

# Appendix 8

---

## Traffic Impact Assessment

**Riverdale Resources**  
**Proposed Coal Mine near Blairmore AB**  
  
**Traffic Impact Assessment**

**April 28, 2015**

# Revision and Version Tracking

---

Report Title: Riverdale Resources Proposed Coal Mine near Blairmore, AB

Traffic Impact Assessment

Submission Date: April 28, 2015

Version #	Filename and Description	Author	Checker	Approver	Date
v01	Riverdale_Resources_Blairmore_Coal_Development_TIA_v01.docx	M. Palomba	J. Hemingway	J. Hemingway	Apr. 22, 2015
v03	Riverdale_Resources_Blairmore_Coal_Development_TIA_v03.docx	M. Palomba	J. Hemingway	J. Withers	Apr. 28, 2015

 This document has been formatted for double side printing.

This document has been prepared for the titled project or named part thereof and should not be relied upon or used for any other project without an independent check being carried out as to its suitability and prior written authorization of Hatch Mott MacDonald being obtained. Hatch Mott MacDonald accepts no responsibility or liability for the consequence of this document being used for a purpose other than the purposes for which it was commissioned. Any person using or relying on the document for such other purpose agrees, and will by such use or reliance be taken to confirm their agreement to indemnify Hatch Mott MacDonald for all loss or damage resulting therefrom. Hatch Mott MacDonald accepts no responsibility or liability for this document to any party other than the person by whom it was commissioned.

To the extent that this report is based on information supplied by other parties, Hatch Mott MacDonald accepts no liability for any loss or damage suffered by the client, whether through contract or tort, stemming from any conclusions based on data supplied by parties other than Hatch Mott MacDonald and used by Hatch Mott MacDonald in preparing this report.

# Table of Contents

1.	Background Information .....	1
1.1	Proposed Development .....	1
1.2	Highway .....	1
1.3	Study Area .....	1
2.	Existing Infrastructure and Conditions .....	3
2.1	Existing Highway Conditions .....	3
2.2	Existing Intersection Conditions .....	3
2.3	Collision History .....	5
2.4	Committed Improvements .....	6
2.5	Existing Traffic Conditions .....	6
3.	Traffic Projections .....	8
3.1	Existing Background Traffic .....	8
3.2	Build Year .....	8
3.2.1	Projected Background Traffic .....	8
3.2.2	Projected Development Traffic .....	11
3.2.3	2021 Horizon Total Peak Hour Traffic Volumes .....	14
3.3	20-Year Horizon .....	14
3.3.1	Projected Background Traffic .....	14
3.3.2	Projected Total Traffic .....	14
4.	Analysis .....	18
4.1	Operational and Capacity Analysis of Intersections .....	18
4.1.1	Existing 2015 Traffic Operations .....	18
4.1.2	2021 Background Traffic Operations .....	19
4.1.3	2021 Future Total Traffic Operations .....	21
4.1.4	2041 Future Total Traffic Operations .....	22
4.1.5	Site Access .....	24
4.2	Illumination Warrant Analysis .....	25
4.3	Conclusions and Recommendations .....	25

Appendices

## 1. Background Information

### 1.1 Proposed Development

Riverdale Resources (Riverdale) is proposing to develop a coal mine in the Crowsnest area in southwestern Alberta. The site is located north of the Highway 3 and the community of Blairmore, as shown on [Figure 1](#). The proposed mine will have an annual production of 4 million tonnes per annum (MTPA) when fully developed. Assuming all approvals are obtained, the mine is to commence operations during the fall of 2018 and reach 100 percent of the 4 MTPA production by 2021. At full production, the mine will employ 400 workers and will operate on two shifts per day, with shift changes at 7 a.m. and 7 p.m. Fifty-two staff and 80 hourly operations employees will be attending the site per shift. Approximately 80 percent of the staff and hourly operations workers will be bused to the mine from communities in the area. Production from the mine is to be shipped by conveyor to a loadout facility at the CP rail line located on the south side of Highway 3 near the West Access to Blairmore.

### 1.2 Highway

The site is located north of Highway 3, between the east and west accesses to the community of Blairmore, AB. It will be accessed by an existing gravel access road located approximately 1 km east of the intersection of Highway 3 and 107<sup>th</sup> Street within Control Section 2 of the highway. This existing access road intersection is located between the 107<sup>th</sup> Street and 129<sup>th</sup> Street intersections with Highway 3. The 129<sup>th</sup> Street intersection is located approximately 700m east of the existing gravel access road and approximately 1000 m west of the east access to Blairmore at 20 Avenue.

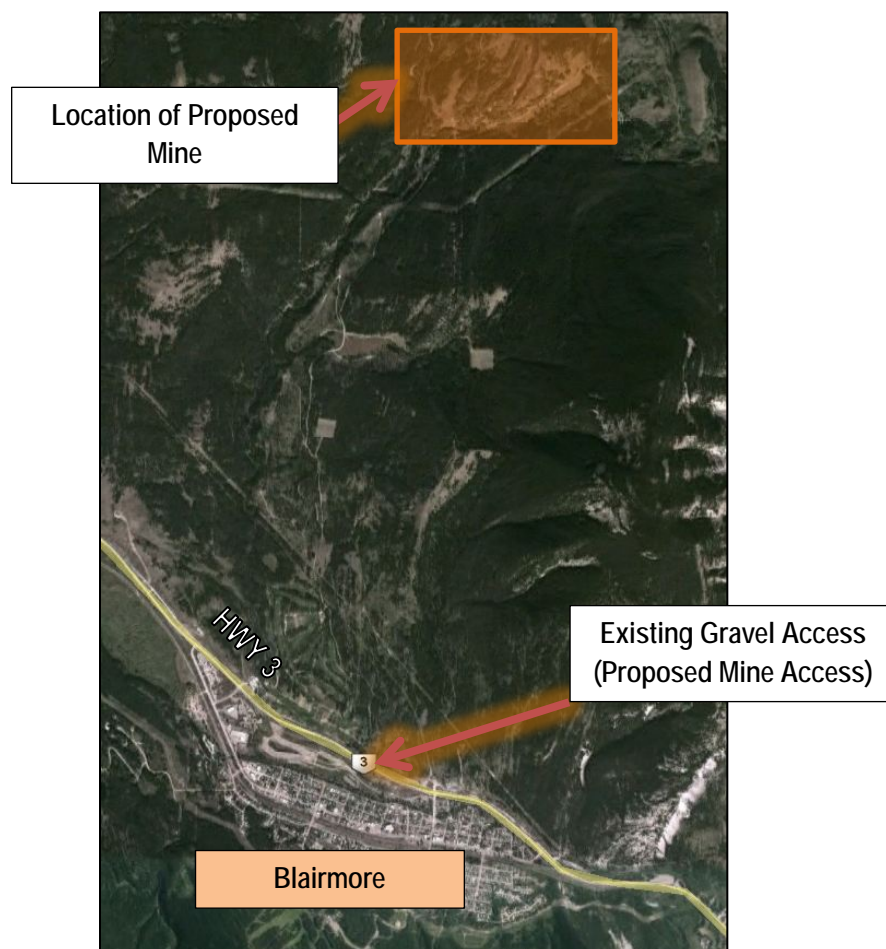
### 1.3 Study Area

The Site and Location Plan showing the location of the proposed mine in relation the main access road and Highway 3 is shown in [Figure 1](#) and [Figure 2](#). For the purposes of this traffic impact assessment, an analysis area that includes the west and east accesses to Blairmore and the section of Highway 3 in the vicinity of the existing gravel access road to the mine are considered.

Figure 1 – Site Location



Figure 2 – Site Plan



## 2. Existing Infrastructure and Conditions

### 2.1 Existing Highway Conditions

In the vicinity of the existing gravel access road, Highway 3 consists of a basic two-lane rural cross section, with travel lane widths of 3.7 metres and 2.5-metre paved shoulders. The centerline marking on the highway at the access road includes a passing zone in the westbound direction and no passing in the eastbound direction. Shoulders are delineated with solid white edge lines at the travelled lanes. The right-of-way width in the vicinity of the access road is approximately 65 metres.

Approaching the intersection from the east, the highway has a horizontal curvature that curves to the right (north) with a radius of approximately 1,360 metres. This horizontal curve ends approximately 180 metres east of the intersection. From this point to approximately 60 metres west of the intersection, the highway alignment is on tangent after which the highway curves to the left (south) with a radius of approximately 1,030 metres. The vertical alignment of the highway at the intersection is flat. There is a high point located approximately 190 metres east of the intersection.

The posted speed on the highway is 80 km/h. This speed is maintained for the section of the highway between the east and west accesses to Blairmore. For the purposes of this traffic impact assessment, a design speed of 100 km/h has been used for the highway.

There are no existing or proposed accesses in the vicinity of the existing gravel access road. The current access road intersection with the highway is not illuminated and the intersection operates with STOP sign control on the access approach to the highway. The traffic control signage is limited to the STOP sign at the highway intersection.

### 2.2 Existing Intersection Conditions

**Figure 3** illustrates the lane configuration and traffic control on the highway and intersecting roads in the study area. **Figure 4** illustrates the access road intersection configuration with the highway. The access approach to the highway is on a slight horizontal curve to the left leading to an intersection angle of close to 90 degrees. The access is on a slight downgrade towards the highway. There are no major developments currently using the access road. The road provides access to generally undeveloped areas north of the highway.

Figure 3 – Existing Lane Configuration and Traffic Control

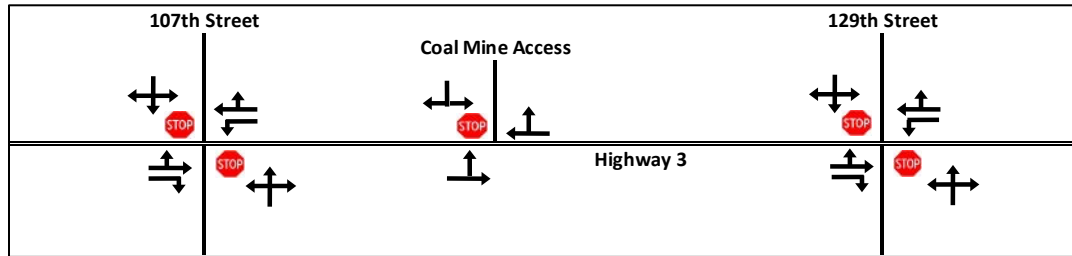


Figure 4 – Existing Mine Access Road Intersection Configuration



The available sight distance at the existing gravel access road was measured using procedures outlined in the *Alberta Transportation Highway Geometric Design Guide* and the *Manual of Uniform Traffic Control Devices of Canada (MUTCD)*, published by the Transportation Association of Canada. Both the departing and approaching sight distance were measured. The departing sight distance measures the sight distance available to the driver wanting to make either a left or right turn from the access road to the highway. For this case, a height of eye of 1.05 metres was used at a point on the access road measured 3 metres from the edge of the closest travelled lane on the highway. Sight distance was measured to an approaching object height of 1.25 metres representing a height slightly below the top of vehicle. The approaching sight distance measures the sight distance available to a driver approaching the intersection to detect an object on the highway at the intersection. For this case, a driver's height of eye of 1.05 metres was used to see an object with a height of 0.3 metres, or roughly the taillight height of a vehicle at the intersection. [Table 1](#) summarizes the departure and approaching sight distance available and the sight distance required at the intersection.

**Table 1 – Sight Distance Availability**

Approaching/Departing	Minimum Required Sight Distance (m)	Available Sight Distance To East (m)	Available Sight Distance To West (m)
Departing – Turning Left or Right from Access	385	386	487
Approaching - To avoid unforeseen obstacle at access	300	362	402

Notes:

1. Sight Distance required for departing movements from access taken from Figure D – 4.2.2.2 of the Alberta Geometric Design Manual based on Single Unit design vehicle and 100 km/h design speed on highway.
2. Sight distance required for approaching movements based on decision sight distance for a 100 km/h highway design speed.

Minimum sight distance requirements are met in all cases at the existing gravel access road intersection with Highway 3.

### 2.3 Collision History

Collision data for the study area was provided by Alberta Infrastructure and Transportation, for the intersections and midblock sections located within the study area for the five-year period from 2008-2012. There were a total of 20 collisions reported in the surrounding area of the proposed mine access excluding the intersections of 107<sup>th</sup> Street and 129<sup>th</sup> Street. All collisions reported are within the midblock sections on the east and west side of the proposed mine access. There were no collisions reported at the existing gravel access roadway. Below are summary tables of the reported collisions; **Table 2** summarizes collisions by severity, and **Table 3** summarizes collisions by impact type:

Fatal Collisions	Non-fatal Injury Collisions	Property Damage (PDO)	Other	Total Collisions
0	1	19	0	20

**Table 2 – Reported Collisions by Severity**

SMV - other	SMV – Animal	Rear End	Other	Total Collisions
2	16	1	1	20

**Table 3 – Reported Collisions by Impact Type**

The majority of collisions that have occurred within the study area are the result of vehicles colliding with animals entering Highway 3. Of the 20 collisions that have occurred, only 1 has resulted in injury, while the remaining have resulted in property damage only. Of the 4 collisions that did not involve an animal, none of them occurred at the intersection of the proposed site access.

## 2.4 Committed Improvements

Alberta Infrastructure and Transportation has indicated that it is planning to install traffic signals at the intersection of Highway 3 and 107 Street during 2015. Beyond this improvement, nothing has been committed or included in the provincial capital budget.

## 2.5 Existing Traffic Conditions

**Table 4** summarizes the traffic volume and vehicle classification data for highway traffic in the section of Highway 3 between the east and west accesses to Blairmore.

**Table 4 – 2013 Daily Traffic Volumes and Percent Commercial Vehicles: Highway 3 East of West Access to Blairmore, AB**

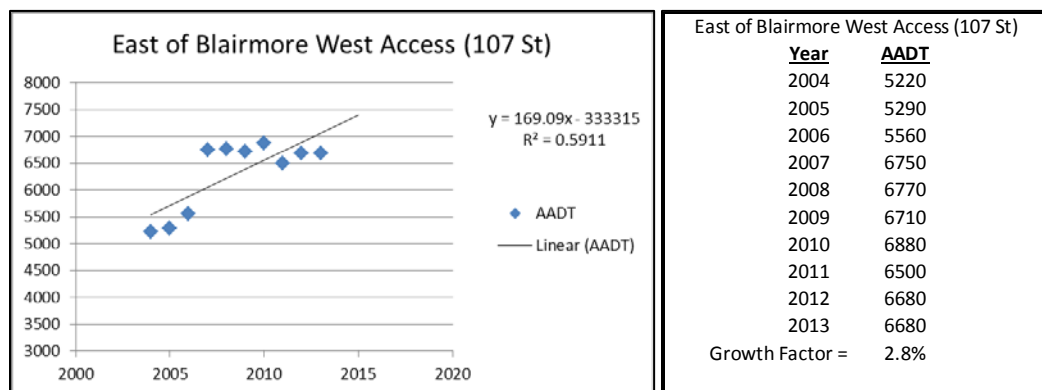
Length (km)	AADT (veh/d)	WAADT (veh/d)	WASDT (veh/d)	% Commercial
4.25	6,680	7,250	8,750	10.5

Notes:

1. AADT – Annual Average Daily Traffic in vehicles per day
2. WAADT – Weekday Annual Average Daily Traffic
3. WASDT – Weekday Average Summer Daily Traffic
4. Percent Commercial includes buses, single unit trucks and tractor trailer unit trucks

Annual Average Daily Traffic (AADT) volumes in 2013 were 6,680 vehicles per day (veh/d). Of these, approximately 10.5 percent were light to heavy trucks. Historically, during the period from 2004 – 2013, AADT volumes on the highway east of the west access to Blairmore have been growing at a simple rate of growth of 2.8 percent, as indicated in **Figure 5**. For this analysis, a 3 percent per annum rate of growth has been used to project traffic volumes to a 2021 horizon. For the longer term, a slightly lower rate of growth of 2.5 percent per annum has been used, which is consistent with the long-term average rate of growth on Alberta highways.

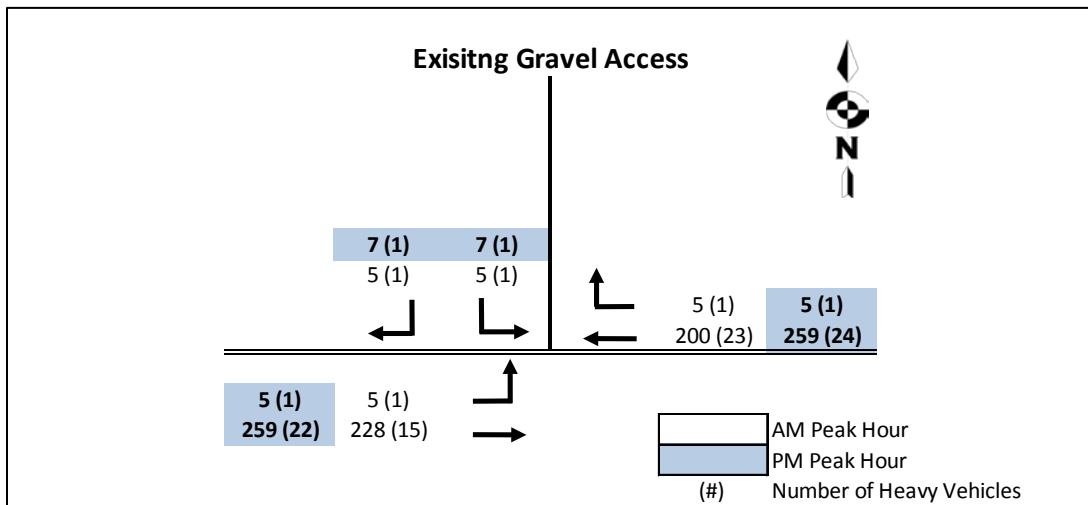
**Figure 5 – Historical Traffic Growth Highway 3 East of the West Access to Blairmore**



To establish intersection turning movements, traffic count data provided by the Alberta Infrastructure and Transportation for the intersections of 107 Street and 20 Avenue with Highway 3 were used. These counts are contained in [Appendix A](#). In addition, a peak period traffic count was conducted at the intersection of the existing gravel access road to the mine site and highway 3. The traffic count at the existing access road during the morning and afternoon peak hours did not capture any traffic using the existing access road. For the purposes of this assessment a minimal amount of traffic has been assumed to be using this roadway in the peak hours. From the count, the morning peak hour extended from 8:00 a.m. to 9:00 a.m. The afternoon peak hour extended from 4:15 p.m. to 5:15 p.m.

[Figure 6](#) summarizes the existing peak hour traffic volumes at the mine access intersection. The available counts from Alberta Transportation were expanded from the 2014 count year to a 2015 base year for this analysis using the historical traffic growth rate of 3 percent per annum (simple). The AADT for the existing access road is very low.

**Figure 6 – 2015 Weekday Peak Hour Traffic Volumes for Highway 3 at Existing Gravel Access Road**



### 3. Traffic Projections

#### 3.1 Existing Background Traffic

**Figure 7** summarizes the existing background weekday peak hour traffic volumes on roadways in the study area. These volumes were developed from the available 2014 intersection turning movement counts at the west and east accesses to Blairmore. These volumes were expanded by a one-year growth factor of 3 percent. Volumes between the intersections were then balanced, incorporating the assumed turning movements from the existing gravel access and turning movements at 129 Street that are assumed to be approximately equal to those at 107 Street. No other development is proposed in the area that will affect the background traffic volumes, and these volumes have been used as a basis to forecast traffic into the future. The available traffic volumes from Alberta Transportation and the intersection count collected during this study were balanced to produce the volumes shown in **Figure 7**.

#### 3.2 Build Year

##### 3.2.1 Projected Background Traffic

The proposed mine is to be in full production by 2021. Therefore, a build year for analysis purposes of 2021 has been used for this analysis. The 2015 base year peak hour traffic volumes were expanded to a horizon year of 2021 using the historical traffic growth rate of 3 percent per annum. **Figure 8** summarizes the resulting 2021 peak hour background traffic volumes.

In developing the 2021 background peak hour traffic volumes on the highway, the existing peak hour traffic volumes were adjusted to reflect the peak hour of traffic generated by the proposed mine. The existing peak hour background traffic volumes represent the peak hour of the highway traffic which is based on the 100<sup>th</sup> highest hour for the a. m. peak and the p. m. peak. However the peak hour of the site occurs at the shift changes at 7:00 a.m. and 7:00 p.m. Using historical raw traffic count data from the count station at the west access to Blairmore, an morning and afternoon factor has been determined to convert the peak hour highway volumes to the volumes that would be occurring at the peak hour of site generated traffic. **Figure 9** illustrates hourly variation of Highway traffic volumes and shows the differences between the volumes at the morning and afternoon peak hours of highway traffic and the highway volumes occurring at the times of the mine shift changes.

The estimated AADT for the highway in 2021 is 8,460 veh/d. The AADT for background traffic using the existing gravel access road remains very low.

Figure 7 - Existing Traffic Volumes

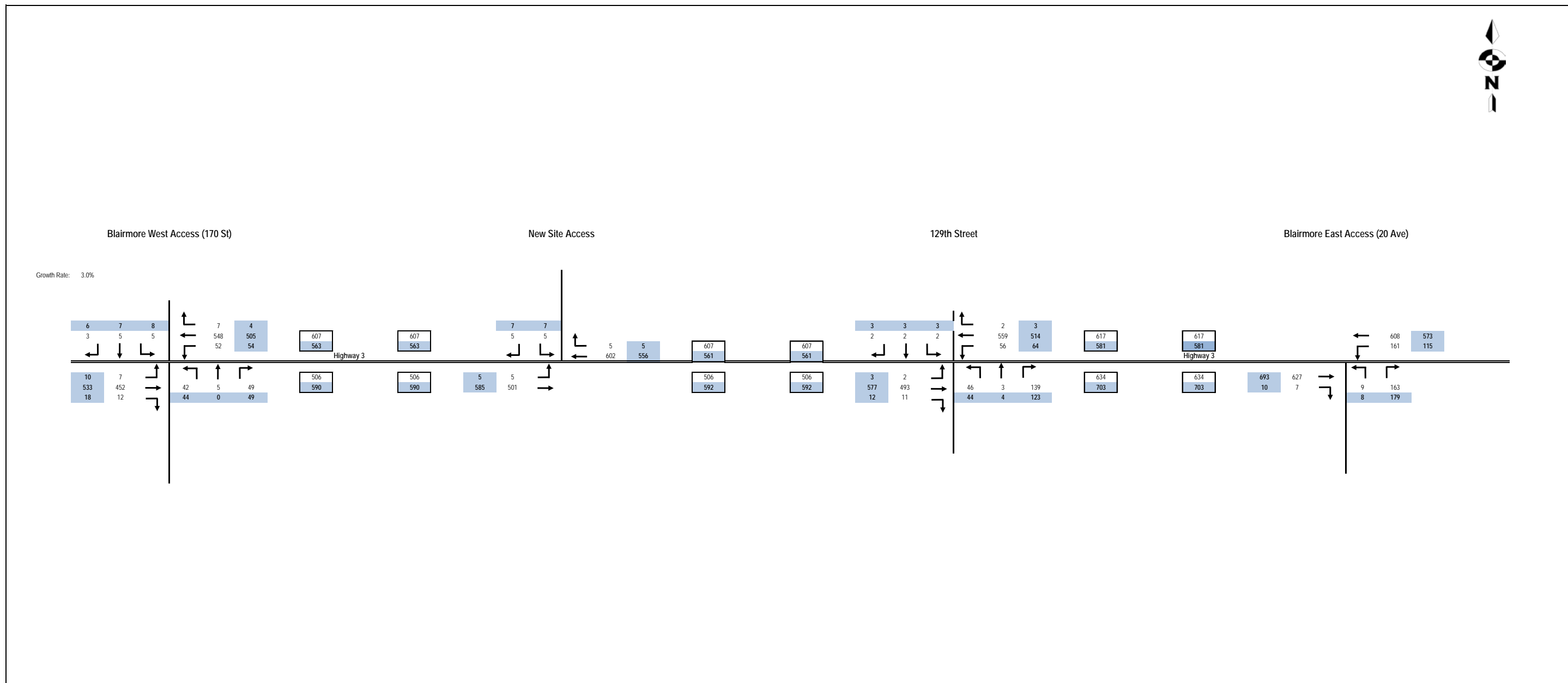


Figure 7 - 2015 Existing Balanced

AM Peak Hour  
 PM Peak Hour

Figure 8 – 2021 Background Traffic Volumes

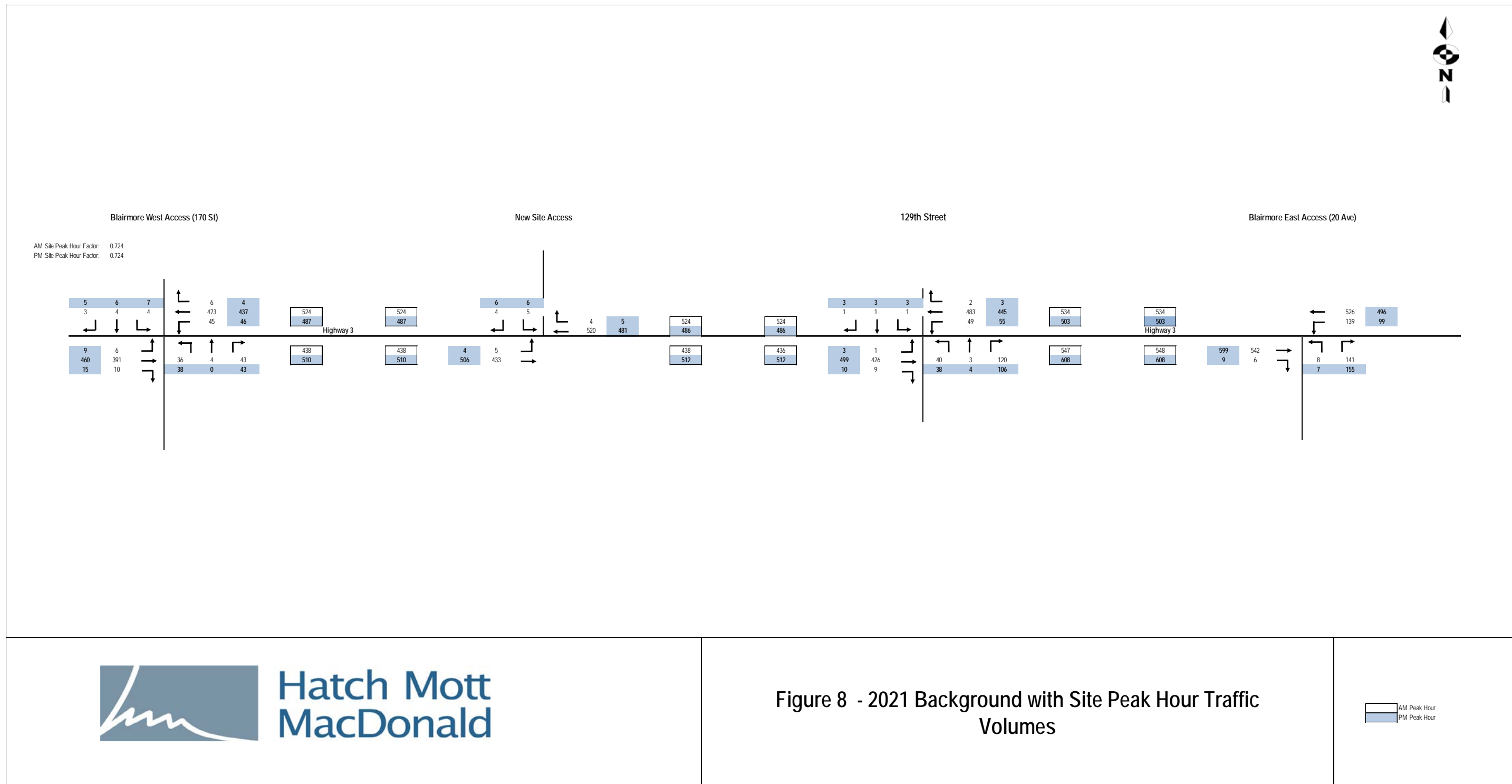
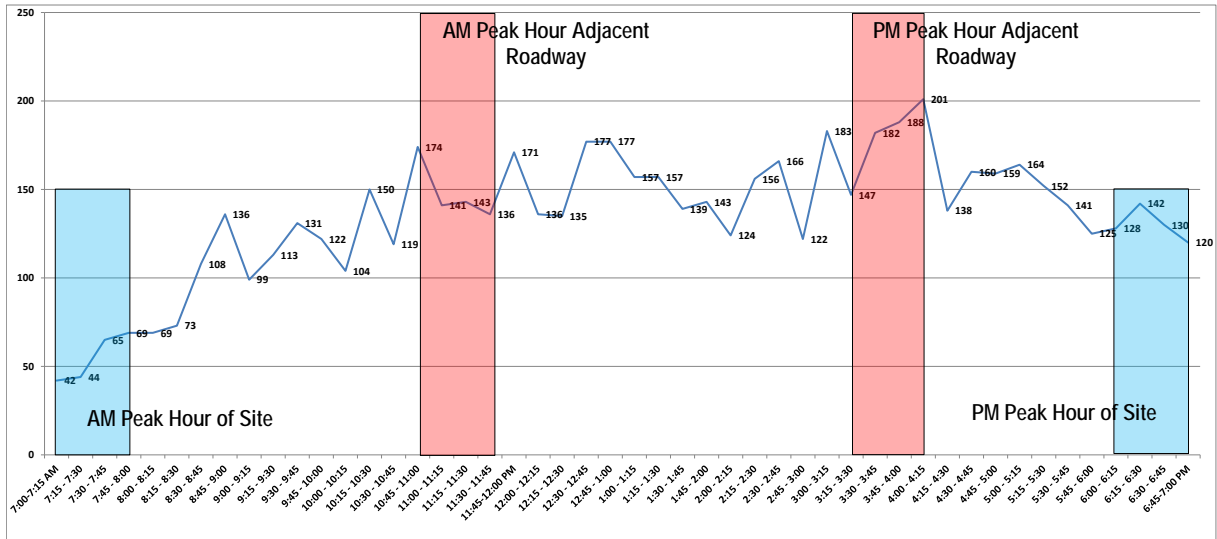


Figure 8 - 2021 Background with Site Peak Hour Traffic Volumes

AM Peak Hour  
 PM Peak Hour

Figure 9 – Peak Hour Period Comparison of Adjacent Roadway and Site



The peak periods for both roadways are occurring at different times throughout the day, with the peak periods of the site occurring at times where the traffic volumes along Highway 3 are much lower than at the peak periods of Highway 3. Using this information, peak hour factors were calculated to apply to the existing background traffic volumes, to produce traffic conditions corresponding to the peak periods of the proposed site. The resulting peak hour factors are shown Figure 10:

Figure 10 – Calculated Peak Hour Factors for Proposed Site Peak Periods

Peak Hour Factors for Propose Site				
	AM Peak Hour		PM Peak Hour	
Adjacent Peak Hour Volume	594	veh/hr	718	veh/hr
Site Peak Hour Volume	220	veh/hr	520	veh/hr
Peak Hour Factor:	0.370		0.724	

From the results, the PM peak hour volumes of the site represent approximately 72 percent of the peak hour of the adjacent highway, and the AM peak is 37 percent of the adjacent highway volumes. Since the morning peak hour factor is significantly lower than the afternoon factor, the afternoon factor of 72 percent was applied to both the AM and PM peak hour volumes to determine Future Background traffic conditions shown in Figure 8.

### 3.2.2 Projected Development Traffic

No intermediate staging years have been assumed for this analysis. The mine is to begin operations in 2018 when it will initially be producing 1 MTPA. From this opening day till 2021 it will be ramping up production to the fully operational level of 4 MTPA by 2021.

Traffic generated by the proposed mine that could potentially affect the traffic operations of Highway 3 and related intersections will only include contributions from the staff and hourly worker movements during shift change periods. As noted above, the mine will have a complement of 79 staff and 321 hourly personnel, for a total employee complement of 400 persons. The mine will be operating on two 12-hour shifts, with shifts starting at 7 a.m. and 7 p.m. The total employees per shift include 52 staff and 80 operational personnel. Approximately 80 percent of employees will be bused from communities east of the mine (60 percent from Blairmore, Frank, Bellevue, Hillcrest and areas east), and west of the mine (40 percent from Coleman and areas west). The remaining 20 percent of employees will use personal transportation to get to/from the mine. It has been assumed here that approximately 10 percent of employees will carpool with others and the remaining 10 percent will use their own vehicles to travel to/from the mine. [Appendix B](#) includes a summary of the daily and peak hourly traffic generation by the mine employees that was developed from first principles. [Table 5](#) summarizes the inbound and outbound peak hour traffic generation by mine employees during the morning (all inbound to mine), afternoon (shift change with one shift exiting mine and one shift entering mine), and during the off-peak hours. The shift times are 7 a.m. and 7 p.m. and for the purposes of this analysis, the highway traffic volumes occurring at these times have been used to assess intersection operations. Similar analysis of intersection operations at the peak hours of highway traffic volumes were not completed as the site-generated traffic at these times is very low, approximately 4 vehicles inbound and 4 vehicles outbound from the site.

**Table 5 – Site Peak Hour Traffic Generation**

	AM Peak Hour	PM Peak Hour	Off Peak Hour
In	32 (3)	22 (3)	1 (1)
Out	22 (3)	22 (3)	1 (1)
<b>Total</b>	<b>54 (6)</b>	<b>44 (6)</b>	<b>2 (2)</b>

*Note: Volumes in parentheses indicate the number of heavy vehicles (buses)*

Traffic generated by the mine has been assigned to the surrounding roads on the basis of the directional distribution noted above, with 60 percent travelling to/from areas to the east and 40 percent travelling to/from areas to the west. [Figure 11](#) summarizes the peak hour traffic volumes generated by the proposed mine.

Figure 11 – 2021 Full Build Out Site Traffic Volumes

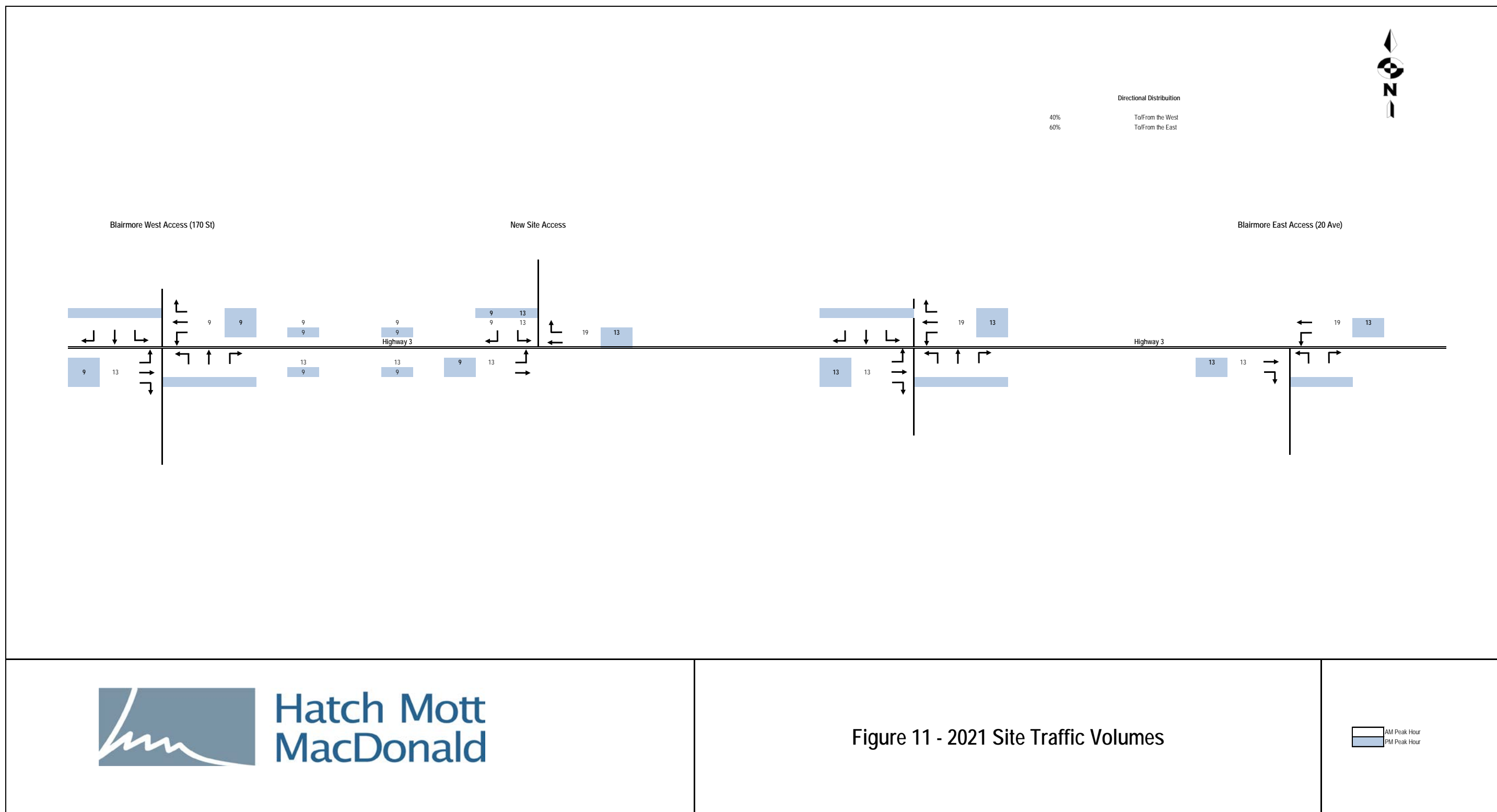
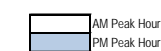


Figure 11 - 2021 Site Traffic Volumes



### 3.2.3 2021 Horizon Total Peak Hour Traffic Volumes

The projected 2021 peak hour background traffic volumes were added to the projected 2021 full production mine peak hour traffic volumes to obtain the projected 2021 peak hour total traffic volumes shown on [Figure 12](#). The volumes produced for these scenarios refer to the peak hours of the mine operation. The estimated AADT for the existing gravel access road in 2021 with the mine in full production is approximately 130 – 140 veh/d.

## 3.3 20-Year Horizon

### 3.3.1 Projected Background Traffic

The 2021 background mine peak hour traffic volumes were expanded to a horizon year of 2041 using a long-term traffic growth rate of 2.5 percent per annum. This rate of growth is slightly lower than the 2.8 percent per annum estimated from historical traffic volumes during the period of 2004 - 2013, but is representative of a long-term sustained growth rate that generally matches the provincial average highway traffic growth. [Figure 13](#) summarizes the resulting 2041 background peak hour traffic volumes that were derived using this rate of background traffic growth. The estimated AADT for background traffic using the highway in 2041 is 13,800 veh/d. The AADT for background traffic using the existing access road is estimated to remain very low for the 2041 horizon, assuming no significant further development along this road.

### 3.3.2 Projected Total Traffic

The projected 2041 mine peak hour background traffic volumes were added to the projected full production mine peak hour traffic volumes to obtain the projected 2041 total mine peak hour traffic volumes shown on [Figure 14](#). The estimated AADT for the existing gravel access road in 2041, with the mine in full production is estimated to remain at approximately 130 – 140 veh/d.

Figure 12 – 2021 Total (With Site) Traffic Volumes

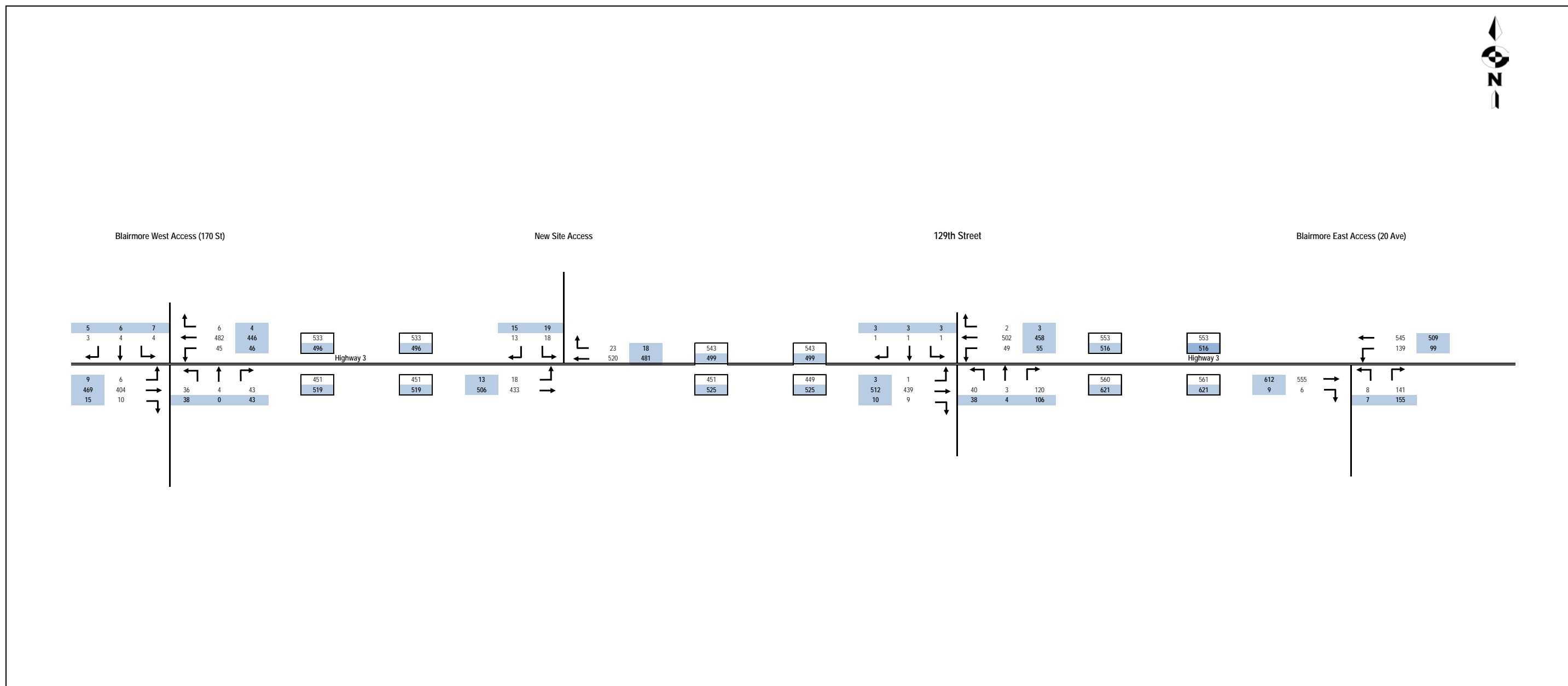


Figure 12 - 2021 Future Total With Site Peak Hour Traffic Volumes

AM Peak Hour  
 PM Peak Hour

Figure 13 – 2041 Background Traffic Volumes

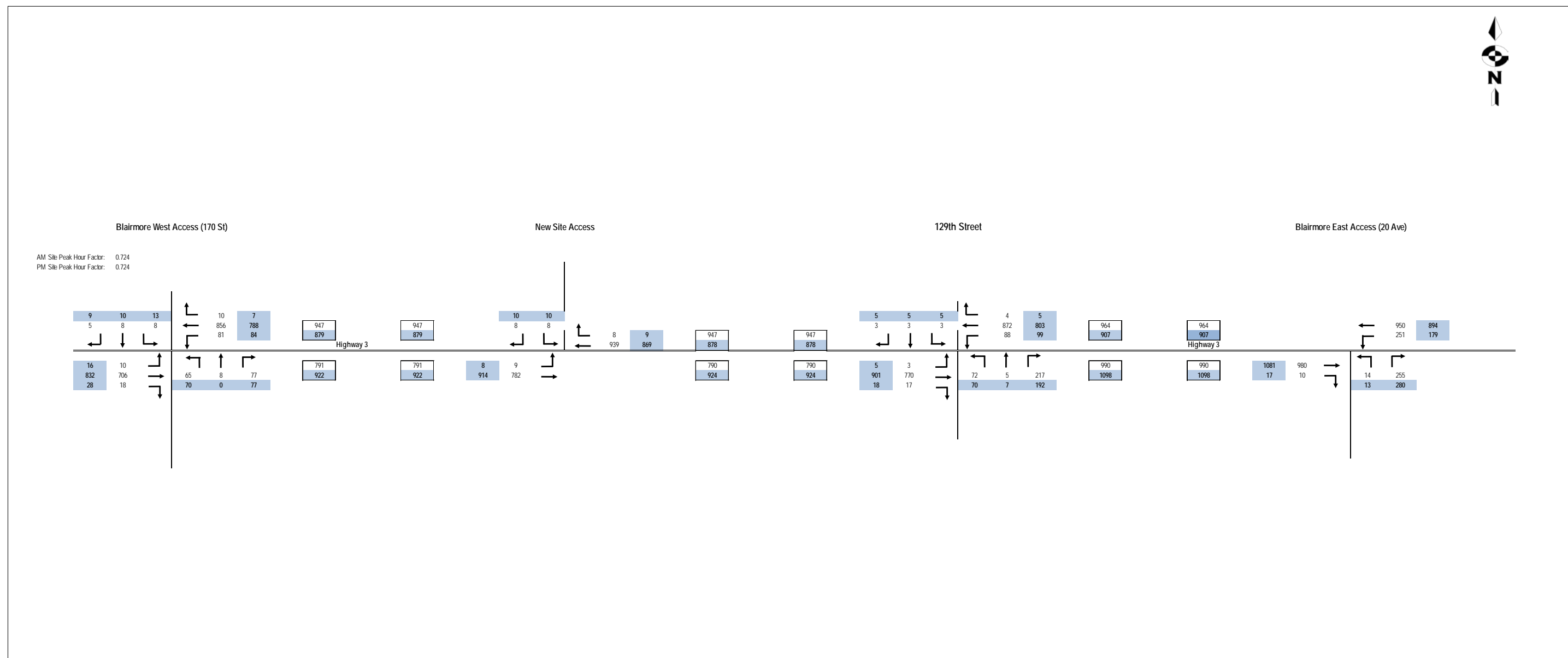


Figure 13 - 2041 Background with Site Peak Hour Traffic Volumes

AM Peak Hour  
 PM Peak Hour

Figure 14 – 2041 Future Total Traffic Volumes

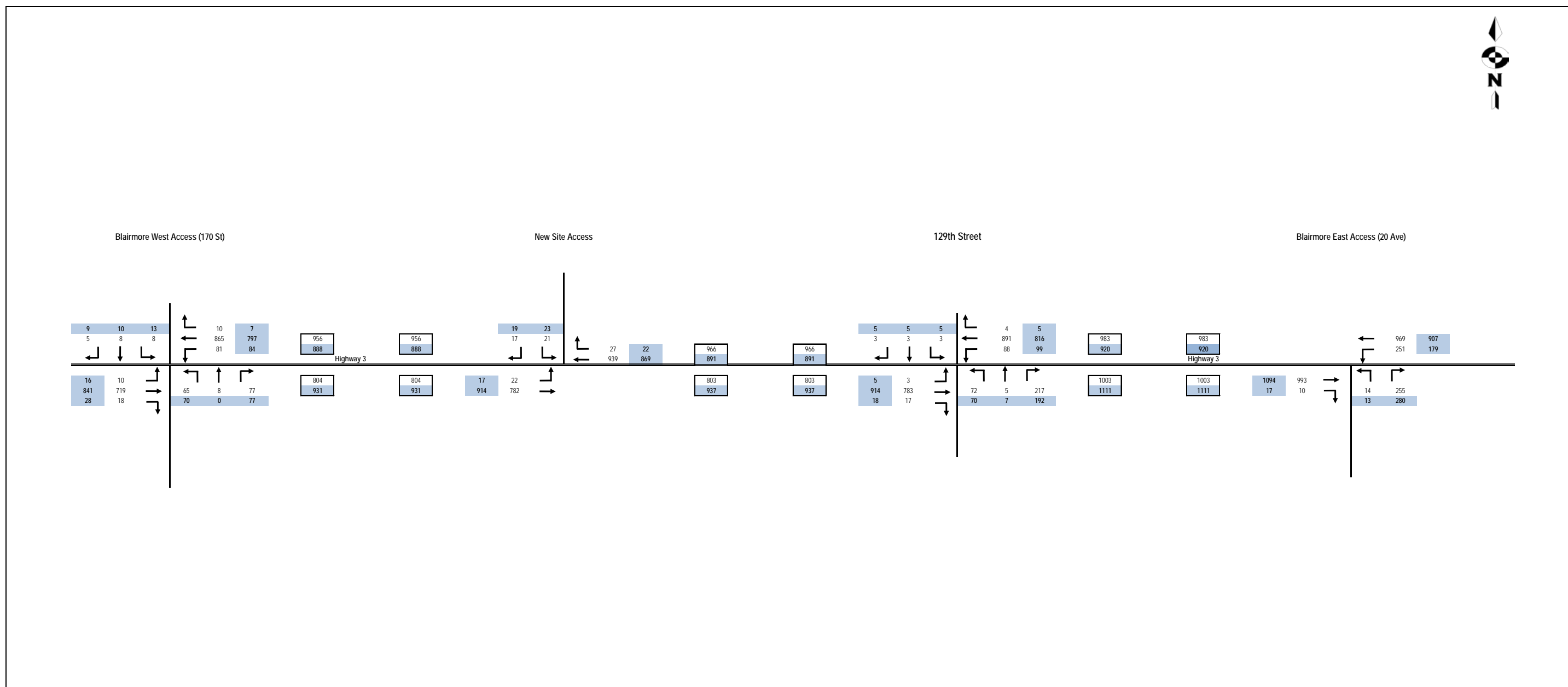


Figure 14 - 2021 Future Total With Site Peak Hour Traffic Volumes

AM Peak Hour  
 PM Peak Hour

## 4. Analysis

### 4.1 Operational and Capacity Analysis of Intersections

Operational analysis was conducted for three intersections within the study area, Highway 3 and 107<sup>th</sup> Street, Highway 3 and Gravel Access to the proposed site, and Highway 3 and 129<sup>th</sup> Street.

#### 4.1.1 Existing 2015 Traffic Operations

Using the expected annual traffic growth rate noted above, the existing 2014 turning movement counts have been modified to represent 2015 traffic volumes. The traffic volumes were then balanced between each of the intersections within the study area. The existing network was modelled and simulated using Synchro 8/SimTraffic, and utilizing the HCM 2000 methodology to evaluate and analyze traffic operations. **Table 6** displays the results for the AM and PM highway peak hours of the analysis:

**Table 6 – Existing (2015) Peak Hour Intersection Traffic Operations**

2015 Existing									
Intersection	Movement	AM Peak Hour				PM Peak Hour			
		LOS	Delay(s)	V/C	95 <sup>th</sup> Queue (m)	LOS	Delay(s)	V/C	95 <sup>th</sup> Queue (m)
Highway 3 and 107 Street (West Access)	<b>Overall</b>	<b>A</b>	<b>3</b>	<b>0.71</b>	<b>-</b>	<b>A</b>	<b>3.6</b>	<b>0.76</b>	<b>-</b>
	EBLT	A	0.2	0.01	0.2	A	0.3	0.01	0.2
	EBR	-	-	-	-	-	0.0	0.01	0.0
	WBLT	A	1.4	0.05	1.3	A	1.6	0.06	1.5
	WBR	-	-	-	-	-	0.0	0.00	0.0
	NBLT	D	26.6	0.35	11.4	-	-	-	-
	NBR	-	-	-	-	D	29.7	0.37	12.5
	SBLTR	D	27.6	0.08	2.0	D	29.7	0.14	3.5
Highway 3 and New Coal Mine Access Road	<b>Overall</b>	<b>A</b>	<b>0.2</b>	<b>0.42</b>	<b>-</b>	<b>A</b>	<b>0.3</b>	<b>0.45</b>	<b>-</b>
	EBLT	A	0.2	0.01	0.2	A	0.2	0.0	0.1
	WBTR	-	-	-	-	-	0.0	0.36	0.0
	SBLR	C	18.2	0.03	0.6	C	18.6	0.04	1.0
Highway 3 and 129th Street	<b>Overall</b>	<b>A</b>	<b>3.8</b>	<b>0.60</b>	<b>-</b>	<b>A</b>	<b>4</b>	<b>0.66</b>	<b>-</b>
	EBTL	A	0.1	0.00	0.1	A	0.1	0.00	0.1
	EBR	-	0.0	0.01	0.0	-	0.0	0.01	0.0
	WBL	A	8.7	0.06	1.4	A	9.1	0.07	1.8
	WBTR	-	0.0	0.36	0.0	-	0.0	0.33	0.0
	NBTL	C	22.7	0.39	13.9	D	26.5	0.43	16.0
	NBR	-	-	-	-	-	-	-	-
	SBLTR	D	30.1	0.04	1.0	D	33.2	0.07	1.7

Currently the existing traffic conditions are acceptable as all three intersections operate at a LOS (Level of Service) of A, representing little or no delay. Traffic that is entering Highway 3 from the south (exiting the Town of Blairmore) at the 107<sup>th</sup> and 129<sup>th</sup> Street intersections experience some delay, however existing highway traffic volumes allow sufficient gaps for these movements to operate efficiently.

#### 4.1.2 2021 Background Traffic Operations

The expected completion of the full build out of the proposed mine is the year 2021, therefore using the 3% annual growth rate, the existing traffic volumes, adjusted to the mine peak hour, were grown to represent the background traffic conditions at the time of build out. These volumes were then incorporated back into the traffic model of the existing network in the study area. A traffic signal has been approved for construction at the intersection of 107<sup>th</sup> Street and Highway 3, and therefore the 2021 background analysis includes an assessment of conditions with and without the signal installed. With the installation of the traffic signal, the intersection of 107<sup>th</sup> Street and Highway 3 will require the following improvements:

##### 107<sup>th</sup> Street and Highway 3

1. Addition of a semi-actuated signal with 90s cycle length. (Splits optimized)
2. Addition of NB (107<sup>th</sup> Street) left turn lane with 60m storage
3. Existing NB (107<sup>th</sup> Street) lane converted to a shared through/right lane
4. Addition of a EB (Highway 3) left turning lane with minimal storage
5. Addition of a WB (Highway 3) left turning lane with minimal storage
6. WB (Highway 3) right turning lane converted into shared through/right lane

Along with the changes made at 107<sup>th</sup> Street, 129<sup>th</sup> Street will require the following improvements to accommodate the future growth in background traffic:

##### 129<sup>th</sup> Street and Highway 3

1. Widen NB (129 Street) approach to 2 lanes to the existing bridge to allow for a NB left lane with 30 metres of storage and a NB through/right turning lane.

The results of the future background conditions are displayed in [Table 7](#):

Table 7 – 2021 Background Intersection Traffic Operations

2021 Background									
Intersection	Movement	AM Peak Hour				PM Peak Hour			
		LOS	Delay(s)	V/C	95 <sup>th</sup> Queue (m)	LOS	Delay(s)	V/C	95 <sup>th</sup> Queue (m)
Highway 3 and 107 Street (West Access)	<b>Overall</b>	<b>A</b>	<b>2.3</b>	<b>0.63</b>	<b>-</b>	<b>A</b>	<b>2.4</b>	<b>0.67</b>	<b>-</b>
	EBLT	A	0.2	0.01	0.1	A	0.2	0.01	0.2
	EBR	-	0.0	0.01	0.0	-	0.0	0.01	0.0
	WBLT	A	1.1	0.04	0.9	A	1.2	0.04	1.0
	WBR	-	0.0	0.00	0.0	-	0.0	0.00	0.0
	NBLT	C	17.5	0.18	4.9	C	18.7	0.19	5.2
	NBR	-	-	-	-	-	-	-	-
SBLTR	C	19.2	0.04	1.0	C	20.5	0.07	1.7	
Highway 3 and 107 Street (West Access) with traffic signal	<b>Overall</b>	<b>A</b>	<b>6.3</b>	<b>0.32</b>	<b>-</b>	<b>A</b>	<b>6.4</b>	<b>0.31</b>	<b>-</b>
	EBL	A	2.0	0.01	1.1	A	2.0	0.01	1.4
	EBT	A	2.9	0.26	26.3	A	3.2	0.31	32.5
	EBR	A	2.0	0.01	0.2	A	2.0	0.01	0.5
	WBL	A	2.2	0.06	4.1	A	2.3	0.06	4.2
	WBTR	A	3.2	0.32	33.5	A	3.1	0.30	30.7
	NBL	D	40.7	0.34	13.6	D	40.7	0.36	14.2
NBTR	D	38.2	0.06	9.7	D	37.7	0.03	0.0	
SBLTR	D	38.3	0.07	5.6	D	38.3	0.11	7.7	
Highway 3 and New Coal Mine Access Road	<b>Overall</b>	<b>A</b>	<b>0.2</b>	<b>0.38</b>	<b>-</b>	<b>A</b>	<b>0.2</b>	<b>0.37</b>	<b>-</b>
	EBL	A	8.5	0.00	0.1	A	8.5	0.00	0.1
	EBT	-	0.0	0.25	0.0	-	0.0	0.30	0.0
	WBTR	-	0.0	0.31	0.0	-	0.0	0.29	0.0
SBLR	C	15.3	0.02	0.4	B	15.0	0.02	0.5	
Highway 3 and 129 <sup>th</sup> Street	<b>Overall</b>	<b>A</b>	<b>2.7</b>	<b>0.53</b>	<b>-</b>	<b>A</b>	<b>5.5</b>	<b>0.77</b>	<b>-</b>
	EBTL	A	0.0	0.00	0.0	A	0.1	0.00	0.1
	EBR	-	0.0	0.01	0.0	-	0.0	0.01	0.0
	WBL	A	8.3	0.04	1.0	A	8.6	0.05	1.3
	WBTR	-	0.0	0.29	0.0	-	0.0	0.26	0.0
	NBTL	C	15.8	0.20	5.8	C	17.4	0.22	6.3
NBR	-	-	-	-	-	-	-	-	
SBLTR	C	20.4	0.01	0.3	C	21.8	0.04	1.0	

All three intersections within the study area remain at acceptable LOS (Level of Service) of B or better in the year 2021 under background traffic volumes. However, movements entering Highway 3 from the intersections of 107<sup>th</sup> Street and 129<sup>th</sup> street experience high delays and Level of Service (LOS) E operation in both the AM peak hour and PM peak hours. This is due to the increase in volume along Highway 3, as there are fewer gaps in traffic to allow left turning vehicle movements time to turn onto Highway 3. This has created higher delay times for both approaches and caused additional queuing.

With the addition of a traffic signal at the intersection of 107<sup>th</sup> Street and Highway 3, traffic operations are improved. The signal will provide sufficient time for traffic entering from the north and south approaches and reduce the overall delay. The increase in traffic volume has caused a decrease in the traffic operations at the intersection of 129<sup>th</sup> Street and Highway 3. In both the AM and PM peak hours, the north and south approach movements will operate near capacity.

4.1.3 2021 Future Total Traffic Operations

The traffic analysis completed for the 2021 “full build out” scenario was completed using the total of the site generated traffic and the existing 2021 background traffic volumes occurring during the peak hour of mine operation. Table 8 shows the operations results of 2021 Future Total Traffic Conditions with no further improvement made to the 2021 background road network.

Table 8 – 2021 Future Total Intersection Traffic Volume Operations

2021 Future Total - with Site Peak Hour Volumes									
Intersection	Movement	AM Peak Hour				PM Peak Hour			
		LOS	Delay(s)	V/C	95 <sup>th</sup> Queue (m)	LOS	Delay(s)	V/C	95 <sup>th</sup> Queue (m)
Highway 3 and 107 Street (West Access)	<i>Overall</i>	A	6.6	0.38	-	A	6.6	0.36	-
	EBL	A	2.0	0.01	1.1	A	2.1	0.01	1.4
	EBT	A	3.2	0.30	29.3	A	3.5	0.36	35.9
	EBR	A	2.0	0.01	0.2	A	2.0	0.01	0.5
	WBL	A	2.2	0.06	4.2	A	2.3	0.07	4.4
	WBTR	A	3.7	0.38	38.5	A	3.4	0.34	33.6
	NBL	D	40.9	0.35	13.6	D	40.7	0.36	14.2
	NBTR	D	38.2	0.06	9.6	D	37.7	0.03	0.0
Highway 3 and New Coal Mine Access Road	<i>Overall</i>	A	0.6	0.39	-	A	0.6	0.37	-
	EBL	A	8.6	0.02	0.40	A	8.5	0.01	0.3
	EBT	-	0.0	0.25	0.0	-	0.0	0.30	0.0
	WBTR	-	0.0	0.32	0.0	-	0.0	0.29	0.0
	SBLR	C	16.5	0.07	1.7	C	16.2	0.07	1.8
Highway 3 and 129th Street	<i>Overall</i>	A	2.7	0.53	-	A	2.8	0.58	-
	EBTL	A	0.0	0.00	0.0	A	0.1	0.00	0.1
	EBR	-	0.0	0.01	0.0	-	0.0	0.01	0.0
	WBL	A	8.4	0.04	1.0	A	8.6	0.05	1.3
	WBTR	-	0.0	0.30	0.0	-	0.0	0.27	0.0
	NBTL	C	16.3	0.21	6.1	C	17.8	0.23	6.7
	NBR	-	-	-	-	-	-	-	-
SBLTR	C	21.1	0.01	0.3	C	22.5	0.04	1.0	

The results show no significant changes in operation at any of the intersections analyzed, as all intersections operate at a Level of Service (LOS) of “A” overall and do not exceed capacity limitations. From this analysis, it was concluded that no further improvements are required at the study area intersections to accommodate the added site-generated traffic.

It should be noted that although the NB and SB approaches at the 129<sup>th</sup> Street intersection are experiencing minor delays. The southbound volumes are minimal and the approach does not show capacity problems. The NB approach has a high right turning volume and with a separation of the left and through/right turn lanes the approach will operate acceptably. This however is not reflected in the results as the HCM 2000 methodology groups the NB lanes together and because the left turning movement experiences delays and queues, it reports a lower combined level of operation.

4.1.4 2041 Future Total Traffic Operations

An analysis of the study area intersection operation for a 20-year horizon was undertaken in accordance with the requirements of the Alberta Infrastructure and Transportation Traffic Impact Assessment guidelines. For this analysis the traffic volumes were expanded using a growth rate of 2.5 percent per annum for the period from 2021 to 2041. The volumes analyzed are representative of the peak hour traffic volumes occurring on Highway 3 during the peak hour of mine operation. These volumes were then incorporated into the Synchro model, with the results presented in Table 9.

Table 9 – 2041 Background Intersection Traffic Volume Operations

2041 Background									
Intersection	Movement	AM Peak Hour				PM Peak Hour			
		LOS	Delay(s)	V/C	95 <sup>th</sup> Queue (m)	LOS	Delay(s)	V/C	95 <sup>th</sup> Queue (m)
Highway 3 and 107 Street (West Access)	<b>Overall</b>	<b>A</b>	<b>9.9</b>	<b>0.68</b>	<b>-</b>	<b>A</b>	<b>8.6</b>	<b>0.57</b>	<b>-</b>
	EBL	A	2.5	0.02	1.8	A	2.6	0.04	2.4
	EBT	A	5.8	0.55	78.2	A	6.0	0.58	93.9
	EBR	A	2.4	0.01	0.9	A	2.5	0.02	1.7
	WBL	A	3.5	0.17	8.9	A	3.9	0.20	9.8
	WBTR	A	8.5	0.70	128.5	A	5.7	0.55	86.2
	NBL	D	40.2	0.51	21.1	D	40.3	0.52	22.2
	NBTR	D	35.9	0.11	13.0	D	35.4	0.05	0.0
SBLTR	D	36.0	0.11	8.4	D	36.1	0.16	10.9	
Highway 3 and New Coal Mine Access Road	<b>Overall</b>	<b>A</b>	<b>0.2</b>	<b>0.69</b>	<b>-</b>	<b>A</b>	<b>0.4</b>	<b>0.58</b>	<b>-</b>
	EBL	B	10.1	0.01	0.3	A	9.9	0.01	0.2
	EBT	-	0.0	0.46	0.0	-	0	0.54	0.0
	WBTR	-	0.0	0.56	0.0	-	0	0.52	0.0
	SBLR	C	18.7	0.04	1.1	D	33.9	0.12	2.9
Highway 3 and 129 <sup>th</sup> Street	<b>Overall</b>	<b>C</b>	<b>18.8</b>	<b>0.90</b>	<b>-</b>	<b>D</b>	<b>25.3</b>	<b>0.99</b>	<b>-</b>
	EBTL	A	0.1	0.00	0.1	A	0.2	0.01	0.1
	EBR	-	0.0	0.01	0.0	-	0.0	0.01	0.0
	WBL	A	9.8	0.11	2.7	B	10.6	0.13	3.5
	WBTR	-	0.0	0.52	0.0	-	0.0	0.48	0.0
	NBTL	F	125.2	1.46	134.7	F	184.6	1.77	150.3
	NBR	-	-	-	-	-	-	-	-
SBLTR	F	107.8	0.2	5.1	F	170.3	0.43	10.90	

The increase in traffic volume has decreased the overall operations of the intersections within the study area. The intersection of 129<sup>th</sup> Street and Highway 3 will experience the majority of the effects, seeing increases in delay times, capacity and queuing. These increases cause the intersection LOS (Level of Service) to fall to an unacceptable level. The increase in through traffic volumes along Highway 3 restricts the available gaps in traffic to allow the NB and SB movements sufficient time to turn onto Highway 3. This has caused greater queuing, especially on the NB approach as left turning movements have very little time to enter the highway and this additional delay and queuing restricts right turning vehicles in reaching the intersection.

The existing gravel access road intersection with Highway 3 is projected to be operating at LOS D even though the traffic using this access is small. This is a result of the heavy volumes on the highway that are restricted to using one through lane in each direction. Signalization of the 129<sup>th</sup> Street and Highway 3 intersection will be necessary in this time frame to accommodate the projected traffic volumes. Synchro

worksheets of the analysis of operations resulting from the 2041 background traffic volumes during the peak hour of mine operation is provided in Appendix C.

**Table 10** presents the analysis results for the 2041 Future Total scenario with the addition of site-generated traffic. The 2041 Future Total scenario utilized the same approach as the 2021 Future Total scenarios as the analysis was completed using traffic volumes for the peak hour of the site and not the peak hour of the highway.

**Table 10 – 2041 Intersection Operations under Future Total Traffic Volumes**

2041 Future Total - with Site Peak Hour Volumes									
Intersection	Movement	AM Peak Hour				PM Peak Hour			
		LOS	Delay(s)	V/C	95 <sup>th</sup> Queue (m)	LOS	Delay(s)	V/C	95 <sup>th</sup> Queue (m)
Highway 3 and 107 Street (West Access)	<i>Overall</i>	<i>A</i>	<i>10.0</i>	<i>0.69</i>	<i>-</i>	<i>A</i>	<i>9.9</i>	<i>0.64</i>	<i>-</i>
	EBL	A	2.6	0.03	1.8	A	2.7	0.04	2.5
	EBT	A	5.9	0.56	80.5	A	7.7	0.66	115.3
	EBR	A	2.4	0.01	0.9	A	2.5	0.02	1.7
	WBL	A	3.6	0.17	8.9	A	4.4	0.23	10.5
	WBTR	A	8.7	0.71	132.2	A	7.0	0.63	102.8
	NBL	D	40.2	0.51	21.1	D	40.5	0.52	22.3
	NBTR	D	35.9	0.11	13.0	D	35.3	0.05	0.0
Highway 3 and New Coal Mine Access Road	<i>Overall</i>	<i>A</i>	<i>1.0</i>	<i>0.61</i>	<i>-</i>	<i>A</i>	<i>1.1</i>	<i>0.58</i>	<i>-</i>
	EBL	B	10.3	0.03	0.7	B	10.0	0.02	0.5
	EBT	-	0.0	0.46	0.0	-	0.0	0.54	0.0
	WBTR	-	0.0	0.57	0.0	-	0.0	0.52	0.0
	SBLR	E	40.8	0.24	6.9	E	42.8	0.28	8.2
Highway 3 and 129th Street	<i>Overall</i>	<i>C</i>	<i>20.2</i>	<i>0.90</i>	<i>-</i>	<i>D</i>	<i>26.7</i>	<i>0.99</i>	<i>-</i>
	EBTL	A	0.1	0.00	0.1	A	0.2	0.01	0.1
	EBR	-	0.0	0.01	0.0	-	0.0	0.01	0.0
	WBL	A	9.9	0.11	2.7	B	10.7	0.13	3.5
	WBTR	-	0.0	0.53	0.0	-	0.0	0.48	0.0
	NBTL	F	136.5	1.54	142.3	F	197.6	1.86	155.4
	NBR	-	-	-	-	-	-	-	-
SBLTR	F	116.9	0.22	116.9	F	186.2	0.46	11.5	

With the addition of the site traffic generated by the proposed mine development, there are no significant changes to the overall operations at the three intersections within the study area from that identified from the future background traffic. It has been concluded that there is no significant effect to traffic operations will result from the implementation of the new development. However future improvements to 107<sup>th</sup> and 129<sup>th</sup> Street intersections to allow for more capacity as discussed above, will be needed in the future to accommodate the background traffic volume growth.

4.1.5 Site Access

The existing access roadway, which has been proposed as the access serving the coal mine development, is a single lane gravel roadway that intersects with Highway 3 to form a T-intersection. The roadway leads up into the mountains and is approximately 10m wide, with the throat at the intersection being roughly 27m in width at the highway intersection. The intersection is STOP sign controlled with free flowing movements for the traffic travelling along Highway 3. Currently the existing traffic volumes utilizing the access road are minimal, and with the addition of 54 vehicles in the a. m. peak hour and 44 vehicles in the p. m. peak hour, it was concluded that the roadway has sufficient capacity to accommodate the traffic demand.

Along with analysis of the intersection, it has been determined that under existing and future background traffic conditions, a separate eastbound left turn lane on Highway 3 is not warranted. Under 2021 total (with site) traffic volumes, a Type IV left turning lane for the eastbound left turning movements is warranted. The volumes on the highway are sufficiently high enough that a small increase in eastbound left turning traffic will require the addition of a separate left lane. It is recommended that this lane be provided by the time initial operations start at the mine in the fall of 2018. The addition of a Type IV left turn lane with a minimal design will provide a storage capacity of 20 meters along with 170 meters for a deceleration length. A warrant analysis for the provision of a separate right turning lane on the westbound approach was also completed. It was determined that a right turning lane is not required, as the number of right turning vehicles, as well as the number of vehicles travelling along the intersecting road, are below the minimum criteria stated in the warrant guideline. [Table 11](#) and [Table 12](#) present the results of the left and right turn lane warrants.

Table 11 Left Turn Lane Warrant Analysis

	Highway 3 and Coal Mine Access									
	Existing		2021 Background		2021 Future Total		2041 Background		2041 Future Total	
	AM	PM	AM	PM	AM	PM	AM	PM	AM	PM
V <sub>L</sub>	5	5	5	5	18	14	9	8	22	17
V <sub>A</sub>	506	590	605	705	618	714	1093	1273	1106	1282
%L	1%	0.8%	0.8%	0.7%	3%	2%	0.8%	0.6%	2%	1.3%
V <sub>o</sub>	607	561	724	671	743	684	1308	1212	1327	1225
Warranted	No	No	No	No	Yes Type IV	Yes Type IV	No	No	Yes Type IV	Yes Type IV

Notes:

1. Left turn volumes for background and total traffic reflect balancing of traffic volumes between intersections.
2. Left turn lane not warranted under existing and future background traffic volumes on the basis of no observed traffic using the existing gravel access.

Table 12 – Right Turning Lane Warrant Results

Warrant Criteria	Right Turn Lane Warrant				
	Existing	2021 Background	2021 Future Total	2041 Background	2041 Future Total
Main Road AADT $\geq$ 1800	✓	✓	✓	✓	✓
Intersecting Road $\geq$ 900	X	X	X	X	X
Right Turn Volume $\geq$ 360 veh/day	X	X	X	X	X
Warranted	NO	NO	NO	NO	NO
* All three criteria must be met in order to warrant a right turn lane					

#### 4.2 Illumination Warrant Analysis

The requirement for partial illumination of the intersection was reviewed using the Warrant for illumination at Rural Intersections published by the Transportation Association of Canada. A copy of the completed warrant worksheet is included in [Appendix D](#). The volumes for the proposed access are less than 100 vehicles per day and no collisions have been reported at the intersection in the last 5 years. The score for the intersection was calculated to be 100 points, with partial illumination being warranted at 120 points. It was concluded therefore that partial illumination is not warranted at the Highway 3 and gravel access intersection.

#### 4.3 Conclusions and Recommendations

The study area is composed of three unsignalized intersections located within a 1.7 km section of Highway 3 in the vicinity of the community of Blairmore. The proposed access to the coal mine is an existing gravel access located approximately 1 km to the east of 107th Street and 700 metres west of 129th Street. A total of 54 vehicle trips will be generated by the proposed coal mine development: 32 inbound trips and 22 outbound trips. During the p. m. peak hour, a total of 44 vehicle trips will be generated: 22 inbound and 22 outbound from the site. During the off-peak hours approximately 8 vehicles trips will be generated: 4 inbound to the mine and 4 outbound from the mine.

Historically traffic on Highway 3 has been growing at an average rate of approximately 2.5 percent – 3 percent per annum. This analysis has found that the existing intersection is operating at a good level of service. By the 2021 horizon, the existing roadway and intersection geometry is sufficient to accommodate projected traffic volumes. The intersection of 107<sup>th</sup> Street and Highway 3 has been approved for the installation of a traffic signal; this installation has been incorporated into the analysis and, in conjunction with other related improvements including provision of separate eastbound and westbound left turn lanes on the highway, will improve operations at this intersection for the 2021 horizon and beyond. After the full build out

of the mine and the addition of the site-generated traffic, the road network can continue to operate satisfactorily and does not require further improvement.

Continued growth post 2021 to a 2041 planning horizon will require additional improvements to accommodate just background (without site) traffic volumes. These improvements should include extension of the left turn lane storage at major intersections and the signalization of the 129<sup>th</sup> Street intersection should also be considered when volume warrants are met. The addition of site related traffic will increase highway volumes by approximately 2 percent and would not cause significant deterioration of the operation of nearby intersections.

The gravel access road intersection with Highway 3 that will serve as the mine access road can accommodate existing and future 2021 and 2041 background traffic volumes without the need for additional turning lanes. However, with the development of the mine, a separate eastbound Type IV left turn lane will be required by the time the mine commences operations in the fall of 2018. A separate eastbound Type IV left turn lane, including a 210 metre taper length and 85 metre parallel lane will be required. Provision of partial illumination of the intersection is not warranted.

# APPENDICES

---

# Appendix A

---

## Intersection Turning Movement Counts

### Turning Movement Summary Diagram

Reference No.: 70000080

Intersection of:

3 & BLAIRMORE EAST ACC (20 AVE) 36-7-4-513800480

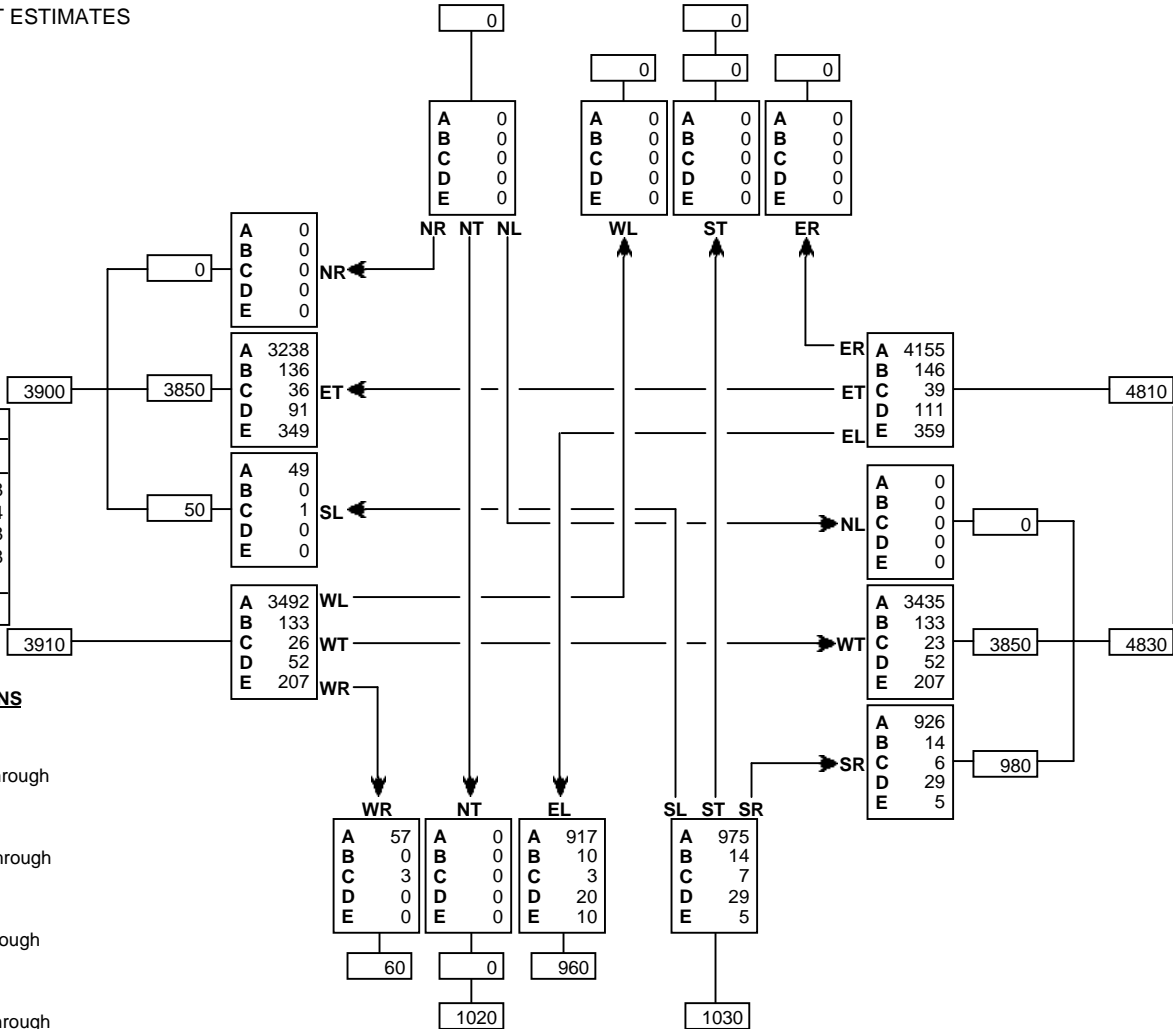
2014 AADT / ASDT ESTIMATES

North On		
Vehicle Type	Vol	%
A: Passenger Vehicle	0	0.0
B: Recreational Vehicle	0	0.0
C: Bus	0	0.0
D: Single Unit Truck	0	0.0
E: Tractor Trailer Unit	0	0.0
<b>ASDT</b>	<b>AAADT</b>	0

West On 3		
Vehicle Type	Vol	%
A: Passenger Vehicle	6779	86.8
B: Recreational Vehicle	269	3.4
C: Bus	63	0.8
D: Single Unit Truck	143	1.8
E: Tractor Trailer Unit	556	7.1
<b>ASDT</b>	<b>AAADT</b>	7810

East On 3		
Vehicle Type	Vol	%
A: Passenger Vehicle	8516	88.3
B: Recreational Vehicle	293	3.0
C: Bus	68	0.7
D: Single Unit Truck	192	2.0
E: Tractor Trailer Unit	571	5.9
<b>ASDT</b>	<b>AAADT</b>	9640

South On 20 Ave		
Vehicle Type	Vol	%
A: Passenger Vehicle	1949	95.1
B: Recreational Vehicle	24	1.2
C: Bus	13	0.6
D: Single Unit Truck	49	2.4
E: Tractor Trailer Unit	15	0.7
<b>ASDT</b>	<b>AAADT</b>	2050



**TURNING MOVEMENT ABBREVIATIONS**

- NR: Traffic From North Turning Right
- NL: Traffic From North Turning Left
- NT: Traffic From North Proceeding Through
- SR: Traffic From South Turning Right
- SL: Traffic From South Turning Left
- ST: Traffic From South Proceeding Through
- ER: Traffic From East Turning Right
- EL: Traffic From East Turning Left
- ET: Traffic From East Proceeding Through
- WR: Traffic From West Turning Right
- WL: Traffic From West Turning Left
- WT: Traffic From West Proceeding Through

**TURNING MOVEMENT ABBREVIATIONS**

- AAADT: Average Annual Daily Traffic  
Average daily traffic expressed as vehicles per day for period of January 1 to December 31 (365 days)
- ASDT: Average Summer Daily Traffic  
Average daily traffic expressed as vehicles per day for period of May 1 to September 30 (153 days)

### Turning Movement Summary Diagram

Reference No.: 70000080

Intersection of:

3 & BLAIRMORE EAST ACC (20 AVE) 36-7-4-513800480

2014 a.m. 100th Highest Hour ESTIMATES

North On		
Vehicle Type	Vol	%
A: Passenger Vehicle	0	0.0
B: Recreational Vehicle	0	0.0
C: Bus	0	0.0
D: Single Unit Truck	0	0.0
E: Tractor Trailer Unit	0	0.0
<b>Total</b>	<b>0</b>	

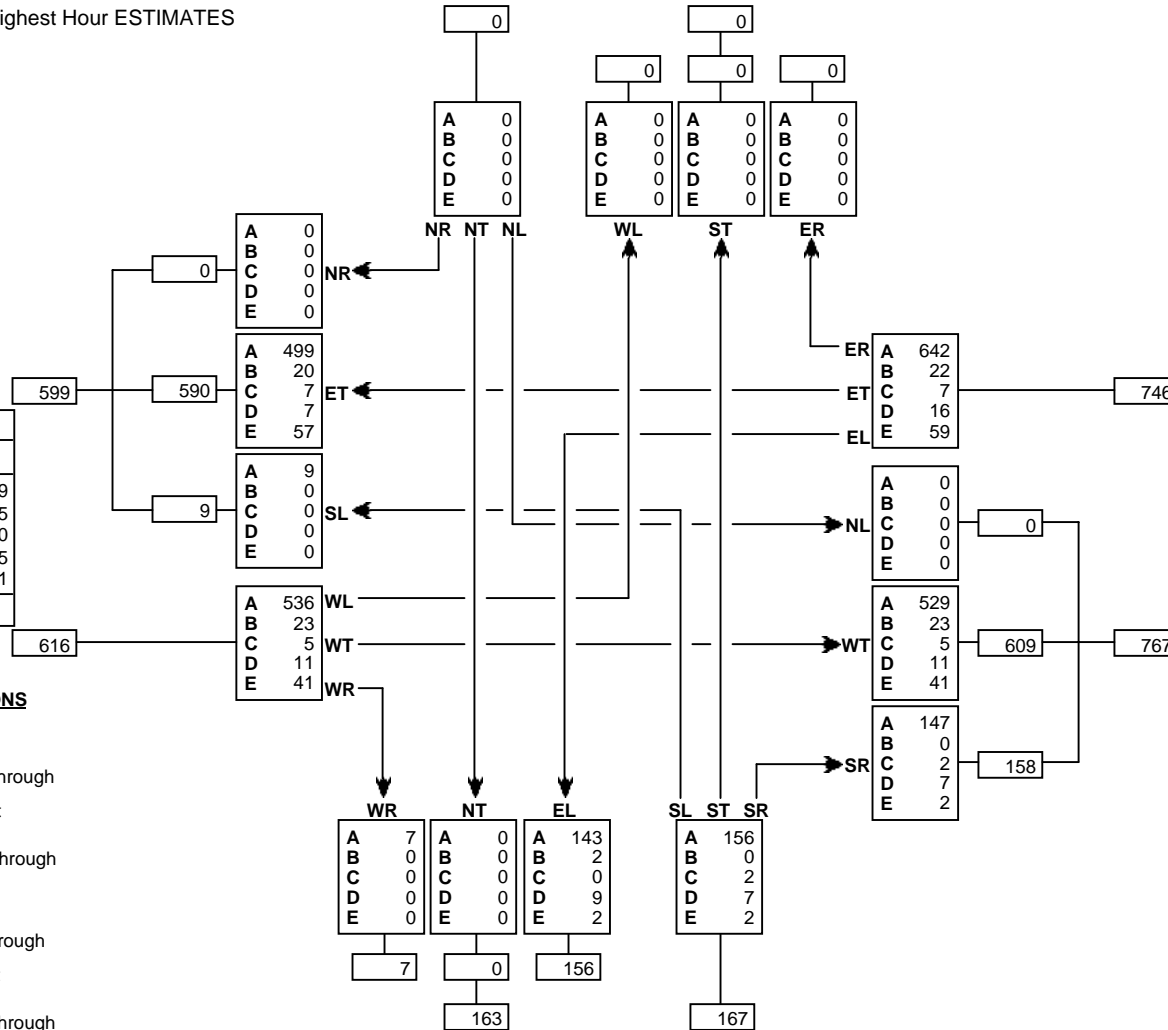
West On 3		
Vehicle Type	Vol	%
A: Passenger Vehicle	1044	85.9
B: Recreational Vehicle	43	3.5
C: Bus	12	1.0
D: Single Unit Truck	18	1.5
E: Tractor Trailer Unit	98	8.1
<b>Total</b>	<b>1215</b>	

East On 3		
Vehicle Type	Vol	%
A: Passenger Vehicle	1318	87.1
B: Recreational Vehicle	45	3.0
C: Bus	14	0.9
D: Single Unit Truck	34	2.2
E: Tractor Trailer Unit	102	6.7
<b>Total</b>	<b>1513</b>	

South On 20 Ave		
Vehicle Type	Vol	%
A: Passenger Vehicle	306	92.7
B: Recreational Vehicle	2	0.6
C: Bus	2	0.6
D: Single Unit Truck	16	4.8
E: Tractor Trailer Unit	4	1.2
<b>Total</b>	<b>330</b>	

**TURNING MOVEMENT ABBREVIATIONS**

- NR: Traffic From North Turning Right
- NL: Traffic From North Turning Left
- NT: Traffic From North Proceeding Through
- SR: Traffic From South Turning Right
- SL: Traffic From South Turning Left
- ST: Traffic From South Proceeding Through
- ER: Traffic From East Turning Right
- EL: Traffic From East Turning Left
- ET: Traffic From East Proceeding Through
- WR: Traffic From West Turning Right
- WL: Traffic From West Turning Left
- WT: Traffic From West Proceeding Through



### Turning Movement Summary Diagram

Reference No.: 70000080

Intersection of:

3 & BLAIRMORE EAST ACC (20 AVE) 36-7-4-513800480

2014 p.m. 100th Highest Hour ESTIMATES

North On		
Vehicle Type	Vol	%
A: Passenger Vehicle	0	0.0
B: Recreational Vehicle	0	0.0
C: Bus	0	0.0
D: Single Unit Truck	0	0.0
E: Tractor Trailer Unit	0	0.0
<b>Total</b>	<b>0</b>	

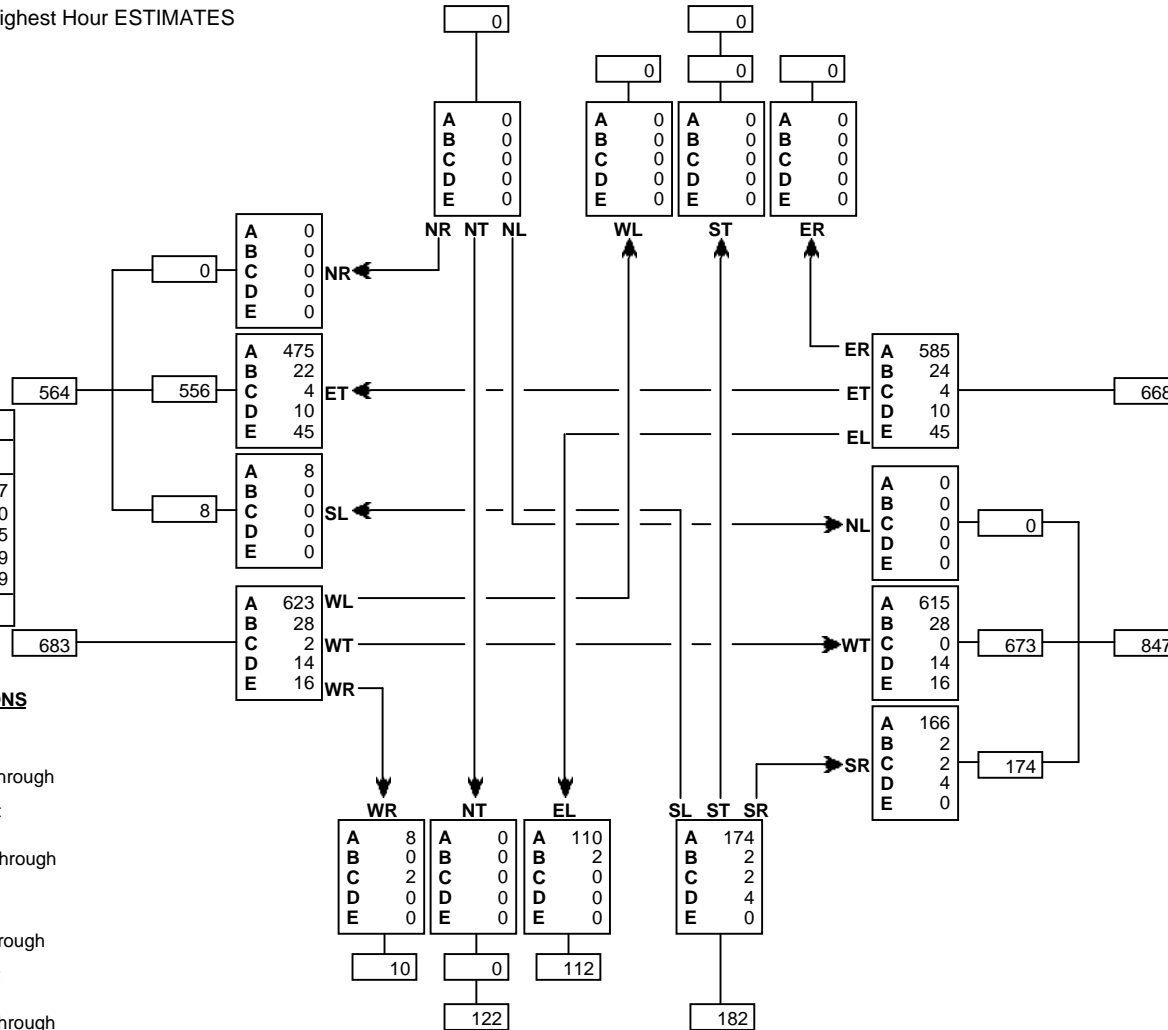
West On 3		
Vehicle Type	Vol	%
A: Passenger Vehicle	1106	88.7
B: Recreational Vehicle	50	4.0
C: Bus	6	0.5
D: Single Unit Truck	24	1.9
E: Tractor Trailer Unit	61	4.9
<b>Total</b>	<b>1247</b>	

East On 3		
Vehicle Type	Vol	%
A: Passenger Vehicle	1366	90.2
B: Recreational Vehicle	54	3.6
C: Bus	6	0.4
D: Single Unit Truck	28	1.8
E: Tractor Trailer Unit	61	4.0
<b>Total</b>	<b>1515</b>	

South On 20 Ave		
Vehicle Type	Vol	%
A: Passenger Vehicle	292	96.1
B: Recreational Vehicle	4	1.3
C: Bus	4	1.3
D: Single Unit Truck	4	1.3
E: Tractor Trailer Unit	0	0.0
<b>Total</b>	<b>304</b>	

**TURNING MOVEMENT ABBREVIATIONS**

- NR: Traffic From North Turning Right
- NL: Traffic From North Turning Left
- NT: Traffic From North Proceeding Through
- SR: Traffic From South Turning Right
- SL: Traffic From South Turning Left
- ST: Traffic From South Proceeding Through
- ER: Traffic From East Turning Right
- EL: Traffic From East Turning Left
- ET: Traffic From East Proceeding Through
- WR: Traffic From West Turning Right
- WL: Traffic From West Turning Left
- WT: Traffic From West Proceeding Through







### Turning Movement Summary Diagram

Reference No.: 70000006

Intersection of:

3 & BLAIRMORE WEST ACC (107 ST) 3-8-4-504500805

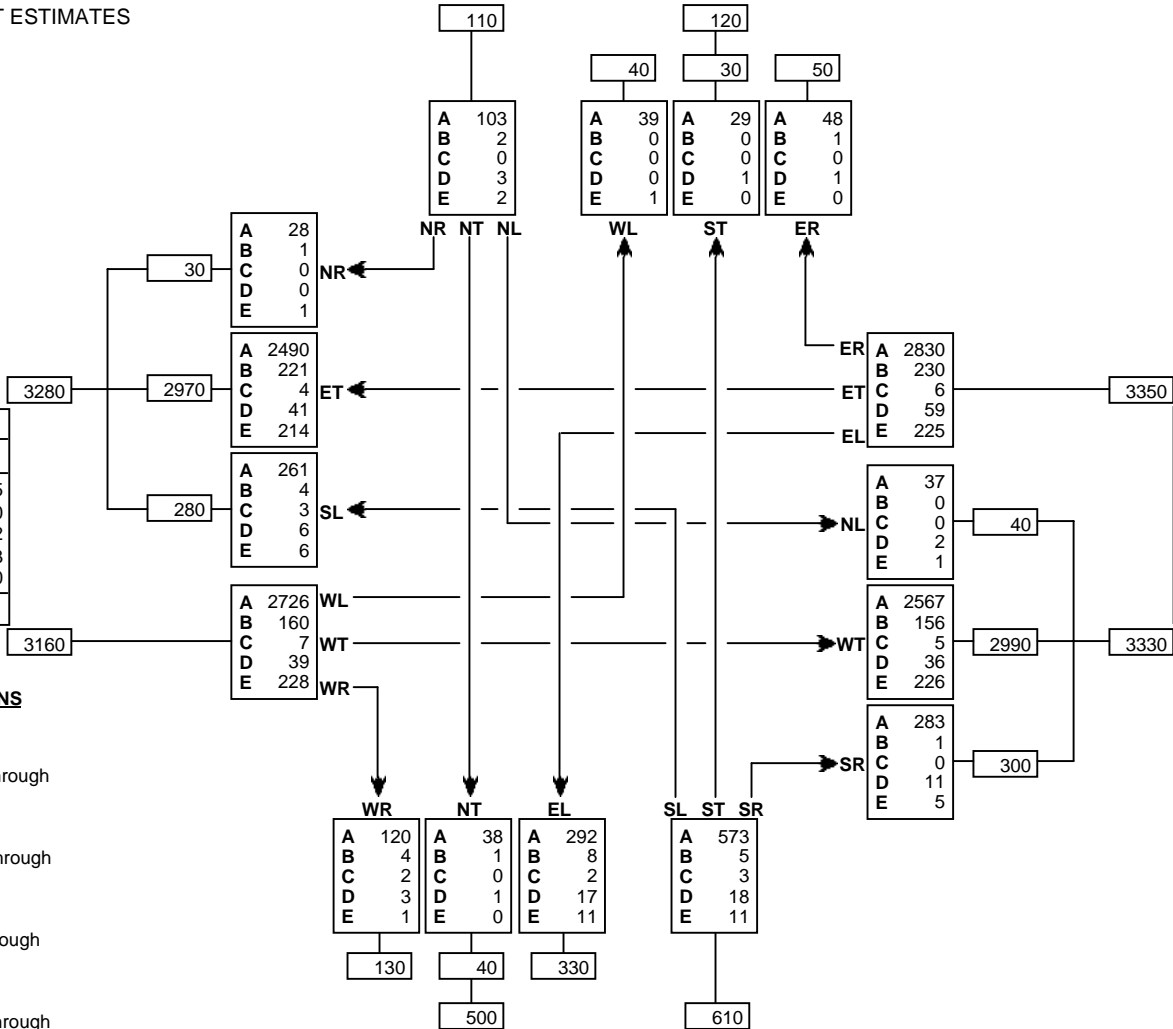
2014 AADT / ASDT ESTIMATES

North On		Local Rd	
Vehicle Type	Vol	%	
A: Passenger Vehicle	219	95.2	
B: Recreational Vehicle	3	1.3	
C: Bus	0	0.0	
D: Single Unit Truck	5	2.2	
E: Tractor Trailer Unit	3	1.3	
<b>ASDT</b>	<b>290</b>	<b>AADT</b>	<b>230</b>

West On 3		Vehicle Type		Vol	%
A: Passenger Vehicle	5505			85.5	
B: Recreational Vehicle	386			6.0	
C: Bus	14			0.2	
D: Single Unit Truck	86			1.3	
E: Tractor Trailer Unit	449			7.0	
<b>ASDT</b>	<b>8020</b>	<b>AADT</b>	<b>6440</b>		

East On 3		Vehicle Type		Vol	%
A: Passenger Vehicle	5717			85.6	
B: Recreational Vehicle	387			5.8	
C: Bus	11			0.2	
D: Single Unit Truck	108			1.6	
E: Tractor Trailer Unit	457			6.8	
<b>ASDT</b>	<b>8320</b>	<b>AADT</b>	<b>6680</b>		

South On		107 St	
Vehicle Type	Vol	%	
A: Passenger Vehicle	1023	92.2	
B: Recreational Vehicle	18	1.6	
C: Bus	7	0.6	
D: Single Unit Truck	39	3.5	
E: Tractor Trailer Unit	23	2.1	
<b>ASDT</b>	<b>1380</b>	<b>AADT</b>	<b>1110</b>



**TURNING MOVEMENT ABBREVIATIONS**

- NR: Traffic From North Turning Right
- NL: Traffic From North Turning Left
- NT: Traffic From North Proceeding Through
- SR: Traffic From South Turning Right
- SL: Traffic From South Turning Left
- ST: Traffic From South Proceeding Through
- ER: Traffic From East Turning Right
- EL: Traffic From East Turning Left
- ET: Traffic From East Proceeding Through
- WR: Traffic From West Turning Right
- WL: Traffic From West Turning Left
- WT: Traffic From West Proceeding Through

**TURNING MOVEMENT ABBREVIATIONS**

- AADT: Average Annual Daily Traffic  
Average daily traffic expressed as vehicles per day for period of January 1 to December 31 (365 days)
- ASDT: Average Summer Daily Traffic  
Average daily traffic expressed as vehicles per day for period of May 1 to September 30 (153 days)

### Turning Movement Summary Diagram

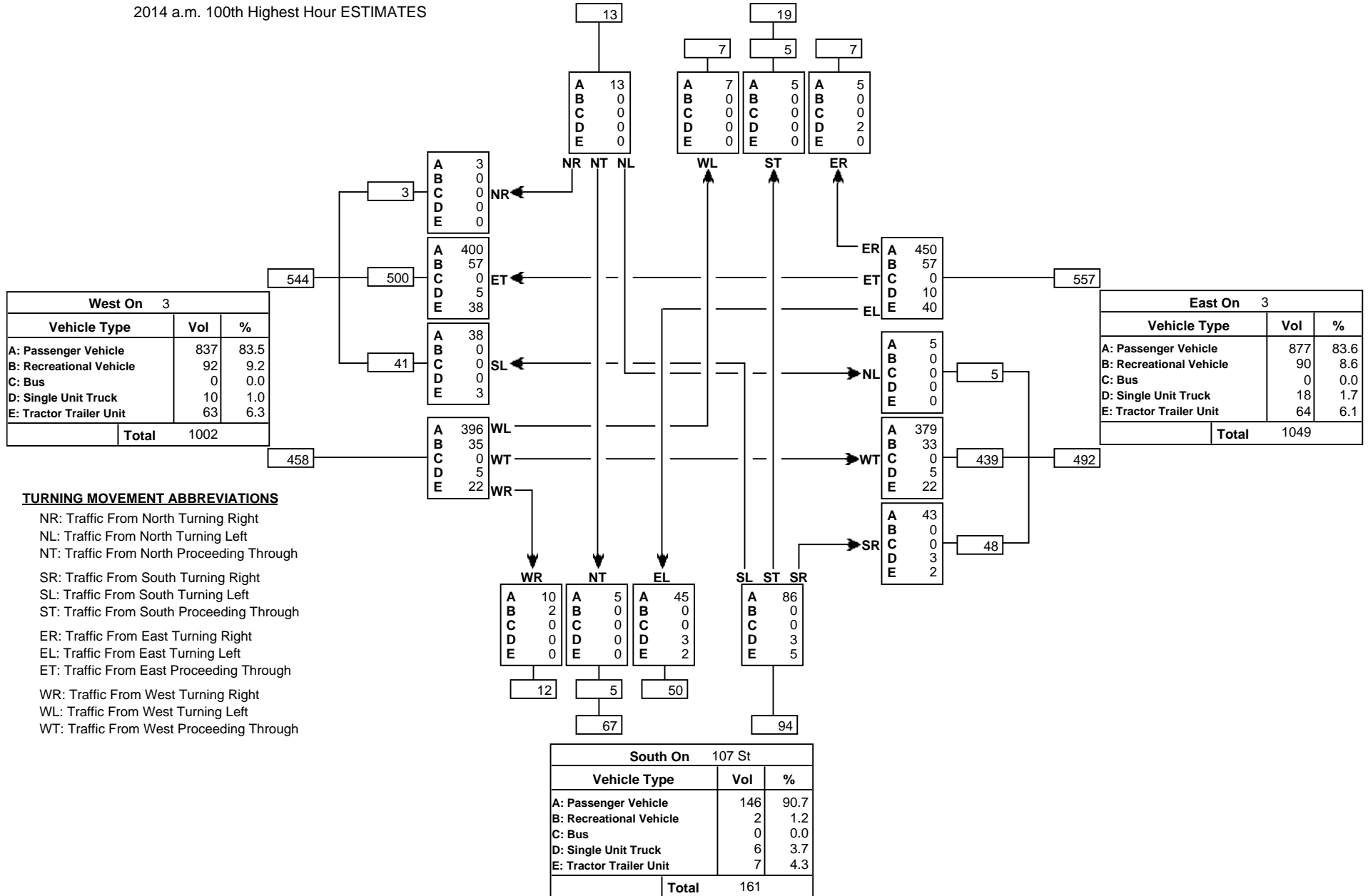
Reference No.: 70000006

Intersection of:

3 & BLAIRMORE WEST ACC (107 ST) 3-8-4-504500805

2014 a.m. 100th Highest Hour ESTIMATES

North On Local Rd		Vol	%
Vehicle Type			
A: Passenger Vehicle		30	93.8
B: Recreational Vehicle		0	0.0
C: Bus		0	0.0
D: Single Unit Truck		2	6.3
E: Tractor Trailer Unit		0	0.0
<b>Total</b>		<b>32</b>	



### Turning Movement Summary Diagram

Reference No.: 70000006

Intersection of:

3 & BLAIRMORE WEST ACC (107 ST) 3-8-4-504500805

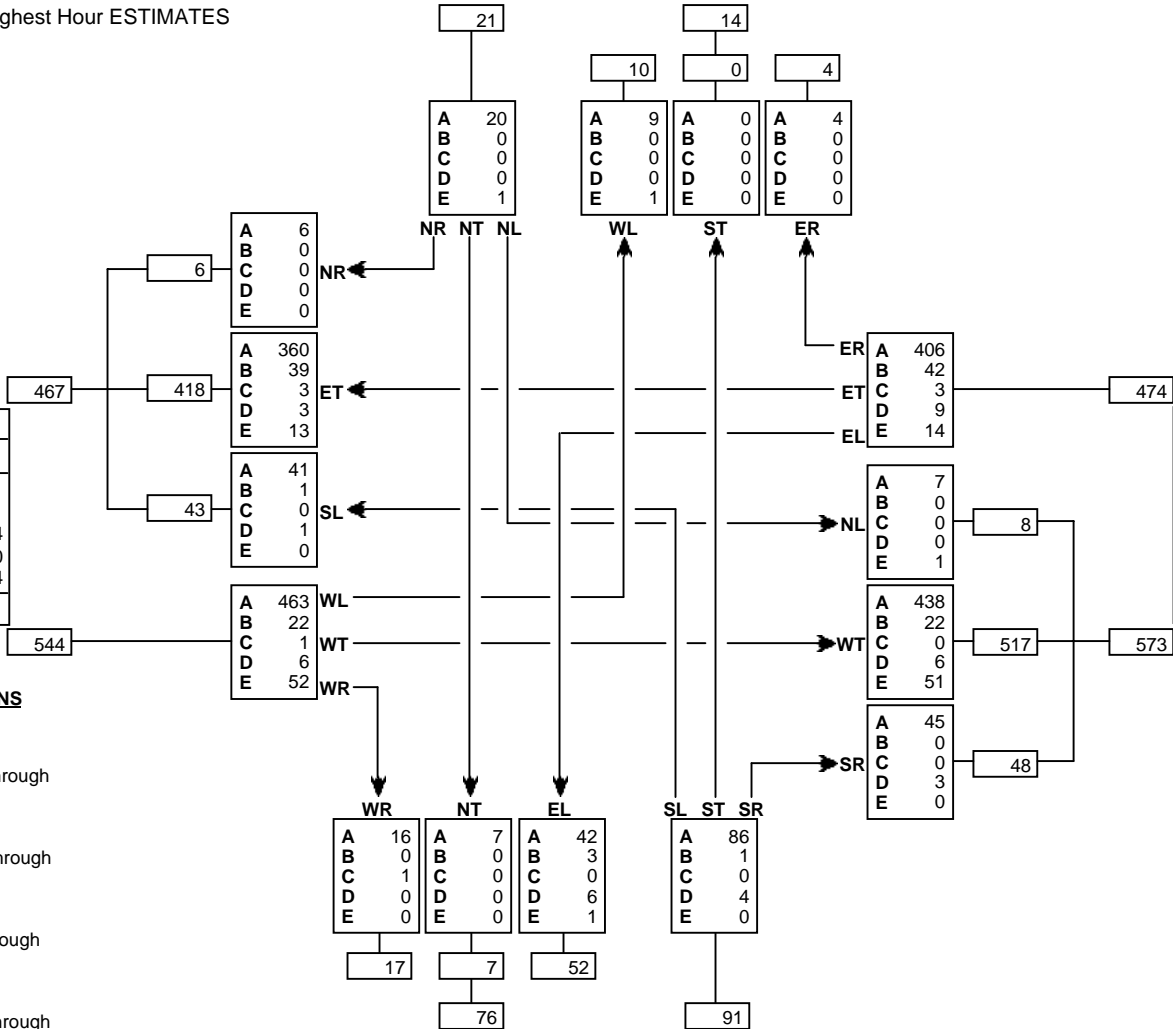
2014 p.m. 100th Highest Hour ESTIMATES

North On Local Rd			
Vehicle Type		Vol	%
A: Passenger Vehicle		33	94.3
B: Recreational Vehicle		0	0.0
C: Bus		0	0.0
D: Single Unit Truck		0	0.0
E: Tractor Trailer Unit		2	5.7
<b>Total</b>		<b>35</b>	

West On 3		
Vehicle Type	Vol	%
A: Passenger Vehicle	870	86.1
B: Recreational Vehicle	62	6.1
C: Bus	4	0.4
D: Single Unit Truck	10	1.0
E: Tractor Trailer Unit	65	6.4
<b>Total</b>		<b>1011</b>

East On 3		
Vehicle Type	Vol	%
A: Passenger Vehicle	896	85.6
B: Recreational Vehicle	64	6.1
C: Bus	3	0.3
D: Single Unit Truck	18	1.7
E: Tractor Trailer Unit	66	6.3
<b>Total</b>		<b>1047</b>

South On 107 St		
Vehicle Type	Vol	%
A: Passenger Vehicle	151	90.4
B: Recreational Vehicle	4	2.4
C: Bus	1	0.6
D: Single Unit Truck	10	6.0
E: Tractor Trailer Unit	1	0.6
<b>Total</b>		<b>167</b>



**TURNING MOVEMENT ABBREVIATIONS**

- NR: Traffic From North Turning Right
- NL: Traffic From North Turning Left
- NT: Traffic From North Proceeding Through
- SR: Traffic From South Turning Right
- SL: Traffic From South Turning Left
- ST: Traffic From South Proceeding Through
- ER: Traffic From East Turning Right
- EL: Traffic From East Turning Left
- ET: Traffic From East Proceeding Through
- WR: Traffic From West Turning Right
- WL: Traffic From West Turning Left
- WT: Traffic From West Proceeding Through

**2015 Existing Traffic Volumes - Highway 3 at Gravel Access Road**

Date: Mar/23/15 Weather: Overcast/Light Snow, -1°C  
 Time: 0600 - 0800

TIME	EBT							EBL							WBT							WBR							SBL							SBR														
	PV	RV	Bus	SUT	TTU	Ped	Bike	PV	RV	Bus	SUT	TTU	Ped	Bike	PV	RV	Bus	SUT	TTU	Ped	Bike	PV	RV	Bus	SUT	TTU	Ped	Bike	PV	RV	Bus	SUT	TTU	Ped	Bike	PV	RV	Bus	SUT	TTU	Ped	Bike								
0700 - 0715	20					1									21						4																													
0715 - 0730	26														23			1			4																													
0730 - 0745	27			3		3									33						3																													
0745 - 0800	36			1	1	1									56				3		5																													
0800 - 0815	40				1	1									46				1		5																													
0815 - 0830	52			1		3									50			4	4	2																														
0830 - 0845	55	1		2	2	1									50				2	1																														
0845 - 0900	66				1	2									31				1	3																														
<b>Sum</b>	<b>322</b>	<b>1</b>	<b>7</b>	<b>5</b>	<b>12</b>										<b>310</b>	<b>5</b>	<b>11</b>	<b>27</b>																																

**Total Vehicle Traffic: 700**

Date: Mar/23/15 Weather: Mix of Sun and Cloud, 0°C  
 Time: 1600 - 1800

TIME	EBT							EBL							WBT							WBR							SBL							SBR													
	PV	RV	Bus	SUT	TTU	Ped	Bike	PV	RV	Bus	SUT	TTU	Ped	Bike	PV	RV	Bus	SUT	TTU	Ped	Bike	PV	RV	Bus	SUT	TTU	Ped	Bike	PV	RV	Bus	SUT	TTU	Ped	Bike	PV	RV	Bus	SUT	TTU	Ped	Bike							
1600 - 1615	61														55			2	1	7																													
1615 - 1630	52					8									64			1		8																													
1630 - 1645	63					3									67				1	6																													
1645 - 1700	58				1	7									50					5																													
1700 - 1715	64					3									54					3																													
1715 - 1730	54					1									41				1	5																													
1730 - 1745	63	1				2									58				1	8																													
1745 - 1800	35					2									47				1	7																													
<b>Sum</b>	<b>450</b>	<b>1</b>			<b>1</b>	<b>26</b>									<b>436</b>	<b>3</b>	<b>5</b>	<b>49</b>																															

**Total Vehicle Traffic: 971**

# Appendix B

---

## Mine Daily and Hourly Trip Generation

## Site Generated Trips

		<u>Inbound:</u>	<u># of trips</u>
<b>AM Peak Hour</b>	Office Staff	52 staff in AM 65% of 52 = 34 staff take the bus Remaining 18 staff: 50% carpool = 9 staff 50% Single veh. = 9 staff	1 HV 4.5 PV 9 PV
	Hourly Operational Workers	80 workers in AM 80% of 80 = 64 will take the bus Remaining 16 workers: 50% carpool = 8 staff 50% Single veh. = 8 staff	2 HV 4 PV 8 PV
	Visitors		1 PV
	General		1 PV
	Contractors		1 PV

Total Trips: 31.5 (3 HV)

		<u>Outbound:</u>	<u># of trips</u>
<b>AM Peak Hour</b>	Office Staff	15 staff in AM 65% of 15 = 9.75 staff take the bus Remaining 5.25 staff: 50% carpool = 2.625 staff 50% Single veh. = 2.625 staff	1 HV 1.3 PV 2.625 PV
	Hourly Operational Workers	80 workers in AM 80% of 80 = 64 will take the bus Remaining 16 workers: 50% carpool = 8 staff 50% Single veh. = 8 staff	2 HV 4 PV 8 PV
	Visitors		1 PV
	General		1 PV
	Contractors		1 PV

Total Trips: 21.93 (3 HV)

<b>PM Peak Hour (5pm)</b>	Office Staff	1 bus to pick up office Staff	1 HV
	Hourly Operational Workers		
	Visitors		1 PV
	General		1 PV
	Contractors		1 PV

Total Trips: 4 (1HV)

<b>PM Peak Hour (5pm)</b>	Office Staff	37 staff in PM 65% of 37 = 24.05 staff take the bus Remaining 12.95 staff: 50% carpool = 6.475 staff 50% Single veh. = 6.475 staff	1 HV 3.2 PV 6.5 PV
	Hourly Operational Workers		
	Visitors		1 PV
	General		1 PV
	Contractors		1 PV

Total Trips: 13.7 (1HV)

<b>PM Peak Hour (7pm)</b>	Office Staff	15 Staff Shift Workers: 65% of 15 = 10 staff take the bus Remaining 5 workers: 50% carpool = 2.5 staff 50% Single veh. = 2.5 staff	1 HV 1.5 PV 2.5 PV
	Hourly Operational Workers	80 workers in AM 80% of 80 = 64 will take the bus Remaining 16 workers: 50% carpool = 8 staff 50% Single veh. = 8 staff	2 HV 4 PV 8 PV
	Visitors		1 PV
	General		1 PV
	Contractors		1 PV

Total Trips: 22 (3HV)

<b>PM Peak Hour (7pm)</b>	Office Staff	15 Staff Shift Workers: 65% of 15 = 10 staff take the bus Remaining 5 workers: 50% carpool = 2.5 staff 50% Single veh. = 2.5 staff	1 HV 1.5 PV 2.5 PV
	Hourly Operational Workers	80 workers in AM 80% of 80 = 64 will take the bus Remaining 16 workers: 50% carpool = 8 staff 50% Single veh. = 8 staff	2 HV 4 PV 8 PV
	Visitors		1 PV
	General		1 PV
	Contractors		1 PV

Total Trips: 22 (3HV)

Overall Total Trips:					
		AM Peak 7am	PM Peak 7pm	Off Peak 5pm	
In:	32	In:	22	In:	4
Out:	22	Out:	22	Out:	14
Total:	54	Total:	44	Total:	18

# Appendix C

---

## Synchro Worksheets

HCM Unsignalized Intersection Capacity Analysis  
 3: Highway 3 & Coal Mine Access

2015 Existing AM Peak Hour  
 Blairmore Coal Mine T.I.A























Movement	SEL	SET	NWT	NWR	SWL	SWR
Lane Configurations		↔	↔		↔	↔
Volume (veh/h)	5	501	602	5	5	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)	5	545	654	5	5	5
Pedestrians						
Lane Width (m)						
Walking Speed (m/s)						
Percent Blockage						
Right turn flare (veh)						3
Median type		None	None			
Median storage veh						
Upstream signal (m)						
pX, platoon unblocked						
vC, conflicting volume	660				1212	657
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	660				1212	657
tC, single (s)	4.1				6.4	6.3
tC, 2 stage (s)						
tF (s)	2.2				3.5	3.4
p0 queue free %	99				97	99
cM capacity (veh/h)	914				197	454

Direction, Lane #	SE 1	NW 1	SW 1
Volume Total	550	660	11
Volume Left	5	0	5
Volume Right	0	5	5
cSH	914	1700	394
Volume to Capacity	0.01	0.39	0.03
Queue Length 95th (m)	0.1	0.0	0.6
Control Delay (s)	0.2	0.0	18.4
Lane LOS	A		C
Approach Delay (s)	0.2	0.0	18.4
Approach LOS			C

Intersection Summary			
Average Delay		0.2	
Intersection Capacity Utilization		42.0%	ICU Level of Service
Analysis Period (min)		15	A

HCM Unsignalized Intersection Capacity Analysis  
 5: 107 Street (West Access)/107 Street & Highway 3

2015 Existing AM Peak Hour  
 Blairmore Coal Mine T.I.A

												
Movement	SEL	SET	SER	NWL	NWT	NWR	NEL	NET	NER	SWL	SWT	SWR
Lane Configurations												
Volume (veh/h)	7	452	12	52	548	7	42	5	49	5	5	3
Sign Control		Free			Free			Stop			Stop	
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	491	13	57	596	8	46	5	53	5	5	3
Pedestrians												
Lane Width (m)												
Walking Speed (m/s)												
Percent Blockage												
Right turn flare (veh)									3			
Median type		None			None							
Median storage (veh)												
Upstream signal (m)												
pX, platoon unblocked												
vC, conflicting volume	603			504			1221	1223	491	1245	1228	596
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	603			504			1221	1223	491	1245	1228	596
tC, single (s)	4.1			4.1			7.1	6.5	6.2	7.1	6.5	6.2
tC, 2 stage (s)												
tF (s)	2.2			2.2			3.5	4.0	3.3	3.5	4.0	3.3
p0 queue free %	99			95			68	97	91	96	97	99
cM capacity (veh/h)	974			1060			145	168	577	127	167	504
<b>Direction, Lane #</b>	<b>SE 1</b>	<b>SE 2</b>	<b>NW 1</b>	<b>NW 2</b>	<b>NE 1</b>	<b>SW 1</b>						
Volume Total	499	13	652	8	104	14						
Volume Left	8	0	57	0	46	5						
Volume Right	0	13	0	8	53	3						
cSH	974	1700	1060	1700	301	173						
Volume to Capacity	0.01	0.01	0.05	0.00	0.35	0.08						
Queue Length 95th (m)	0.2	0.0	1.3	0.0	11.4	2.0						
Control Delay (s)	0.2	0.0	1.4	0.0	26.6	27.6						
Lane LOS	A		A		D	D						
Approach Delay (s)	0.2		1.4		26.6	27.6						
Approach LOS					D	D						
<b>Intersection Summary</b>												
Average Delay			3.2									
Intersection Capacity Utilization			71.2%		ICU Level of Service				C			
Analysis Period (min)			15									

HCM Unsignalized Intersection Capacity Analysis  
8: 129th Street & Highway 3

2015 Existing AM Peak Hour  
Blairmore Coal Mine T.I.A



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↕	↗	↖	↖	↖		↕	↗		↕	
Volume (veh/h)	2	493	11	56	559	2	46	3	139	2	2	2
Sign Control		Free			Free			Stop			Stop	
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)	2	536	12	61	608	2	50	3	151	2	2	2
Pedestrians												
Lane Width (m)												
Walking Speed (m/s)												
Percent Blockage												
Right turn flare (veh)									3			
Median type		None			None							
Median storage (veh)												
Upstream signal (m)												
pX, platoon unblocked												
vC, conflicting volume	610			548			1273	1272	536	1348	1283	609
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	610			548			1273	1272	536	1348	1283	609
tC, single (s)	4.1			4.1			7.1	6.5	6.2	7.1	6.5	6.2
tC, 2 stage (s)												
tF (s)	2.2			2.2			3.5	4.0	3.3	3.5	4.0	3.3
p0 queue free %	100			94			63	98	72	97	99	100
cM capacity (veh/h)	969			1022			135	157	545	87	155	495

Direction, Lane #	EB 1	EB 2	WB 1	WB 2	NB 1	SB 1
Volume Total	538	12	61	610	204	7
Volume Left	2	0	61	0	50	2
Volume Right	0	12	0	2	151	2
cSH	969	1700	1022	1700	525	150
Volume to Capacity	0.00	0.01	0.06	0.36	0.39	0.04
Queue Length 95th (m)	0.1	0.0	1.4	0.0	13.9	1.0
Control Delay (s)	0.1	0.0	8.7	0.0	22.7	30.1
Lane LOS	A		A		C	D
Approach Delay (s)	0.1		0.8		22.7	30.1
Approach LOS					C	D

Intersection Summary

Average Delay		3.8				
Intersection Capacity Utilization		59.7%		ICU Level of Service		B
Analysis Period (min)		15				

HCM Unsignalized Intersection Capacity Analysis  
 3: Highway 3 & Coal Mine Access

2015 Existing PM Peak  
 Blairmore Coal Mine T.I.A























Movement	SEL	SET	NWT	NWR	SWL	SWR
Lane Configurations		↔	↔		↔	↔
Volume (veh/h)	5	585	556	5	7	7
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)	5	636	604	5	8	8
Pedestrians						
Lane Width (m)						
Walking Speed (m/s)						
Percent Blockage						
Right turn flare (veh)						3
Median type		None	None			
Median storage veh						
Upstream signal (m)						
pX, platoon unblocked						
vC, conflicting volume	610				1254	607
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	610				1254	607
tC, single (s)	4.2				6.4	6.2
tC, 2 stage (s)						
tF (s)	2.3				3.5	3.3
p0 queue free %	99				96	98
cM capacity (veh/h)	940				189	494

Direction, Lane #	SE 1	NW 1	SW 1
Volume Total	641	610	15
Volume Left	5	0	8
Volume Right	0	5	8
cSH	940	1700	377
Volume to Capacity	0.01	0.36	0.04
Queue Length 95th (m)	0.1	0.0	1.0
Control Delay (s)	0.2	0.0	18.6
Lane LOS	A		C
Approach Delay (s)	0.2	0.0	18.6
Approach LOS			C

Intersection Summary			
Average Delay		0.3	
Intersection Capacity Utilization		44.8%	ICU Level of Service
Analysis Period (min)		15	A

HCM Unsignalized Intersection Capacity Analysis  
 5: 107 Street (West Access)/107 Street & Highway 3

2015 Existing PM Peak  
 Blairmore Coal Mine T.I.A

												
Movement	SEL	SET	SER	NWL	NWT	NWR	NEL	NET	NER	SWL	SWT	SWR
Lane Configurations												
Volume (veh/h)	10	533	18	54	505	4	44	0	49	8	7	6
Sign Control		Free			Free			Stop			Stop	
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)	11	579	20	59	549	4	48	0	53	9	8	7
Pedestrians												
Lane Width (m)												
Walking Speed (m/s)												
Percent Blockage												
Right turn flare (veh)									3			
Median type		None			None							
Median storage (veh)												
Upstream signal (m)												
pX, platoon unblocked												
vC, conflicting volume	553			599			1278	1272	579	1294	1287	549
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	553			599			1278	1272	579	1294	1287	549
tC, single (s)	4.1			4.1			7.1	6.5	6.2	7.1	6.5	6.2
tC, 2 stage (s)												
tF (s)	2.2			2.2			3.5	4.0	3.3	3.5	4.0	3.3
p0 queue free %	99			94			63	100	90	93	95	99
cM capacity (veh/h)	1017			978			129	156	515	118	153	536
<b>Direction, Lane #</b>	<b>SE 1</b>	<b>SE 2</b>	<b>NW 1</b>	<b>NW 2</b>	<b>NE 1</b>	<b>SW 1</b>						
Volume Total	590	20	608	4	101	23						
Volume Left	11	0	59	0	48	9						
Volume Right	0	20	0	4	53	7						
cSH	1017	1700	978	1700	272	168						
Volume to Capacity	0.01	0.01	0.06	0.00	0.37	0.14						
Queue Length 95th (m)	0.2	0.0	1.5	0.0	12.5	3.5						
Control Delay (s)	0.3	0.0	1.6	0.0	29.7	29.7						
Lane LOS	A		A		D	D						
Approach Delay (s)	0.3		1.6		29.7	29.7						
Approach LOS					D	D						
<b>Intersection Summary</b>												
Average Delay			3.6									
Intersection Capacity Utilization			76.0%		ICU Level of Service				D			
Analysis Period (min)			15									

HCM Unsignalized Intersection Capacity Analysis  
8: 129th Street & Highway 3

2015 Existing PM Peak  
Blairmore Coal Mine T.I.A



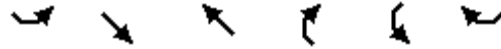
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↖	↗	↖	↗			↖	↗		↕	
Volume (veh/h)	3	577	12	64	514	3	44	4	123	3	3	3
Sign Control		Free			Free			Stop			Stop	
Grade		0%			0%			0%			0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	3	627	13	70	559	3	48	4	134	3	3	3
Pedestrians												
Lane Width (m)												
Walking Speed (m/s)												
Percent Blockage												
Right turn flare (veh)									3			
Median type		None			None							
Median storage (veh)												
Upstream signal (m)												
pX, platoon unblocked												
vC, conflicting volume	562			640			1336	1335	627	1402	1346	560
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	562			640			1336	1335	627	1402	1346	560
tC, single (s)	4.1			4.1			7.1	6.5	6.2	7.1	6.5	6.2
tC, 2 stage (s)												
tF (s)	2.2			2.2			3.5	4.0	3.3	3.5	4.0	3.3
p0 queue free %	100			93			60	97	72	96	98	99
cM capacity (veh/h)	1009			944			120	142	483	78	140	528

Direction, Lane #	EB 1	EB 2	WB 1	WB 2	NB 1	SB 1
Volume Total	630	13	70	562	186	10
Volume Left	3	0	70	0	48	3
Volume Right	0	13	0	3	134	3
cSH	1009	1700	944	1700	433	137
Volume to Capacity	0.00	0.01	0.07	0.33	0.43	0.07
Queue Length 95th (m)	0.1	0.0	1.8	0.0	16.0	1.7
Control Delay (s)	0.1	0.0	9.1	0.0	26.5	33.2
Lane LOS	A		A		D	D
Approach Delay (s)	0.1		1.0		26.5	33.2
Approach LOS					D	D

Intersection Summary

Average Delay		4.0				
Intersection Capacity Utilization		66.1%		ICU Level of Service		C
Analysis Period (min)		15				

3: Highway 3 & Coal Mine Access



Movement	SEL	SET	NWT	NWR	SWL	SWR
Lane Configurations						
Volume (veh/h)	5	433	520	4	5	4
Sign Control		Free	Free		Stop	
Grade		0%	0%		0%	
Peak Hour Factor	1.00	1.00	1.00	1.00	1.00	1.00
Hourly flow rate (vph)	5	433	520	4	5	4
Pedestrians						
Lane Width (m)						
Walking Speed (m/s)						
Percent Blockage						
Right turn flare (veh)						3
Median type		None	None			
Median storage veh						
Upstream signal (m)						
pX, platoon unblocked						
vC, conflicting volume	524				965	522
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	524				965	522
tC, single (s)	4.1				6.4	6.3
tC, 2 stage (s)						
tF (s)	2.2				3.5	3.4
p0 queue free %	100				98	99
cM capacity (veh/h)	1027				278	543





















Direction, Lane #	SE 1	NW 1	SW 1
Volume Total	438	524	9
Volume Left	5	0	5
Volume Right	0	4	4
cSH	1027	1700	500
Volume to Capacity	0.00	0.31	0.02
Queue Length 95th (m)	0.1	0.0	0.4
Control Delay (s)	0.2	0.0	15.3
Lane LOS	A		C
Approach Delay (s)	0.2	0.0	15.3
Approach LOS			C

Intersection Summary			
Average Delay		0.2	
Intersection Capacity Utilization		37.6%	ICU Level of Service A
Analysis Period (min)		15	

2021 AM Background - with Site Peak Hour Volumes

5: 107 Street (West Access)/107 Street & Highway 3




















Blairmore Coal Mine T.I.A

												
Movement	SEL	SET	SER	NWL	NWT	NWR	NEL	NET	NER	SWL	SWT	SWR
Lane Configurations												
Volume (veh/h)	6	391	10	45	473	6	36	4	43	4	4	3
Sign Control		Free			Free			Stop			Stop	
Grade		0%			0%			0%			0%	
Peak Hour Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Hourly flow rate (vph)	6	391	10	45	473	6	36	4	43	4	4	3
Pedestrians												
Lane Width (m)												
Walking Speed (m/s)												
Percent Blockage												
Right turn flare (veh)											3	
Median type	None					None						
Median storage veh												
Upstream signal (m)												
pX, platoon unblocked												
vC, conflicting volume	479			401			971	972	391	990	976	473
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	479			401			971	972	391	990	976	473
tC, single (s)	4.1			4.1			7.1	6.5	6.2	7.1	6.5	6.2
tC, 2 stage (s)												
tF (s)	2.2			2.2			3.5	4.0	3.3	3.5	4.0	3.3
p0 queue free %	99			96			84	98	93	98	98	99
cM capacity (veh/h)	1083			1158			220	241	658	201	240	591
<b>Direction, Lane #</b>	<b>SE 1</b>	<b>SE 2</b>	<b>NW 1</b>	<b>NW 2</b>	<b>NE 1</b>	<b>SW 1</b>						
Volume Total	397	10	518	6	83	11						
Volume Left	6	0	45	0	36	4						
Volume Right	0	10	0	6	43	3						
cSH	1083	1700	1158	1700	462	264						
Volume to Capacity	0.01	0.01	0.04	0.00	0.18	0.04						
Queue Length 95th (m)	0.1	0.0	0.9	0.0	4.9	1.0						
Control Delay (s)	0.2	0.0	1.1	0.0	17.5	19.2						
Lane LOS	A		A		C	C						
Approach Delay (s)	0.2		1.1		17.5	19.2						
Approach LOS					C	C						
<b>Intersection Summary</b>												
Average Delay			2.3									
Intersection Capacity Utilization			63.1%	ICU Level of Service		B						
Analysis Period (min)			15									

2021 AM Background - with Site Peak Hour Volumes

8: 129th Street & Highway 3

Blairmore Coal Mine T.I.A

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (veh/h)	1	426	9	49	483	2	40	3	120	1	1	1
Sign Control		Free			Free			Stop			Stop	
Grade		0%			0%			0%			0%	
Peak Hour Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Hourly flow rate (vph)	1	426	9	49	483	2	40	3	120	1	1	1
Pedestrians												
Lane Width (m)												
Walking Speed (m/s)												
Percent Blockage												
Right turn flare (veh)									13			
Median type		None			None							
Median storage (veh)												
Upstream signal (m)												
pX, platoon unblocked												
vC, conflicting volume	485			435			1010	1011	426	1072	1019	484
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	485			435			1010	1011	426	1072	1019	484
tC, single (s)	4.1			4.1			7.1	6.5	6.2	7.1	6.5	6.2
tC, 2 stage (s)												
tF (s)	2.2			2.2			3.5	4.0	3.3	3.5	4.0	3.3
p0 queue free %	100			96			81	99	81	99	100	100
cM capacity (veh/h)	1078			1125			210	229	628	153	226	583
Direction, Lane #	EB 1	EB 2	WB 1	WB 2	NB 1	SB 1						
Volume Total	427	9	49	485	163	3						
Volume Left	1	0	49	0	40	1						
Volume Right	0	9	0	2	120	1						
cSH	1078	1700	1125	1700	800	237						
Volume to Capacity	0.00	0.01	0.04	0.29	0.20	0.01						
Queue Length 95th (m)	0.0	0.0	1.0	0.0	5.8	0.3						
Control Delay (s)	0.0	0.0	8.3	0.0	15.8	20.4						
Lane LOS	A		A		C	C						
Approach Delay (s)	0.0		0.8		15.8	20.4						
Approach LOS					C	C						
Intersection Summary												
Average Delay			2.7									
Intersection Capacity Utilization			53.0%	ICU Level of Service	A							
Analysis Period (min)			15									

## 3: Highway 3 &amp; Coal Mine Access

Blairmore Coal Mine T.I.A






















Movement	SEL	SET	NWT	NWR	SWL	SWR
Lane Configurations						
Volume (veh/h)	4	506	481	5	6	6
Sign Control		Free	Free		Stop	
Grade		0%	0%		0%	
Peak Hour Factor	1.00	1.00	1.00	1.00	1.00	1.00
Hourly flow rate (vph)	4	506	481	5	6	6
Pedestrians						
Lane Width (m)						
Walking Speed (m/s)						
Percent Blockage						
Right turn flare (veh)						3
Median type		None	None			
Median storage veh						
Upstream signal (m)						
pX, platoon unblocked						
vC, conflicting volume	486				998	484
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	486				998	484
tC, single (s)	4.2				6.4	6.2
tC, 2 stage (s)						
tF (s)	2.3				3.5	3.3
p0 queue free %	100				98	99
cM capacity (veh/h)	1046				269	581
<b>Direction, Lane #</b>	<b>SE 1</b>	<b>NW 1</b>	<b>SW 1</b>			
Volume Total	510	486	12			
Volume Left	4	0	6			
Volume Right	0	5	6			
cSH	1046	1700	539			
Volume to Capacity	0.00	0.29	0.02			
Queue Length 95th (m)	0.1	0.0	0.5			
Control Delay (s)	0.1	0.0	15.0			
Lane LOS	A		B			
Approach Delay (s)	0.1	0.0	15.0			
Approach LOS			B			
<b>Intersection Summary</b>						
Average Delay			0.2			
Intersection Capacity Utilization			39.8%		ICU Level of Service	A
Analysis Period (min)			15			

2021 PM Background - with Site Peak Hour Volumes

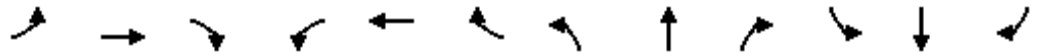
5: 107 Street (West Access)/107 Street & Highway 3

Blairmore Coal Mine T.I.A

												
Movement	SEL	SET	SER	NWL	NWT	NWR	NEL	NET	NER	SWL	SWT	SWR
Lane Configurations												
Volume (veh/h)	9	460	15	46	437	4	38	0	43	7	6	5
Sign Control		Free			Free			Stop			Stop	
Grade		0%			0%			0%			0%	
Peak Hour Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Hourly flow rate (vph)	9	460	15	46	437	4	38	0	43	7	6	5
Pedestrians												
Lane Width (m)												
Walking Speed (m/s)												
Percent Blockage												
Right turn flare (veh)											3	
Median type	None					None						
Median storage (veh)												
Upstream signal (m)												
pX, platoon unblocked												
vC, conflicting volume	441			475			1015	1011	460	1028	1022	437
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	441			475			1015	1011	460	1028	1022	437
tC, single (s)	4.1			4.1			7.1	6.5	6.2	7.1	6.5	6.2
tC, 2 stage (s)												
tF (s)	2.2			2.2			3.5	4.0	3.3	3.5	4.0	3.3
p0 queue free %	99			96			81	100	93	96	97	99
cM capacity (veh/h)	1119			1087			203	228	601	189	224	620
<b>Direction, Lane #</b>	<b>SE 1</b>	<b>SE 2</b>	<b>NW 1</b>	<b>NW 2</b>	<b>NE 1</b>	<b>SW 1</b>						
Volume Total	469	15	483	4	81	18						
Volume Left	9	0	46	0	38	7						
Volume Right	0	15	0	4	43	5						
cSH	1119	1700	1087	1700	432	251						
Volume to Capacity	0.01	0.01	0.04	0.00	0.19	0.07						
Queue Length 95th (m)	0.2	0.0	1.0	0.0	5.2	1.7						
Control Delay (s)	0.2	0.0	1.2	0.0	18.7	20.5						
Lane LOS	A		A		C	C						
Approach Delay (s)	0.2		1.2		18.7	20.5						
Approach LOS					C	C						
<b>Intersection Summary</b>												
Average Delay			2.4									
Intersection Capacity Utilization			67.4%	ICU Level of Service		C						
Analysis Period (min)			15									

8: 129th Street & Highway 3

Blairmore Coal Mine T.I.A



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↕	↗	↖	↖			↕	↗		↕	
Volume (veh/h)	3	499	10	55	445	3	38	4	106	3	3	3
Sign Control		Free			Free			Stop			Stop	
Grade		0%			0%			0%			0%	
Peak Hour Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Hourly flow rate (vph)	3	499	10	55	445	3	38	4	106	3	3	3
Pedestrians												
Lane Width (m)												
Walking Speed (m/s)												
Percent Blockage												
Right turn flare (veh)									13			
Median type		None			None							
Median storage (veh)												
Upstream signal (m)												
pX, platoon unblocked												
vC, conflicting volume	448			509			1064	1063	499	1116	1072	446
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	448			509			1064	1063	499	1116	1072	446
tC, single (s)	4.1			4.1			7.1	6.5	6.2	7.1	6.5	6.2
tC, 2 stage (s)												
tF (s)	2.2			2.2			3.5	4.0	3.3	3.5	4.0	3.3
p0 queue free %	100			95			80	98	81	98	99	100
cM capacity (veh/h)	1112			1056			189	211	572	142	209	612

Direction, Lane #	EB 1	EB 2	WB 1	WB 2	NB 1	SB 1
Volume Total	502	10	55	448	148	9
Volume Left	3	0	55	0	38	3
Volume Right	0	10	0	3	106	3
cSH	1112	1700	1056	1700	674	223
Volume to Capacity	0.00	0.01	0.05	0.26	0.22	0.04
Queue Length 95th (m)	0.1	0.0	1.3	0.0	6.3	1.0
Control Delay (s)	0.1	0.0	8.6	0.0	17.4	21.8
Lane LOS	A		A		C	C
Approach Delay (s)	0.1		0.9		17.4	21.8
Approach LOS					C	C

Intersection Summary		
Average Delay		2.8
Intersection Capacity Utilization	57.8%	ICU Level of Service
Analysis Period (min)		15
		B



Movement	SEL	SET	SER	NWL	NWT	NWR	NEL	NET	NER	SWL	SWT	SWR
Lane Configurations												
Volume (vph)	6	391	10	45	473	6	36	4	43	4	4	3
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	6.0	6.0	6.0	6.0	6.0		6.0	6.0			6.0	
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00		1.00	1.00			1.00	
Frt	1.00	1.00	0.85	1.00	1.00		1.00	0.86			0.96	
Flt Protected	0.95	1.00	1.00	0.95	1.00		0.95	1.00			0.98	
Satd. Flow (prot)	1789	1883	1601	1789	1880		1789	1625			1782	
Flt Permitted	0.48	1.00	1.00	0.53	1.00		0.75	1.00			0.86	
Satd. Flow (perm)	912	1883	1601	1000	1880		1413	1625			1561	
Peak-hour factor, PHF	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj. Flow (vph)	6	391	10	45	473	6	36	4	43	4	4	3
RTOR Reduction (vph)	0	0	2	0	0	0	0	40	0	0	3	0
Lane Group Flow (vph)	6	391	8	45	479	0	36	7	0	0	8	0
Turn Type	Perm	NA	Perm	Perm	NA		Perm	NA		Perm	NA	
Protected Phases		6			2			4			8	
Permitted Phases	6		6	2			4			8		
Actuated Green, G (s)	69.7	69.7	69.7	69.7	69.7		6.6	6.6			6.6	
Effective Green, g (s)	69.7	69.7	69.7	69.7	69.7		6.6	6.6			6.6	
Actuated g/C Ratio	0.79	0.79	0.79	0.79	0.79		0.07	0.07			0.07	
Clearance Time (s)	6.0	6.0	6.0	6.0	6.0		6.0	6.0			6.0	
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0		3.0	3.0			3.0	
Lane Grp Cap (vph)	719	1486	1263	789	1483		105	121			116	
v/s Ratio Prot		0.21			c0.25			0.00				
v/s Ratio Perm	0.01		0.00	0.05			c0.03				0.01	
v/c Ratio	0.01	0.26	0.01	0.06	0.32		0.34	0.06			0.07	
Uniform Delay, d1	2.0	2.5	2.0	2.1	2.6		38.8	38.0			38.0	
Progression Factor	1.00	1.00	1.00	1.00	1.00		1.00	1.00			1.00	
Incremental Delay, d2	0.0	0.4	0.0	0.1	0.6		2.0	0.2			0.3	
Delay (s)	2.0	2.9	2.0	2.2	3.2		40.7	38.2			38.3	
Level of Service	A	A	A	A	A		D	D			D	
Approach Delay (s)		2.9			3.1			39.3			38.3	
Approach LOS		A			A			D			D	

**Intersection Summary**

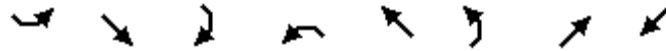
HCM 2000 Control Delay	6.3	HCM 2000 Level of Service	A
HCM 2000 Volume to Capacity ratio	0.32		
Actuated Cycle Length (s)	88.3	Sum of lost time (s)	12.0
Intersection Capacity Utilization	48.2%	ICU Level of Service	A
Analysis Period (min)	15		
c Critical Lane Group			



Movement	SET	SER	NWL	NWT	NEL	NER
Lane Configurations	↑↑		↙	↑	↘	
Volume (vph)	762	8	192	745	11	195
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)	5.5		5.5	5.5	5.5	
Lane Util. Factor	0.95		1.00	1.00	1.00	
Frt	1.00		1.00	1.00	0.87	
Flt Protected	1.00		0.95	1.00	1.00	
Satd. Flow (prot)	3573		1789	1883	1638	
Flt Permitted	1.00		0.21	1.00	1.00	
Satd. Flow (perm)	3573		388	1883	1638	
Peak-hour factor, PHF	1.00	1.00	1.00	1.00	1.00	1.00
Adj. Flow (vph)	762	8	192	745	11	195
RTOR Reduction (vph)	1	0	0	0	168	0
Lane Group Flow (vph)	769	0	192	745	38	0
Turn Type	NA		pm+pt	NA	NA	
Protected Phases	6		5	2	4	
Permitted Phases			2			
Actuated Green, G (s)	16.9		31.8	31.8	7.0	
Effective Green, g (s)	16.9		31.8	31.8	7.0	
Actuated g/C Ratio	0.34		0.64	0.64	0.14	
Clearance Time (s)	5.5		5.5	5.5	5.5	
Vehicle Extension (s)	3.0		3.0	3.0	3.0	
Lane Grp Cap (vph)	1212		512	1202	230	
v/s Ratio Prot	0.22		0.07	c0.40	c0.02	
v/s Ratio Perm			0.17			
v/c Ratio	0.63		0.38	0.62	0.17	
Uniform Delay, d1	13.9		4.9	5.4	18.8	
Progression Factor	1.00		1.00	1.00	1.00	
Incremental Delay, d2	1.1		0.5	1.0	0.3	
Delay (s)	14.9		5.4	6.3	19.2	
Level of Service	B		A	A	B	
Approach Delay (s)	14.9			6.1	19.2	
Approach LOS	B			A	B	

**Intersection Summary**

HCM 2000 Control Delay	11.1	HCM 2000 Level of Service	B
HCM 2000 Volume to Capacity ratio	0.63		
Actuated Cycle Length (s)	49.8	Sum of lost time (s)	16.5
Intersection Capacity Utilization	61.0%	ICU Level of Service	B
Analysis Period (min)	15		
c Critical Lane Group			



Lane Group	SEL	SET	SER	NWL	NWT	NEL	NET	SWT
Lane Group Flow (vph)	6	391	10	45	479	36	47	11
v/c Ratio	0.01	0.25	0.01	0.06	0.31	0.29	0.26	0.08
Control Delay	2.8	3.3	0.1	2.9	3.6	41.7	16.0	30.7
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	2.8	3.3	0.1	2.9	3.6	41.7	16.0	30.7
Queue Length 50th (m)	0.2	14.4	0.0	1.4	18.7	6.2	0.7	1.4
Queue Length 95th (m)	1.1	26.3	0.2	4.1	33.5	13.6	9.7	5.6
Internal Link Dist (m)		106.7			139.4		69.8	71.7
Turn Bay Length (m)	50.0		100.0	100.0		60.0		
Base Capacity (vph)	743	1535	1312	815	1533	293	371	326
Starvation Cap Reductn	0	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0	0
Reduced v/c Ratio	0.01	0.25	0.01	0.06	0.31	0.12	0.13	0.03

Intersection Summary



Lane Group	SET	NWL	NWT	NEL
Lane Group Flow (vph)	770	192	745	206
v/c Ratio	0.65	0.38	0.62	0.52
Control Delay	17.2	6.0	8.4	10.3
Queue Delay	0.0	0.0	0.0	0.0
Total Delay	17.2	6.0	8.4	10.3
Queue Length 50th (m)	28.0	4.9	28.1	0.8
Queue Length 95th (m)	51.9	13.6	68.2	16.5
Internal Link Dist (m)	253.8		274.2	80.4
Turn Bay Length (m)		100.0		
Base Capacity (vph)	3009	709	1873	668
Starvation Cap Reductn	0	0	0	0
Spillback Cap Reductn	0	0	0	0
Storage Cap Reductn	0	0	0	0
Reduced v/c Ratio	0.26	0.27	0.40	0.31

Intersection Summary



Movement	SEL	SET	SER	NWL	NWT	NWR	NEL	NET	NER	SWL	SWT	SWR
Lane Configurations												
Volume (vph)	9	460	15	46	437	4	38	0	43	7	6	5
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	6.0	6.0	6.0	6.0	6.0		6.0	6.0			6.0	
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00		1.00	1.00			1.00	
Frt	1.00	1.00	0.85	1.00	1.00		1.00	0.85			0.96	
Flt Protected	0.95	1.00	1.00	0.95	1.00		0.95	1.00			0.98	
Satd. Flow (prot)	1789	1883	1601	1789	1881		1789	1601			1778	
Flt Permitted	0.51	1.00	1.00	0.50	1.00		0.75	1.00			0.85	
Satd. Flow (perm)	954	1883	1601	933	1881		1404	1601			1548	
Peak-hour factor, PHF	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj. Flow (vph)	9	460	15	46	437	4	38	0	43	7	6	5
RTOR Reduction (vph)	0	0	3	0	0	0	0	40	0	0	5	0
Lane Group Flow (vph)	9	460	12	46	441	0	38	3	0	0	13	0
Turn Type	Perm	NA	Perm	Perm	NA		Perm	NA		Perm	NA	
Protected Phases		6			2			4			8	
Permitted Phases	6		6	2			4			8		
Actuated Green, G (s)	69.3	69.3	69.3	69.3	69.3		6.7	6.7			6.7	
Effective Green, g (s)	69.3	69.3	69.3	69.3	69.3		6.7	6.7			6.7	
Actuated g/C Ratio	0.79	0.79	0.79	0.79	0.79		0.08	0.08			0.08	
Clearance Time (s)	6.0	6.0	6.0	6.0	6.0		6.0	6.0			6.0	
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0		3.0	3.0			3.0	
Lane Grp Cap (vph)	751	1482	1260	734	1481		106	121			117	
v/s Ratio Prot		c0.24			0.23			0.00				
v/s Ratio Perm	0.01		0.01	0.05			c0.03				0.01	
v/c Ratio	0.01	0.31	0.01	0.06	0.30		0.36	0.03			0.11	
Uniform Delay, d1	2.0	2.6	2.0	2.1	2.6		38.6	37.6			37.9	
Progression Factor	1.00	1.00	1.00	1.00	1.00		1.00	1.00			1.00	
Incremental Delay, d2	0.0	0.5	0.0	0.2	0.5		2.1	0.1			0.4	
Delay (s)	2.0	3.2	2.0	2.3	3.1		40.7	37.7			38.3	
Level of Service	A	A	A	A	A		D	D			D	
Approach Delay (s)		3.1			3.0			39.1			38.3	
Approach LOS		A			A			D			D	

**Intersection Summary**

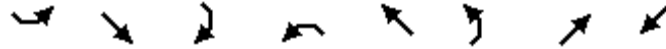
HCM 2000 Control Delay	6.4	HCM 2000 Level of Service	A
HCM 2000 Volume to Capacity ratio	0.31		
Actuated Cycle Length (s)	88.0	Sum of lost time (s)	12.0
Intersection Capacity Utilization	49.6%	ICU Level of Service	A
Analysis Period (min)	15		
c Critical Lane Group			



Movement	SET	SER	NWL	NWT	NEL	NER
Lane Configurations	↑↑		↖	↑	↗	
Volume (vph)	762	8	192	745	11	195
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)	5.5		5.5	5.5	5.5	
Lane Util. Factor	0.95		1.00	1.00	1.00	
Frt	1.00		1.00	1.00	0.87	
Flt Protected	1.00		0.95	1.00	1.00	
Satd. Flow (prot)	3573		1789	1883	1638	
Flt Permitted	1.00		0.21	1.00	1.00	
Satd. Flow (perm)	3573		388	1883	1638	
Peak-hour factor, PHF	1.00	1.00	1.00	1.00	1.00	1.00
Adj. Flow (vph)	762	8	192	745	11	195
RTOR Reduction (vph)	1	0	0	0	168	0
Lane Group Flow (vph)	769	0	192	745	38	0
Turn Type	NA		pm+pt	NA	NA	
Protected Phases	6		5	2	4	
Permitted Phases			2			
Actuated Green, G (s)	16.9		31.8	31.8	7.0	
Effective Green, g (s)	16.9		31.8	31.8	7.0	
Actuated g/C Ratio	0.34		0.64	0.64	0.14	
Clearance Time (s)	5.5		5.5	5.5	5.5	
Vehicle Extension (s)	3.0		3.0	3.0	3.0	
Lane Grp Cap (vph)	1212		512	1202	230	
v/s Ratio Prot	0.22		0.07	c0.40	c0.02	
v/s Ratio Perm			0.17			
v/c Ratio	0.63		0.38	0.62	0.17	
Uniform Delay, d1	13.9		4.9	5.4	18.8	
Progression Factor	1.00		1.00	1.00	1.00	
Incremental Delay, d2	1.1		0.5	1.0	0.3	
Delay (s)	14.9		5.4	6.3	19.2	
Level of Service	B		A	A	B	
Approach Delay (s)	14.9			6.1	19.2	
Approach LOS	B			A	B	

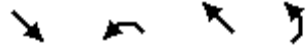
**Intersection Summary**

HCM 2000 Control Delay	11.1	HCM 2000 Level of Service	B
HCM 2000 Volume to Capacity ratio	0.63		
Actuated Cycle Length (s)	49.8	Sum of lost time (s)	16.5
Intersection Capacity Utilization	61.0%	ICU Level of Service	B
Analysis Period (min)	15		
c Critical Lane Group			



Lane Group	SEL	SET	SER	NWL	NWT	NEL	NET	SWT
Lane Group Flow (vph)	9	460	15	46	441	38	43	18
v/c Ratio	0.01	0.30	0.01	0.06	0.29	0.30	0.08	0.12
Control Delay	2.9	3.6	0.4	3.0	3.5	41.7	0.3	29.8
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	2.9	3.6	0.4	3.0	3.5	41.7	0.3	29.8
Queue Length 50th (m)	0.3	17.9	0.0	1.4	16.9	6.5	0.0	2.2
Queue Length 95th (m)	1.4	32.5	0.5	4.2	30.7	14.2	0.0	7.7
Internal Link Dist (m)		106.7			139.4		69.8	71.7
Turn Bay Length (m)	50.0		100.0	100.0		60.0		
Base Capacity (vph)	777	1531	1309	758	1531	292	689	326
Starvation Cap Reductn	0	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0	0
Reduced v/c Ratio	0.01	0.30	0.01	0.06	0.29	0.13	0.06	0.06

Intersection Summary



Lane Group	SET	NWL	NWT	NEL
Lane Group Flow (vph)	770	192	745	206
v/c Ratio	0.65	0.38	0.62	0.52
Control Delay	17.2	6.0	8.4	10.3
Queue Delay	0.0	0.0	0.0	0.0
Total Delay	17.2	6.0	8.4	10.3
Queue Length 50th (m)	28.0	4.9	28.1	0.8
Queue Length 95th (m)	51.9	13.6	68.2	16.5
Internal Link Dist (m)	253.8		274.2	80.4
Turn Bay Length (m)		100.0		
Base Capacity (vph)	3009	709	1873	668
Starvation Cap Reductn	0	0	0	0
Spillback Cap Reductn	0	0	0	0
Storage Cap Reductn	0	0	0	0
Reduced v/c Ratio	0.26	0.27	0.40	0.31

Intersection Summary

3: Highway 3 & Coal Mine Access



Movement	SEL	SET	NWT	NWR	SWL	SWR
Lane Configurations						
Volume (veh/h)	18	433	520	23	18	13
Sign Control		Free	Free		Stop	
Grade		0%	0%		0%	
Peak Hour Factor	1.00	1.00	1.00	1.00	1.00	1.00
Hourly flow rate (vph)	18	433	520	23	18	13
Pedestrians						
Lane Width (m)						
Walking Speed (m/s)						
Percent Blockage						
Right turn flare (veh)						3
Median type		None	None			
Median storage veh						
Upstream signal (m)						
pX, platoon unblocked						
vC, conflicting volume	543				1000	532
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	543				1000	532
tC, single (s)	4.1				6.4	6.3
tC, 2 stage (s)						
tF (s)	2.2				3.5	3.4
p0 queue free %	98				93	98
cM capacity (veh/h)	1011				261	536

Direction, Lane #	SE 1	SE 2	NW 1	SW 1
Volume Total	18	433	543	31
Volume Left	18	0	0	18
Volume Right	0	0	23	13
cSH	1011	1700	1700	450
Volume to Capacity	0.02	0.25	0.32	0.07
Queue Length 95th (m)	0.4	0.0	0.0	1.7
Control Delay (s)	8.6	0.0	0.0	16.5
Lane LOS	A			C
Approach Delay (s)	0.3		0.0	16.5
Approach LOS				C

Intersection Summary			
Average Delay		0.6	
Intersection Capacity Utilization		38.8%	ICU Level of Service A
Analysis Period (min)		15	

2021 AM Future Total - with Site Peak Hour Volumes

8: 129th Street & Highway 3

Blairmore Coal Mine T.I.A



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↖	↗	↖	↗			↖	↗		↕	
Volume (veh/h)	1	439	9	49	502	2	40	3	120	1	1	1
Sign Control		Free			Free			Stop			Stop	
Grade		0%			0%			0%			0%	
Peak Hour Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Hourly flow rate (vph)	1	439	9	49	502	2	40	3	120	1	1	1
Pedestrians												
Lane Width (m)												
Walking Speed (m/s)												
Percent Blockage												
Right turn flare (veh)									13			
Median type		None			None							
Median storage (veh)												
Upstream signal (m)												
pX, platoon unblocked												
vC, conflicting volume	504			448			1042	1043	439	1104	1051	503
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	504			448			1042	1043	439	1104	1051	503
tC, single (s)	4.1			4.1			7.1	6.5	6.2	7.1	6.5	6.2
tC, 2 stage (s)												
tF (s)	2.2			2.2			3.5	4.0	3.3	3.5	4.0	3.3
p0 queue free %	100			96			80	99	81	99	100	100
cM capacity (veh/h)	1061			1112			199	219	618	145	217	569

Direction, Lane #	EB 1	EB 2	WB 1	WB 2	NB 1	SB 1
Volume Total	440	9	49	504	163	3
Volume Left	1	0	49	0	40	1
Volume Right	0	9	0	2	120	1
cSH	1061	1700	1112	1700	761	226
Volume to Capacity	0.00	0.01	0.04	0.30	0.21	0.01
Queue Length 95th (m)	0.0	0.0	1.0	0.0	6.1	0.3
Control Delay (s)	0.0	0.0	8.4	0.0	16.3	21.1
Lane LOS	A		A		C	C
Approach Delay (s)	0.0		0.7		16.3	21.1
Approach LOS					C	C

Intersection Summary		
Average Delay		2.7
Intersection Capacity Utilization	53.0%	ICU Level of Service
Analysis Period (min)		15
		A

## 3: Highway 3 &amp; Coal Mine Access



Movement	SEL	SET	NWT	NWR	SWL	SWR
Lane Configurations						
Volume (veh/h)	13	506	481	18	19	15
Sign Control		Free	Free		Stop	
Grade		0%	0%		0%	
Peak Hour Factor	1.00	1.00	1.00	1.00	1.00	1.00
Hourly flow rate (vph)	13	506	481	18	19	15
Pedestrians						
Lane Width (m)						
Walking Speed (m/s)						
Percent Blockage						
Right turn flare (veh)						3
Median type		None	None			
Median storage veh						
Upstream signal (m)						
pX, platoon unblocked						
vC, conflicting volume	499				1022	490
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	499				1022	490
tC, single (s)	4.2				6.4	6.2
tC, 2 stage (s)						
tF (s)	2.3				3.5	3.3
p0 queue free %	99				93	97
cM capacity (veh/h)	1035				258	576
<b>Direction, Lane #</b>	<b>SE 1</b>	<b>SE 2</b>	<b>NW 1</b>	<b>SW 1</b>		
Volume Total	13	506	499	34		
Volume Left	13	0	0	19		
Volume Right	0	0	18	15		
cSH	1035	1700	1700	462		
Volume to Capacity	0.01	0.30	0.29	0.07		
Queue Length 95th (m)	0.3	0.0	0.0	1.8		
Control Delay (s)	8.5	0.0	0.0	16.2		
Lane LOS	A			C		
Approach Delay (s)	0.2		0.0	16.2		
Approach LOS				C		
<b>Intersection Summary</b>						
Average Delay			0.6			
Intersection Capacity Utilization			36.6%		ICU Level of Service	A
Analysis Period (min)			15			

## 8: 129th Street &amp; Highway 3



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↔	↔	↔	↔			↔	↔		↔	
Volume (veh/h)	3	512	10	55	458	3	38	4	106	3	3	3
Sign Control		Free			Free			Stop			Stop	
Grade		0%			0%			0%			0%	
Peak Hour Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Hourly flow rate (vph)	3	512	10	55	458	3	38	4	106	3	3	3
Pedestrians												
Lane Width (m)												
Walking Speed (m/s)												
Percent Blockage												
Right turn flare (veh)									20			
Median type		None			None							
Median storage (veh)												
Upstream signal (m)												
pX, platoon unblocked												
vC, conflicting volume	461			522			1090	1089	512	1142	1098	460
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	461			522			1090	1089	512	1142	1098	460
tC, single (s)	4.1			4.1			7.1	6.5	6.2	7.1	6.5	6.2
tC, 2 stage (s)												
tF (s)	2.2			2.2			3.5	4.0	3.3	3.5	4.0	3.3
p0 queue free %	100			95			79	98	81	98	99	100
cM capacity (veh/h)	1100			1044			181	204	562	136	201	602
<b>Direction, Lane #</b>	<b>EB 1</b>	<b>EB 2</b>	<b>WB 1</b>	<b>WB 2</b>	<b>NB 1</b>	<b>SB 1</b>						
Volume Total	515	10	55	461	148	9						
Volume Left	3	0	55	0	38	3						
Volume Right	0	10	0	3	106	3						
cSH	1100	1700	1044	1700	647	214						
Volume to Capacity	0.00	0.01	0.05	0.27	0.23	0.04						
Queue Length 95th (m)	0.1	0.0	1.3	0.0	6.7	1.0						
Control Delay (s)	0.1	0.0	8.6	0.0	17.8	22.5						
Lane LOS	A		A		C	C						
Approach Delay (s)	0.1		0.9		17.8	22.5						
Approach LOS					C	C						
<b>Intersection Summary</b>												
Average Delay			2.8									
Intersection Capacity Utilization			57.8%		ICU Level of Service				B			
Analysis Period (min)			15									

2021 AM Future Total - with Site Peak Hour Volumes

5: 107 Street (West Access)/107 Street & Highway 3

Blairmore Coal Mine T.I.A

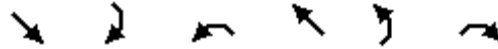


Movement	SEL	SET	SER	NWL	NWT	NWR	NEL	NET	NER	SWL	SWT	SWR
Lane Configurations												
Volume (vph)	6	404	10	45	482	6	36	4	43	4	4	3
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	6.0	6.0	6.0	6.0	6.0		6.0	6.0			6.0	
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00		1.00	1.00			1.00	
Frt	1.00	1.00	0.85	1.00	1.00		1.00	0.86			0.96	
Flt Protected	0.95	1.00	1.00	0.95	1.00		0.95	1.00			0.98	
Satd. Flow (prot)	1825	1685	1396	1659	1610		1706	1519			1817	
Flt Permitted	0.48	1.00	1.00	0.52	1.00		0.75	1.00			0.86	
Satd. Flow (perm)	920	1685	1396	916	1610		1347	1519			1592	
Peak-hour factor, PHF	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj. Flow (vph)	6	404	10	45	482	6	36	4	43	4	4	3
RTOR Reduction (vph)	0	0	2	0	0	0	0	40	0	0	3	0
Lane Group Flow (vph)	6	404	8	45	488	0	36	7	0	0	8	0
Heavy Vehicles (%)	0%	14%	17%	10%	19%	29%	7%	0%	10%	0%	0%	0%
Turn Type	Perm	NA	Perm	Perm	NA		Perm	NA		Perm	NA	
Protected Phases		6			2			4			8	
Permitted Phases	6		6	2			4			8		
Actuated Green, G (s)	69.7	69.7	69.7	69.7	69.7		6.7	6.7			6.7	
Effective Green, g (s)	69.7	69.7	69.7	69.7	69.7		6.7	6.7			6.7	
Actuated g/C Ratio	0.79	0.79	0.79	0.79	0.79		0.08	0.08			0.08	
Clearance Time (s)	6.0	6.0	6.0	6.0	6.0		6.0	6.0			6.0	
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0		3.0	3.0			3.0	
Lane Grp Cap (vph)	725	1328	1100	722	1269		102	115			120	
v/s Ratio Prot		0.24			c0.30			0.00				
v/s Ratio Perm	0.01		0.01	0.05			c0.03				0.01	
v/c Ratio	0.01	0.30	0.01	0.06	0.38		0.35	0.06			0.07	
Uniform Delay, d1	2.0	2.6	2.0	2.1	2.8		38.8	37.9			38.0	
Progression Factor	1.00	1.00	1.00	1.00	1.00		1.00	1.00			1.00	
Incremental Delay, d2	0.0	0.6	0.0	0.2	0.9		2.1	0.2			0.2	
Delay (s)	2.0	3.2	2.0	2.2	3.7		40.9	38.2			38.2	
Level of Service	A	A	A	A	A		D	D			D	
Approach Delay (s)		3.1			3.6			39.3			38.2	
Approach LOS		A			A			D			D	

Intersection Summary

HCM 2000 Control Delay	6.6	HCM 2000 Level of Service	A
HCM 2000 Volume to Capacity ratio	0.38		
Actuated Cycle Length (s)	88.4	Sum of lost time (s)	12.0
Intersection Capacity Utilization	48.7%	ICU Level of Service	A
Analysis Period (min)	15		

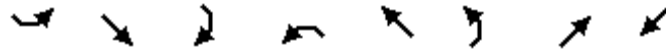
c Critical Lane Group



Movement	SET	SER	NWL	NWT	NEL	NER
Lane Configurations	↑↑		↶	↷	↷	
Volume (vph)	1495	23	248	1236	17	386
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)	5.5		5.5	5.5	5.5	
Lane Util. Factor	0.95		1.00	1.00	1.00	
Frt	1.00		1.00	1.00	0.87	
Flt Protected	1.00		0.95	1.00	1.00	
Satd. Flow (prot)	3570		1789	1883	1636	
Flt Permitted	1.00		0.09	1.00	1.00	
Satd. Flow (perm)	3570		169	1883	1636	
Peak-hour factor, PHF	1.00	1.00	1.00	1.00	1.00	1.00
Adj. Flow (vph)	1495	23	248	1236	17	386
RTOR Reduction (vph)	1	0	0	0	272	0
Lane Group Flow (vph)	1517	0	248	1236	131	0
Turn Type	NA		pm+pt	NA	NA	
Protected Phases	6		5	2	4	
Permitted Phases			2			
Actuated Green, G (s)	39.1		56.7	56.7	10.7	
Effective Green, g (s)	39.1		56.7	56.7	10.7	
Actuated g/C Ratio	0.50		0.72	0.72	0.14	
Clearance Time (s)	5.5		5.5	5.5	5.5	
Vehicle Extension (s)	3.0		3.0	3.0	3.0	
Lane Grp Cap (vph)	1780		372	1361	223	
v/s Ratio Prot	0.42		0.10	c0.66	c0.08	
v/s Ratio Perm			0.38			
v/c Ratio	0.85		0.67	0.91	0.59	
Uniform Delay, d1	17.1		18.4	8.8	31.8	
Progression Factor	1.00		1.00	1.00	1.00	
Incremental Delay, d2	4.2		4.5	9.0	3.9	
Delay (s)	21.3		22.9	17.8	35.7	
Level of Service	C		C	B	D	
Approach Delay (s)	21.3			18.6	35.7	
Approach LOS	C			B	D	

**Intersection Summary**

HCM 2000 Control Delay	21.8	HCM 2000 Level of Service	C
HCM 2000 Volume to Capacity ratio	0.93		
Actuated Cycle Length (s)	78.4	Sum of lost time (s)	16.5
Intersection Capacity Utilization	99.0%	ICU Level of Service	F
Analysis Period (min)	15		
c Critical Lane Group			



Lane Group	SEL	SET	SER	NWL	NWT	NEL	NET	SWT
Lane Group Flow (vph)	6	404	10	45	488	36	47	11
v/c Ratio	0.01	0.29	0.01	0.06	0.37	0.30	0.27	0.07
Control Delay	2.8	3.6	0.1	3.0	4.2	42.1	16.3	30.5
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	2.8	3.6	0.1	3.0	4.2	42.1	16.3	30.5
Queue Length 50th (m)	0.2	15.6	0.0	1.4	20.5	6.2	0.7	1.4
Queue Length 95th (m)	1.1	29.3	0.2	4.2	38.5	13.6	9.6	5.6
Internal Link Dist (m)		106.7			1026.0		69.8	71.7
Turn Bay Length (m)	50.0		100.0	100.0		60.0		
Base Capacity (vph)	749	1372	1143	746	1310	279	349	331
Starvation Cap Reductn	0	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0	0
Reduced v/c Ratio	0.01	0.29	0.01	0.06	0.37	0.13	0.13	0.03

Intersection Summary

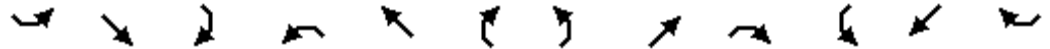


Lane Group	SET	NWL	NWT	NEL
Lane Group Flow (vph)	1518	248	1236	403
v/c Ratio	0.86	0.67	0.91	0.81
Control Delay	25.1	24.5	22.3	23.1
Queue Delay	0.0	0.0	0.0	0.0
Total Delay	25.1	24.5	22.3	23.1
Queue Length 50th (m)	98.8	19.6	123.3	13.4
Queue Length 95th (m)	#174.1	45.9	#284.5	#45.4
Internal Link Dist (m)	952.9		71.2	80.4
Turn Bay Length (m)		100.0		
Base Capacity (vph)	1971	463	1518	591
Starvation Cap Reductn	0	0	0	0
Spillback Cap Reductn	0	0	0	0
Storage Cap Reductn	0	0	0	0
Reduced v/c Ratio	0.77	0.54	0.81	0.68

**Intersection Summary**

# 95th percentile volume exceeds capacity, queue may be longer.  
 Queue shown is maximum after two cycles.

## 5: 107 Street (West Access)/107 Street &amp; Highway 3



Movement	SEL	SET	SER	NWL	NWT	NWR	NEL	NET	NER	SWL	SWT	SWR
Lane Configurations												
Volume (vph)	9	469	15	46	446	4	38	0	43	7	6	5
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	6.0	6.0	6.0	6.0	6.0		6.0	6.0			6.0	
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00		1.00	1.00			1.00	
Frt	1.00	1.00	0.85	1.00	1.00		1.00	0.85			0.96	
Flt Protected	0.95	1.00	1.00	0.95	1.00		0.95	1.00			0.98	
Satd. Flow (prot)	1659	1671	1541	1615	1685		1738	1541			1727	
Flt Permitted	0.50	1.00	1.00	0.49	1.00		0.75	1.00			0.85	
Satd. Flow (perm)	875	1671	1541	832	1685		1364	1541			1503	
Peak-hour factor, PHF	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj. Flow (vph)	9	469	15	46	446	4	38	0	43	7	6	5
RTOR Reduction (vph)	0	0	3	0	0	0	0	40	0	0	5	0
Lane Group Flow (vph)	9	469	12	46	450	0	38	3	0	0	13	0
Heavy Vehicles (%)	10%	15%	6%	13%	14%	0%	5%	0%	6%	13%	0%	0%
Turn Type	Perm	NA	Perm	Perm	NA		Perm	NA		Perm	NA	
Protected Phases		6			2			4			8	
Permitted Phases	6		6	2			4			8		
Actuated Green, G (s)	69.3	69.3	69.3	69.3	69.3		6.8	6.8			6.8	
Effective Green, g (s)	69.3	69.3	69.3	69.3	69.3		6.8	6.8			6.8	
Actuated g/C Ratio	0.79	0.79	0.79	0.79	0.79		0.08	0.08			0.08	
Clearance Time (s)	6.0	6.0	6.0	6.0	6.0		6.0	6.0			6.0	
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0		3.0	3.0			3.0	
Lane Grp Cap (vph)	688	1314	1212	654	1325		105	118			116	
v/s Ratio Prot		c0.28			0.27			0.00				
v/s Ratio Perm	0.01		0.01	0.06			c0.03				0.01	
v/c Ratio	0.01	0.36	0.01	0.07	0.34		0.36	0.03			0.12	
Uniform Delay, d1	2.0	2.8	2.0	2.1	2.7		38.6	37.6			37.8	
Progression Factor	1.00	1.00	1.00	1.00	1.00		1.00	1.00			1.00	
Incremental Delay, d2	0.0	0.8	0.0	0.2	0.7		2.1	0.1			0.4	
Delay (s)	2.1	3.5	2.0	2.3	3.4		40.7	37.7			38.3	
Level of Service	A	A	A	A	A		D	D			D	
Approach Delay (s)		3.5			3.3			39.1			38.3	
Approach LOS		A			A			D			D	

## Intersection Summary

HCM 2000 Control Delay	6.6	HCM 2000 Level of Service	A
HCM 2000 Volume to Capacity ratio	0.36		
Actuated Cycle Length (s)	88.1	Sum of lost time (s)	12.0
Intersection Capacity Utilization	50.1%	ICU Level of Service	A
Analysis Period (min)	15		

c Critical Lane Group

11: 20 Avenue (East Access) & Highway 3



Movement	SET	SER	NWL	NWT	NEL	NER
Lane Configurations	↑↑		↵	↑	↵	
Volume (vph)	762	8	192	745	11	195
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)	5.5		5.5	5.5	5.5	
Lane Util. Factor	0.95		1.00	1.00	1.00	
Frt	1.00		1.00	1.00	0.87	
Flt Protected	1.00		0.95	1.00	1.00	
Satd. Flow (prot)	3573		1789	1883	1638	
Flt Permitted	1.00		0.21	1.00	1.00	
Satd. Flow (perm)	3573		388	1883	1638	
Peak-hour factor, PHF	1.00	1.00	1.00	1.00	1.00	1.00
Adj. Flow (vph)	762	8	192	745	11	195
RTOR Reduction (vph)	1	0	0	0	168	0
Lane Group Flow (vph)	769	0	192	745	38	0
Turn Type	NA		pm+pt	NA	NA	
Protected Phases	6		5	2	4	
Permitted Phases			2			
Actuated Green, G (s)	16.9		31.8	31.8	7.0	
Effective Green, g (s)	16.9		31.8	31.8	7.0	
Actuated g/C Ratio	0.34		0.64	0.64	0.14	
Clearance Time (s)	5.5		5.5	5.5	5.5	
Vehicle Extension (s)	3.0		3.0	3.0	3.0	
Lane Grp Cap (vph)	1212		512	1202	230	
v/s Ratio Prot	0.22		0.07	c0.40	c0.02	
v/s Ratio Perm			0.17			
v/c Ratio	0.63		0.38	0.62	0.17	
Uniform Delay, d1	13.9		4.9	5.4	18.8	
Progression Factor	1.00		1.00	1.00	1.00	
Incremental Delay, d2	1.1		0.5	1.0	0.3	
Delay (s)	14.9		5.4	6.3	19.2	
Level of Service	B		A	A	B	
Approach Delay (s)	14.9			6.1	19.2	
Approach LOS	B			A	B	

Intersection Summary

HCM 2000 Control Delay	11.1	HCM 2000 Level of Service	B
HCM 2000 Volume to Capacity ratio	0.63		
Actuated Cycle Length (s)	49.8	Sum of lost time (s)	16.5
Intersection Capacity Utilization	61.0%	ICU Level of Service	B
Analysis Period (min)	15		
c Critical Lane Group			

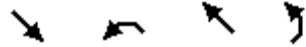
5: 107 Street (West Access)/107 Street & Highway 3



Lane Group	SEL	SET	SER	NWL	NWT	NEL	NET	SWT
Lane Group Flow (vph)	9	469	15	46	450	38	43	18
v/c Ratio	0.01	0.35	0.01	0.07	0.33	0.30	0.08	0.13
Control Delay	2.9	4.0	0.4	3.1	3.9	42.1	0.3	29.9
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	2.9	4.0	0.4	3.1	3.9	42.1	0.3	29.9
Queue Length 50th (m)	0.3	19.2	0.0	1.4	18.0	6.5	0.0	2.2
Queue Length 95th (m)	1.4	35.9	0.5	4.4	33.6	14.2	0.0	7.7
Internal Link Dist (m)		106.7			139.4		69.8	71.7
Turn Bay Length (m)	50.0		100.0	100.0		60.0		
Base Capacity (vph)	711	1358	1259	677	1370	284	669	316
Starvation Cap Reductn	0	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0	0
Reduced v/c Ratio	0.01	0.35	0.01	0.07	0.33	0.13	0.06	0.06

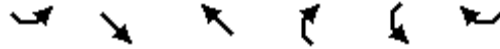
Intersection Summary

11: 20 Avenue (East Access) & Highway 3



Lane Group	SET	NWL	NWT	NEL
Lane Group Flow (vph)	770	192	745	206
v/c Ratio	0.65	0.38	0.62	0.52
Control Delay	17.2	6.0	8.4	10.3
Queue Delay	0.0	0.0	0.0	0.0
Total Delay	17.2	6.0	8.4	10.3
Queue Length 50th (m)	28.0	4.9	28.1	0.8
Queue Length 95th (m)	51.9	13.6	68.2	16.5
Internal Link Dist (m)	253.8		274.2	80.4
Turn Bay Length (m)		100.0		
Base Capacity (vph)	3009	709	1873	668
Starvation Cap Reductn	0	0	0	0
Spillback Cap Reductn	0	0	0	0
Storage Cap Reductn	0	0	0	0
Reduced v/c Ratio	0.26	0.27	0.40	0.31
<b>Intersection Summary</b>				

3: Highway 3 & Coal Mine Access



Movement	SEL	SET	NWT	NWR	SWL	SWR
Lane Configurations						
Volume (veh/h)	9	782	8	939	8	8
Sign Control		Free	Free		Stop	
Grade		0%	0%		0%	
Peak Hour Factor	1.00	1.00	1.00	1.00	1.00	1.00
Hourly flow rate (vph)	9	782	8	939	8	8
Pedestrians						
Lane Width (m)						
Walking Speed (m/s)						
Percent Blockage						
Right turn flare (veh)						3
Median type		None	None			
Median storage veh						
Upstream signal (m)						
pX, platoon unblocked						
vC, conflicting volume	947				1278	478
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	947				1278	478
tC, single (s)	4.1				6.4	6.3
tC, 2 stage (s)						
tF (s)	2.2				3.5	3.4
p0 queue free %	99				96	99
cM capacity (veh/h)	713				179	576

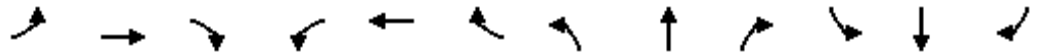
Direction, Lane #	SE 1	SE 2	NW 1	SW 1
Volume Total	9	782	947	16
Volume Left	9	0	0	8
Volume Right	0	0	939	8
cSH	713	1700	1700	357
Volume to Capacity	0.01	0.46	0.56	0.04
Queue Length 95th (m)	0.3	0.0	0.0	1.1
Control Delay (s)	10.1	0.0	0.0	18.7
Lane LOS	B			C
Approach Delay (s)	0.1		0.0	18.7
Approach LOS				C

Intersection Summary				
Average Delay			0.2	
Intersection Capacity Utilization		68.6%		ICU Level of Service C
Analysis Period (min)		15		

2041 AM Background - with Site Peak Hour Volumes

8: 129th Street & Highway 3

Blairmore Coal Mine T.I.A

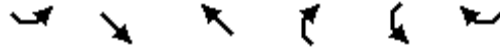


Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↕	↗	↖	↖			↕	↗		↕	
Volume (veh/h)	3	770	17	88	872	4	72	5	217	3	3	3
Sign Control		Free			Free			Stop			Stop	
Grade		0%			0%			0%			0%	
Peak Hour Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Hourly flow rate (vph)	3	770	17	88	872	4	72	5	217	3	3	3
Pedestrians												
Lane Width (m)												
Walking Speed (m/s)												
Percent Blockage												
Right turn flare (veh)									13			
Median type		None			None							
Median storage (veh)												
Upstream signal (m)												
pX, platoon unblocked												
vC, conflicting volume	876			787			1828	1828	770	1937	1843	874
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	876			787			1828	1828	770	1937	1843	874
tC, single (s)	4.1			4.1			7.1	6.5	6.2	7.1	6.5	6.2
tC, 2 stage (s)												
tF (s)	2.2			2.2			3.5	4.0	3.3	3.5	4.0	3.3
p0 queue free %	100			89			0	93	46	85	96	99
cM capacity (veh/h)	771			832			52	68	401	20	67	349

Direction, Lane #	EB 1	EB 2	WB 1	WB 2	NB 1	SB 1
Volume Total	773	17	88	876	294	9
Volume Left	3	0	88	0	72	3
Volume Right	0	17	0	4	217	3
cSH	771	1700	832	1700	202	44
Volume to Capacity	0.00	0.01	0.11	0.52	1.46	0.21
Queue Length 95th (m)	0.1	0.0	2.7	0.0	134.7	5.1
Control Delay (s)	0.1	0.0	9.8	0.0	125.2	107.8
Lane LOS	A		A		F	F
Approach Delay (s)	0.1		0.9		125.2	107.8
Approach LOS					F	F

Intersection Summary		
Average Delay		18.8
Intersection Capacity Utilization	89.9%	ICU Level of Service
Analysis Period (min)		15

3: Highway 3 & Coal Mine Access



Movement	SEL	SET	NWT	NWR	SWL	SWR
Lane Configurations						
Volume (veh/h)	8	914	869	9	10	10
Sign Control		Free	Free		Stop	
Grade		0%	0%		0%	
Peak Hour Factor	1.00	1.00	1.00	1.00	1.00	1.00
Hourly flow rate (vph)	8	914	869	9	10	10
Pedestrians						
Lane Width (m)						
Walking Speed (m/s)						
Percent Blockage						
Right turn flare (veh)						3
Median type		None	None			
Median storage veh						
Upstream signal (m)						
pX, platoon unblocked						
vC, conflicting volume	878				1804	874
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	878				1804	874
tC, single (s)	4.2				6.4	6.2
tC, 2 stage (s)						
tF (s)	2.3				3.5	3.3
p0 queue free %	99				88	97
cM capacity (veh/h)	745				86	348

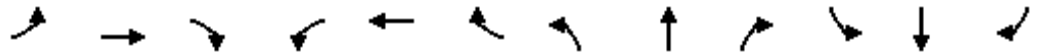
Direction, Lane #	SE 1	SE 2	NW 1	SW 1
Volume Total	8	914	878	20
Volume Left	8	0	0	10
Volume Right	0	0	9	10
cSH	745	1700	1700	173
Volume to Capacity	0.01	0.54	0.52	0.12
Queue Length 95th (m)	0.2	0.0	0.0	2.9
Control Delay (s)	9.9	0.0	0.0	33.9
Lane LOS	A			D
Approach Delay (s)	0.1		0.0	33.9
Approach LOS				D

Intersection Summary			
Average Delay		0.4	
Intersection Capacity Utilization		58.1%	ICU Level of Service B
Analysis Period (min)		15	

2041 PM Background - with Site Peak Hour Volumes

8: 129th Street & Highway 3

Blairmore Coal Mine T.I.A



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↖	↗	↖	↗			↖	↗		↕	
Volume (veh/h)	5	901	18	99	803	5	70	7	192	5	5	5
Sign Control		Free			Free			Stop			Stop	
Grade		0%			0%			0%			0%	
Peak Hour Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Hourly flow rate (vph)	5	901	18	99	803	5	70	7	192	5	5	5
Pedestrians												
Lane Width (m)												
Walking Speed (m/s)												
Percent Blockage												
Right turn flare (veh)									20			
Median type		None			None							
Median storage (veh)												
Upstream signal (m)												
pX, platoon unblocked												
vC, conflicting volume	808			919			1920	1917	901	2014	1932	806
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	808			919			1920	1917	901	2014	1932	806
tC, single (s)	4.1			4.1			7.1	6.5	6.2	7.1	6.5	6.2
tC, 2 stage (s)												
tF (s)	2.2			2.2			3.5	4.0	3.3	3.5	4.0	3.3
p0 queue free %	99			87			0	88	43	67	91	99
cM capacity (veh/h)	817			743			42	58	337	15	57	382

Direction, Lane #	EB 1	EB 2	WB 1	WB 2	NB 1	SB 1
Volume Total	906	18	99	808	269	15
Volume Left	5	0	99	0	70	5
Volume Right	0	18	0	5	192	5
cSH	817	1700	743	1700	152	35
Volume to Capacity	0.01	0.01	0.13	0.48	1.77	0.43
Queue Length 95th (m)	0.1	0.0	3.5	0.0	150.3	10.9
Control Delay (s)	0.2	0.0	10.6	0.0	184.6	170.3
Lane LOS	A		B		F	F
Approach Delay (s)	0.2		1.2		184.6	170.3
Approach LOS					F	F

Intersection Summary		
Average Delay		25.3
Intersection Capacity Utilization	98.8%	ICU Level of Service
Analysis Period (min)		15
		F



Lane Group	SEL	SET	SER	NWL	NWT	NEL	NET	SWT
Lane Group Flow (vph)	10	706	18	81	866	65	85	21
v/c Ratio	0.02	0.53	0.02	0.17	0.68	0.44	0.36	0.12
Control Delay	3.8	6.6	0.6	4.7	9.8	43.6	14.2	28.0
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	3.8	6.6	0.6	4.7	9.8	43.6	14.2	28.0
Queue Length 50th (m)	0.3	39.6	0.0	3.0	60.9	9.8	1.2	2.3
Queue Length 95th (m)	1.8	78.2	0.9	8.9	128.5	21.1	13.0	8.4
Internal Link Dist (m)		106.7			1026.0		69.8	71.7
Turn Bay Length (m)	50.0		100.0	100.0		60.0		
Base Capacity (vph)	417	1332	1111	488	1273	283	383	335
Starvation Cap Reductn	0	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0	0
Reduced v/c Ratio	0.02	0.53	0.02	0.17	0.68	0.23	0.22	0.06

Intersection Summary



Lane Group	SET	NWL	NWT	NEL
Lane Group Flow (vph)	1518	248	1236	403
v/c Ratio	0.86	0.67	0.91	0.81
Control Delay	25.1	24.5	22.3	23.1
Queue Delay	0.0	0.0	0.0	0.0
Total Delay	25.1	24.5	22.3	23.1
Queue Length 50th (m)	98.8	19.6	123.3	13.4
Queue Length 95th (m)	#174.1	45.9	#284.5	#45.4
Internal Link Dist (m)	952.9		71.2	80.4
Turn Bay Length (m)		100.0		
Base Capacity (vph)	1971	463	1518	591
Starvation Cap Reductn	0	0	0	0
Spillback Cap Reductn	0	0	0	0
Storage Cap Reductn	0	0	0	0
Reduced v/c Ratio	0.77	0.54	0.81	0.68

**Intersection Summary**

# 95th percentile volume exceeds capacity, queue may be longer.  
 Queue shown is maximum after two cycles.



Movement	SEL	SET	SER	NWL	NWT	NWR	NEL	NET	NER	SWL	SWT	SWR
Lane Configurations												
Volume (vph)	10	706	18	81	856	10	65	8	77	8	8	5
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	6.0	6.0	6.0	6.0	6.0		6.0	6.0			6.0	
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00		1.00	1.00			1.00	
Frt	1.00	1.00	0.85	1.00	1.00		1.00	0.86			0.97	
Flt Protected	0.95	1.00	1.00	0.95	1.00		0.95	1.00			0.98	
Satd. Flow (prot)	1825	1685	1396	1659	1610		1706	1522			1825	
Flt Permitted	0.28	1.00	1.00	0.35	1.00		0.74	1.00			0.84	
Satd. Flow (perm)	529	1685	1396	618	1610		1335	1522			1563	
Peak-hour factor, PHF	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj. Flow (vph)	10	706	18	81	856	10	65	8	77	8	8	5
RTOR Reduction (vph)	0	0	4	0	0	0	0	70	0	0	5	0
Lane Group Flow (vph)	10	706	14	81	866	0	65	15	0	0	16	0
Heavy Vehicles (%)	0%	14%	17%	10%	19%	29%	7%	0%	10%	0%	0%	0%
Turn Type	Perm	NA	Perm	Perm	NA		Perm	NA		Perm	NA	
Protected Phases		6			2			4			8	
Permitted Phases	6		6	2			4			8		
Actuated Green, G (s)	66.0	66.0	66.0	66.0	66.0		8.3	8.3			8.3	
Effective Green, g (s)	66.0	66.0	66.0	66.0	66.0		8.3	8.3			8.3	
Actuated g/C Ratio	0.76	0.76	0.76	0.76	0.76		0.10	0.10			0.10	
Clearance Time (s)	6.0	6.0	6.0	6.0	6.0		6.0	6.0			6.0	
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0		3.0	3.0			3.0	
Lane Grp Cap (vph)	404	1288	1067	472	1231		128	146			150	
v/s Ratio Prot		0.42			c0.54			0.01				
v/s Ratio Perm	0.02		0.01	0.13			c0.05				0.01	
v/c Ratio	0.02	0.55	0.01	0.17	0.70		0.51	0.11			0.11	
Uniform Delay, d1	2.4	4.1	2.4	2.7	5.2		37.1	35.6			35.6	
Progression Factor	1.00	1.00	1.00	1.00	1.00		1.00	1.00			1.00	
Incremental Delay, d2	0.1	1.7	0.0	0.8	3.4		3.1	0.3			0.3	
Delay (s)	2.5	5.8	2.4	3.5	8.5		40.2	35.9			36.0	
Level of Service	A	A	A	A	A		D	D			D	
Approach Delay (s)		5.7			8.1			37.8			36.0	
Approach LOS		A			A			D			D	

**Intersection Summary**

HCM 2000 Control Delay	9.9	HCM 2000 Level of Service	A
HCM 2000 Volume to Capacity ratio	0.68		
Actuated Cycle Length (s)	86.3	Sum of lost time (s)	12.0
Intersection Capacity Utilization	72.0%	ICU Level of Service	C
Analysis Period (min)	15		

c Critical Lane Group



Movement	SET	SER	NWL	NWT	NEL	NER
Lane Configurations	↑↑		↙	↑	↘	
Volume (vph)	1495	23	248	1236	17	386
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)	5.5		5.5	5.5	5.5	
Lane Util. Factor	0.95		1.00	1.00	1.00	
Frt	1.00		1.00	1.00	0.87	
Flt Protected	1.00		0.95	1.00	1.00	
Satd. Flow (prot)	3570		1789	1883	1636	
Flt Permitted	1.00		0.09	1.00	1.00	
Satd. Flow (perm)	3570		169	1883	1636	
Peak-hour factor, PHF	1.00	1.00	1.00	1.00	1.00	1.00
Adj. Flow (vph)	1495	23	248	1236	17	386
RTOR Reduction (vph)	1	0	0	0	272	0
Lane Group Flow (vph)	1517	0	248	1236	131	0
Turn Type	NA		pm+pt	NA	NA	
Protected Phases	6		5	2	4	
Permitted Phases			2			
Actuated Green, G (s)	39.1		56.7	56.7	10.7	
Effective Green, g (s)	39.1		56.7	56.7	10.7	
Actuated g/C Ratio	0.50		0.72	0.72	0.14	
Clearance Time (s)	5.5		5.5	5.5	5.5	
Vehicle Extension (s)	3.0		3.0	3.0	3.0	
Lane Grp Cap (vph)	1780		372	1361	223	
v/s Ratio Prot	0.42		0.10	c0.66	c0.08	
v/s Ratio Perm			0.38			
v/c Ratio	0.85		0.67	0.91	0.59	
Uniform Delay, d1	17.1		18.4	8.8	31.8	
Progression Factor	1.00		1.00	1.00	1.00	
Incremental Delay, d2	4.2		4.5	9.0	3.9	
Delay (s)	21.3		22.9	17.8	35.7	
Level of Service	C		C	B	D	
Approach Delay (s)	21.3			18.6	35.7	
Approach LOS	C			B	D	

**Intersection Summary**

HCM 2000 Control Delay	21.8	HCM 2000 Level of Service	C
HCM 2000 Volume to Capacity ratio	0.93		
Actuated Cycle Length (s)	78.4	Sum of lost time (s)	16.5
Intersection Capacity Utilization	99.0%	ICU Level of Service	F
Analysis Period (min)	15		
c Critical Lane Group			



Movement	SEL	SET	SER	NWL	NWT	NWR	NEL	NET	NER	SWL	SWT	SWR
Lane Configurations												
Volume (vph)	16	832	28	84	788	7	70	0	77	13	10	9
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	6.0	6.0	6.0	6.0	6.0		6.0	6.0			6.0	
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00		1.00	1.00			1.00	
Frt	1.00	1.00	0.85	1.00	1.00		1.00	0.85			0.96	
Flt Protected	0.95	1.00	1.00	0.95	1.00		0.95	1.00			0.98	
Satd. Flow (prot)	1789	1883	1601	1789	1881		1789	1601			1776	
Flt Permitted	0.31	1.00	1.00	0.29	1.00		0.74	1.00			0.83	
Satd. Flow (perm)	582	1883	1601	548	1881		1387	1601			1510	
Peak-hour factor, PHF	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj. Flow (vph)	16	832	28	84	788	7	70	0	77	13	10	9
RTOR Reduction (vph)	0	0	7	0	0	0	0	69	0	0	8	0
Lane Group Flow (vph)	16	832	21	84	795	0	70	8	0	0	24	0
Turn Type	Perm	NA	Perm	Perm	NA		Perm	NA		Perm	NA	
Protected Phases		6			2			4				8
Permitted Phases	6		6	2			4			8		
Actuated Green, G (s)	65.7	65.7	65.7	65.7	65.7		8.4	8.4			8.4	
Effective Green, g (s)	65.7	65.7	65.7	65.7	65.7		8.4	8.4			8.4	
Actuated g/C Ratio	0.76	0.76	0.76	0.76	0.76		0.10	0.10			0.10	
Clearance Time (s)	6.0	6.0	6.0	6.0	6.0		6.0	6.0			6.0	
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0		3.0	3.0			3.0	
Lane Grp Cap (vph)	444	1436	1221	418	1435		135	156			147	
v/s Ratio Prot		c0.44			0.42			0.00				
v/s Ratio Perm	0.03		0.01	0.15			c0.05				0.02	
v/c Ratio	0.04	0.58	0.02	0.20	0.55		0.52	0.05			0.16	
Uniform Delay, d1	2.5	4.3	2.4	2.9	4.2		36.9	35.2			35.6	
Progression Factor	1.00	1.00	1.00	1.00	1.00		1.00	1.00			1.00	
Incremental Delay, d2	0.2	1.7	0.0	1.1	1.5		3.3	0.1			0.5	
Delay (s)	2.6	6.0	2.5	3.9	5.7		40.3	35.4			36.1	
Level of Service	A	A	A	A	A		D	D			D	
Approach Delay (s)		5.9			5.6			37.7			36.1	
Approach LOS		A			A			D			D	

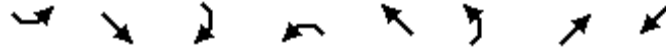
Intersection Summary			
HCM 2000 Control Delay	8.6	HCM 2000 Level of Service	A
HCM 2000 Volume to Capacity ratio	0.57		
Actuated Cycle Length (s)	86.1	Sum of lost time (s)	12.0
Intersection Capacity Utilization	71.9%	ICU Level of Service	C
Analysis Period (min)	15		
c Critical Lane Group			



Movement	SET	SER	NWL	NWT	NEL	NER
Lane Configurations	↑↑		←	↑	↑↑	
Volume (vph)	762	8	192	745	11	195
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)	5.5		5.5	5.5	5.5	
Lane Util. Factor	0.95		1.00	1.00	1.00	
Frt	1.00		1.00	1.00	0.87	
Flt Protected	1.00		0.95	1.00	1.00	
Satd. Flow (prot)	3573		1789	1883	1638	
Flt Permitted	1.00		0.21	1.00	1.00	
Satd. Flow (perm)	3573		388	1883	1638	
Peak-hour factor, PHF	1.00	1.00	1.00	1.00	1.00	1.00
Adj. Flow (vph)	762	8	192	745	11	195
RTOR Reduction (vph)	1	0	0	0	168	0
Lane Group Flow (vph)	769	0	192	745	38	0
Turn Type	NA		pm+pt	NA	NA	
Protected Phases	6		5	2	4	
Permitted Phases			2			
Actuated Green, G (s)	16.9		31.8	31.8	7.0	
Effective Green, g (s)	16.9		31.8	31.8	7.0	
Actuated g/C Ratio	0.34		0.64	0.64	0.14	
Clearance Time (s)	5.5		5.5	5.5	5.5	
Vehicle Extension (s)	3.0		3.0	3.0	3.0	
Lane Grp Cap (vph)	1212		512	1202	230	
v/s Ratio Prot	0.22		0.07	c0.40	c0.02	
v/s Ratio Perm			0.17			
v/c Ratio	0.63		0.38	0.62	0.17	
Uniform Delay, d1	13.9		4.9	5.4	18.8	
Progression Factor	1.00		1.00	1.00	1.00	
Incremental Delay, d2	1.1		0.5	1.0	0.3	
Delay (s)	14.9		5.4	6.3	19.2	
Level of Service	B		A	A	B	
Approach Delay (s)	14.9			6.1	19.2	
Approach LOS	B			A	B	

**Intersection Summary**

HCM 2000 Control Delay	11.1	HCM 2000 Level of Service	B
HCM 2000 Volume to Capacity ratio	0.63		
Actuated Cycle Length (s)	49.8	Sum of lost time (s)	16.5
Intersection Capacity Utilization	61.0%	ICU Level of Service	B
Analysis Period (min)	15		
c Critical Lane Group			



Lane Group	SEL	SET	SER	NWL	NWT	NEL	NET	SWT
Lane Group Flow (vph)	16	832	28	84	795	70	77	32
v/c Ratio	0.03	0.56	0.02	0.19	0.54	0.45	0.21	0.18
Control Delay	3.8	6.9	1.1	5.2	6.5	43.4	1.3	27.8
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	3.8	6.9	1.1	5.2	6.5	43.4	1.3	27.8
Queue Length 50th (m)	0.6	48.9	0.0	3.2	45.0	10.5	0.0	3.3
Queue Length 95th (m)	2.4	93.9	1.7	9.8	86.2	22.2	0.0	10.9
Internal Link Dist (m)		106.7			139.4		69.8	71.7
Turn Bay Length (m)	50.0		100.0	100.0		60.0		
Base Capacity (vph)	459	1485	1270	432	1484	294	507	327
Starvation Cap Reductn	0	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0	0
Reduced v/c Ratio	0.03	0.56	0.02	0.19	0.54	0.24	0.15	0.10

Intersection Summary



Lane Group	SET	NWL	NWT	NEL
Lane Group Flow (vph)	770	192	745	206
v/c Ratio	0.65	0.38	0.62	0.52
Control Delay	17.2	6.0	8.4	10.3
Queue Delay	0.0	0.0	0.0	0.0
Total Delay	17.2	6.0	8.4	10.3
Queue Length 50th (m)	28.0	4.9	28.1	0.8
Queue Length 95th (m)	51.9	13.6	68.2	16.5
Internal Link Dist (m)	253.8		274.2	80.4
Turn Bay Length (m)		100.0		
Base Capacity (vph)	3009	709	1873	668
Starvation Cap Reductn	0	0	0	0
Spillback Cap Reductn	0	0	0	0
Storage Cap Reductn	0	0	0	0
Reduced v/c Ratio	0.26	0.27	0.40	0.31

**Intersection Summary**

3: Highway 3 & Coal Mine Access

Blairmore Coal Mine T.I.A



Movement	SEL	SET	NWT	NWR	SWL	SWR
Lane Configurations						
Volume (veh/h)	22	782	939	27	21	17
Sign Control		Free	Free		Stop	
Grade		0%	0%		0%	
Peak Hour Factor	1.00	1.00	1.00	1.00	1.00	1.00
Hourly flow rate (vph)	22	782	939	27	21	17
Pedestrians						
Lane Width (m)						
Walking Speed (m/s)						
Percent Blockage						
Right turn flare (veh)						3
Median type		None	None			
Median storage veh						
Upstream signal (m)						
pX, platoon unblocked						
vC, conflicting volume	966				1778	952
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	966				1778	952
tC, single (s)	4.1				6.4	6.3
tC, 2 stage (s)						
tF (s)	2.2				3.5	3.4
p0 queue free %	97				76	94
cM capacity (veh/h)	701				86	306

Direction, Lane #	SE 1	SE 2	NW 1	SW 1
Volume Total	22	782	966	38
Volume Left	22	0	0	21
Volume Right	0	0	27	17
cSH	701	1700	1700	156
Volume to Capacity	0.03	0.46	0.57	0.24
Queue Length 95th (m)	0.7	0.0	0.0	6.9
Control Delay (s)	10.3	0.0	0.0	40.8
Lane LOS	B			E
Approach Delay (s)	0.3		0.0	40.8
Approach LOS				E

Intersection Summary			
Average Delay		1.0	
Intersection Capacity Utilization		61.1%	ICU Level of Service B
Analysis Period (min)		15	

2041 AM Future Total - with Site Peak Hour Volumes

8: 129th Street & Highway 3

Blairmore Coal Mine T.I.A



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↕	↗	↖	↖	↖		↕	↗		↕	
Volume (veh/h)	3	783	17	88	891	4	72	5	217	3	3	3
Sign Control		Free			Free			Stop			Stop	
Grade		0%			0%			0%			0%	
Peak Hour Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Hourly flow rate (vph)	3	783	17	88	891	4	72	5	217	3	3	3
Pedestrians												
Lane Width (m)												
Walking Speed (m/s)												
Percent Blockage												
Right turn flare (veh)									13			
Median type		None			None							
Median storage (veh)												
Upstream signal (m)												
pX, platoon unblocked												
vC, conflicting volume	895			800			1860	1860	783	1969	1875	893
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	895			800			1860	1860	783	1969	1875	893
tC, single (s)	4.1			4.1			7.1	6.5	6.2	7.1	6.5	6.2
tC, 2 stage (s)												
tF (s)	2.2			2.2			3.5	4.0	3.3	3.5	4.0	3.3
p0 queue free %	100			89			0	92	45	83	95	99
cM capacity (veh/h)	758			823			49	65	394	18	64	340

Direction, Lane #	EB 1	EB 2	WB 1	WB 2	NB 1	SB 1
Volume Total	786	17	88	895	294	9
Volume Left	3	0	88	0	72	3
Volume Right	0	17	0	4	217	3
cSH	758	1700	823	1700	191	41
Volume to Capacity	0.00	0.01	0.11	0.53	1.54	0.22
Queue Length 95th (m)	0.1	0.0	2.7	0.0	142.3	5.5
Control Delay (s)	0.1	0.0	9.9	0.0	136.5	116.9
Lane LOS	A		A		F	F
Approach Delay (s)	0.1		0.9		136.5	116.9
Approach LOS					F	F

Intersection Summary		
Average Delay		20.2
Intersection Capacity Utilization	89.9%	ICU Level of Service
Analysis Period (min)		15
		E

3: Highway 3 & Coal Mine Access

Blairmore Coal Mine T.I.A



Movement	SEL	SET	NWT	NWR	SWL	SWR
Lane Configurations						
Volume (veh/h)	17	914	869	22	23	19
Sign Control		Free	Free		Stop	
Grade		0%	0%		0%	
Peak Hour Factor	1.00	1.00	1.00	1.00	1.00	1.00
Hourly flow rate (vph)	17	914	869	22	23	19
Pedestrians						
Lane Width (m)						
Walking Speed (m/s)						
Percent Blockage						
Right turn flare (veh)						3
Median type		None	None			
Median storage veh						
Upstream signal (m)						
pX, platoon unblocked						
vC, conflicting volume	891				1828	880
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	891				1828	880
tC, single (s)	4.2				6.4	6.2
tC, 2 stage (s)						
tF (s)	2.3				3.5	3.3
p0 queue free %	98				72	94
cM capacity (veh/h)	736				82	345





















Direction, Lane #	SE 1	SE 2	NW 1	SW 1
Volume Total	17	914	891	42
Volume Left	17	0	0	23
Volume Right	0	0	22	19
cSH	736	1700	1700	150
Volume to Capacity	0.02	0.54	0.52	0.28
Queue Length 95th (m)	0.5	0.0	0.0	8.2
Control Delay (s)	10.0	0.0	0.0	42.8
Lane LOS	B			E
Approach Delay (s)	0.2		0.0	42.8
Approach LOS				E

Intersection Summary			
Average Delay		1.1	
Intersection Capacity Utilization		58.1%	ICU Level of Service B
Analysis Period (min)		15	

2041 PM Future Total - with Site Peak Hour Volumes

8: 129th Street & Highway 3

Blairmore Coal Mine T.I.A

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (veh/h)	5	914	18	99	816	5	70	7	192	5	5	5
Sign Control		Free			Free			Stop			Stop	
Grade		0%			0%			0%			0%	
Peak Hour Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Hourly flow rate (vph)	5	914	18	99	816	5	70	7	192	5	5	5
Pedestrians												
Lane Width (m)												
Walking Speed (m/s)												
Percent Blockage												
Right turn flare (veh)											20	
Median type	None					None						
Median storage (veh)												
Upstream signal (m)												
pX, platoon unblocked												
vC, conflicting volume	821			932			1946	1943	914	2040	1958	818
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	821			932			1946	1943	914	2040	1958	818
tC, single (s)	4.1			4.1			7.1	6.5	6.2	7.1	6.5	6.2
tC, 2 stage (s)												
tF (s)	2.2			2.2			3.5	4.0	3.3	3.5	4.0	3.3
p0 queue free %	99			87			0	87	42	65	91	99
cM capacity (veh/h)	808			734			40	56	331	14	55	376
<b>Direction, Lane #</b>	<b>EB 1</b>	<b>EB 2</b>	<b>WB 1</b>	<b>WB 2</b>	<b>NB 1</b>	<b>SB 1</b>						
Volume Total	919	18	99	821	269	15						
Volume Left	5	0	99	0	70	5						
Volume Right	0	18	0	5	192	5						
cSH	808	1700	734	1700	145	33						
Volume to Capacity	0.01	0.01	0.13	0.48	1.86	0.46						
Queue Length 95th (m)	0.1	0.0	3.5	0.0	155.4	11.5						
Control Delay (s)	0.2	0.0	10.7	0.0	197.6	186.2						
Lane LOS	A		B		F	F						
Approach Delay (s)	0.2		1.1		197.6	186.2						
Approach LOS					F	F						
<b>Intersection Summary</b>												
Average Delay			26.7									
Intersection Capacity Utilization			98.8%		ICU Level of Service		F					
Analysis Period (min)			15									

2041 AM Future Total - with Site Peak Hour Volumes

5: 107 Street (West Access)/107 Street & Highway 3

Blairmore Coal Mine T.I.A



Movement	SEL	SET	SER	NWL	NWT	NWR	NEL	NET	NER	SWL	SWT	SWR
Lane Configurations												
Volume (vph)	10	719	18	81	865	10	65	8	77	8	8	5
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	6.0	6.0	6.0	6.0	6.0		6.0	6.0			6.0	
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00		1.00	1.00			1.00	
Frt	1.00	1.00	0.85	1.00	1.00		1.00	0.86			0.97	
Flt Protected	0.95	1.00	1.00	0.95	1.00		0.95	1.00			0.98	
Satd. Flow (prot)	1825	1685	1396	1659	1610		1706	1522			1825	
Flt Permitted	0.27	1.00	1.00	0.35	1.00		0.74	1.00			0.84	
Satd. Flow (perm)	521	1685	1396	607	1610		1335	1522			1563	
Peak-hour factor, PHF	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj. Flow (vph)	10	719	18	81	865	10	65	8	77	8	8	5
RTOR Reduction (vph)	0	0	4	0	0	0	0	70	0	0	5	0
Lane Group Flow (vph)	10	719	14	81	875	0	65	15	0	0	16	0
Heavy Vehicles (%)	0%	14%	17%	10%	19%	29%	7%	0%	10%	0%	0%	0%
Turn Type	Perm	NA	Perm	Perm	NA		Perm	NA		Perm	NA	
Protected Phases		6			2			4			8	
Permitted Phases	6		6	2			4			8		
Actuated Green, G (s)	66.0	66.0	66.0	66.0	66.0		8.3	8.3			8.3	
Effective Green, g (s)	66.0	66.0	66.0	66.0	66.0		8.3	8.3			8.3	
Actuated g/C Ratio	0.76	0.76	0.76	0.76	0.76		0.10	0.10			0.10	
Clearance Time (s)	6.0	6.0	6.0	6.0	6.0		6.0	6.0			6.0	
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0		3.0	3.0			3.0	
Lane Grp Cap (vph)	398	1288	1067	464	1231		128	146			150	
v/s Ratio Prot		0.43			c0.54			0.01				
v/s Ratio Perm	0.02		0.01	0.13			c0.05				0.01	
v/c Ratio	0.03	0.56	0.01	0.17	0.71		0.51	0.11			0.11	
Uniform Delay, d1	2.4	4.2	2.4	2.8	5.2		37.1	35.6			35.6	
Progression Factor	1.00	1.00	1.00	1.00	1.00		1.00	1.00			1.00	
Incremental Delay, d2	0.1	1.8	0.0	0.8	3.5		3.1	0.3			0.3	
Delay (s)	2.6	5.9	2.4	3.6	8.7		40.2	35.9			36.0	
Level of Service	A	A	A	A	A		D	D			D	
Approach Delay (s)		5.8			8.3			37.8			36.0	
Approach LOS		A			A			D			D	

Intersection Summary

HCM 2000 Control Delay	10.0	HCM 2000 Level of Service	A
HCM 2000 Volume to Capacity ratio	0.69		
Actuated Cycle Length (s)	86.3	Sum of lost time (s)	12.0
Intersection Capacity Utilization	72.5%	ICU Level of Service	C
Analysis Period (min)	15		

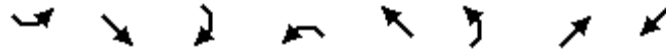
c Critical Lane Group



Movement	SET	SER	NWL	NWT	NEL	NER
Lane Configurations	↑↑		↵	↑	↗	
Volume (vph)	1495	23	248	1236	17	386
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)	5.5		5.5	5.5	5.5	
Lane Util. Factor	0.95		1.00	1.00	1.00	
Frt	1.00		1.00	1.00	0.87	
Flt Protected	1.00		0.95	1.00	1.00	
Satd. Flow (prot)	3570		1789	1883	1636	
Flt Permitted	1.00		0.09	1.00	1.00	
Satd. Flow (perm)	3570		169	1883	1636	
Peak-hour factor, PHF	1.00	1.00	1.00	1.00	1.00	1.00
Adj. Flow (vph)	1495	23	248	1236	17	386
RTOR Reduction (vph)	1	0	0	0	272	0
Lane Group Flow (vph)	1517	0	248	1236	131	0
Turn Type	NA		pm+pt	NA	NA	
Protected Phases	6		5	2	4	
Permitted Phases			2			
Actuated Green, G (s)	39.1		56.7	56.7	10.7	
Effective Green, g (s)	39.1		56.7	56.7	10.7	
Actuated g/C Ratio	0.50		0.72	0.72	0.14	
Clearance Time (s)	5.5		5.5	5.5	5.5	
Vehicle Extension (s)	3.0		3.0	3.0	3.0	
Lane Grp Cap (vph)	1780		372	1361	223	
v/s Ratio Prot	0.42		0.10	c0.66	c0.08	
v/s Ratio Perm			0.38			
v/c Ratio	0.85		0.67	0.91	0.59	
Uniform Delay, d1	17.1		18.4	8.8	31.8	
Progression Factor	1.00		1.00	1.00	1.00	
Incremental Delay, d2	4.2		4.5	9.0	3.9	
Delay (s)	21.3		22.9	17.8	35.7	
Level of Service	C		C	B	D	
Approach Delay (s)	21.3			18.6	35.7	
Approach LOS	C			B	D	

**Intersection Summary**

HCM 2000 Control Delay	21.8	HCM 2000 Level of Service	C
HCM 2000 Volume to Capacity ratio	0.93		
Actuated Cycle Length (s)	78.4	Sum of lost time (s)	16.5
Intersection Capacity Utilization	99.0%	ICU Level of Service	F
Analysis Period (min)	15		
c Critical Lane Group			



Lane Group	SEL	SET	SER	NWL	NWT	NEL	NET	SWT
Lane Group Flow (vph)	10	719	18	81	875	65	85	21
v/c Ratio	0.02	0.54	0.02	0.17	0.69	0.44	0.36	0.12
Control Delay	3.8	6.8	0.6	4.8	10.0	43.6	14.2	28.0
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	3.8	6.8	0.6	4.8	10.0	43.6	14.2	28.0
Queue Length 50th (m)	0.3	40.9	0.0	3.1	62.3	9.8	1.2	2.3
Queue Length 95th (m)	1.8	80.5	0.9	8.9	132.2	21.1	13.0	8.4
Internal Link Dist (m)		106.7			1026.0		69.8	71.7
Turn Bay Length (m)	50.0		100.0	100.0		60.0		
Base Capacity (vph)	411	1332	1111	479	1273	283	383	335
Starvation Cap Reductn	0	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0	0
Reduced v/c Ratio	0.02	0.54	0.02	0.17	0.69	0.23	0.22	0.06

Intersection Summary



Lane Group	SET	NWL	NWT	NEL
Lane Group Flow (vph)	1518	248	1236	403
v/c Ratio	0.86	0.67	0.91	0.81
Control Delay	25.1	24.5	22.3	23.1
Queue Delay	0.0	0.0	0.0	0.0
Total Delay	25.1	24.5	22.3	23.1
Queue Length 50th (m)	98.8	19.6	123.3	13.4
Queue Length 95th (m)	#174.1	45.9	#284.5	#45.4
Internal Link Dist (m)	952.9		71.2	80.4
Turn Bay Length (m)		100.0		
Base Capacity (vph)	1971	463	1518	591
Starvation Cap Reductn	0	0	0	0
Spillback Cap Reductn	0	0	0	0
Storage Cap Reductn	0	0	0	0
Reduced v/c Ratio	0.77	0.54	0.81	0.68

**Intersection Summary**

# 95th percentile volume exceeds capacity, queue may be longer.  
 Queue shown is maximum after two cycles.

2041 PM Future Total - with Site Peak Hour Volumes

5: 107 Street (West Access)/107 Street & Highway 3

Blairmore Coal Mine T.I.A



Movement	SEL	SET	SER	NWL	NWT	NWR	NEL	NET	NER	SWL	SWT	SWR
Lane Configurations												
Volume (vph)	16	841	28	84	797	7	70	0	77	13	10	9
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	6.0	6.0	6.0	6.0	6.0		6.0	6.0			6.0	
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00		1.00	1.00			1.00	
Frt	1.00	1.00	0.85	1.00	1.00		1.00	0.85			0.96	
Flt Protected	0.95	1.00	1.00	0.95	1.00		0.95	1.00			0.98	
Satd. Flow (prot)	1659	1671	1541	1615	1685		1738	1541			1721	
Flt Permitted	0.30	1.00	1.00	0.29	1.00		0.74	1.00			0.83	
Satd. Flow (perm)	530	1671	1541	485	1685		1347	1541			1463	
Peak-hour factor, PHF	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj. Flow (vph)	16	841	28	84	797	7	70	0	77	13	10	9
RTOR Reduction (vph)	0	0	7	0	0	0	0	69	0	0	8	0
Lane Group Flow (vph)	16	841	21	84	804	0	70	8	0	0	24	0
Heavy Vehicles (%)	10%	15%	6%	13%	14%	0%	5%	0%	6%	13%	0%	0%
Turn Type	Perm	NA	Perm	Perm	NA		Perm	NA		Perm	NA	
Protected Phases		6			2			4			8	
Permitted Phases	6		6	2			4			8		
Actuated Green, G (s)	65.7	65.7	65.7	65.7	65.7		8.6	8.6			8.6	
Effective Green, g (s)	65.7	65.7	65.7	65.7	65.7		8.6	8.6			8.6	
Actuated g/C Ratio	0.76	0.76	0.76	0.76	0.76		0.10	0.10			0.10	
Clearance Time (s)	6.0	6.0	6.0	6.0	6.0		6.0	6.0			6.0	
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0		3.0	3.0			3.0	
Lane Grp Cap (vph)	403	1272	1173	369	1282		134	153			145	
v/s Ratio Prot		c0.50			0.48			0.00				
v/s Ratio Perm	0.03		0.01	0.17			c0.05				0.02	
v/c Ratio	0.04	0.66	0.02	0.23	0.63		0.52	0.05			0.16	
Uniform Delay, d1	2.5	5.0	2.5	3.0	4.7		36.9	35.2			35.6	
Progression Factor	1.00	1.00	1.00	1.00	1.00		1.00	1.00			1.00	
Incremental Delay, d2	0.2	2.7	0.0	1.4	2.3		3.6	0.1			0.5	
Delay (s)	2.7	7.7	2.5	4.4	7.0		40.5	35.3			36.1	
Level of Service	A	A	A	A	A		D	D			D	
Approach Delay (s)		7.4			6.8			37.8			36.1	
Approach LOS		A			A			D			D	

Intersection Summary

HCM 2000 Control Delay	9.9	HCM 2000 Level of Service	A
HCM 2000 Volume to Capacity ratio	0.64		
Actuated Cycle Length (s)	86.3	Sum of lost time (s)	12.0
Intersection Capacity Utilization	72.4%	ICU Level of Service	C
Analysis Period (min)	15		

c Critical Lane Group



Movement	SET	SER	NWL	NWT	NEL	NER
Lane Configurations	↑↑		←	↑	↑↑	
Volume (vph)	762	8	192	745	11	195
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)	5.5		5.5	5.5	5.5	
Lane Util. Factor	0.95		1.00	1.00	1.00	
Frt	1.00		1.00	1.00	0.87	
Flt Protected	1.00		0.95	1.00	1.00	
Satd. Flow (prot)	3573		1789	1883	1638	
Flt Permitted	1.00		0.21	1.00	1.00	
Satd. Flow (perm)	3573		388	1883	1638	
Peak-hour factor, PHF	1.00	1.00	1.00	1.00	1.00	1.00
Adj. Flow (vph)	762	8	192	745	11	195
RTOR Reduction (vph)	1	0	0	0	168	0
Lane Group Flow (vph)	769	0	192	745	38	0
Turn Type	NA		pm+pt	NA	NA	
Protected Phases	6		5	2	4	
Permitted Phases			2			
Actuated Green, G (s)	16.9		31.8	31.8	7.0	
Effective Green, g (s)	16.9		31.8	31.8	7.0	
Actuated g/C Ratio	0.34		0.64	0.64	0.14	
Clearance Time (s)	5.5		5.5	5.5	5.5	
Vehicle Extension (s)	3.0		3.0	3.0	3.0	
Lane Grp Cap (vph)	1212		512	1202	230	
v/s Ratio Prot	0.22		0.07	c0.40	c0.02	
v/s Ratio Perm			0.17			
v/c Ratio	0.63		0.38	0.62	0.17	
Uniform Delay, d1	13.9		4.9	5.4	18.8	
Progression Factor	1.00		1.00	1.00	1.00	
Incremental Delay, d2	1.1		0.5	1.0	0.3	
Delay (s)	14.9		5.4	6.3	19.2	
Level of Service	B		A	A	B	
Approach Delay (s)	14.9			6.1	19.2	
Approach LOS	B			A	B	

**Intersection Summary**

HCM 2000 Control Delay	11.1	HCM 2000 Level of Service	B
HCM 2000 Volume to Capacity ratio	0.63		
Actuated Cycle Length (s)	49.8	Sum of lost time (s)	16.5
Intersection Capacity Utilization	61.0%	ICU Level of Service	B
Analysis Period (min)	15		
c Critical Lane Group			



Lane Group	SEL	SET	SER	NWL	NWT	NEL	NET	SWT
Lane Group Flow (vph)	16	841	28	84	804	70	77	32
v/c Ratio	0.04	0.64	0.02	0.22	0.61	0.45	0.21	0.18
Control Delay	3.9	8.8	1.2	5.7	8.0	43.8	1.4	27.9
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	3.9	8.8	1.2	5.7	8.0	43.8	1.4	27.9
Queue Length 50th (m)	0.6	55.9	0.0	3.4	50.6	10.5	0.0	3.3
Queue Length 95th (m)	2.5	115.3	1.7	10.5	102.8	22.3	0.0	10.9
Internal Link Dist (m)		106.7			139.4		69.8	71.7
Turn Bay Length (m)	50.0		100.0	100.0		60.0		
Base Capacity (vph)	416	1315	1221	382	1327	285	491	317
Starvation Cap Reductn	0	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0	0
Reduced v/c Ratio	0.04	0.64	0.02	0.22	0.61	0.25	0.16	0.10

Intersection Summary



Lane Group	SET	NWL	NWT	NEL
Lane Group Flow (vph)	770	192	745	206
v/c Ratio	0.65	0.38	0.62	0.52
Control Delay	17.2	6.0	8.4	10.3
Queue Delay	0.0	0.0	0.0	0.0
Total Delay	17.2	6.0	8.4	10.3
Queue Length 50th (m)	28.0	4.9	28.1	0.8
Queue Length 95th (m)	51.9	13.6	68.2	16.5
Internal Link Dist (m)	253.8		274.2	80.4
Turn Bay Length (m)		100.0		
Base Capacity (vph)	3009	709	1873	668
Starvation Cap Reductn	0	0	0	0
Spillback Cap Reductn	0	0	0	0
Storage Cap Reductn	0	0	0	0
Reduced v/c Ratio	0.26	0.27	0.40	0.31
<b>Intersection Summary</b>				

# Appendix D

---

## Illumination Warrant Worksheet

TAC Guide for the Design of Roadway Lighting (2006)

Warrant for Intersection Lighting

Highway Crownstest Hwy (Hwy 3)  
 Location Mine Access  
 Date: April, 2015

WP No: \_\_\_\_\_  
 Name Michael Dworczak

CLASSIFICATION FACTOR	RATING (I)					Weight Subcategory (if Applicable)	WEIGHT	RATING (0 through 4)	SCORE [RATING*WEIGHT]																														
	0	1	2	3	4																																		
<b>Geometric Factors ( G )</b>																																							
Channelization	none	right and/or left turn lanes on minor approach	right turn lane(s) only on major leg(s)	left turn lane(s) on major leg(s)	left and right turn lanes on all legs	raised and operating speed less than 70 km/h on at least one channelized approach OR	15.0	0	0.0																														
						raised and operating speed 70 km/h or more on at least one channelized approach OR	20.0	0	0.0																														
						painted only	5.0	0	0.0																														
Approach Sight Distance on the most constrained approach (relative to recommended minimum intersection sight distance)	100% or more	75% - 99%	50% - 74%	25% - 49%	<25%		10.0	0	0.0																														
Horizontal curvature (radius) at or immediately before intersection on any leg for a posted speed limit of:																																							
110 km/h	tangent	>1,800m	1,150 to 1,800m	750 to 1,150m	<750m																																		
90 or 100 km/h	tangent	>1,400m	950 to 1,400m	600 to 950m	<600m																																		
70 or 80 km/h	tangent	>950m	550 to 950m	340 to 550m	<340m	5.0	4	20.0																															
60 km/h	tangent	>575m	320 to 575m	190 to 320m	<190m																																		
angle of intersection OR offset intersection	90° angle	80° or 100° angle	--	70° or 110° angle	<70° or >110° OR offset intersection	5.0	1	5.0																															
downhill approach grades at or immediately before intersection on any leg	<3.0%	3.1 to 3.9% and meets design guidelines for type and speed of road	4.0 to 4.9% and meets design guidelines for type and speed of road	5.0 to 7.0% and meets design guidelines for type and speed of road	>7.0% OR exceeds maximum gradient for the type and speed of road	3.0	4	12.0																															
number of legs	--	3	4	5	6 or more	3.0	1	3.0																															
<b>Subtotal Geometric Factors</b>									<b>40.0</b>																														
<b>Operational Factors ( O )</b>																																							
<b>IF THE INTERSECTION IS SIGNALIZED, ILLUMINATION IS WARRANTED.</b> <b>IF THE INTERSECTION IS NOT SIGNALIZED, points should be calculated on the basis of either the AADT factor or the signalization warrant factor</b>																																							
either																																							
AADT (2-way) (See Note 1): on major road and on minor road	<1,000	1,000 to 2,000	2,000 to 3,000	3,000 to 5,000	>5,000		10.0	4	40.0																														
	<500	500 to 1,000	1,000 to 1,500	1,500 to 2,000	>2,000		20.0	0	0.0																														
or signalization warrant (See Note 1)	intersection not signalized and volume-based warrant is less than 20% satisfied	intersection is not signalized and volume-based warrant is 20% to 40% satisfied	intersection is not signalized and volume-based warrant is 40% to 60% satisfied	intersection is not signalized and volume-based warrant is 60% to 80% satisfied	intersection is not signalized and volume-based warrant is over 80% satisfied		30.0	0	0.0																														
Regular night-time hourly pedestrian volume (See Note 2)	no pedestrians	up to 10	10 to 30	30 to 50	over 50		10.0	0	0.0																														
Intersecting roadway classifications	no primary road involved	primary/rural major, primary/rural minor, or primary/designated community access	primary/secondary	primary/primary	intersection includes divided highway		5.0	1	5.0																														
operating speed or posted speed limit on major road (See Note 3)	50 km/h or less	60 km/h	70 km/h	80 km/h	90 km/h or over		5.0	3	15.0																														
operating speed or posted speed limit on minor road (See Note 3)	50 km/h or less	60 km/h	70 km/h	80 km/h	90 km/h or over		5.0	0	0.0																														
<b>Subtotal Operational Factors</b>									<b>60.0</b>																														
<b>Environmental Factors ( E )</b>																																							
lighted development within 150m radius of intersection	--	in one quadrant	in two quadrants	in three quadrants	in four quadrants		5.0	0	0.0																														
<b>Subtotal Environmental Factors</b>									<b>0.0</b>																														
<b>Collision Factors ( A )</b>																																							
average annual night-time collision frequency or rate over last 3 years (only collisions potentially attributable to inadequate lighting)	0 collisions per year	1 collision per year	--	2 collisions per year	3 or more per year OR at least 1.5 collisions per million entering vehicles per year and an average ratio of all night to day collisions of at least 1.5.	1 or 2 collisions per year	15.0	0	0.0																														
						3 or more collisions per year OR rate ≥ 1.5 collisions/MEV	30.0	0	0.0																														
<b>Subtotal Collisions Factors</b>									<b>0.0</b>																														
<table border="0" style="width: 100%;"> <tr> <td style="width: 50%;"><b>Subtotal Geometric Factors</b></td> <td style="width: 10%; text-align: right;">=</td> <td style="width: 10%; text-align: right;">40</td> <td style="width: 10%;"></td> <td style="width: 10%;"></td> </tr> <tr> <td><b>Subtotal Operational Factors</b></td> <td style="text-align: right;">=</td> <td style="text-align: right;">60.0</td> <td></td> <td></td> </tr> <tr> <td><b>Subtotal Environmental Factors</b></td> <td style="text-align: right;">=</td> <td style="text-align: right;">0.0</td> <td></td> <td></td> </tr> <tr> <td><b>Subtotal Collisions Factors</b></td> <td style="text-align: right;">=</td> <td style="text-align: right;">0.0</td> <td></td> <td></td> </tr> <tr> <td><b>Sum G + E + O + A</b></td> <td style="text-align: right;">=</td> <td style="text-align: right;"><b>100</b></td> <td></td> <td></td> </tr> <tr> <td><b>Partial Illumination</b></td> <td style="text-align: right;">=</td> <td style="text-align: right;"><b>120 Points</b></td> <td></td> <td></td> </tr> </table>										<b>Subtotal Geometric Factors</b>	=	40			<b>Subtotal Operational Factors</b>	=	60.0			<b>Subtotal Environmental Factors</b>	=	0.0			<b>Subtotal Collisions Factors</b>	=	0.0			<b>Sum G + E + O + A</b>	=	<b>100</b>			<b>Partial Illumination</b>	=	<b>120 Points</b>		
<b>Subtotal Geometric Factors</b>	=	40																																					
<b>Subtotal Operational Factors</b>	=	60.0																																					
<b>Subtotal Environmental Factors</b>	=	0.0																																					
<b>Subtotal Collisions Factors</b>	=	0.0																																					
<b>Sum G + E + O + A</b>	=	<b>100</b>																																					
<b>Partial Illumination</b>	=	<b>120 Points</b>																																					
<b>WARRANTING CONDITION</b>								<b>83.3%</b>	<b>Not Warranted</b>																														

Notes:

- 1 If the intersection is not signalized, the user should choose EITHER the AADT factor OR the signalization warrant factor. The points from either factor, but not both factors, may be used in the warrant points calculation.
- 2 The number of certain types of vulnerable pedestrians should be factored to reflect their increased need for visibility. The number of child pedestrians (ages 12 and under) should be multiplied by 2, and the number of senior pedestrians (ages 65 and over) should be multiplied by 1.5.
- 3 85th percentile night-time speed should be used if available. Otherwise, the posted speed limit may be used.
- 4 Reported collisions, rounded to nearest whole number.