

REPORT

DECISION REPORT TO COUNCIL

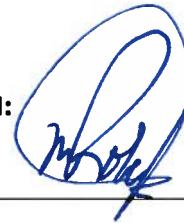
DATE: May 4, 2016
FROM: Department of Engineering and Operations
SUBJECT: South Bonson Traffic Study

FILE: 11-5700-20/16

RECOMMENDATION: THAT Council:

- A. Direct staff to forward the South Bonson Traffic Study (April 2016) to Onni for Information; AND
- B. Direct staff to incorporate all infrastructure upgrades, including Option 2, identified in the South Bonson Traffic Study (April 2016) within the Servicing Agreements for 19451 Sutton Ave, 19265 Airport Way (Golden Ears Business Park Phase 3) and 19300 Airport Way (Golden Ears Business Park Phase 4) all to be paid for fully by the developer; OR
- C. Other.

CHIEF ADMINISTRATIVE OFFICER COMMENT/RECOMMENDATION:



PURPOSE: The purpose of this study was to prepare an independent, third party, traffic study for the South Bonson community to assess the impacts of future proposed developments on road network performance, intersection control methods, and pedestrian safety / accessibility, especially the future planned development of Golden Ears Business Park (GEBP) and other residential / institutional land uses along Airport Way.

BACKGROUND:

At the May 3, 2016 regular council meeting, Council received the Staff report regarding the South Bonson Traffic Study and it's corresponding attachments, and deferred further discussion on the issue to the May 10, 2016 Council in Committee meeting. This report has been brought back to Council in its entirety to facilitate discussions on proposed South Bonson development.

At staff's request, the developer has completed the following traffic studies as part of the development application process:

- Golden Ears Business Park: Phase 1 (November 2007)
- Golden Ears Business Park: Phase 2 (September 2010)
- Golden Ears Business Park: Phase 3 (April 2015)
 - Developer's consultant suggested 2 additional traffic studies at:
 - Phase 2 = 50% construction
 - Phase 3 = 50% construction
- Sutton Ave Residential Development (September 2015)

On Oct 20, 2015, Council directed staff to report back with a comprehensive traffic study for South Bonson based on the proposed developments with a specific focus on safe active transportation connections and future development impacts on the current road network. Through an RFP process McElhanney was awarded this contract and has completed the requested South Bonson Traffic Study included as attachment A.

ANALYSIS: McElhanney's traffic study can be summarized into 5 subsections:

1. Trip generation, Distribution and Assumptions
2. Future Traffic Considerations
3. Traffic Operations Analysis
4. Active Transportation Considerations
5. Recommended Upgrades

Trip Generation, Distribution and Assumptions:

Staff requested McElhanney to consider 2016 weekday AM (7AM to 9AM) and weekday PM (2:30PM to 6PM) traffic to determine peak hour traffic flows within the AM and PM periods. These results were then modeled to interpolate peak hour flows for a short-term look ahead (5-year = 2021) and a long-term look ahead (15-year = 2031).

McElhanney then considered a directional distribution of proposed trips within the study area and concluded that the traffic distribution of the developer's previous studies remained applicable for the purpose of this study. This distribution can be found on table 4 and is mapped on figure 4. Furthermore, staff supplied McElhanney with the developer's proposed development schedule found in table 1.

Table 4 Trip Distribution

Direction	Trip Distribution
East on Airport Way towards Golden Ears Way	50%
West on Airport Way towards Bayne Road	0%
North on Harris Road towards Lougheed Highway	30%
North on Bonson Road towards Hammond Road	15%
South on Harris Road towards Fraser Way	5%
Total	100%

Figure 4 Trip Distribution



Table 1 Development Summary

Development	Size	Completion by 2021	Completion by 2031
GEBP Phase 2	1,156,000 sqft	100%	-
GEBP Phase 3	886,400 sqft	50%	100%
GEBP Phase 4	981,300 sqft	50%	100%
19451 Sutton Avenue Residential	248 Units Townhome	100%	-
School at SW quadrant of Airport Way / Bonson Rd	15,000 sqft	0%	100%

In addition to the traffic generated from the all phases of the proposed Golden Ears Business Park, a 2% per year of traffic growth was applied to the existing conditions (2016) to determine the 2021 and 2031 background traffic volumes to which the development traffic volumes have been combined.

While existing traffic counts in the study area show a relatively low Heavy Vehicle percentage, currently accounting for approximately 2% of the overall traffic, McElhanney has adjusted this percentage for future trips given the proposed land use. Accordingly, the consultant assumed a truck volume of 10% for future trip generations, which is in line with industry standards for light industrial land use.

To determine the number of trips generated by the proposed developments, trip generation rates from the Institute of Transportation Engineering (ITE) Trip Generation Manual were used. The ITE Trip Generation Manual is the industry standard for determining trip generations of future developments.

Future Traffic Considerations:

Previous traffic studies in the area suggest that the traffic volumes along Airport Way increased from 2009 to 2012 after the opening of the Golden Ears Interchange. However, after 2012 there has been no traffic growth. As stated above, Staff directed McElhanney to use a conservative approach and implement a 2% growth rate for future background traffic volumes.

Traffic Operations Analysis:

The study considered 8 intersections:

1. Airport Way / Harris Road (Roundabout)
2. Airport Way / Bonson Road (Roundabout)
3. Airport Way / Southgate Road
4. Harris Road / Fieldstone Walk
5. Bonson Road / Hammond Road (Signal)
6. Bonson Road / 116B Ave
7. Bonson Road / 116A Ave
8. Bonson Road / Sutton Ave

In order to articulate intersection performance, the Highway Capacity Manuals concept of level of service (LOS) was used. The LOS per intersection is essentially the average time a vehicle will wait at an intersection before making its' desired movement. These delays could be a result of queuing, signal timing or insufficient gaps in oncoming traffic. This rating system is summarized in Table 5 below:

Table 5 Level of Service & Delay Criteria for Unsignalized Intersections

LOS	Delay Criteria (sec/veh)		Description
	Signalized	Unsignalized	
A	<10	<10	Represents free flow. Individual users are virtually unaffected by others in the traffic stream.
B	>10 and <20	>10 and <15	Stable flow, but the presence of other users in the traffic stream begins to be noticeable.
C	>20 and <35	>15 and <25	Stable flow, but the operation of individual users becomes significantly affected by interactions with others in the traffic stream.
D	>35 and <55	>25 and <35	Represents high-density, but stable flow.
E	>55 and <80	>35 and <50	Represents operating conditions at or near the capacity level.
F	>80	>50	Represents forced or breakdown flow.

For example, a LOS of A, means that on average, a vehicle will wait less than 10 seconds at the intersection before being able to perform its desired maneuver.

Accordingly, table 6 below shows the overall performance in terms of LOS:

Table 6 Intersection Performance Summary

Location	Control Type ⁽¹⁾	Peak	2016		2021 Background		2031 Background		2021 Combined		2031 Combined	
			LOS	Delay (s/veh)	LOS	Delay (s/veh)	LOS	Delay (s/veh)	LOS	Delay (s/veh)	LOS	Delay (s/veh)
Airport Way / Harris Road	RA	AM	A	1.4	A	7.2	A	8.5	F	74.4	F	159.5
		PM	A	7.2	A	7.8	A	9.3	F	133.6	F	237.7
Airport Way / Bonson Road	RA	AM	B	11.4	B	13.6	C	21.5	F	85.1	F	199.5
		PM	B	12.7	C	16.0	D	30.9	F	214.6	F	418.2
Airport Way / Southgate Road	SSSC	AM	A	0.9	A	0.9	A	1.1	A	1.0	A	1.9
		PM	A	1.0	A	1.2	A	1.5	A	2.2	A	6.7
Bonson Road / Hammond Road	Signal	AM	B	15.2	B	16.9	B	19.4	C	22.7	C	29.5
		PM	C	22.0	C	25.2	C	22.6	C	23.0	C	28.5
Bonson Road / 116a / 116b Ave	SSSC	AM	A	4.9	A	5.3	A	6.4	A	5.5	A	9.6
		PM	A	2.5	A	2.6	A	2.9	A	2.3	A	3.0
Bonson Road / Sutton Ave	SSSC	AM	A	1.1	A	1.1	A	1.1	A	2.6	A	3.4
		PM	A	0.5	A	0.5	A	0.5	A	1.1	A	1.8
Harris Road / Fieldstone Walk	SSSC	AM	A	0.2	A	0.2	A	0.2	A	0.2	A	0.2
		PM	A	0.3	A	0.3	A	0.3	A	0.3	A	0.3

Notes:

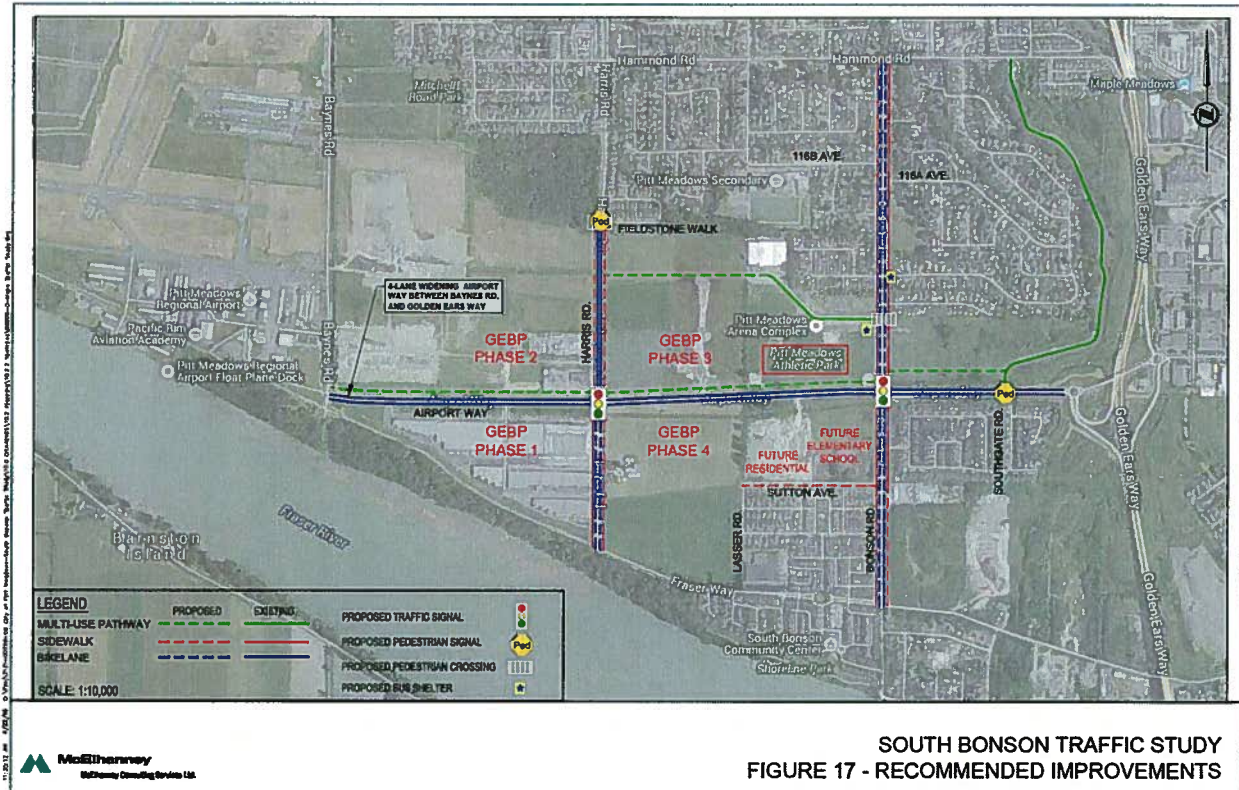
1. RA = Roundabout

SSSC = Side-street stop-controlled

Bold indicates unacceptable operation (LOS E or F)

Active Transportation Considerations:

In consideration of active transportation, McElhanney reviewed: transit, pedestrian and cyclist facilities within the study area and their recommendations for connectivity are shown in figure 17 below:



It should be noted that when considering future intersection control at Airport Way / Harris Road and Airport Way / Bonson Road, McElhanney recommends signalization rather than two-lane roundabouts in consideration of pedestrian and cyclist safety. If two-lane roundabouts are installed, McElhanney suggests an overhead pedestrian walkway be considered to facilitate a safer connection to the athletic park across Airport Way.

Recommended Upgrades:

The recommended upgrades are found in table 16:

Table 16 Summary of Recommended Upgrades with Costs

Location	Upgrade Description	Cost estimate	Comments
Airport Way between Baynes Road and Golden Ears Way	<ul style="list-style-type: none"> Four Lane widening 	\$4,268,505	Widening to be completed by 2021
Airport Way / Harris Road Intersection	<ul style="list-style-type: none"> Option 1 - Conversion from one lane to two lane roundabout 	\$1,318,937	2 approach lanes in all four directions and 1 receiving lane along Harris Road exits
	<ul style="list-style-type: none"> Option 2 - Intersection Signalization 	\$1,614,720	4-lane widening not required by 2021 for signal option. Cost estimate shown for 2031 configuration.
Airport Way / Bonson Road Intersection	<ul style="list-style-type: none"> Option 1 - Conversion from one lane to two lane roundabout 	\$1,154,156	By 2021, 2 approach lanes along Airport Way and a 1 approach lane for NB and SB directions. By 2031, 2 approach lanes in all four directions. Cost estimate shown for 2031 configuration.
	<ul style="list-style-type: none"> Option 2 - Intersection Signalization 	\$1,449,940	4-lane widening not required by 2021 for signal option
Airport Way / Southgate Road Intersection	<ul style="list-style-type: none"> Pedestrian Crossing as the traffic is significantly increased due to future planned developments. 	\$175,000	Installation subject to meeting pedestrian signal warrant
Harris Road / fieldstone Walk intersection	<ul style="list-style-type: none"> Signalized crosswalk as the traffic is significantly increased due to future planned developments 	\$175,000	Installation subject to meeting pedestrian signal warrant
Bonson Road @ Athletic Park Entrance	<ul style="list-style-type: none"> Marked Pedestrian crosswalk 	\$15,000	
Sidewalks	<ul style="list-style-type: none"> Harris Road – east side between Fraser Way and Airport Way 	\$126,254	
	<ul style="list-style-type: none"> Harris Road – both east and west side between Airport Way and Fieldstone Walk 	\$216,568	
	<ul style="list-style-type: none"> Sutton Avenue - North side between Lasser Road to Bonson Road 	\$126,254	
Bike lanes	<ul style="list-style-type: none"> Bonson Road – between Sutton Avenue to Hammond Road 	\$16,886	On street painted bike lanes using existing pavement structure. No lane widening is assumed. Cost includes paint lines and signing.
	<ul style="list-style-type: none"> Harris Road – between Fraser Way and Airport Way 	\$9,698	
Bus Shelters	<ul style="list-style-type: none"> Two bus shelters on Bonson Road (Figure 17) 	\$80,000	
Total with Option 1		\$7,682,258	
Total with Option 2		\$8,273,825	

It is staff's intent to align all infrastructure upgrades in the above table, including option 2, with required implementation dates based on the developers construction schedule to ensure all future infrastructure is in place ahead of the demand. This will ensure an appropriate level of service is maintained throughout the development process.

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Additionally, it is staff's intent that all projects identified in Option 2 above will be carried forward to the Servicing Agreements for 19451 Sutton Ave, 19265 Airport Way (Golden Ears Business Park Phase 3) and 19300 Airport Way (Golden Ears Business Park Phase 4) all to be paid for fully by the developer.

RELEVANT POLICY: None identified by staff.

STRATEGIC ALIGNMENT: Transportation and Infrastructure – the City will work to ensure that the roads, facilities, and systems that keep the city functional and people moving are well maintained and meet the core needs of our residents.

OTHER CONSIDERATIONS: None identified by staff.

Submitted by: F.Smith, Director of Engineering and Operations

Approved by: M. Roberts, CAO

ATTACHMENT(S):

A. South Bonson Traffic Study – McElhanney Consulting Services Ltd. (April 2016)

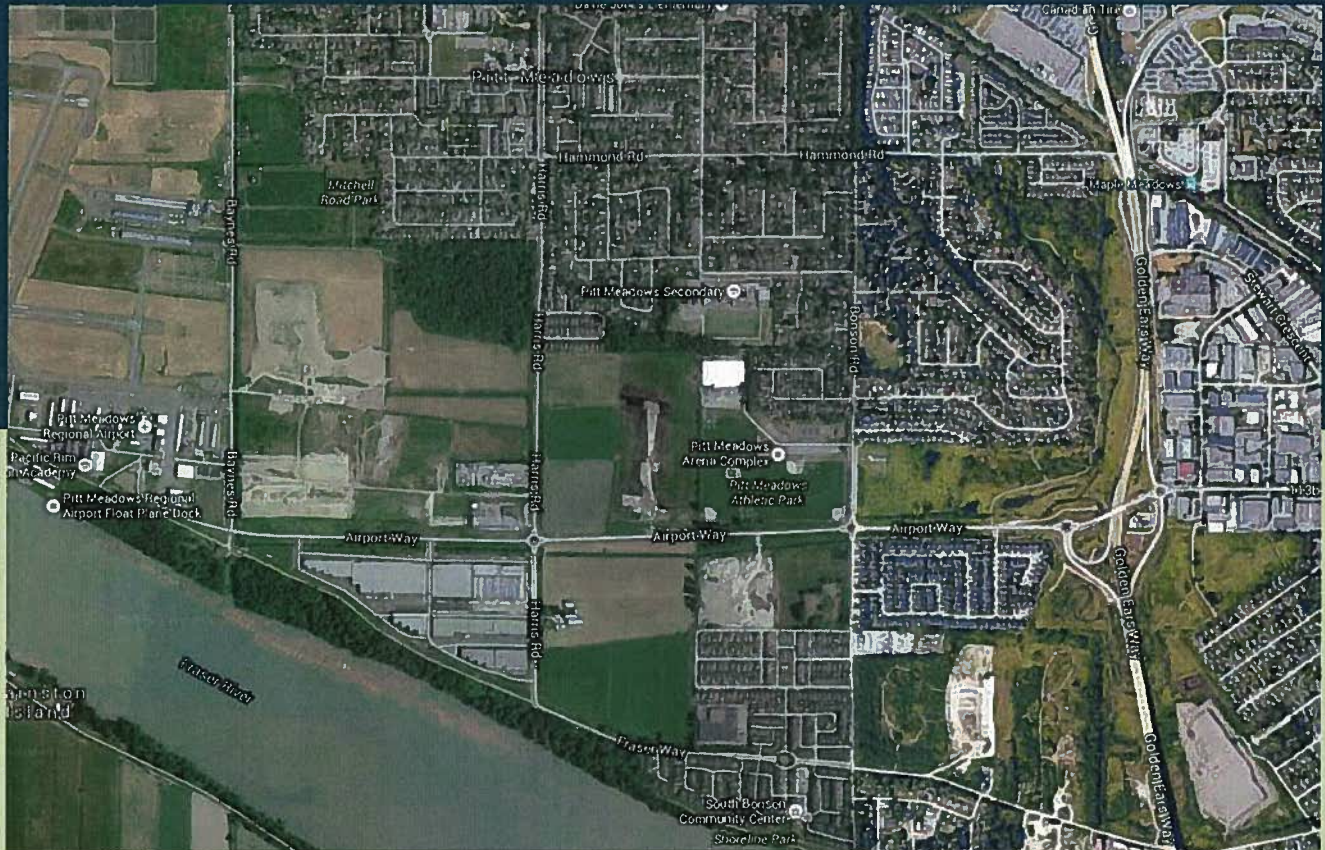
April 2016

Prepared for:



South Bonson Traffic Study

Final Report


McElhanney

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OQM | Organizational Quality
Management Program



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- A Excerpts - City of Pitt Meadows Official Community Plan / Pedestrian and Cycling Master Plan
- B Detailed Traffic Counts
- C Synchro / Sidra Output
- D Signal Warrants
- E Wolski Cost Estimates Summary

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Executive Summary

Study Purpose

The purpose of this study was to prepare a Traffic Study for the South Bonson Area to assess the impacts of future developments on road network performance, intersection control methods, and pedestrian safety / accessibility, especially the future planned development of Golden Ears Business Park (GEBP) and other residential / institutional land uses along Airport Way.

This report focussed on:

- Future development and growth for years 2021 and 2031 (full build-out);
- Traffic operations at eight (8) intersections;
- Pedestrian access throughout the neighbourhood; and
- Traffic control elements.

Developments

All currently approved developments are assumed to be completed in the short term horizon, by 2021, and complete buildout of the area as per the City of Pitt Meadows Official Community Plan (OCP) in the long term horizon, by 2031.

Traffic and Pedestrian Counts Developments

Weekday AM and PM peak period traffic and pedestrian counts at the eight study intersections were recorded between Wednesday, January 27, 2016, and Tuesday, February 2, 2016. Weekday AM peak traffic volumes were recorded from 7 AM to 9 AM; weekday PM peak volumes from 2:30 PM to 6 PM. Based on the peak period counts, the peak hour (hour of highest traffic volumes within the peak period) were used for analysis at each study intersection.

A pedestrian count at the Bonson Road / 116A / 116B Avenue intersection showed a surge in pedestrian activity between 8:00 and 8:30 in the morning and between 2:30 and 3:15 in the afternoon due to school drop off / pickup at Pitt Meadows Secondary school on 116B Avenue.

Trip Generation and Distribution

The proposed developments expected to be completed by 2021 are estimated to generate an additional 1,401 weekday AM peak hour trips (1,077 inbound and 324 outbound), and 1,850 weekday PM peak hour trips (448 inbound and 1,402 outbound).

Compared to 2016 traffic conditions, the proposed developments completed by 2031 are expected to generate an additional 1,943 weekday AM peak hour trips (1,502 inbound and 441 outbound), and 2,626 weekday PM peak hour trips (620 inbound and 2,004 outbound).

The directional distribution (origin / destination) of proposed development trips is presented in **Table ES1**. This traffic distribution remains applicable for the purposes of this study as it is similar to the distribution applied in a previous Traffic Impact Assessment report by EBA Consulting for GEBP Phase 2 and also in the MMM Group's GEBP Phase 3 / 4 Transportation Impact Study, 2015.

Table ES1 Trip Distribution

Direction	Trip Distribution
East on Airport Way towards Golden Ears Way	50%
West on Airport Way towards Bayne Road	0%
North on Harris Road towards Lougheed Highway	30%
North on Bonson Road towards Hammond Road	15%
South on Harris Road towards Fraser Way	5%
Total	100%

Traffic Growth and Combined Volumes

A 2% per year traffic growth rate was applied to Existing Conditions (2016) traffic volumes to determine the 2021 and 2031 background traffic volumes at the study intersections. The calculated trips generated by the expected developments were assigned to the network and then added to the background traffic to estimate the total future combined volumes for 2021 and 2031.

Traffic Analysis

All study intersections were analyzed using Synchro and Sidra traffic simulation software to calculate the traffic performance at the study intersections.

A summary of the overall intersection performance in terms of LOS, and average delays in seconds/vehicle (s/veh) for each study intersection is shown in **Table ES2**. Individual movement LOS, delay and 95th percentile queue length (in metres) for the Existing Conditions (2016) and Future Years 2021 and 2031 scenarios are presented in the report.

Table ES2 Intersection Performance Summary

Location	Control Type ⁽¹⁾	Peak	2016		2021 Background		2031 Background		2021 Combined		2031 Combined	
			LOS	Delay (s/veh)	LOS	Delay (s/veh)	LOS	Delay (s/veh)	LOS	Delay (s/veh)	LOS	Delay (s/veh)
Airport Way / Harris Road	RA	AM	A	1.4	A	7.2	A	8.5	F	74.4	F	159.5
		PM	A	7.2	A	7.8	A	9.3	F	133.6	F	237.7
Airport Way / Bonson Road	RA	AM	B	11.4	B	13.6	C	21.5	F	85.1	F	199.5
		PM	B	12.7	C	16.0	D	30.9	F	214.6	F	418.2
Airport Way / Southgate Road	SSSC	AM	A	0.9	A	0.9	A	1.1	A	1.0	A	1.9
		PM	A	1.0	A	1.2	A	1.5	A	2.2	A	6.7
Bonson Road / Hammond Road	Signal	AM	B	15.2	B	16.9	B	19.4	C	22.7	C	29.5
		PM	C	22.0	C	25.2	C	22.6	C	23.0	C	28.5
Bonson Road / 116A / 116B Ave	SSSC	AM	A	4.9	A	5.3	A	6.4	A	5.5	A	9.6
		PM	A	2.5	A	2.6	A	2.9	A	2.3	A	3.0
Bonson Road / Sutton Ave	SSSC	AM	A	1.1	A	1.1	A	1.1	A	2.6	A	3.4
		PM	A	0.5	A	0.5	A	0.5	A	1.1	A	1.8
Harris Road / Fieldstone Walk	SSSC	AM	A	0.2	A	0.2	A	0.2	A	0.2	A	0.2
		PM	A	0.3	A	0.3	A	0.3	A	0.3	A	0.3

Notes: 1. RA = Roundabout | SSSC = Side-street stop-controlled | **Red** indicates unacceptable operation (LOS E or F)

Based on the intersection performance for the background and combined traffic performance, capacity issues were identified and suitable improvement options were recommended as listed below.

- Airport Way / Harris Road – Intersection Signalization
- Airport Way / Bonson Road – Intersection Signalization
- Right-in-Right-out Access at Airport Way for Sutton Ave Development - Channelized traffic island
- Airport Way / Southgate Road - Signalized pedestrian crossing (subject to meeting the pedestrian crossing control warrant)
- Harris Road / Fieldstone Walk - Signalized pedestrian crossing (subject to meeting the pedestrian crossing control warrant)

Existing Airport Way / Bonson Road Roundabout Operational and Safety Review

A site visit to the Bonson Road / Airport Road roundabout was conducted during the after school period (3 to 4 PM) to observe safety and operational performance, particularly related to sight distance, pedestrian movements and traffic conflicts. The following observations were noted:

- Numerous students were observed to cross the roundabout and no unusual conflicts were noted between pedestrians and vehicles.
- The absence of a narrow boulevard separation between the curb and concrete sidewalk may lead to conflicts between pedestrians and the overhang portion of large vehicles in the roundabout circulating lane.
- Approaching cyclists on Airport Way are directed to a 1.5m concrete sidewalk. Normally, a shared pedestrian / cyclist sidewalk is a minimum of 2.5m to 3.0m wide. If the desire is to direct cyclists to the travel lane and have them ride through the roundabout, shared road pavement markings and “Share the Road” signs should be installed.
- A drainage issue exists on the westbound Airport Way bike lane approach to the sidewalk ramp, as ponding was observed in this area.
- The south leg currently has no sight distance restriction, but this should be considered when the property in the southwest quadrant develops. The north and east leg approaches may have a slight sight distance deficiency, which can be easily rectified with landscape maintenance.
- Sight distance on Airport Way at the west approach to the roundabout appears to be limited by an embankment in the northwest quadrant. Heavy vehicles approaching eastbound on Airport Way were observed to hesitate, begin to accelerate and then suddenly brake near the yield line as they saw an approaching vehicle from the north.
- The available sight distance on the west leg appears to be very close to the minimum requirement. Sight distance may benefit from relocating the existing porta-potty to a different location.

Transit, Pedestrian and Bicycle Access

Pedestrian movements were observed and existing transit and pedestrian / bicycle facilities, such as sidewalks, cross walks, bike lanes etc. were documented during the site visit.

Bus route C41 Meadowtown / Maple Meadows station is the only route serving the South Bonson community. It is recommended that as the population grows and South Bonson Area develops, the City should work with TransLink to determine if an additional bus route, more frequent bus service, or extension of the current route are required to better serve the South Bonson Area. Based on the current and future transit demand, two bus shelters on either side of Bonson Road at the Athletic Park access are recommended to be installed.

In order to ensure that the sidewalk and bike lane network in South Bonson community is complete and facilitates continuous connections and safe pedestrian flow to GEBP, Athletic Park, and Pitt Meadows Secondary School, bike lanes and sidewalks are recommended to be implemented as the developments are constructed in the study area. In addition, considering the expected future increase in pedestrian activity due to residential development and Elementary school, a crosswalk is recommended on Bonson Road at the Athletic Park entrance. This crosswalk is considered important for pedestrian / bike flow connecting the multiuse pathway across the Bonson Road.

All existing and proposed pedestrian and bicyclist facilities are shown in **Figure ES1**.

Recommended Upgrades

All recommended upgrades have been costed using high level Wolski Cost Estimating Methodology. **Table ES3** summarizes the upgrades with cost estimates.

Table ES3 Summary of Recommended Upgrades with Costs

Location	Upgrade Description	Cost estimate	Comments
Airport Way between Baynes Road and Golden Ears Way	<ul style="list-style-type: none"> Four Lane widening 	\$4,268,505	Widening to be completed by 2021
Airport Way / Harris Road Intersection	<ul style="list-style-type: none"> Option 1 - Conversion from one lane to two lane roundabout 	\$1,318,937	2 approach lanes in all four directions and 1 receiving lane along Harris Road exits
	<ul style="list-style-type: none"> Option 2 - Intersection Signalization 	\$1,614,720	4-lane widening not required by 2021 for signal option. Cost estimate shown for 2031 configuration.
Airport Way / Bonson Road Intersection	<ul style="list-style-type: none"> Option 1 - Conversion from one lane to two lane roundabout 	\$1,154,156	By 2021, 2 approach lanes along Airport Way and a 1 approach lane for NB and SB directions. By 2031, 2 approach lanes in all four directions. Cost estimate shown for 2031 configuration.
	<ul style="list-style-type: none"> Option 2 - Intersection Signalization 	\$1,449,940	4-lane widening not required by 2021 for signal option
Airport Way / Southgate Road Intersection	<ul style="list-style-type: none"> Pedestrian Crossing as the traffic is significantly increased due to future planned developments. 	\$175,000	Installation subject to meeting pedestrian signal warrant
Harris Road / fieldstone Walk Intersection	<ul style="list-style-type: none"> Signalized crosswalk as the traffic is significantly increased due to future planned developments 	\$175,000	Installation subject to meeting pedestrian signal warrant
Bonson Road @ Athletic Park Entrance	<ul style="list-style-type: none"> Marked Pedestrian crosswalk 	\$15,000	
Sidewalks	<ul style="list-style-type: none"> Harris Road – east side between Fraser Way and Airport Way 	\$126,254	
	<ul style="list-style-type: none"> Harris Road – both east and west side between Airport Way and Fieldstone Walk 	\$216,568	
	<ul style="list-style-type: none"> Sutton Avenue - North side between Lasser Road to Bonson Road 	\$126,254	
Bike lanes	<ul style="list-style-type: none"> Bonson Road – between Sutton Avenue to Hammond Road 	\$16,886	On street painted bike lanes using existing pavement structure. No lane

	<ul style="list-style-type: none"> Harris Road – between Fraser Way and Airport Way 	\$9,698	widening is assumed. Cost includes paint lines and signing.
Bus Shelters	<ul style="list-style-type: none"> Two bus shelters on Bonson Road (Figure 17) 	\$80,000	
Total with Option 1		\$7,682,258	
Total with Option 2		\$8,273,825	



SOUTH BONSON TRAFFIC STUDY
FIGURE ES1 - RECOMMENDED IMPROVEMENTS

1. Introduction

The South Bonson Community in Pitt Meadows is currently a predominantly residential neighbourhood. However, the future planned development of Golden Ears Business Park (GEBP) and other residential / institutional land uses along Airport Way will change the nature of the traffic pattern from an exclusively residential neighbourhood to a mixed use area. Due to its linkage to the Golden Ears Bridge, Airport Way has become the main access to the Golden Ears Connector system in the southern area of Pitt Meadows and is considered a new gateway into the community. The future developments will see an increase in traffic volumes in the South Bonson area.

McElhanney was commissioned to prepare a Traffic Study for the South Bonson Area to assess the impacts of future developments on the performance on road network, intersection control methods, and pedestrian safety/ accessibility.

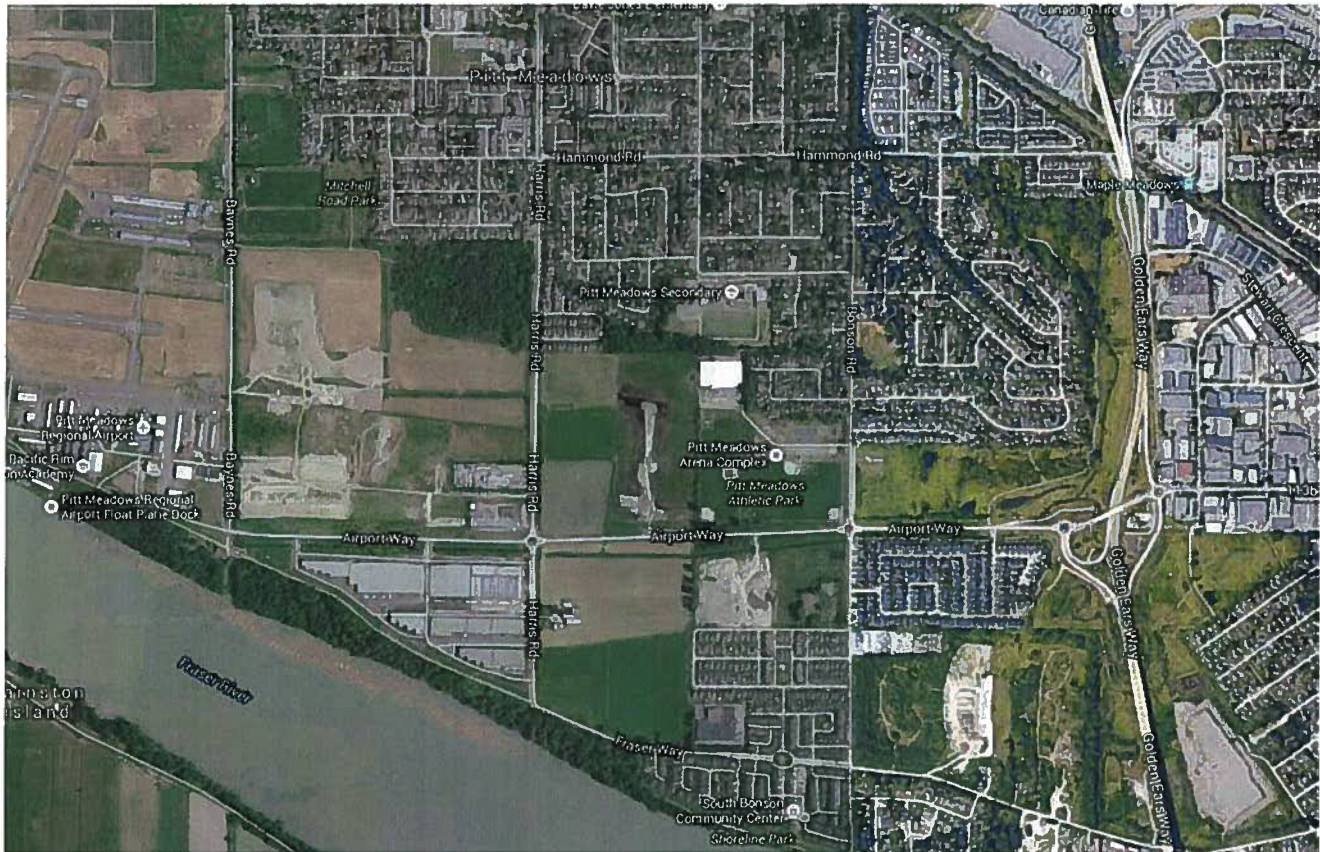
1.1. Study Area

The study area limits are:

- Airport Way from Baynes Road in the west to Southgate Road in the east.
- Bonson Road from Sutton Avenue in the south to Hammond Road in the north.
- Harris Road from Fraser Way in the south to Fieldstone Walk in the north.

Figure 1 shows the study area.

Figure 1 South Bonson Study Area



Source: Google Maps

1.2. Study Objective

The purpose of this study is to assess the impacts of proposed future developments on the performance of the road network, intersection control methods, and pedestrian accessibility in the South Bonson neighborhood in the City of Pitt Meadows.

This report will focus on:

- Future development and growth for years 2021 and 2031 (full build-out);
- Traffic operations at eight (8) intersections;
- Pedestrian access throughout the neighbourhood; and
- Traffic control elements.

Eight (8) study intersections were selected for evaluation:

1. Airport Way / Harris Road (roundabout)
2. Airport Way/ Bonson Road (roundabout)
3. Airport Way / Southgate Road

4. Harris Road / Fieldstone Walk
5. Boson Road / Hammond Road (signal)
6. Bonson Road / 116B Ave
7. Bonson Road / 116A Avenue
8. Bonson Road / Sutton Avenue

The following study horizons were analyzed for weekday AM and PM peak hours:

- Existing Conditions (2016)
- Short Term Horizon Year (2021)
- Long Term Horizon Year (2031)

The City has also identified the following for review in the study:

- Operational and safety performance for the Bonson / Airport roundabout; particularly pedestrian movements, sight line, traffic conflict, operating speed, etc.
- Right-in-right-out operations at the proposed residential development access on Airport Way.
- Pedestrian safety and connectivity from Bonson Road to the Pitt Meadows Athletic Park.
- Potential impacts to transit services and bicycle facilities.

1.3. Future Development Description / Assumptions

As per the study's Terms of Reference, the following is assumed:

- All currently approved developments are assumed to be completed in short term horizon, i.e. by 2021; and
- Complete buildout of the City of Pitt Meadows Official Community Plan (OCP) in the long term horizon, i.e. by 2031.

After review of the OCP and consultation with the city staff, the expected developments to be completed in the short and long terms are summarized in **Table 3** and shown in **Figure 2**.

Table 1 Development Summary

Development	Size	Completion by 2021	Completion by 2031
GEBP Phase 2	1,156,000 sqft	100%	-
GEBP Phase 3	886,400 sqft	50%	100%
GEBP Phase 4	981,300 sqft	50%	100%
19451 Sutton Avenue Residential	248 Units Townhome	100%	-
School at SW quadrant of Airport Way / Bonson Rd	15,000 sqft	0%	100%

Figure 2 Future Development



1.4. Roadway Network

Based on the 2009 City of Pitt Meadows Official Community Plan, the functional classifications of the major roadways within the proposed project area are as follows.

1.4.1. Arterial Roads

Airport Way

Airport Way is the main access to the Golden Ears Bridge system in the south area of Pitt Meadows and has become a new gateway into the community. This road will see an increase in traffic volumes as all the planned developments are built. It has a current posted speed limit of 50 kph east of Bonson Road and 60 kph west of Bonson Road. The current two lane cross-section is planned to be widened to four lanes. Airport Way has bike lanes in both east and westbound directions.

Harris Road

Harris Road is a primary north-south arterial in the South Bonson area which connects Fraser Way to Lougheed Highway. It is a two-lane arterial road with a posted speed of 50 km/h and bike lanes on each direction north of Airport Way.

1.4.2. Collector Roads

Bonson Road

Bonson Road is a primary two lane north-south collector road in the South Bonson community connecting local roads between Fraser Way and Hammond Road. It has sidewalks on each side between Sutton Avenue and Hammond Road.

The *City of Pitt Meadows Official Community Plan (2009)* road classification map is included in **Appendix A**.

1.5. Existing (2016) Traffic Volumes

Weekday AM and PM peak period turning movement counts at the eight study intersections, listed in **Section 1.2**, were recorded between Wednesday, January 27, 2016, and Tuesday, February 2, 2016, by Creative Transportation Solutions (CTS). Weekday AM peak traffic volumes were recorded from 7 AM to 9 AM, weekday PM peak volumes from 2:30 PM to 6 PM. Based on the peak period counts, the peak hour (hour of highest traffic volumes within the peak period) was used for analysis at each study intersection. The AM peak hour fell between 7:45 and 8:45, and the PM peak hour was observed between 4:15 to 5:15. The afternoon count was started at 2:30 to capture after school traffic peak. Vehicular traffic in and out of 116B Avenue increased between morning and afternoon school peak hours. It is noted that the morning school peak hour coincides with the traffic peak hour; however, the afterschool peak traffic was lower than in the PM peak hour.

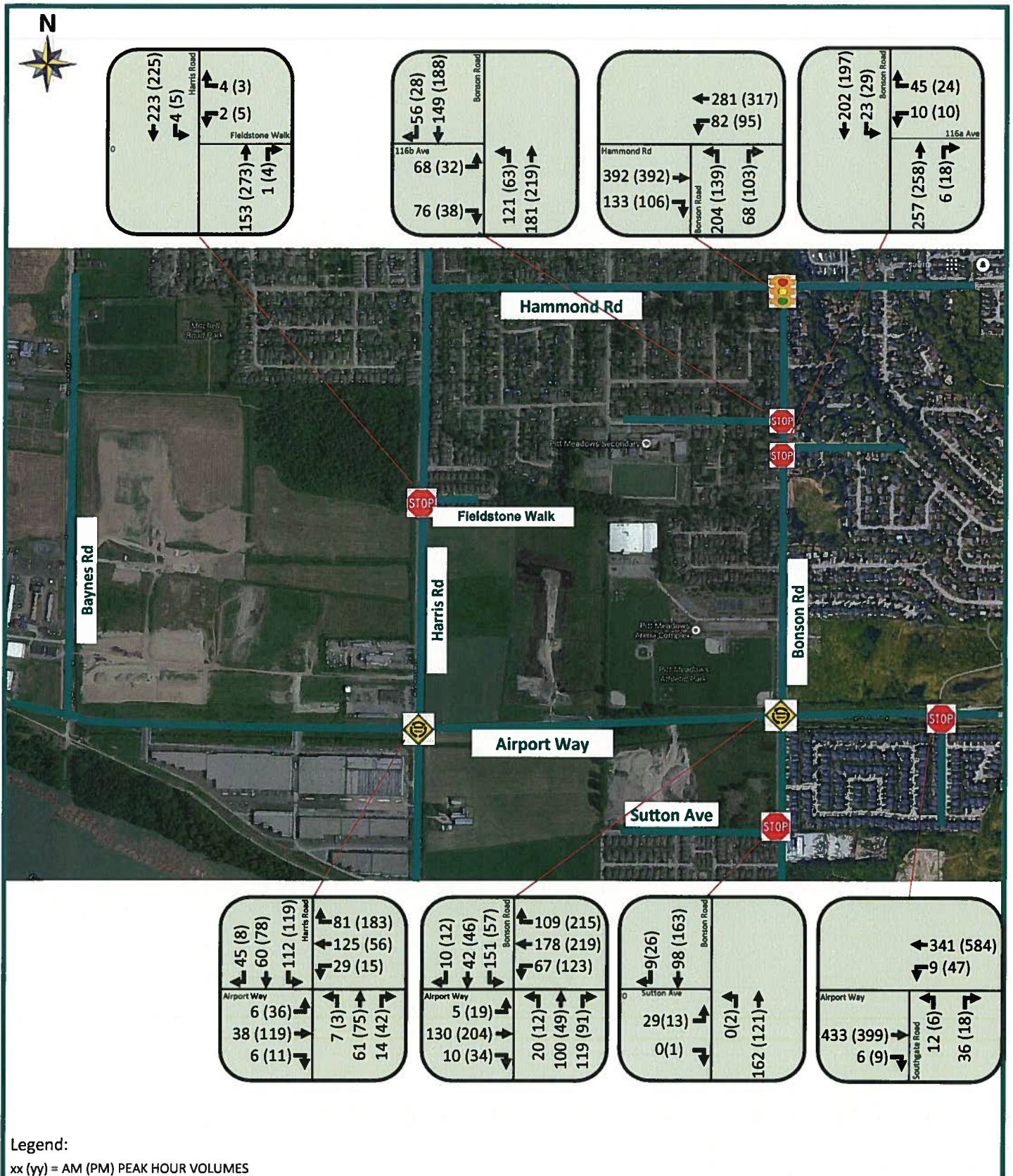
Existing (2016) peak hour traffic volumes at the study intersections are shown in **Figure 3**. Detailed intersection volume counts can be found in **Appendix B**.

1.5.1. Pedestrian Count / Observations

A pedestrian count was also conducted at the same time as the traffic counts. A pedestrian count at the Bonson Road / 116A /116B Avenue intersection shows a surge in pedestrian activity between 8:00 and 8:30 in the morning and between 2:30 and 3:15 in the afternoon due to school drop off / pickup at Pitt Meadows Secondary school on 116B Avenue. The total intersection pedestrian count increased from 6 pedestrians between 7:30 and 8 am, to 28 pedestrians between 8 and 8:30 am. Similarly, 105 pedestrians were recorded at the intersection between 2:30 to 3:30 pm, dropping to 25 between 3:30 - 4:30 pm. Most of the pedestrians observed on Bonson Road were school children. No unsafe pedestrian / traffic conflicts were observed.

1.5.2. Heavy Vehicle Traffic

The existing counts in the study area show a relatively low Heavy Vehicle percentage (HV%), accounting for about 2% of the overall traffic. However, the HV% is expected to increase with the construction of a Business Park in the study area, especially along the Airport Way and Harris Road corridors. Assuming 10% heavy vehicles for future GEBP development trips, the estimated HV% in the combined traffic scenarios will be about 7%.



SOUTH BONSON TRAFFIC STUDY
2016 EXISTING TRAFFIC VOLUMES

2. Trip Generation, Distribution and Assignment

2.1. Trip Generation

Project trip generation refers to the process for estimating the amount of vehicular traffic a development would add to the surrounding roadway system. The total amount of traffic entering and exiting from the new development is calculated for an average weekday, and separate estimates are created for each of the peak hours (AM, PM) when traffic volumes on the surrounding streets are highest. Project traffic includes both new traffic generated by the project and traffic that would already be on the adjacent roadways but the driver decides to stop at the site (referred to as “pass-by” trips). However, because the majority of the land use in the South Bonson area is residential or light industrial, and all of the anticipated development is residential or light industrial, no pass-by reduction was assumed.

Future estimated development for the South Bonson Area was provided by the City. To determine the number of trips generated by the expected developments, trip generation rates from the *Institute of Transportation Engineering (ITE) Trip Generation Manual*, 9th Edition (2012) were used. The *ITE Trip Generation Manual* is the industry standard for determining trip generation of future developments. It is a compilation of information about vehicular traffic that is generated by different land uses, based on observations of how many vehicles enter and exit a site devoted to a particular land use.

Trip generation calculations were performed for Future Years 2021 and 2031. **Table 2** shows the ITE average trip generation rates. As the development size increases the average rates tend to over/underestimate expected trips and the ITE fitted curve equation becomes a more realistic traffic estimate. The following ITE fitted curve equations were used for GEBP to estimate the generated trips.

AM Peak hour $\ln(T) = 0.79\ln(X) + 0.91$

PM Peak hour $T = 0.78(X) + 30.48$

where T = Generated trips and X = Development size in 1000's of sqft

Table 3 summarizes the estimated, overall, trip generation for the anticipated development in the South Bonson Neighbourhood.

Table 2 ITE Trip Generation Rates

Land Use Description	ITE Land Use	ITE Land Use Code	Units	AM Peak Hour			PM Peak Hour		
				Average Rate	In	Out	Average Rate	In	Out
GEBP (Phase 2 to 4)	Industrial Park	130	Trips/1000 ft ²	0.82	82%	18%	0.85	21%	79%
19451 Sutton Ave Development	Residential Condo / Townhomes	230	DU	0.44	17%	83%	0.52	67%	33%
School	Elementary school	520	Trips/1000 ft ²	5.20	56%	44%	3.11	44%	56%

Table 3 Estimated Trip Generation

Land Use Description	Size	Units	AM Peak Hour			PM Peak Hour		
			Total	In	Out	Total	In	Out
2021 Trip Generation								
GEBP Phase 2	1,156	1000 ft²	653	535	118	932	196	736
GEBP Phase 3 (50%)	443	1000 ft²	306	251	55	376	79	297
GEBP Phase 4 (50%)	491	1000 ft²	332	272	60	413	87	326
19451 Sutton Ave Development	248	DU	110	19	91	129	86	43
Total			1401	1077	324	1850	448	1402
2031 Trip Generation								
GEBP Phase 2	1,156	1000 ft²	653	535	118	932	196	736
GEBP Phase 3	886	1000 ft²	529	434	95	722	152	570
GEBP Phase 4	981	1000 ft²	573	470	103	796	167	629
19451 Sutton Ave Development	248	DU	110	19	91	129	86	43
School	15	1000 ft²	78	44	34	47	21	26
Total			1943	1502	441	2626	622	2004

Notes: DU = Dwelling Units

The proposed developments expected to be completed by 2021 are estimated to generate an additional 1,401 weekday AM peak hour trips (1,077 inbound and 324 outbound), and 1,850 weekday PM peak hour trips (448 inbound and 1,402 outbound).

Compared to 2016 traffic condition, the proposed developments completed by 2031 are expected to generate an additional 1,943 weekday AM peak hour trips (1,502 inbound and 441 outbound), and 2,626 weekday PM peak hour trips (622 inbound and 2,004 outbound).

2.2. Trip Distribution & Assignment

The directional distribution (origin / destination) of proposed development trips is presented in **Table 4**. This traffic distribution is similar to the one used in the previous Traffic Impact Assessment report by EBA Consulting for GEBP Phase 2 and also in the MMM Group's GEBP Phase 3 / 4 Transportation Impact Study, 2015, and remains applicable for the purposes of this study. Trip distribution is shown schematically in **Figure 4**.

Table 4 Trip Distribution

Direction	Trip Distribution
East on Airport Way towards Golden Ears Way	50%
West on Airport Way towards Bayne Road	0%
North on Harris Road towards Lougheed Highway	30%
North on Bonson Road towards Hammond Road	15%
South on Harris Road towards Fraser Way	5%
Total	100%

Figure 4 Trip Distribution



3. Future Traffic

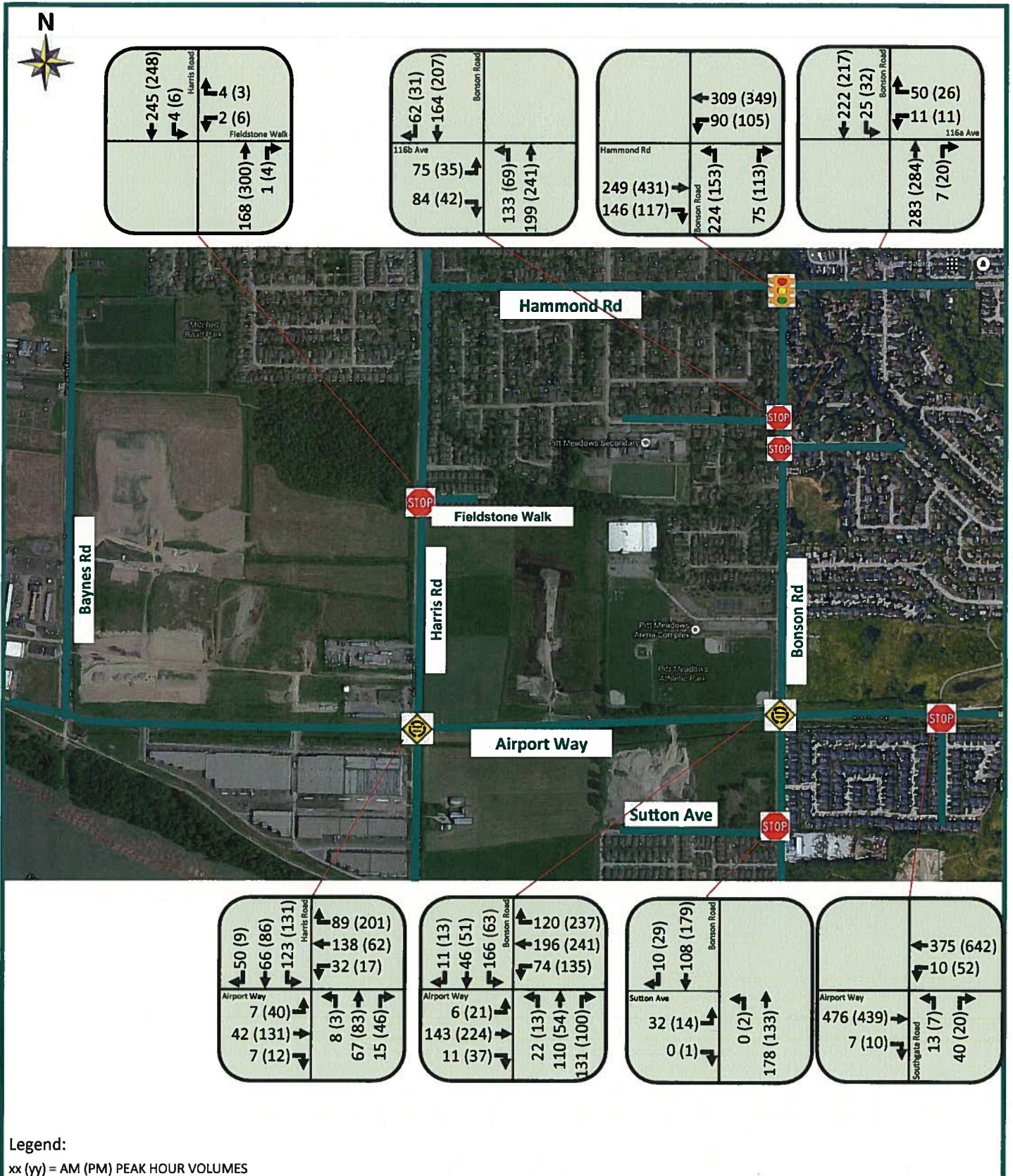
3.1. Growth Rate

Previous traffic impact studies in the area suggested that the traffic volumes along Airport Way increased from 2009 to 2012 after the opening of the Golden Ears Way interchange. However, after 2012 there has been no traffic growth. Based on discussions with the City, a 2% per year linear growth was used to determine background traffic volumes for Future Years 2021 and 2031. This growth rate will result in slightly conservative traffic estimates. The 2021 and 2031 Background traffic volumes can be found in **Figures 5 and 6**, respectively.

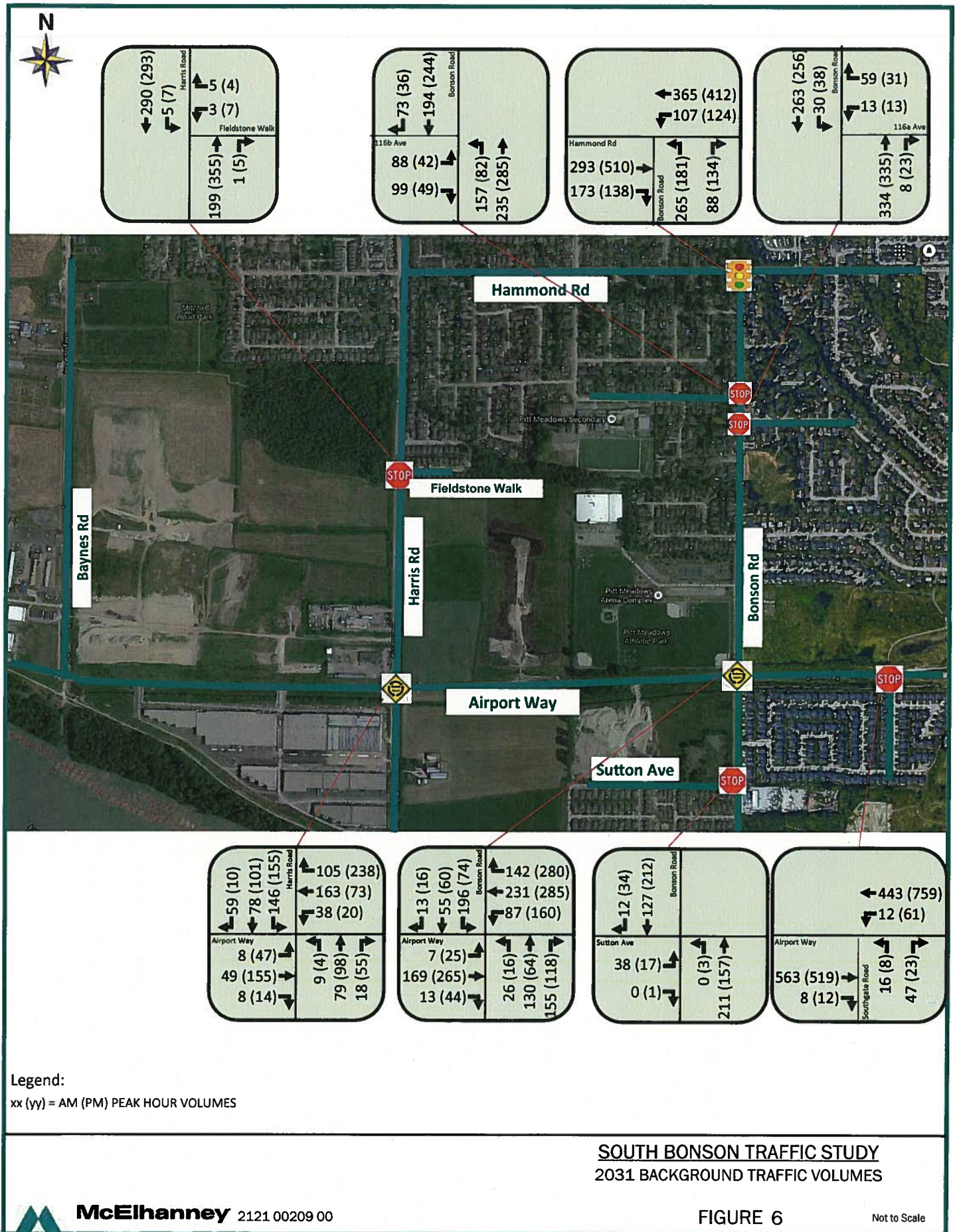
3.2. Future Year 2021 and 2031 Traffic Volumes

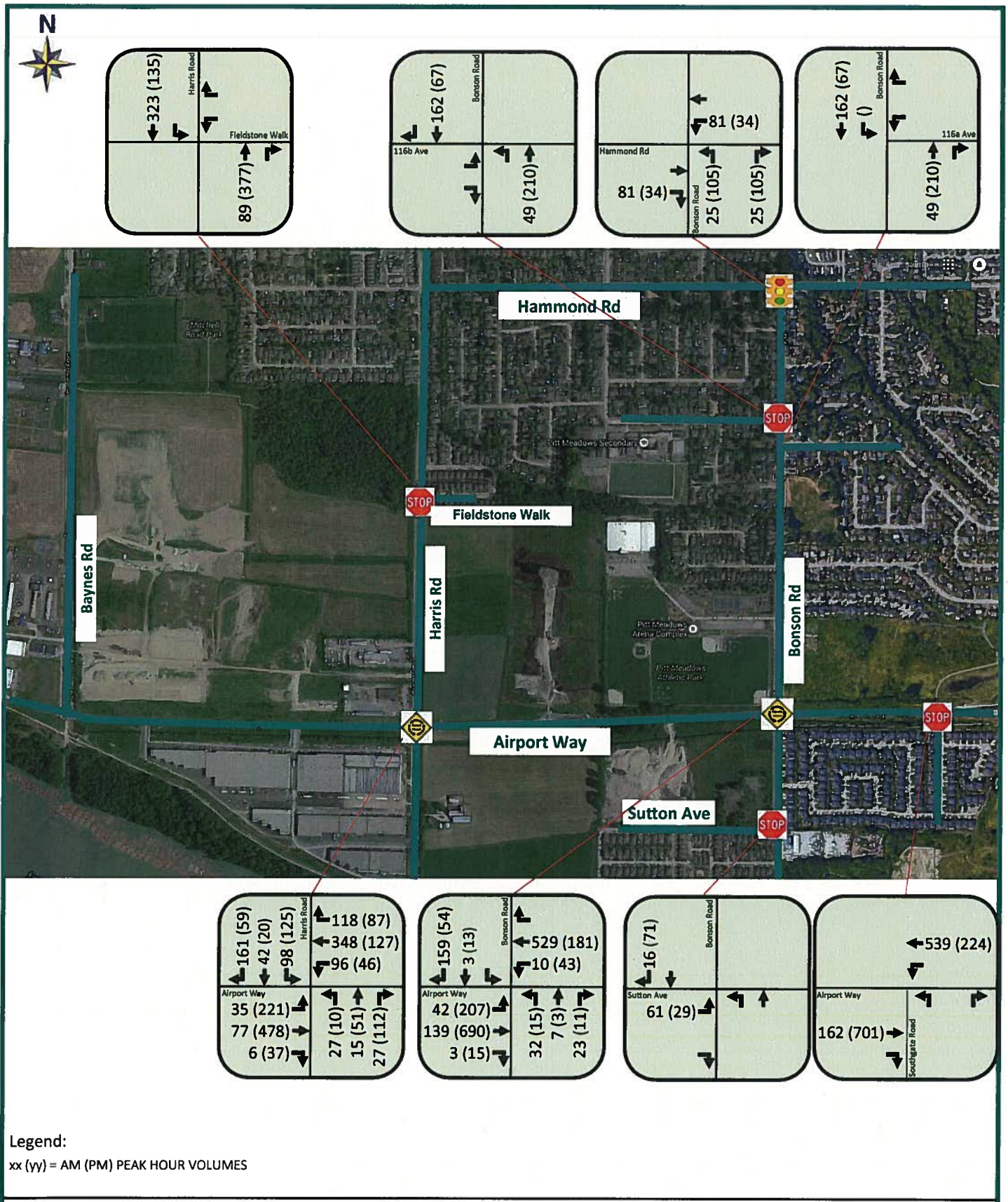
To determine the 2021 and 2031 background traffic volumes at the study intersections, the 2% per year traffic growth rate was applied to the Existing Conditions (2016) traffic volumes. The calculated trips generated by the expected developments were assigned to the network, and then added to the background traffic to estimate the total future combined volumes for 2021 and 2031.

Future Years 2021 and 2031 Development volumes and the combined intersection volumes can be found in **Figures 7 and 10**, respectively.

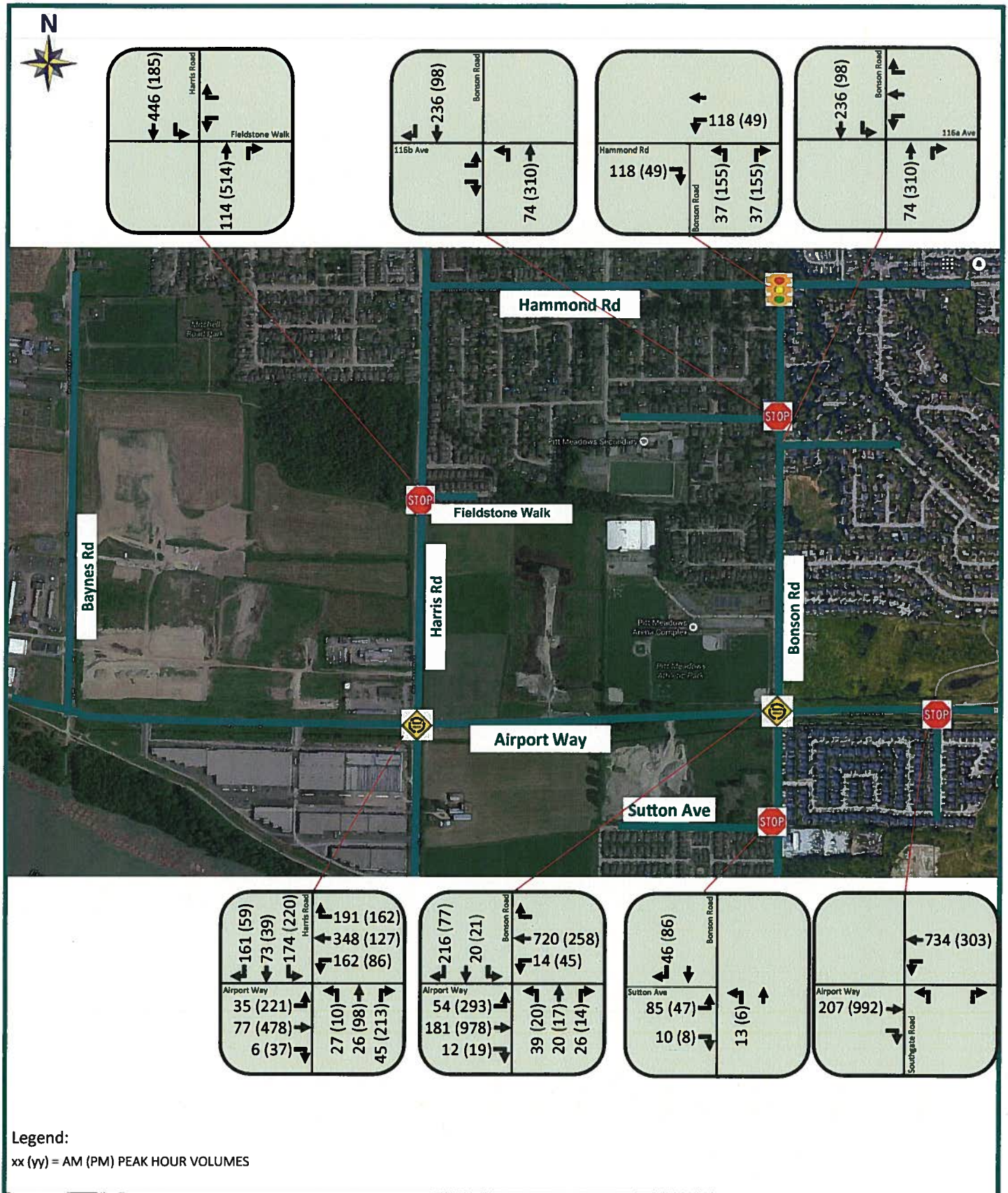


SOUTH BONSON TRAFFIC STUDY
2021 BACKGROUND TRAFFIC VOLUMES





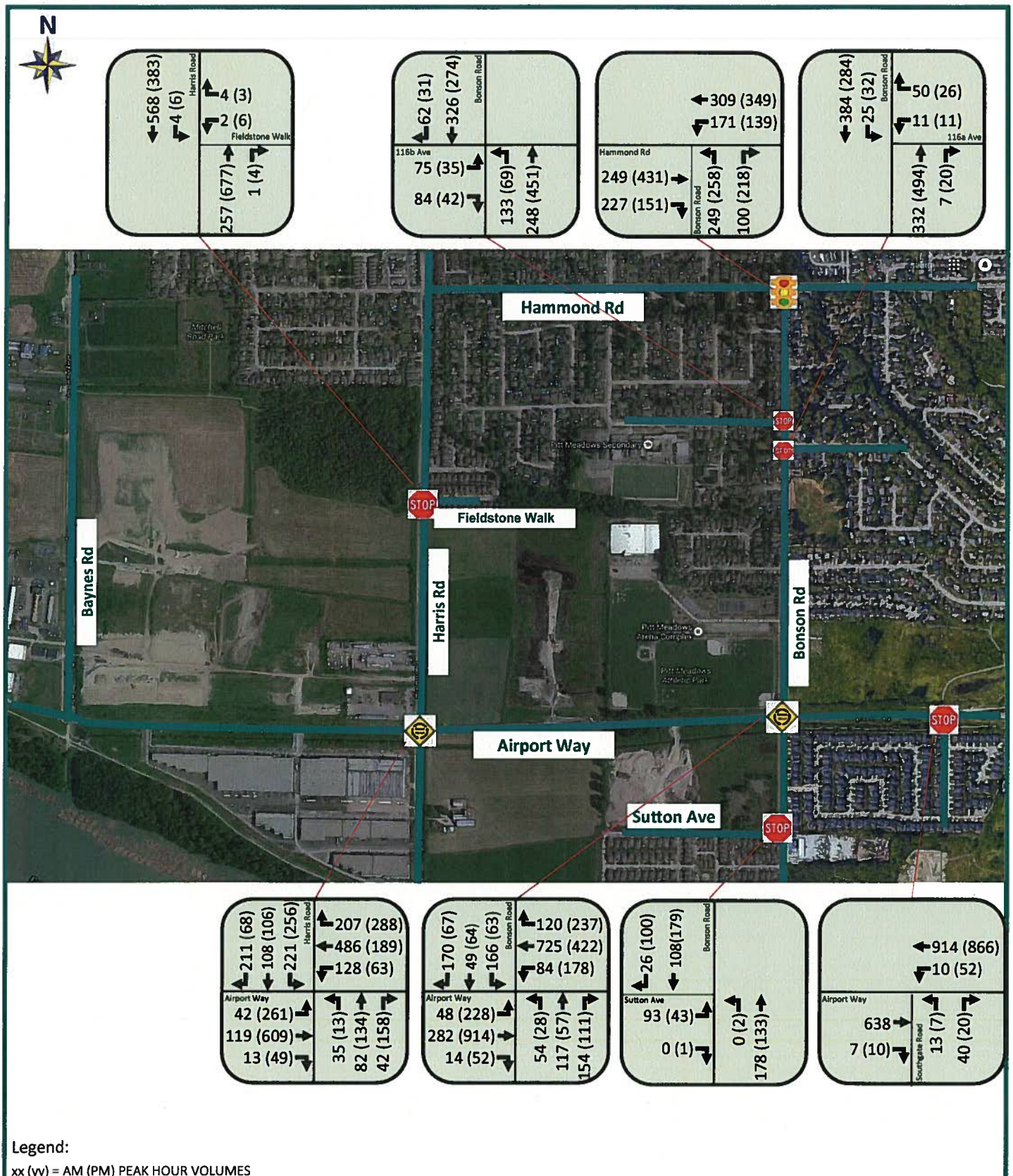
SOUTH BONSON TRAFFIC STUDY
2021 DEVELOPMENT TRAFFIC VOLUMES



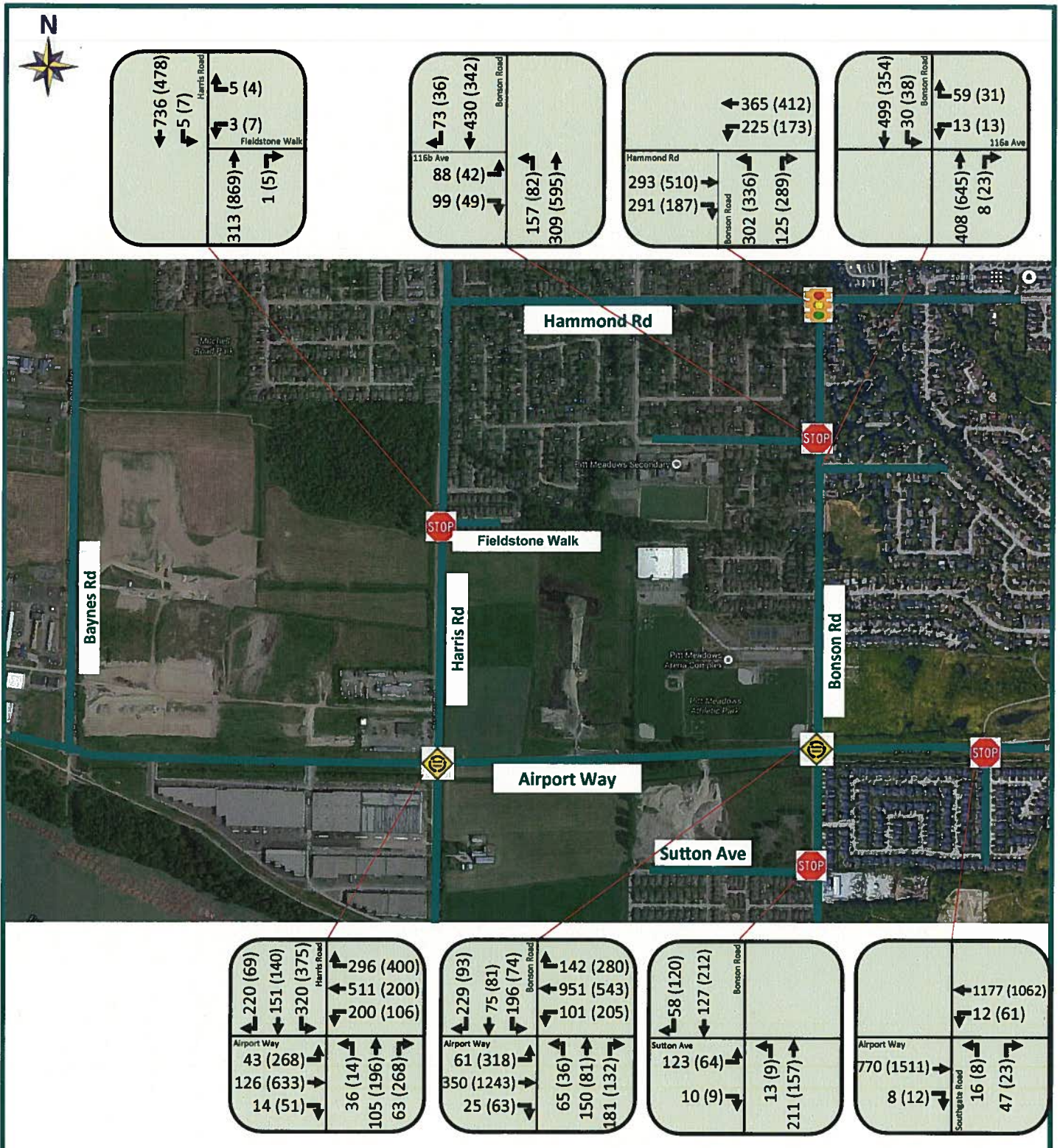
SOUTH BONSON TRAFFIC STUDY
2031 DEVELOPMENT TRAFFIC VOLUMES

FIGURE 8

Not to Scale



SOUTH BONSON TRAFFIC STUDY
2021 COMBINED TRAFFIC VOLUMES



SOUTH BONSON TRAFFIC STUDY
2031 COMBINED TRAFFIC VOLUMES

4. Traffic Operations Analysis

4.1. Intersection Level of Service Criteria

Roadway facility traffic operations are described in terms of Level of Service (LOS). LOS is a commonly used measure of the quality of traffic conditions experienced along a roadway or at an intersection. The Level of Service is typically measured as a function of the control delay per vehicle (seconds / vehicle). Six service levels are defined ranging from LOS A, the best operating conditions, to LOS F, the worst operating conditions. LOS E corresponds to “at or near capacity” operations. When volumes exceed capacity, stop-and-go conditions result and operations are designated LOS F. The typical urban criterion for acceptable intersection operation is LOS D.

4.1.1. Signalized Intersections

The signalized intersections were analyzed using the methodology contained in the Highway Capacity Manual (HCM). This methodology determines the level of service by comparing the average control delay for all vehicles approaching the intersection to the delay thresholds shown in *Table 5*.

4.1.2. Unsignalized Intersections

For unsignalized intersections, the level of service calculations were conducted using the method in Chapter 19 of the Highway Capacity Manual (HCM) 2010 (Transportation Research Board, 2010). The LOS rating is based on the average control delay expressed in seconds per vehicle. For controlled approaches composed of a single lane, the control delay is computed as the average of all movements in that lane. *Table 5* presents the thresholds for unsignalized intersections.

Table 5 Level of Service & Delay Criteria for Unsignalized Intersections

LOS	Delay Criteria (sec/veh)		Description
	Signalized	Unsignalized	
A	<10	<10	Represents free flow. Individual users are virtually unaffected by others in the traffic stream.
B	>10 and <20	>10 and <15	Stable flow, but the presence of other users in the traffic stream begins to be noticeable.
C	>20 and <35	>15 and <25	Stable flow, but the operation of individual users becomes significantly affected by interactions with others in the traffic stream.
D	>35 and <55	>25 and <35	Represents high-density, but stable flow.
E	>55 and <80	>35 and <50	Represents operating conditions at or near the capacity level.
F	>80	>50	Represents forced or breakdown flow.

4.1.3. Synchro Software

Synchro was used to calculate the LOS and average delay at the study intersections, based on HCM methodologies for unsignalized / signalized intersections. Synchro is a traffic simulation modeling software used to determine traffic conditions based on volumes, laning, and type of traffic control. The model calculates the average delays and queue lengths for each movement at an intersection. Average delays are translated into a LOS.

4.1.4. Sidra Software

Sidra was used to model the roundabouts in the study area. Similar to Synchro, Sidra s also based on the HCM methodologies and is recognized as an industry standard software for roundabout capacity analysis.

4.2. Intersection Results

A summary of the overall intersection performance in terms of LOS, and average delays in seconds/vehicle (s/v) for each study intersection is shown in **Table 6**. Individual movement LOS, delay and 95th percentile queue length (in metres) for the Existing Conditions (2016) and Future Years 2021 and 2031 scenarios are presented in the following sections. Synchro / SIDRA output sheets are included in **Appendix C**.

Table 6 Intersection Performance Summary

Location	Control Type ⁽¹⁾	Peak	2016		2021 Background		2031 Background		2021 Combined		2031 Combined	
			LOS	Delay (s/veh)	LOS	Delay (s/veh)	LOS	Delay (s/veh)	LOS	Delay (s/veh)	LOS	Delay (s/veh)
Airport Way / Harris Road	RA	AM	A	1.4	A	7.2	A	8.5	F	74.4	F	159.5
		PM	A	7.2	A	7.8	A	9.3	F	133.6	F	237.7
Airport Way / Bonson Road	RA	AM	B	11.4	B	13.6	C	21.5	F	85.1	F	199.5
		PM	B	12.7	C	16.0	D	30.9	F	214.6	F	418.2
Airport Way / Southgate Road	SSSC	AM	A	0.9	A	0.9	A	1.1	A	1.0	A	1.9
		PM	A	1.0	A	1.2	A	1.5	A	2.2	A	6.7
Bonson Road / Hammond Road	Signal	AM	B	15.2	B	16.9	B	19.4	C	22.7	C	29.5
		PM	C	22.0	C	25.2	C	22.6	C	23.0	C	28.5
Bonson Road / 116a / 116b Ave	SSSC	AM	A	4.9	A	5.3	A	6.4	A	5.5	A	9.6
		PM	A	2.5	A	2.6	A	2.9	A	2.3	A	3.0
Bonson Road / Sutton Ave	SSSC	AM	A	1.1	A	1.1	A	1.1	A	2.6	A	3.4
		PM	A	0.5	A	0.5	A	0.5	A	1.1	A	1.8
Harris Road / Fieldstone Walk	SSSC	AM	A	0.2	A	0.2	A	0.2	A	0.2	A	0.2
		PM	A	0.3	A	0.3	A	0.3	A	0.3	A	0.3

Notes:

1. RA = Roundabout

SSSC = Side-street stop-controlled

Bold indicates unacceptable operation (LOS E or F)

4.2.1. Airport Way / Harris Road (Roundabout)

Airport Way / Harris Road intersection is currently operating as a single lane roundabout with one entry and one exit lane on all four approaches. Sidra results for intersection performance are summarized in **Table 7**.

The results show that the intersection will perform at an acceptable LOS in the 2031 background traffic condition; however, with the combined traffic (background plus development), the LOS drops to F by 2021. A single lane roundabout is inadequate to accommodate the future traffic and the intersection will need capacity upgrades.

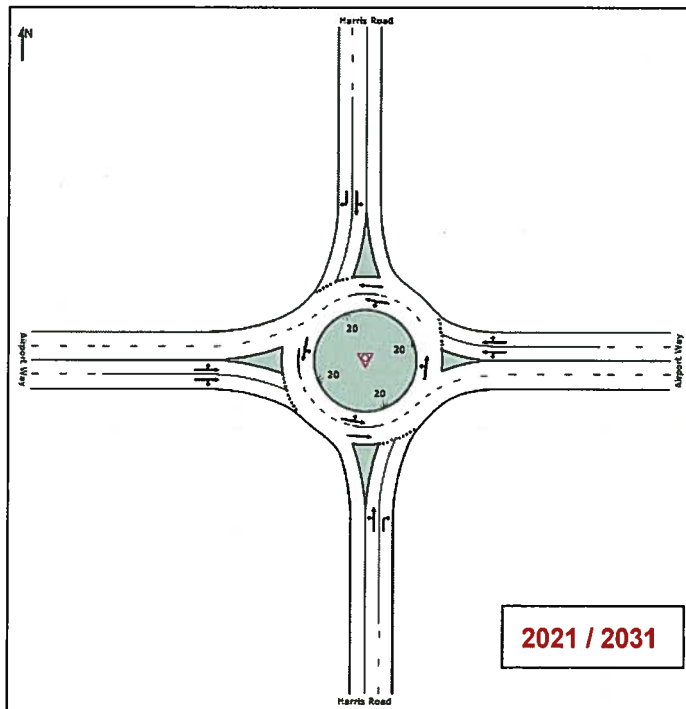
Mitigations

In order to mitigate the poor roundabout operation, two options were analyzed: Option 1 includes upgrade to a two-lane roundabout and Option 2 involves intersection signalization.

Option 1 - 2- Lane Roundabout

Four-laning of Airport Way is assumed to be completed by 2021 with the 2-lane roundabout option. A two-lane roundabout was tested in Sidra and the results revealed it will accommodate future traffic demand at an acceptable LOS, as shown in **Table 8**, except Harris Road SB (AM) and Harris Road NB (PM) in 2031 Combined case. The reported performance for the recommended two lane roundabout is based on 2 approach lanes in all four directions and one receiving lane along the Harris Road approaches, as shown in **Figure 11**. The two lane roundabout will require some property acquisition, possibly, in all four quadrants of the intersection. The exact property take can be determined based on the final roundabout design and 4-lane widening of the Airport Way.

Figure 11 Option 1 Proposed Laning – Airport Way / Harris Road Intersection



Option 2 – Intersection Signalization

An intersection signal option was also tested and the results revealed that signal will also accommodate the 2021 and 2031 combined traffic at acceptable LOS. It is noted that in 2021, the signalized intersection will not require a four-lane cross-section along Airport Way; however, queue lengths are expected to be longer than the 2-lane roundabout option. In 2031 the signalized intersection will require a 4-lane cross-section along Airport Way. The signalized intersection option will also require some property acquisition, but is expected to have a smaller footprint as compared to a two lane roundabout. Furthermore, the signalized intersection will accommodate the pedestrian/bike movements in a more safe/controlled manner with help of pedestrian push buttons/phases as compared to a two-lane roundabout. The proposed laning in 2021 and 2031 is shown in **Figure 12**. The results are included in **Table 8**.

A signal warrant was conducted using Transportation Association of Canada (TAC) methodology and the results show that a signal is warranted based on the projected 2021 and 2031 combined volumes. The results of the Signal Warrant analysis are included in **Appendix D**.

Figure 12 Option 2 Proposed Laning – Airport Way / Harris Road

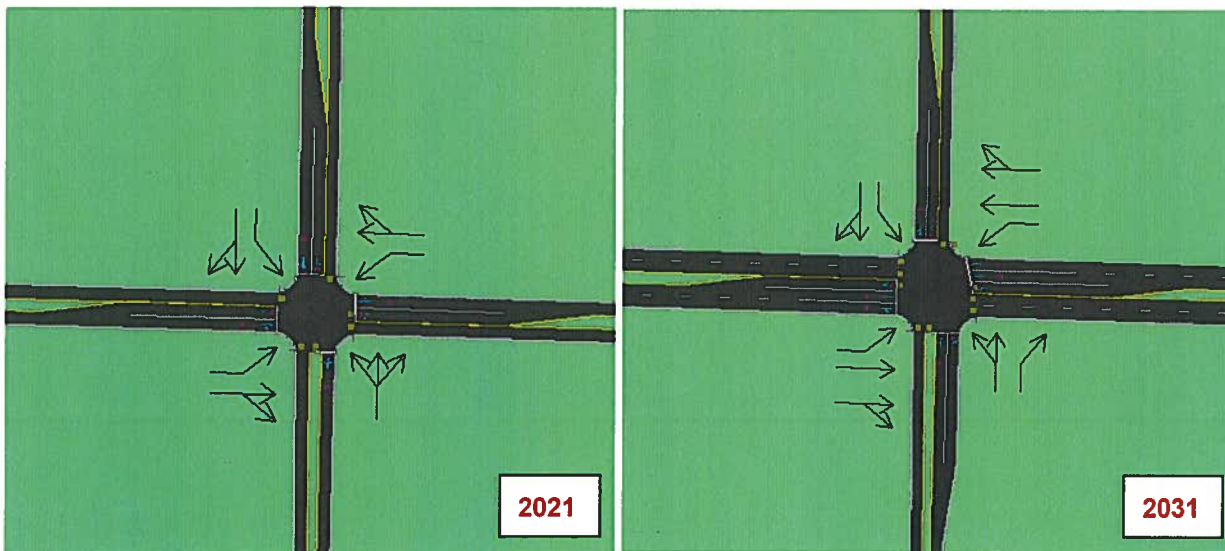


Table 7 Intersection Performance - Airport Way / Harris Road

Scenario	Peak Period	MOE	Airport Way		Harris Road	
			EB	WB	NB	SB
2016 existing	AM	LOS	A	A	A	A
		Delay	5.1	6.7	5.3	7.6
		95% Queue	2.3	10.4	0.5	11.1
	PM	LOS	A	A	A	A
		Delay	7.4	7.8	7.2	6.3
		95% Queue	8.8	12.5	6.8	9.1
2021 Background	AM	LOS	A	A	A	A
		Delay	5.4	7.2	5.6	8.4
		95% Queue	2.7	12.1	4.3	2.7
	PM	LOS	A	A	A	A
		Delay	8.1	8.6	7.9	6.7
		95% Queue	10.2	14.7	7.9	10.5
2031 Background	AM	LOS	A	A	A	B
		Delay	5.9	8.3	6.2	10.1
		95% Queue	3.3	15.7	5.4	17.4
	PM	LOS	A	B	A	A
		Delay	9.7	10.4	9.5	7.6
		95% Queue	13.5	19.7	10.5	13.4
2021 Combined	AM	LOS	A	F	A	F
		Delay	9.2	64.0	8.1	131
		95% Queue	8.7	342	7.4	330
	PM	LOS	F	D	E	B
		Delay	282	27.8	43.4	13.6
		95% Queue	1052	68.6	45.3	30.0
2031 Combined	AM	LOS	B	F	A	F
		Delay	10.8	168.4	9.9	230
		95% Queue	10.3	885	10.4	680
	PM	LOS	F	F	F	D
		Delay	513	69.2	186	34.2
		95% Queue	1488	264	388	91.0

Table 8 Intersection Performance with Upgrades – Airport Way / Harris Road

Mitigation Option	Scenario	Peak Period	MOE	Airport Way		Harris Road	
				EB	WB	NB	SB
2-Lane Roundabout	2021 Combined (1-receiving lane on Harris Rd)	AM	LOS	A	B	A	B
			Delay	6.5	11.1	6.2	14.7
			95% Queue	2.9	21.9	3.5	18.6
		PM	LOS	D	B	C	A
			Delay	28.5	12.6	17.5	7.5
			95% Queue	55.7	19.1	10.4	8.1
	2031 Combined (1-receiving lane on Harris Rd)	AM	LOS	A	C	A	E
			Delay	8.2	15.3	7.3	37.1
			95% Queue	3.6	38.3	4.7	64.0
		PM	LOS	D	C	E	C
			Delay	35.0	21.4	40.7	16.5
			95% Queue	51.0	42.8	30.3	33.4
Signal	2021 Combined (1-approach lane on Airport Way)	AM	LOS	A	C	B	B
			Delay	9.1	21.5	15.3	18.2
			95% Queue	15.8	#136	25.6	43.3
		PM	LOS	D	D	D	D
			Delay	35.4	52.2	48.6	42.2
			95% Queue	#177	#145	#91	#76.6
	2031 Combined (2-approach lanes on Airport Way)	AM	LOS	B	C	C	C
			Delay	15.9	22.0	21.3	21.1
			95% Queue	14.0	#84.5	33.9	#69.9
		PM	LOS	C	B	C	D
			Delay	31.0	13.8	23.0	35.0
			95% Queue	77.2	32.5	54.9	#103

Recommendation

Based on the better intersection performance results, safer pedestrian/ bike accommodations and lower property footprint, the signalized intersection option is recommended at this intersection.

4.2.2. Airport Way / Bonson Road (Roundabout)

Airport Way / Bonson Road intersection is currently operating as a single lane roundabout with one entry and one exit lane on all four approaches. Sidra results for this intersection for all study scenarios are summarized in **Table 9**.

Table 9 Intersection Performance - Airport Way / Bonson Road

Scenario	Peak Period	MOE	Airport Way		Bonson Road	
			EB	WB	NB	SB
2016 existing	AM	LOS	A	B	B	A
		Delay	7.1	13.4	12.2	8.9
		95% Queue	6.6	32.2	23.2	11.4
	PM	LOS	A	C	A	A
		Delay	9.2	16.7	7.0	7.7
		95% Queue	14.1	53.5	6.7	5.6
2021 Background	AM	LOS	A	C	B	B
		Delay	7.8	16.6	14.6	10.1
		95% Queue	7.7	43.7	30.2	13.8
	PM	LOS	B	C	A	A
		Delay	10.4	21.9	7.6	8.4
		95% Queue	17.1	83.2	7.7	6.6
2031 Background	AM	LOS	A	D	C	B
		Delay	9.4	28.7	23.0	13.1
		95% Queue	10.0	84.3	51.6	20.8
	PM	LOS	B	E	A	B
		Delay	13.6	47.8	9.0	10.4
		95% Queue	26.6	279	10.1	8.8
2021 Combined	AM	LOS	B	F	C	F
		Delay	12.1	148	18.6	54.2
		95% Queue	20.8	726	27.8	74.8
	PM	LOS	F	F	C	B
		Delay	362	96.7	17.5	12.8
		95% Queue	1611	465	16.2	12.7
2031 Combined	AM	LOS	C	F	D	F
		Delay	16.5	353	35.0	123
		95% Queue	35.2	1591	53.1	284
	PM	LOS	F	F	C	C
		Delay	661	226	22.9	15.5
		95% Queue	2881	1064	24.2	18.6

The results show that the intersection will perform at acceptable LOS with background traffic in 2021 and the WB movement will experience LOS E in 2031. With the combined traffic, the intersection will operate at poor LOS E and F in all directions except the northbound direction. A single lane roundabout will not be able to accommodate the future traffic demand and will need capacity improvements.

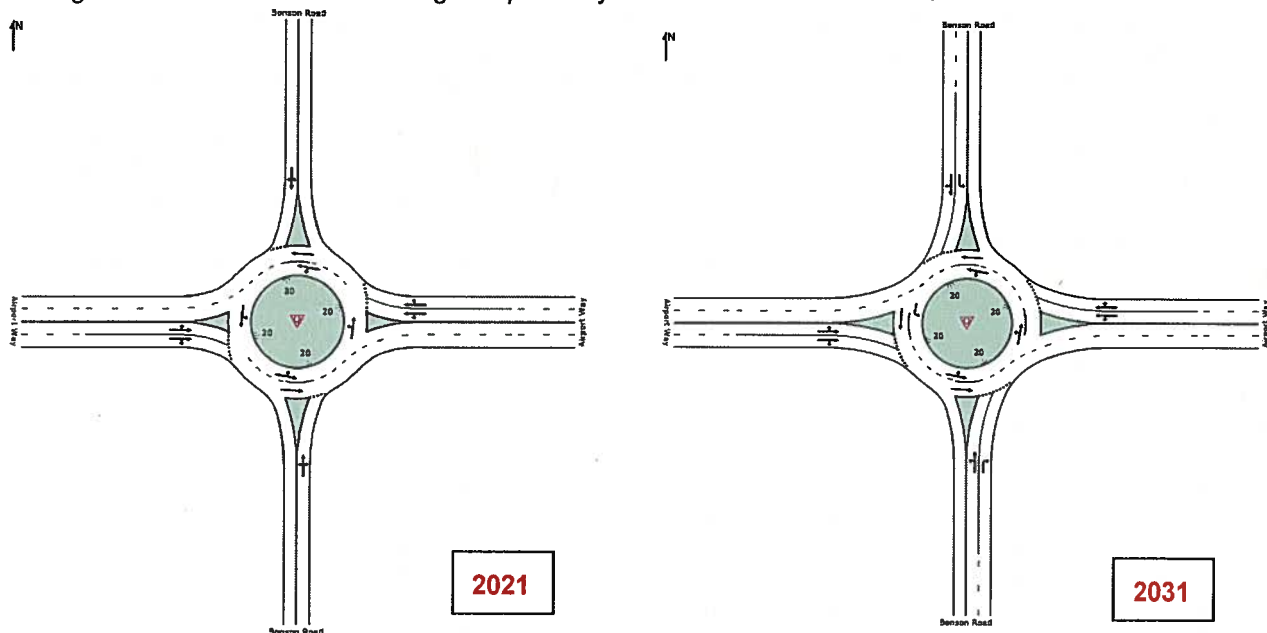
Mitigations

Similar to the Harris Road roundabout, two options were analyzed to mitigate the poor performance. Option 1 includes upgrade to a two-lane roundabout and Option 2 involves intersection signalization.

Option 1 - 2-Lane Roundabout

Four-laning of Airport Way will be required for the two-lane roundabout option. Sidra analysis results revealed that a 2-lane roundabout will handle the future 2021 traffic at acceptable LOS and queues. However, EB movement in 2031 PM peak will experience LOS F even with a 2 lane roundabout. The 2021 traffic was modelled with 2 approach lanes for EB and WB directions and a single approach lane for NB and SB directions as shown in **Figure 13**. The results for 2021 and 2031 combined scenarios with 2-lane roundabout are shown in **Table 10**. Similar to the Harris Road intersection, the two lane roundabout at Bonson Road will require some property acquisition. The exact property take can be determined based on the final roundabout design and 4-lane widening of the Airport Way.

Figure 13 Recommended Laning – Airport Way / Bonson Road Roundabout



Option 2 – Intersection Signalization

Synchro analysis results revealed that an intersection signal will also accommodate the 2021 and 2031 combined traffic at acceptable LOS. It is noted that in 2021 the signalized intersection will not require a four-lane cross-section along Airport Way; however, queue lengths are expected to be longer than with the 2-lane roundabout option. In 2031 the signalized intersection will require a 4-lane cross-section along Airport Way. The proposed laning in 2021 and 2031 is shown in **Figure 14**. The results are included in **Table 10**. The signalized intersection will also require some property acquisition but is expected to have a smaller footprint as compared to a roundabout. Furthermore, the signalized intersection will accommodate the pedestrian/bike movements in a more safe / controlled manner with help of pedestrian push buttons/phases as compared to a two-lane roundabout.

Signal warrant was conducted using TAC methodology and the results show that the signal is warranted based on the projected 2021 volumes. The results of Signal Warrant are included in **Appendix D**.

Figure 14 Option 2 Proposed Laning – Airport Way / Bonson Road

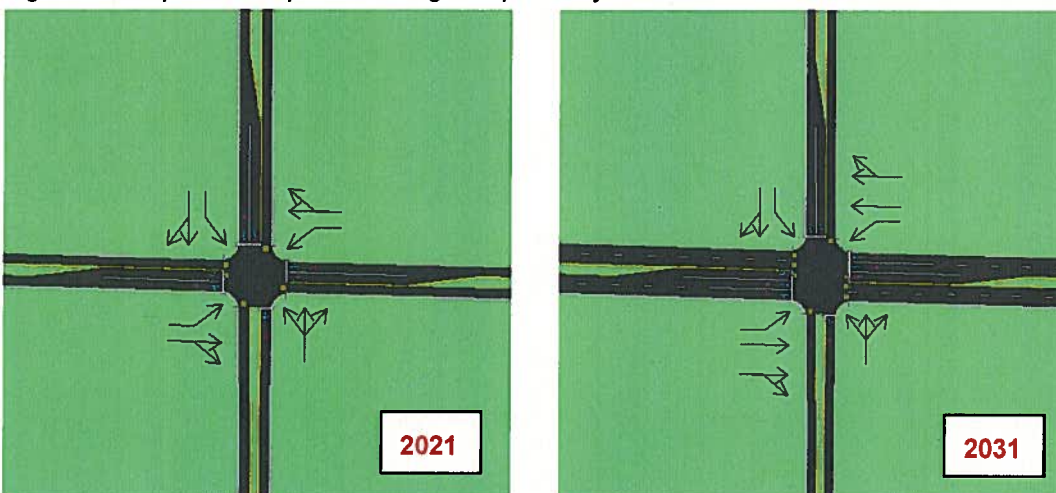


Table 10 Intersection Performance with Upgrades – Airport Way / Bonson Road

Mitigation Option	Scenario	Peak Period	MOE	Airport Way		Bonson Road	
				EB	WB	NB	SB
2-Lane Roundabout	2021 Combined (1-approach lane on Bonson Rd)	AM	LOS	A	B	B	E
			Delay	7.8	14.9	13.1	36.8
			95% Queue	7.7	34.5	16.0	38.6
		PM	LOS	E	B	C	B
			Delay	37.2	16.5	23.4	10.5
			95% Queue	101	33.6	1.9	1.0
	2031 Combined (2-approach lanes on Bonson Rd)	AM	LOS	A	C	B	D
			Delay	8.4	22.9	10.6	33.7
			95% Queue	7.8	51.7	9.3	31.8
		PM	LOS	F	C	C	B
			Delay	109	21.8	22.6	10.9
			95% Queue	439	40.5	10.5	8.3
Signal	2021 Combined (1-approach lane on Airport Way)	AM	LOS	B	C	C	C
			Delay	12.6	34.0	25.5	28.7
			95% Queue	43.6	#213	56.0	#47.8
		PM	LOS	D	B	D	D
			Delay	47.9	17.4	37.1	36.3
			95% Queue	#296	88.6	47.2	30.8
	2031 Combined (2-approach lanes on Airport Way)	AM	LOS	B	B	C	C
			Delay	12.4	17.8	21.1	23.6
			95% Queue	23.1	#84.8	61.0	#50.0
		PM	LOS	C	C	D	C
			Delay	27.3	20.2	35.8	28.7
			95% Queue	#159	72.7	55.5	34.8

Pedestrian Accommodation

The planned Sutton Avenue residential development is expected to generate additional pedestrian traffic at the intersection. A rough estimate of the number of future pedestrian crossings based on the ratio of the existing dwelling units to the future dwelling units showed that the north-south pedestrian crossings at the intersection will increase from 16 in the peak hour to about 28 in future. The planned elementary school may further increase pedestrian crossing demand at the intersection. The proposed signalized intersection option is expected to handle the future pedestrian crossing demand; however, a grade separated pedestrian overpass across Airport Way from Sutton Avenue development to the ball fields on the north side may be considered if Roundabout option is implemented.

Recommendation

Based on the better intersection performance results, safer pedestrian/ bike accommodations and lower property footprint, the signalized intersection option is recommended at this intersection.

4.2.3. Bonson Road / Hammond Road Intersection

This T-intersection is the only signalized intersection in the study area with the following laning:

- EB – 1 through / right turn lane
- WB – 1 left turn lane and 1 through / right turn lane
- NB – 1 left and 1 right turn lane

Synchro results are summarized in **Table 11**.

Table 11 Intersection Performance - Bonson Road / Hammond Road

Scenario	Peak Period	MOE	Hammond Road			Bonson Road	
			EBT	WBL	WBT	NBL	NBR
2016 existing	AM	LOS	C	B	B	B	A
		Delay	22.0	10.6	11.6	13.6	4.4
		95% Queue	58.0	11.2	33.3	33.9	7.0
	PM	LOS	D	B	B	B	A
		Delay	36.9	11.2	10.8	14.6	4.0
		95% Queue	109	12.7	38.1	23.7	8.6
2021 Background	AM	LOS	C	B	B	B	A
		Delay	26.0	10.8	11.2	15.0	4.3
		95% Queue	65.8	12.1	37.0	37.1	7.3
	PM	LOS	D	B	B	B	A
		Delay	44.1	11.8	11.0	14.9	4.0
		95% Queue	125	13.7	42.1	25.8	9.0
2031 Background	AM	LOS	C	B	B	B	A
		Delay	31.69	11.7	11.7	16.6	4.2
		95% Queue	66.6	#33.8	53.3	38.0	6.9
	PM	LOS	D	B	B	C	A
		Delay	36.3	14.0	10.2	20.6	4.9
		95% Queue	152	16.2	49.3	38.0	11.6
2021 Combined	AM	LOS	D	B	B	B	A
		Delay	38.8	19.0	10.7	16.9	4.0
		95% Queue	101	26.9	37.8	41.5	8.4
	PM	LOS	D	B	B	C	A
		Delay	37.9	16.0	10.1	20.2	4.3
		95% Queue	133	18.3	41.2	49.3	13.5
2031 Combined	AM	LOS	D	C	B	C	A
		Delay	49.5	29.2	10.1	24.7	4.7
		95% Queue	143	50	46	63	11
	PM	LOS	D	C	A	C	A
		Delay	45.9	32.9	9.7	32.2	6.7
		95% Queue	177	43	51.1	81.7	21.8

The results show that all movements are expected to operate at acceptable LOS for all background and combined traffic scenarios.

No capacity upgrades are recommended.

4.2.4. Bonson Road / 116A / 116B Avenue Intersection

The two closely spaced T-intersections are separated by about 50m. Each approach has a single lane. Synchro results for these two T-intersections are combined in **Table 12**.

All movements are expected to perform at acceptable LOS C or better except the EB left which operate at LOS E in 2031 AM combined scenario; however, the 95th percentile queue of 43 m (about 6 cars) remains manageable.

No capacity upgrades are recommended at this intersection.

Table 12 Intersection Performance - Bonson Road /116A / 116B Avenue

Scenario	Peak Period	MOE	116 a/b Avenue		Bonson Road			
			EB	WB	NBL	NBT	SBL	SBT
2016 existing	AM	LOS	B	B	A	A	A	A
		Delay	14.2	10.8	0.9	3.7	0.2	1.0
		95% Queue	9.5	2.3	2.6	2.6	0.5	0.5
	PM	LOS	B	B	A	A	A	A
		Delay	12.0	11.0	0.5	2.1	0.2	1.2
		95% Queue	3.5	1.5	1.3	1.3	0.6	0.6
2021 Background	AM	LOS	C	B	A	A	A	A
		Delay	15.8	11.1	1.0	3.8	0.2	1.0
		95% Queue	12.1	2.7	3.0	3.0	0.5	0.5
	PM	LOS	B	B	A	A	A	A
		Delay	12.6	11.4	0.5	2.2	0.3	1.3
		95% Queue	4.2	1.7	1.5	1.5	0.7	0.7
2031 Background	AM	LOS	C	B	A	A	A	A
		Delay	20.5	11.9	1.3	4.1	0.3	1.1
		95% Queue	19.7	3.6	3.7	3.7	0.7	0.7
	PM	LOS	B	B	A	A	A	A
		Delay	14.4	12.3	0.7	2.3	0.3	1.4
		95% Queue	6.1	2.3	1.8	1.8	0.9	0.9
2021 Combined	AM	LOS	C	B	A	A	A	A
		Delay	22.6	12.1	1.3	3.9	0.2	0.7
		95% Queue	18.9	3.1	3.5	3.5	0.6	0.6
	PM	LOS	C	B	A	A	A	A
		Delay	16.0	14.3	0.7	1.7	0.4	1.2
		95% Queue	6.1	2.5	1.6	1.6	0.9	0.9
2031 Combined	AM	LOS	E	B	A	A	A	A
		Delay	48.1	14.0	1.9	4.4	0.4	0.8
		95% Queue	43.0	4.6	4.8	4.8	0.7	0.7
	PM	LOS	C	C	A	A	A	A
		Delay	22.8	18.1	1.1	1.9	0.6	1.4
		95% Queue	11.2	4.1	2.0	2.0	1.2	1.2

4.2.5. Bonson Road / Sutton Avenue Intersection

This unsignalized T-intersection is currently operating with a single lane at each approach. The future residential development is planned to have two full access from Sutton Avenue and a right-in-right-out access at Airport Way. Therefore, the primary development access is at this intersection. Intersection performance is summarized in **Table 13**.

Table 13 Intersection Performance - Bonson Road / Sutton Avenue

Scenario	Peak Period	MOE	Sutton Avenue	Bonson Road	
			EBL/R	NB	SB
2016 existing	AM	LOS	B	A	A
		Delay	10.4	0.0	0.0
		95% Queue	1.2	0.0	0.0
	PM	LOS	B	A	A
		Delay	10.4	0.1	0.0
		95% Queue	0.5	0.0	0.0
2021 Background	AM	LOS	B	A	A
		Delay	10.6	0.0	0.0
		95% Queue	1.3	0.0	0.0
	PM	LOS	B	A	A
		Delay	10.7	0.1	0.0
		95% Queue	0.6	0.0	0.0
2031 Background	AM	LOS	B	A	A
		Delay	11.1	0.0	0.0
		95% Queue	1.7	0.0	0.0
	PM	LOS	B	A	A
		Delay	11.3	0.2	0.0
		95% Queue	0.8	0.1	0.0
2021 Combined	AM	LOS	B	A	A
		Delay	11.3	0.0	0.0
		95% Queue	4.2	0.0	0.0
	PM	LOS	B	A	A
		Delay	11.4	0.1	0.0
		95% Queue	2.0	0.0	0.0
2031 Combined	AM	LOS	B	A	A
		Delay	13.0	0.5	0.0
		95% Queue	7.6	0.2	0.0
	PM	LOS	B	A	A
		Delay	12.6	0.5	0.0
		95% Queue	4.0	0.2	0.0

Synchro results show that all movements at this intersection are expected to perform at acceptable LOS by 2031. No capacity upgrades are required.

Right-in-Right-out Access for 19451 Sutton Avenue Development at Airport Way

The right-in-right-out access was included in the Synchro model to analyze the 2021 and 2031 combined traffic scenarios. The Synchro results revealed that the access will perform with acceptable LOS and queue not exceeding two vehicles in the peak hours. To ensure right-in-right-out compliance, a channelized traffic island is recommended at the Airport Way access.

4.2.6. Airport Way / Southgate Road Intersection

This unsignalized T- intersection is operating with a single lane at each approach. Intersection performance is summarized in **Table 14**.

Table 14 Intersection Performance - Airport Way / Southgate Road

Scenario	Peak Period	MOE	Airport Way				Southgate Road	
			EBT	EBR	WBL	WBT	NBL	NBR
2016 existing	AM	LOS	A	A	A	A	B	B
		Delay	0.0	0.0	0.1	0.3	13.3	13.3
		95% Queue	0	0	0.2	0.2	2.8	2.8
	PM	LOS	A	A	A	A	B	B
		Delay	0.0	0.0	0.6	1.2	14.6	14.6
		95% Queue	0	0	1.1	1.1	1.7	1.7
2021 Background	AM	LOS	A	A	A	A	B	B
		Delay	0.0	0.0	0.1	0.3	14.1	14.1
		95% Queue	0.0	0.0	0.3	0.3	3.4	3.4
	PM	LOS	A	A	A	A	C	C
		Delay	0.0	0.0	0.8	1.4	16.1	16.1
		95% Queue	0.0	0.0	1.3	1.3	2.2	2.2
2031 Background	AM	LOS	A	A	A	A	C	C
		Delay	0.0	0.0	0.2	0.4	16.6	16.6
		95% Queue	0.0	0.0	0.3	0.3	5.2	5.2
	PM	LOS	A	A	A	A	C	C
		Delay	0.0	0.0	1.1	1.7	19.8	19.8
		95% Queue	0.0	0.0	1.7	1.7	3.3	3.3
2021 Combined	AM	LOS	A	A	A	A	C	C
		Delay	0.0	0.0	0.3	0.4	24.9	24.9
		95% Queue	0.0	0.0	0.3	0.3	7.3	7.3
	PM	LOS	A	A	A	A	F	F
		Delay	0.0	0.0	2.8	3.3	58.8	58.8
		95% Queue	0.0	0.0	2.7	2.7	9.5	9.5
2031 Combined	AM	LOS	A	A	A	A	E	E
		Delay	0.0	0.0	0.6	0.7	49.3	49.3
		95% Queue	0.0	0.0	0.4	0.4	17.1	17.1
	PM	LOS	A	A	A	A	F	F
		Delay	0.0	0.0	8.5	8.9	253.4	253.4
		95% Queue	0.0	0.0	4.8	4.8	25.9	25.9

Synchro results show that the intersection performance will remain acceptable for all background scenarios. During the combined traffic conditions, the stop controlled NB movement will experience LOS E/F; however, the queues are expected to remain manageable (26 m, about four vehicles).

Mitigations

Based on the results no capacity upgrades are recommended at this intersection. However, this intersection may be considered for a signalized pedestrian crossing as the planned developments along Airport Way are

constructed and a significant increase in traffic is expected. In addition, an existing multiuse pathway from the north ties in at Airport Road, and a Zebra crossing is provided. The pedestrian signal (subject to meeting the warrant) may become inevitable if Airport Way is widened to 4 lane cross-section.

4.2.7. Harris Road / Fieldstone Walk Intersection

This unsignalized T-intersection serves the residential development along Fieldstone Walk and has very low traffic volumes in and out of the development. The intersection performance is summarized in **Table 15**.

The results show that all movements at the intersection are expected to perform at LOS D or better for all background and combined traffic scenarios. No upgrades are recommended.

Mitigations

Based on the results no capacity upgrades are recommended at this at this intersection. However, this intersection may be considered for a signalized pedestrian crossing (subject to meeting the pedestrian crossing control warrant) as the planned developments along Airport Way are constructed and a significant increase in traffic is expected on Harris Road.

Table 15 Intersection Performance - Harris Road / Fieldstone Walk

Scenario	Peak Period	MOE	Fieldstone Walk	Harris Road	
			EBL/R	NB	SB
2016 existing	AM	LOS	A	A	A
		Delay	9.8	0.0	0.1
		95% Queue	0.2	0.0	0.1
	PM	LOS	B	A	A
		Delay	11.5	0.0	0.2
		95% Queue	0.3	0.0	0.1
2021 Background	AM	LOS	A	A	A
		Delay	10.0	0.0	0.1
		95% Queue	0.2	0.0	0.1
	PM	LOS	B	A	A
		Delay	12.2	0.0	0.3
		95% Queue	0.5	0.0	0.1
2031 Background	AM	LOS	B	A	A
		Delay	10.5	0.0	0.2
		95% Queue	0.3	0.0	0.1
	PM	LOS	B	A	A
		Delay	13.2	0.0	0.3
		95% Queue	0.7	0.0	0.2
2021 Combined	AM	LOS	B	A	A
		Delay	12.2	0.0	0.1
		95% Queue	0.3	0.0	0.1
	PM	LOS	C	A	A
		Delay	20.1	0.0	0.2
		95% Queue	1.0	0.0	0.2
2031 Combined	AM	LOS	B	A	A
		Delay	14.6	0.0	0.1
		95% Queue	0.5	0.0	0.1
	PM	LOS	D	A	A
		Delay	28.1	0.0	0.3
		95% Queue	1.8	0.0	0.3

4.3. Existing Airport Way / Bonson Road Roundabout Operational and Safety Review

A site visit of the Bonson Road / Airport Road roundabout was conducted on Wednesday, January 27, 2016, during the after school period (3-4 pm) to observe safety and operational performance, particularly related to sight distance, pedestrian movements and traffic conflicts. The following observations were noted:

- Sight distance on the Airport Way at the west approach to the roundabout appears to be limited by an embankment in the northwest quadrant. Heavy vehicles approaching eastbound on Airport Way were observed to hesitate, begin to accelerate and then suddenly brake near the yield line as they saw an approaching vehicle from the north. A further analysis of sight distance needs is provided below.
- Numerous students were observed to cross the roundabout and no unusual conflicts were noted between pedestrians and vehicles.
- The absence of a narrow boulevard separation between the curb and concrete sidewalk may lead to conflicts between pedestrians and the overhang portion of large vehicles in the circulating lane of the roundabout.
- Approaching cyclists on Airport Way are directed to a 1.5m concrete sidewalk. Normally, a shared pedestrian/cyclist sidewalk is a minimum of 2.5m – 3.0m wide. If the desire is to direct cyclist to the travel lane, and ride through the roundabout, shared road pavement markings and “Share the Road” signs should be installed.
- A drainage issue exists on the westbound Airport Way bike lane approach to the sidewalk ramp, as ponding was observed in this area (see *Photo 1*).

Photo 1 Ponding in Westbound Bike Lane



Sight Distance Requirements

NCHRP Report #672, Roundabouts: An Informational Guide, provides guidance on sight distance at roundabouts. Intersection sight distance triangles can be measured on each leg based on approach speeds of the upstream entry. It should be noted that NCHRP #672 states, "Providing more than the minimum required intersection sight distance can lead to higher speeds that reduce intersection safety." Assuming approach speeds of 30 km/h, **Figure 9** shows the required sight triangles for each leg at the roundabout.

The south leg currently has no sight distance restriction, but this should be considered when the property in the southwest quadrant develops. The north and east leg approaches may have a slight sight distance deficiency, which can be easily rectified with landscape maintenance.

Photo 2 shows the available sight distance from the west leg to the upstream approach.

The available sight distance on the west leg appears to be very close to the minimum requirement. Sight distance may benefit from relocating the existing porta-potty to a different location.

Figure 15 Sight Triangle Requirements at Bonson Road / Airport Way

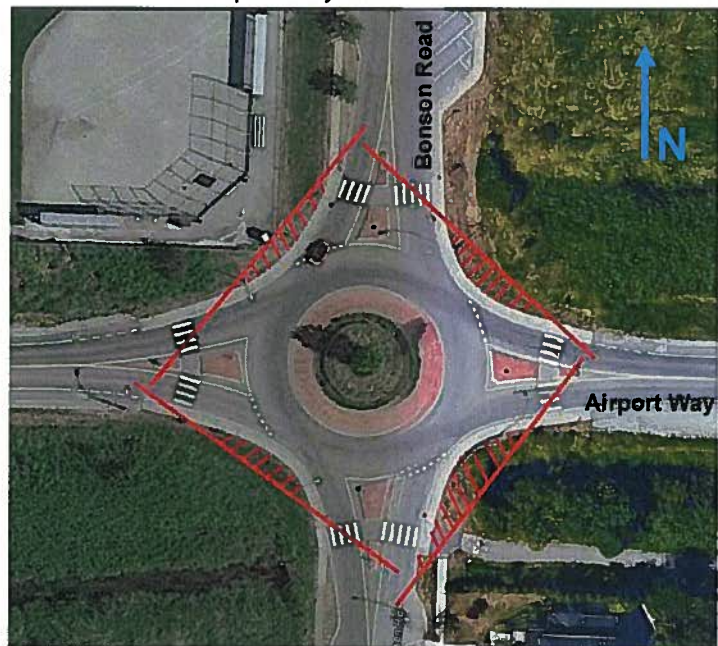


Photo 2 West Leg Sight Distance to Upstream Approach



5. Transit, Pedestrian and Bicycle Access

A site visit was conducted to document pedestrian / bike facilities and connectivity in the study area. Pedestrian movements were observed and existing transit and pedestrian / bicycle facilities, such as sidewalks, cross walks, bike lanes etc. were documented.

5.1. Transit

Bus route C41 Meadowtown / Maple Meadows station is the only route serving the South Bonson community. The route has 30 minute headways during the week and 60 minutes on weekends and is shown in **Figure 16**.

There are some options that may help encourage ridership in the South Bonson Area:

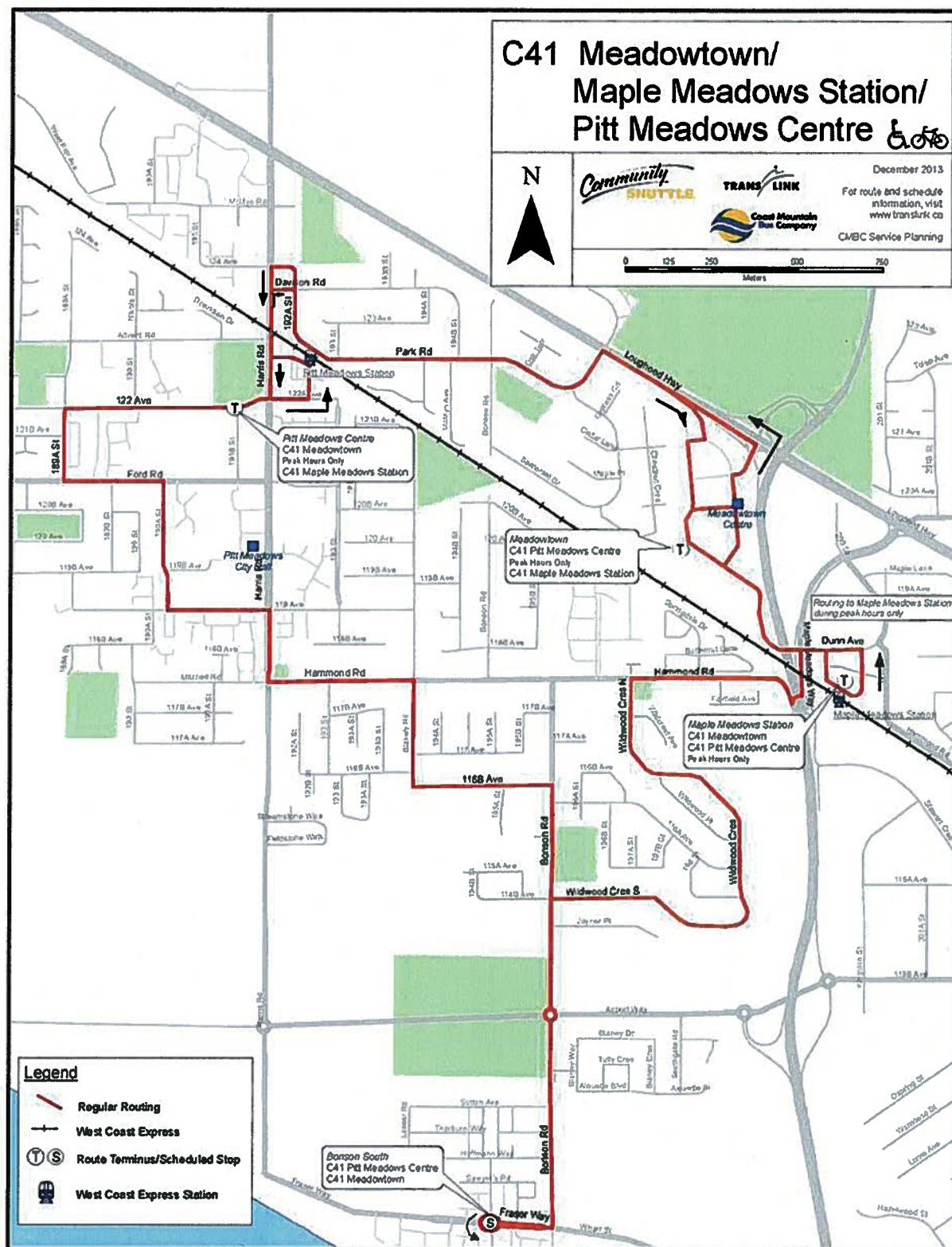
- The addition of bus shelters at existing (and potential future) stops
- Clearly defined paths/sidewalks to all bus stops
- More frequent service

It is recommended that as the population grows and South Bonson Area develops, the City should work with TransLink to determine if an additional bus route, more frequent bus service, or extension of the current route to better serve the South Bonson Area.

5.1.1. Bus Shelters

As Bonson Road serves the only bus route in the South Bonson area, there are bus stops located along the Bonson Road corridor. The presence of the Pitt Meadows Athletic Park, Pitt Meadows Secondary School and the future elementary school along Bonson road will continue to contribute to increased transit ridership and enhanced facilities for the transit users. Based on the current and future transit demand, two bus shelters on either side of Bonson Road at the Athletic Park access are recommended to be installed. The locations of proposed bus stops are shown in **Figure 17**.

Figure 16 Route Map – TransLink Route C41 – Meadowtown /Maple Meadows Station



5.2. Sidewalks

At present, sidewalks are installed along the following locations in the study area:

- Bonson Road
 - West sidewalk - between Fraser Way and Hammond Road;
 - East sidewalk - between Airport Way and Hammond Road.
- Harris Road
 - West sidewalk - between Fraser Way and Airport Way.

The City of Pitt Meadows Pedestrian and Bicycle Master Plan shows the following proposed sidewalk/pathways upgrades in the future:

- Proposed sidewalk on both sides of Harris Road between Fraser Way and Fieldstone Walk;
- Proposed sidewalk on Sutton Avenue;
- Proposed sidewalk on Bonson Road east side from Fraser Way to Sutton Avenue;
- Proposed off-street pathway along Airport Way between Baynes Road and Bonson Road; and
- Proposed off-street pathway along Harris Road between Fraser Way and Hammond Road.

The City's *Subdivision and Development Servicing Bylaw* requires that sidewalks be provided on both sides of collector and arterial roads, and on local roads with higher density residential and commercial developments.

Excerpts from the *Pedestrian and Cycling Master Plan* are included in [Appendix A](#).

5.3. Bike Lanes

At present, bike lanes are installed along the following locations in the study area:

- Airport Way
 - Bike lanes are marked along both sides of Airport Way between Southgate Road and Baynes Road.
- Harris Road
 - Bike lanes are marked along both sides of Harris Road between Airport Way and Fieldstone Walk.

It is noted that there is currently a multi-use pathway north of Airport Way / Southgate Road intersection. The *City of Pitt Meadows Pedestrian and Bicycle Master Plan* shows a proposed bike lane on Bonson Road from Fraser Way to Hammond Road.

In order to ensure that the sidewalk and bike lane network in South Bonson community is complete and facilitates continuous connections to GEBP, Athletic Park, and Pitt Meadows Secondary School and safe pedestrian flow, the proposed upgrades, described above, are recommended to be implemented as the developments are constructed in the study area. In addition, considering the expected future increase in pedestrian activity due to residential development and Elementary school, a crosswalk is recommended across Bonson Road at the Athletic Park entrance. This crosswalk is considered important for pedestrian / bike flow connecting the multiuse pathway across the Bonson Road.

All existing and proposed pedestrian facilities are shown in [Figure 17](#).



SOUTH BONSON TRAFFIC STUDY
FIGURE 17 - RECOMMENDED IMPROVEMENTS

6. Recommended Upgrades and Cost Estimates

All upgrades recommended based on the analysis in previous sections, shown on **Figure 17**, have been costed using high level Wolski Cost Estimating Methodology. **Table 16** summarizes the upgrades with cost estimates. Wolski cost estimate summary is included in **Appendix E**.

Table 16 Summary of Recommended Upgrades with Costs

Location	Upgrade Description	Cost estimate	Comments
Airport Way between Baynes Road and Golden Ears Way	<ul style="list-style-type: none"> Four Lane widening 	\$4,268,505	Widening to be completed by 2021
Airport Way / Harris Road Intersection	<ul style="list-style-type: none"> Option 1 - Conversion from one lane to two lane roundabout 	\$1,318,937	2 approach lanes in all four directions and 1 receiving lane along Harris Road exits
	<ul style="list-style-type: none"> Option 2 - Intersection Signalization 	\$1,614,720	4-lane widening not required by 2021 for signal option. Cost estimate shown for 2031 configuration.
Airport Way / Bonson Road Intersection	<ul style="list-style-type: none"> Option 1 - Conversion from one lane to two lane roundabout 	\$1,154,156	By 2021, 2 approach lanes along Airport Way and a 1 approach lane for NB and SB directions. By 2031, 2 approach lanes in all four directions. Cost estimate shown for 2031 configuration.
	<ul style="list-style-type: none"> Option 2 - Intersection Signalization 	\$1,449,940	4-lane widening not required by 2021 for signal option
Airport Way / Southgate Road Intersection	<ul style="list-style-type: none"> Pedestrian Crossing as the traffic is significantly increased due to future planned developments. 	\$175,000	Installation subject to meeting pedestrian signal warrant
Harris Road / fieldstone Walk Intersection	<ul style="list-style-type: none"> Signalized crosswalk as the traffic is significantly increased due to future planned developments 	\$175,000	Installation subject to meeting pedestrian signal warrant
Bonson Road @ Athletic Park Entrance	<ul style="list-style-type: none"> Marked Pedestrian crosswalk 	\$15,000	
Sidewalks	<ul style="list-style-type: none"> Harris Road – east side between Fraser Way and Airport Way 	\$126,254	
	<ul style="list-style-type: none"> Harris Road – both east and west side between Airport Way and Fieldstone Walk 	\$216,568	
	<ul style="list-style-type: none"> Sutton Avenue - North side between Lasser Road to Bonson Road 	\$126,254	
Bike lanes	<ul style="list-style-type: none"> Bonson Road – between Sutton Avenue to Hammond Road 	\$16,886	On street painted bike lanes using existing pavement structure. No lane widening is assumed. Cost includes paint lines and signing.
	<ul style="list-style-type: none"> Harris Road – between Fraser Way and Airport Way 	\$9,698	
Bus Shelters	<ul style="list-style-type: none"> Two bus shelters on Bonson Road (Figure 17) 	\$80,000	
Total with Option 1		\$7,682,258	
Total with Option 2		\$8,273,825	

7. Closure

The information provided in this report is true and accurate to the best of our knowledge. Please call the undersigned if you have any questions regarding any aspect of this study.

Sincerely,

McELHANNEY CONSULTING SERVICES LTD.

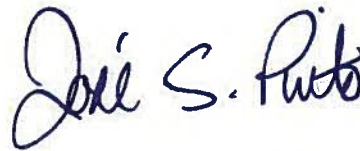
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