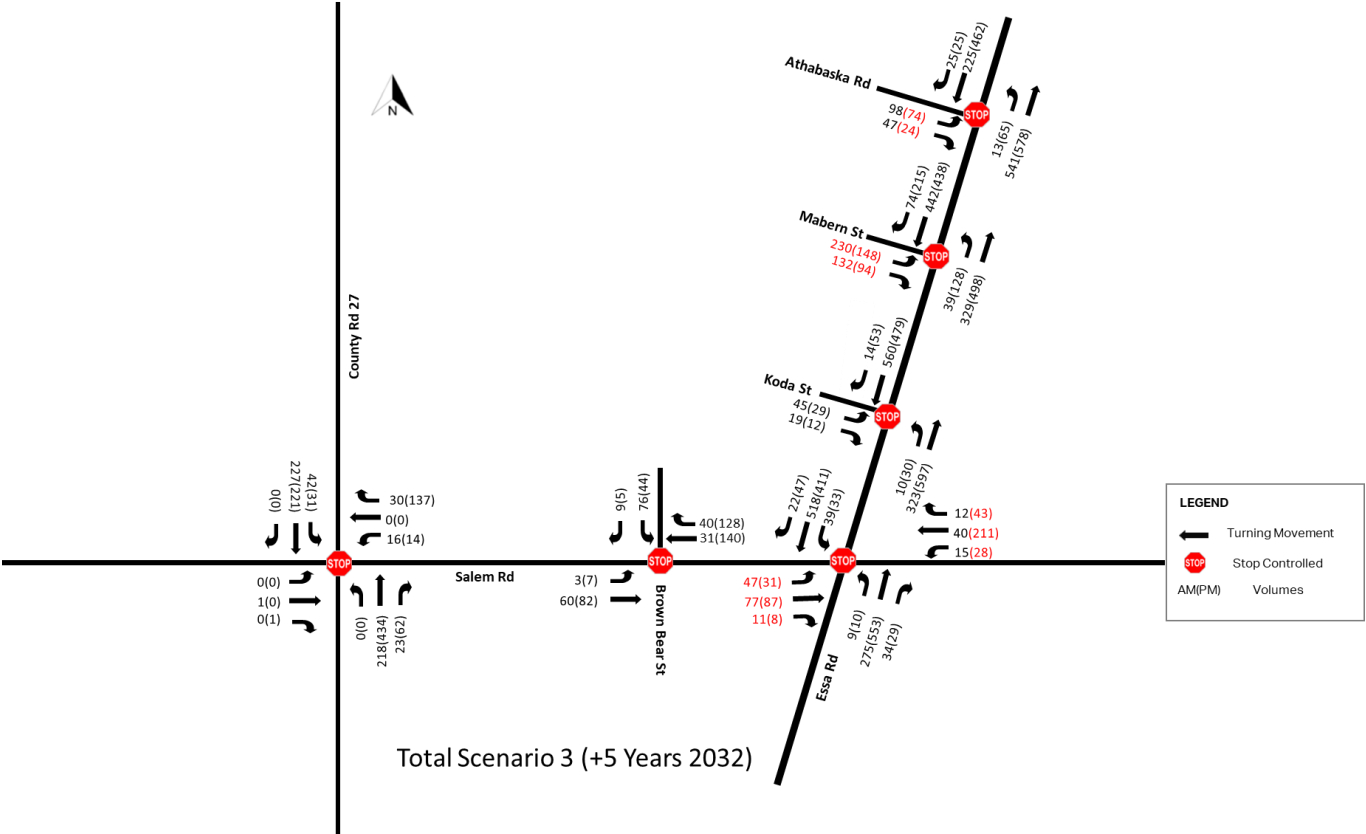


Figure 8-8: Scenario 4 2037 Background Traffic Operations Analysis Graphic

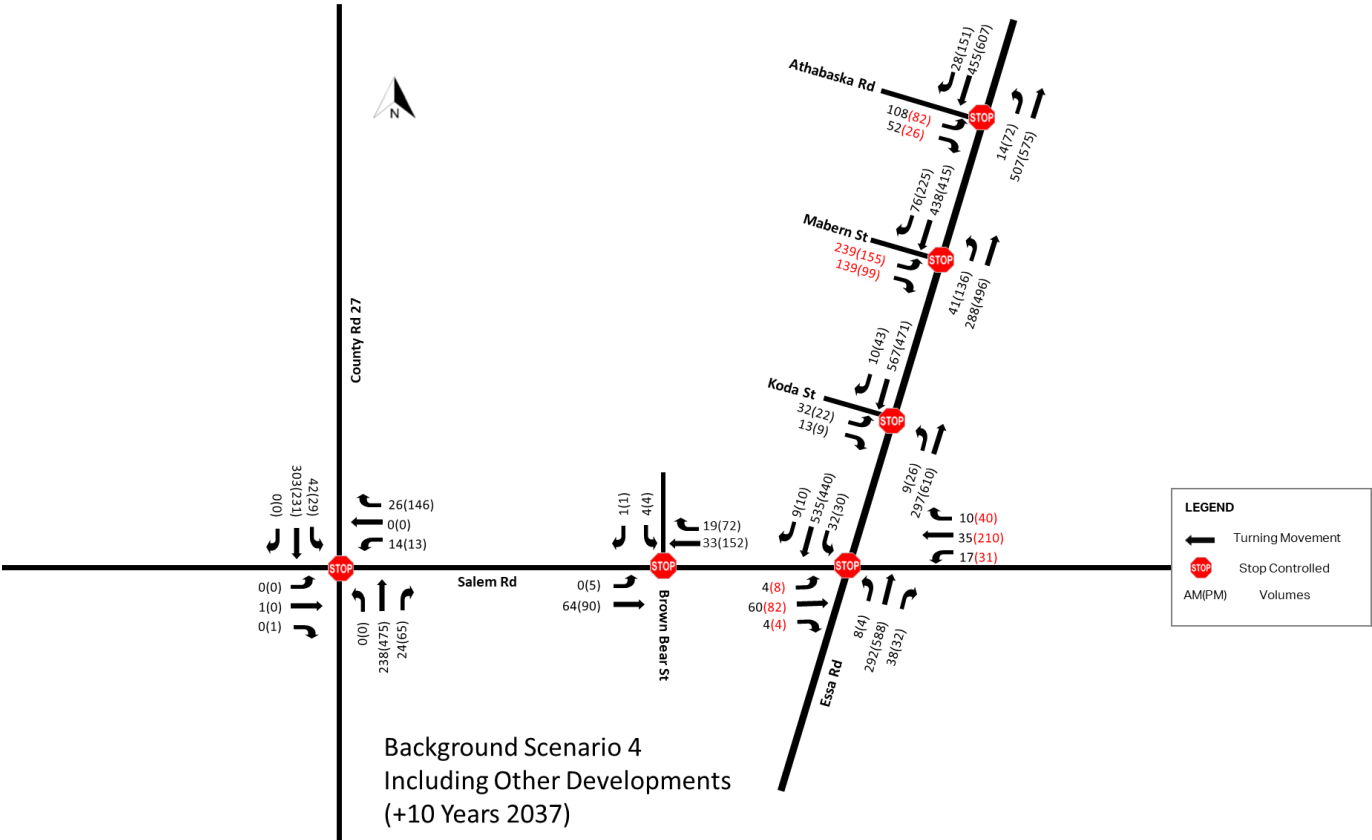
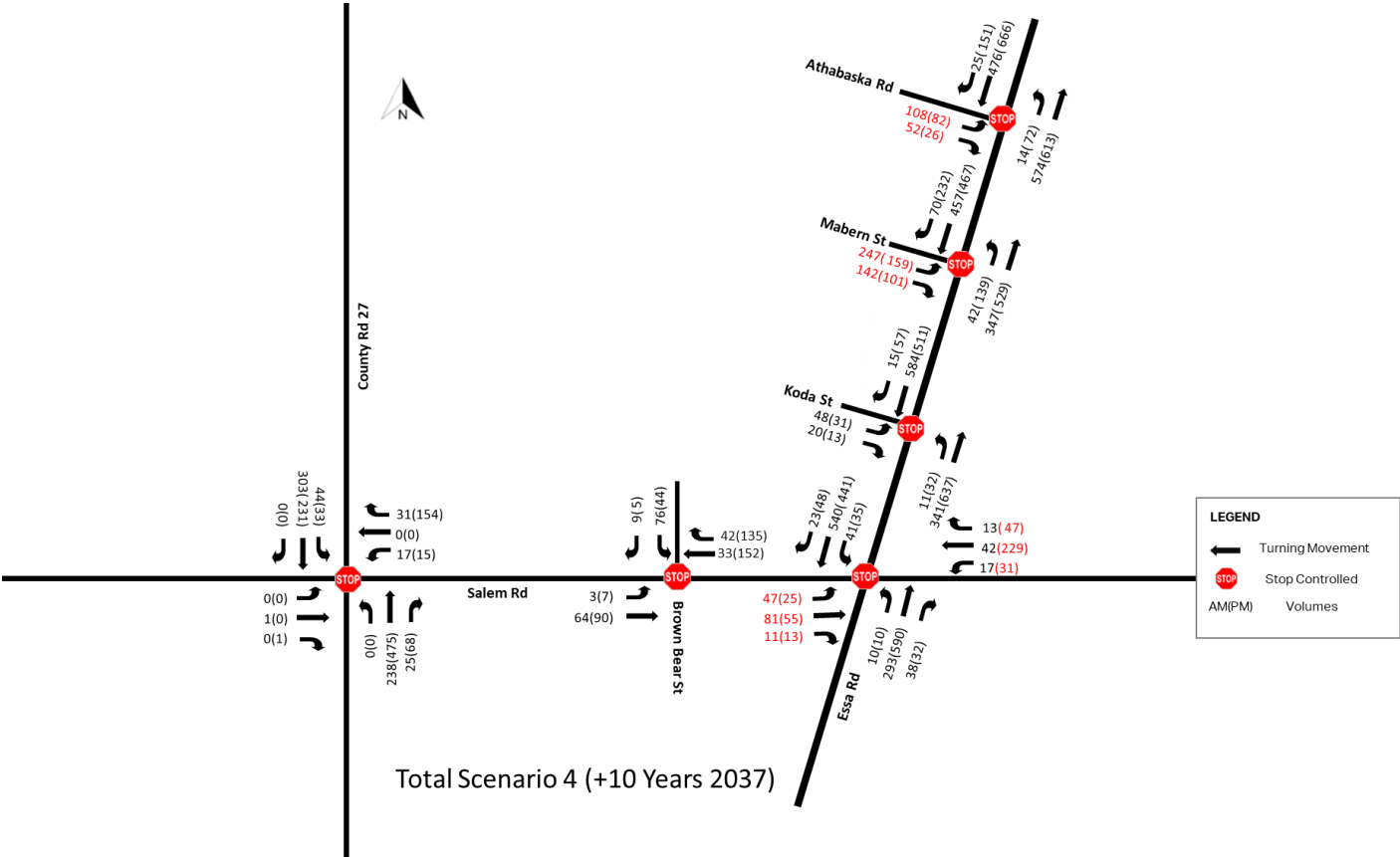


Figure 8-9: Scenario 4 2037 Do-nothing Total Traffic Operations Analysis Graphic



Appendix D Transportation Tomorrow Survey (TTS) – Excerpts

Wed Aug 10 2022 14:34:53 GMT-0400 (Eastern Daylight Time) - Run Time: 2340ms

Cross Tabulation Query Form - Trip - 2016 v1.1

Row: 2006 GTA zone of origin - gta06_orig

Column: Planning district of destination - pd_dest

Filters:

2006 GTA zone of origin - gta06_orig In 8523

Trip 2016

ROW : gta06_orig

COLUMN : pd_dest

gta06_orig	pd_dest	total
8523	1	269
8523	2	17
8523	3	17
8523	4	68
8523	5	67
8523	7	33
8523	8	33
8523	9	121
8523	10	150
8523	11	53
8523	16	72
8523	20	80
8523	25	41
8523	26	14
8523	27	177
8523	28	29
8523	29	117
8523	31	29
8523	32	51
8523	33	325
8523	34	25
8523	35	56
8523	36	148
8523	37	8
8523	38	18
8523	39	21
8523	40	14
8523	70	6
8523	81	18596
8523	82	553
8523	83	162
8523	84	392
8523	85	45
8523	86	641
8523	88	579
8523	103	24
8523	116	20
8523	117	39
8523	120	17
8523	127	81
8523	128	47
8523	129	75
8523	130	105
8523	131	28
8523	133	423
8523	134	296
8523	136	266
8523	998	24

Wed Aug 10 2022 14:35:41 GMT-0400 (Eastern Daylight Time) - Run Time: 2405ms

Cross Tabulation Query Form - Trip - 2016 v1.1

Row: 2006 GTA zone of destination - gta06_dest

Column: Planning district of origin - pd_orig

Filters:

2006 GTA zone of destination - gta06_dest In 8523

Trip 2016

ROW : gta06_dest

COLUMN : pd_orig

gta06_dest	pd_orig	total
8523	1	282
8523	2	17
8523	3	17
8523	4	68
8523	5	29
8523	7	33
8523	8	33
8523	9	121
8523	10	222
8523	11	53
8523	16	58
8523	20	22
8523	25	41
8523	26	14
8523	27	212
8523	28	83
8523	29	117
8523	31	29
8523	32	68
8523	33	366
8523	34	42
8523	35	56
8523	36	164
8523	37	8
8523	38	18
8523	39	7
8523	40	14
8523	81	18915
8523	82	507
8523	83	144
8523	84	367
8523	85	45
8523	86	653
8523	88	574
8523	116	20
8523	117	49
8523	120	17
8523	127	86
8523	128	47
8523	130	105
8523	133	314
8523	134	110
8523	135	19
8523	136	275
8523	998	13

Wed Aug 10 2022 14:36:25 GMT-0400 (Eastern Daylight Time) - Run Time: 1668ms

Cross Tabulation Query Form - Trip - 2016 v1.1

Row: Planning district of household - pd_hhld
Column: Primary travel mode of trip - mode_prime

Filters:

Planning district of household - pd_hhld In 81

Trip 2016

ROW : pd_hhld

COLUMN : mode_prime

pd_hhld	mode_prime	total
81	B	5154
81	C	1944
81	D	212980
81	G	909
81	J	819
81	M	326
81	O	126
81	P	41471
81	S	9309
81	T	314
81	U	58
81	W	16370

Wed Aug 10 2022 14:40:08 GMT-0400 (Eastern Daylight Time) - Run Time: 2081ms

Cross Tabulation Query Form - Trip - 2016 v1.1

Row: 2006 GTA zone of destination - gta06_dest
Column: Primary travel mode of trip - mode_prime

Filters:

2006 GTA zone of destination - gta06_dest In 8523

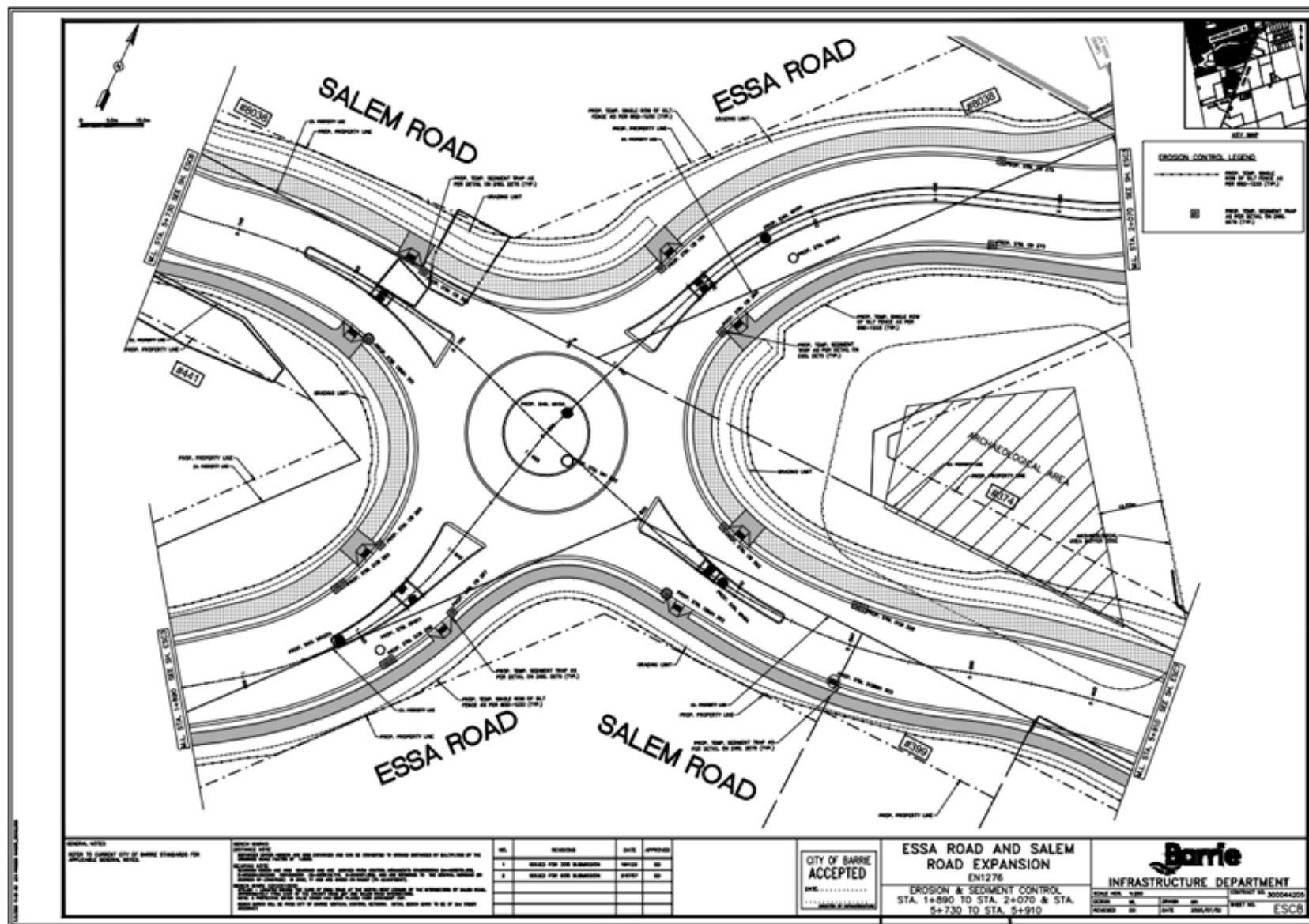
Trip 2016

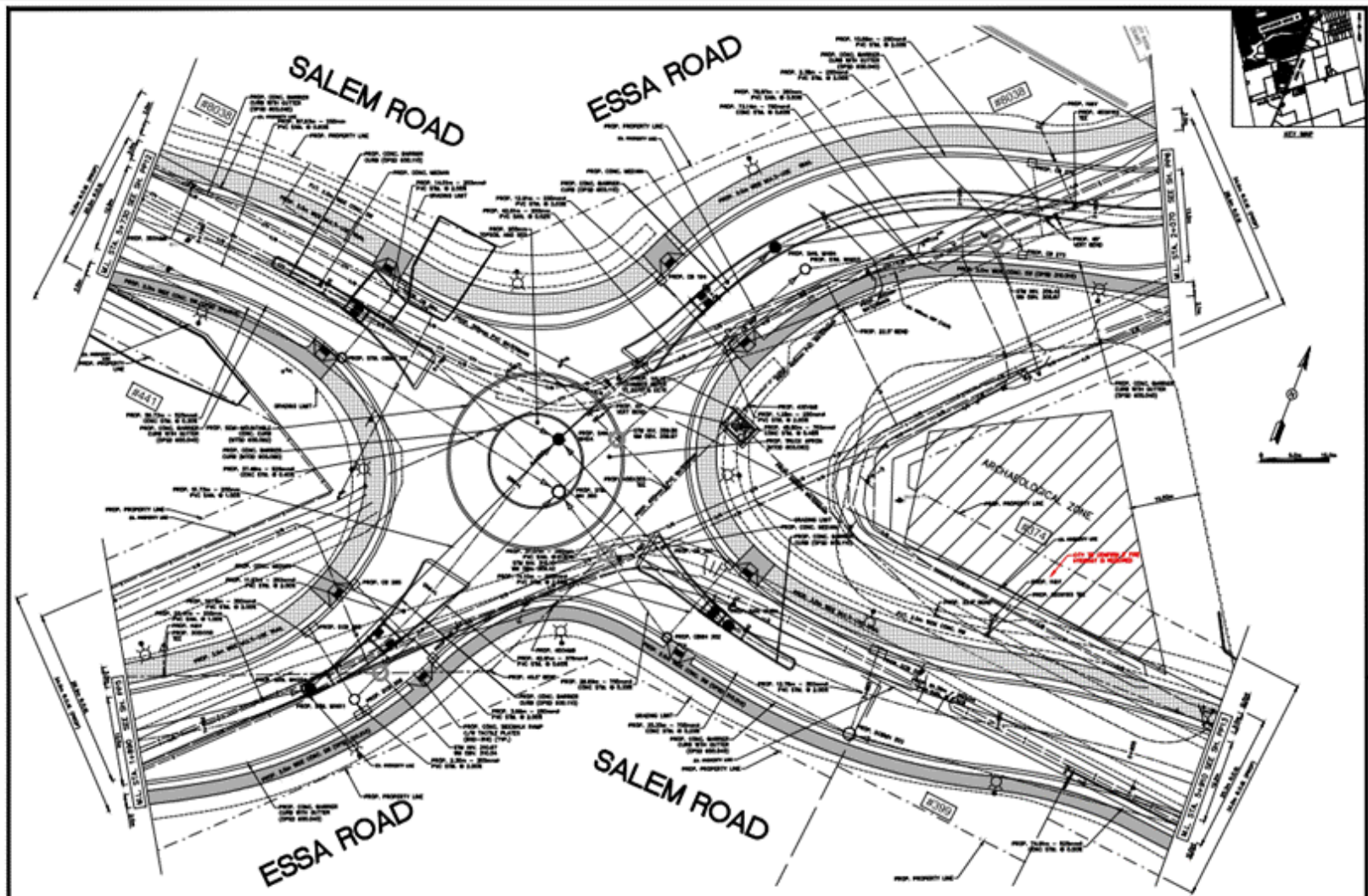
ROW : gta06_dest

COLUMN : mode_prime

gta06_dest	mode_prime	total
8523	B	136
8523	C	144
8523	D	16757
8523	G	65
8523	J	66
8523	P	3432
8523	S	1312
8523	W	2542

Appendix E – Roundabout Design Draft at Essa Road / Salem Road





GENERAL NOTES
 1. REFER TO STANDARD SPECIFICATIONS FOR HIGHWAY CONSTRUCTION FOR APPLICABLE GENERAL NOTES.
 2. THE DESIGNER HAS CONDUCTED VISUAL SURVEYS AND HAS BEEN ADVISED BY SURVEYORS OF THE PROJECT AREA THAT THERE ARE NO KNOWN OR SUSPECTED HISTORIC OR PREHISTORIC REMAINS OR FEATURES IN THE PROJECT AREA.
 3. THE DESIGNER HAS CONDUCTED VISUAL SURVEYS AND HAS BEEN ADVISED BY SURVEYORS OF THE PROJECT AREA THAT THERE ARE NO KNOWN OR SUSPECTED HISTORIC OR PREHISTORIC REMAINS OR FEATURES IN THE PROJECT AREA.
 4. THE DESIGNER HAS CONDUCTED VISUAL SURVEYS AND HAS BEEN ADVISED BY SURVEYORS OF THE PROJECT AREA THAT THERE ARE NO KNOWN OR SUSPECTED HISTORIC OR PREHISTORIC REMAINS OR FEATURES IN THE PROJECT AREA.
 5. THE DESIGNER HAS CONDUCTED VISUAL SURVEYS AND HAS BEEN ADVISED BY SURVEYORS OF THE PROJECT AREA THAT THERE ARE NO KNOWN OR SUSPECTED HISTORIC OR PREHISTORIC REMAINS OR FEATURES IN THE PROJECT AREA.

NO.	REVISION	DATE	APPROVED
1	DESIGN FOR ONE ROUNDABOUT	10/18/10	NO
2	DESIGN FOR TWO ROUNDABOUTS	10/27/10	NO
3	DESIGN FOR TWO ROUNDABOUTS	10/27/10	NO

**CITY OF BARRIE
 ACCEPTED**
 DATE: 10/27/10
 BY: [Signature]

**ESSA ROAD AND SALEM
 ROAD EXPANSION**
 EN1276
 ROUNDABOUT PLAN
 STA. 1+890 TO STA. 2+070 & STA.
 5+730 TO STA. 5+910

**Barrie
 ENGINEERING DEPARTMENT**
 PROJECT NO. 10004200
 SHEET NO. 10004200-PP14
 DATE: 10/27/10
 BY: [Signature]

Appendix F Signal Warrant Analysis

Intersection: Essa Road/Salem Road

Count Date: 2023-11-27

Summary Results

Justification		Compliance	Signal Justified?	
			YES	NO
1. Minimum Vehicular Volume	A Total Volume	100 %	☐	☒
	B Crossing Volume	100 %		
2. Delay to Cross Traffic	A Main Road	100 %	☒	☐
	B Crossing Road	100 %		
3. Combination	A Justificaton 1	100 %	☒	☐
	B Justification 2	100 %		
4. 4-Hr Volume		82 %	☐	☒

5. Collision Experience	73 %	☐	☒
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6. Pedestrians	A Volume	Justification not met	☐	☒
	B Delay	Justification not met		

Intersection: Essa Rd/Mabern St

Count Date: 2023-11-27

Summary Results

Justification		Compliance	Signal Justified?	
			YES	NO
1. Minimum Vehicular Volume	A Total Volume	100 %	☐	☒
	B Crossing Volume	85 %		
2. Delay to Cross Traffic	A Main Road	100 %	☒	☐
	B Crossing Road	100 %		
3. Combination	A Justificaton 1	85 %	☒	☐
	B Justification 2	100 %		
4. 4-Hr Volume		87 %	☐	☒

5. Collision Experience	73 %	☐	☒
-------------------------	------	--------------------------	-------------------------------------

6. Pedestrians	A Volume	Justification not met	☐	☒
	B Delay	Justification not met		

Intersection: Essa Rd/Athabaska Rd

Count Date: 2023-11-27

Summary Results

Justification		Compliance	Signal Justified?	
			YES	NO
1. Minimum Vehicular Volume	A Total Volume	100 %	☐	☒
	B Crossing Volume	44 %	☒	☐
2. Delay to Cross Traffic	A Main Road	100 %	☒	☐
	B Crossing Road	100 %	☒	☐
3. Combination	A Justificaton 1	44 %	☐	☒
	B Justification 2	100 %	☒	☐
4. 4-Hr Volume		78 %	☐	☒

5. Collision Experience	73 %	☐	☒
-------------------------	------	--------------------------	-------------------------------------

6. Pedestrians	A Volume	Justification not met	☐	☒
	B Delay	Justification not met	☒	☐