3 GREATER SUDBURY TODAY: EXISTING TRANSPORTATION CONDITIONS

3.1 Socio-Economic Profile

The 2011 Census of Canada reported over 160,000 people in the City of Greater Sudbury, which is an increase of 1.6% from the 2006 census but is less than the City's peak population of almost 170,000 people in the year 1971. The population traditionally has increased and decreased in line with the demand for natural resources. The 2011 Census reported almost 67,000 households in Greater Sudbury, with an average household size of 2.4 persons. This has decreased from the 1971 average of 4 persons per household.

Historically, mining has played a major role in providing employment in Greater Sudbury. The sector continues to be an important source of jobs but has now been supplemented by service activities such as health care, education and public administration. Reviewing 2011 Census data, the median household income in Greater Sudbury is greater than that of Ontario as a whole as well as greater than the national median, as indicated in **Table 6**.

Table 6: Household Income

Area	2011 Median Total Income ($)
City of Greater Sudbury	82,220
Ontario	73,290
Canada	72,240

Source: 2011 Census of Canada.

3.2 Roadway Network and Travel Characteristics

This section has been subdivided to address:

- Roadway classification;
- Major travel flows – roads;
- Major travel flows – transit;
- Screenlines;
- Existing intersection levels of service (and potential short-term improvements); and
- Collision rates.

3.2.1 Roadway Classification

The existing road classifications are shown in Schedule 6 of the City's Official Plan, included in **Figure 4.** A description of each class of road, as reported in the Official Plan, is shown in **Table 7**.

Figure 4: Roadway Classification

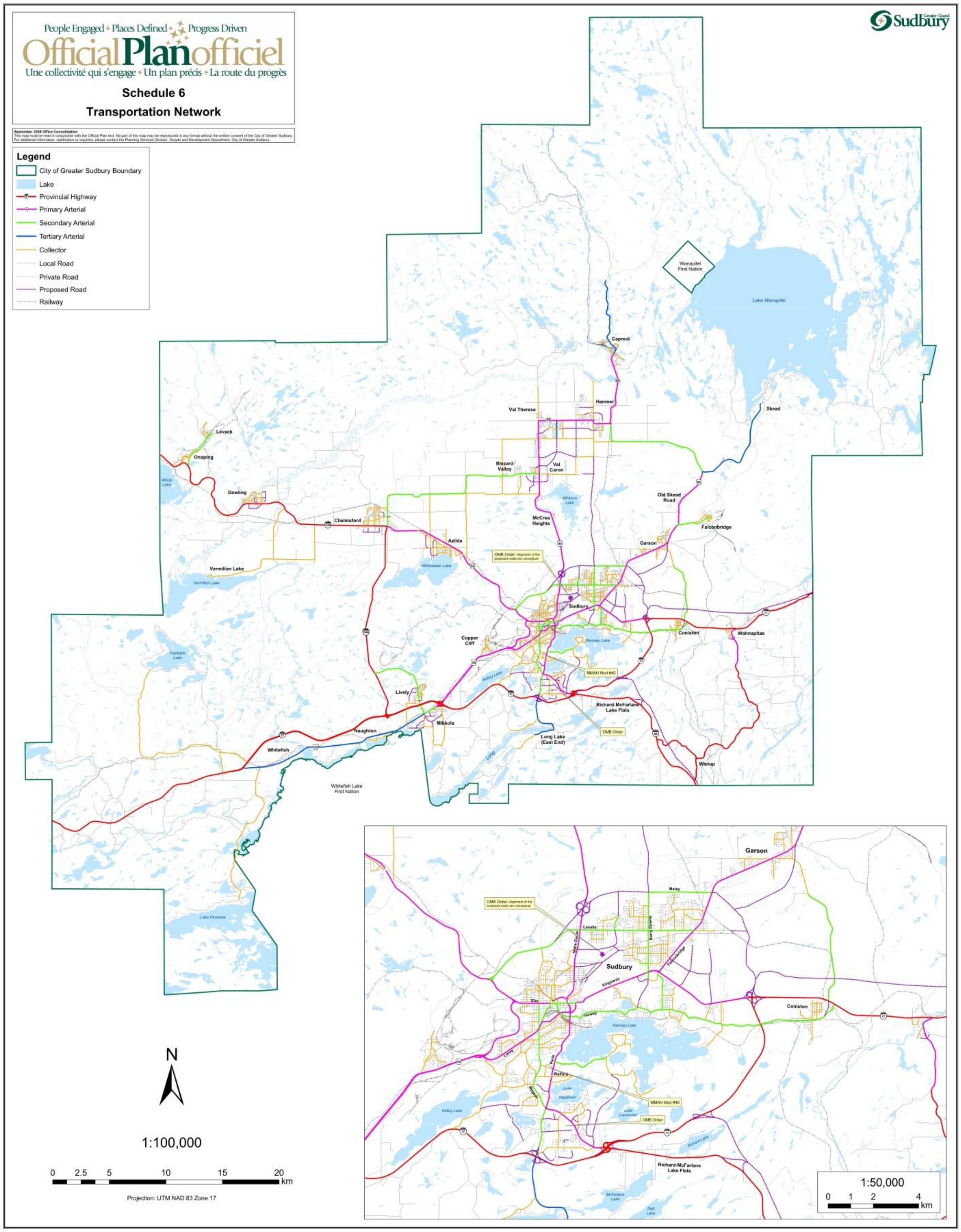


Table 7: Road Classification (as per the Official Plan for the City of Greater Sudbury)

Class of Road	Function	Access	Right-of-Way Width (metres)	Daily Traffic Volumes	Posted Speed (km/hr)	Minimum Intersection Spacing (metres)	Other Regulations
Primary Arterial (Major Highway)	• Connecting City with other major centres outside the City and/or interconnecting communities. • Long distance person or goods movement travel through the City or between major activity areas within the City. • Traffic movement primary consideration.	Intersections with other arterial roads or collector roads. Driveways to major regional activity centres.	35-45 in urban areas. 45-90 in rural areas.	10,000-50,000	60-100	400	No on-street parking Buffers between the roadway and adjacent uses
Secondary Arterial	• Connecting two or more communities or major activity centres; or • Connecting between two primary arterial roads; or • Connecting a community or activity centre with a primary arterial road. • Trip origin and/or destination along it, an intersecting tertiary arterial, intersecting collector or a local street intersecting with the collector. Traffic movement major consideration	Intersection with other roads. Access from adjacent property strictly regulated and kept to a minimum.	26-35 in urban areas. 30-45 in rural areas.	5,000-20,000	50-70	200	No on-street parking Buffers between the roadway and adjacent uses

Class of Road	Function	Access	Right-of-Way Width (metres)	Daily Traffic Volumes	Posted Speed (km/hr)	Minimum Intersection Spacing (metres)	Other Regulations
Tertiary Arterial	• Connecting small communities; or • Connecting communities to primary or secondary arterial leading to a recreational area. • Trip origin and/or destination along it, an intersecting collector or a local street intersecting with the collector. Traffic movement major consideration.	Intersections with other roads. Access from adjacent property strictly regulated and kept to a minimum.	26-35 in urban areas 30-45 in rural areas	5,000-20,000	50-70	200	No on-street parking Buffers between the roadway and adjacent uses
Collector	• Connecting neighbourhoods; or • Connecting a neighbourhood with an arterial road. • Trip origin and/or destination along it or an intersecting local street. • Traffic movement and land access of equal importance.	Intersections with other roads. Regulated access from adjacent property.	20-35 metres	1,000-12,000	50-80	60	On-street parking may be permitted Greater setbacks from roadway of adjacent uses
Local	• Connecting properties within a neighbourhood; • Trip origin and/or destination along its right-of-way; • Traffic movement secondary consideration, land access primary function.	Intersections with collectors or other local roads. Access from adjacent property permitted.	+/- 20	<1,000	40-50	60	On-street parking is generally permitted. Goods movement restricted except for that having origin or destination along the road

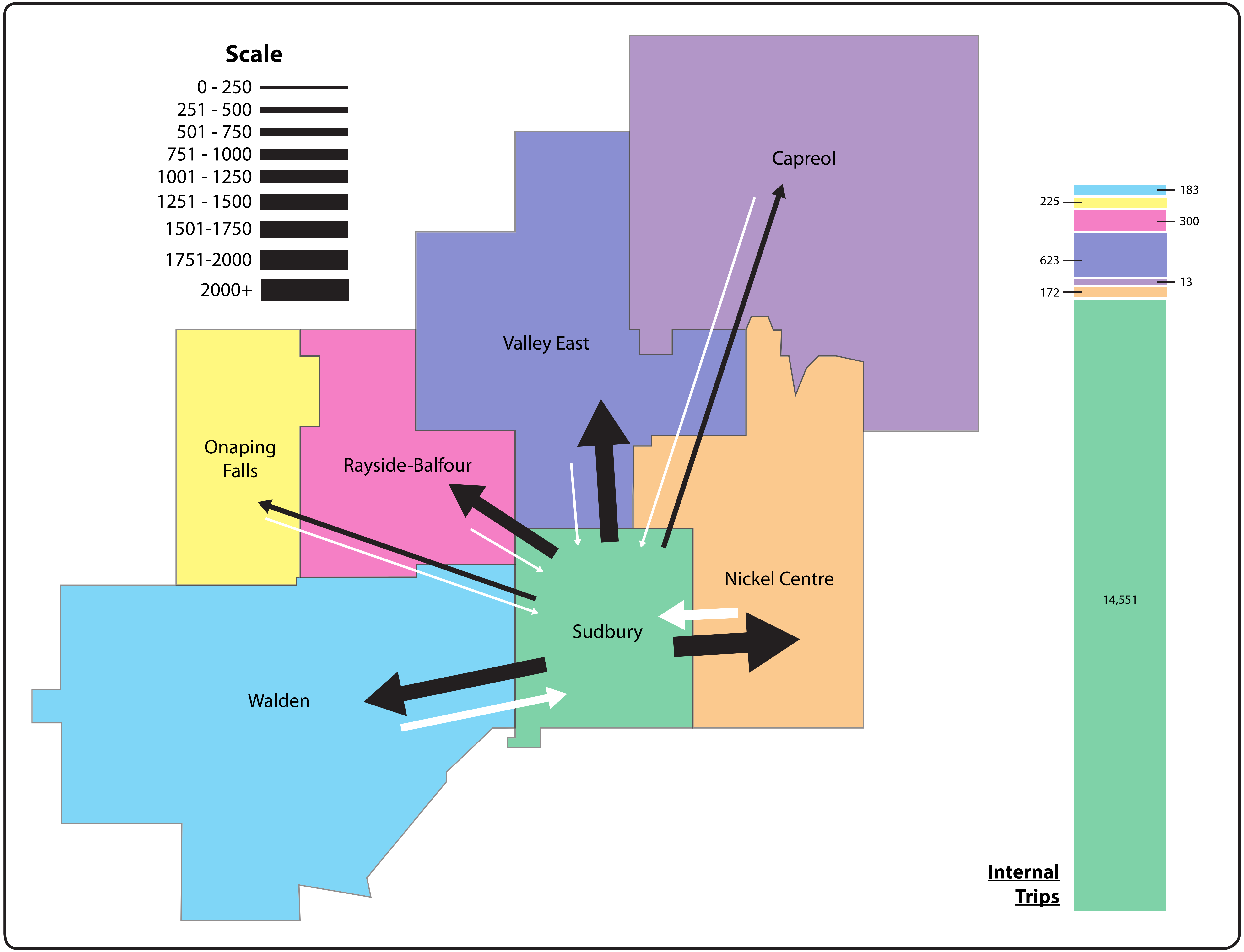
3.2.2 Traffic Volumes and Network Capacity

Existing traffic volumes between the key locations in the region in the p.m. peak period are shown in **Table 8**. They are based on the data for the existing daily travel demand from the 2005 study, to which a peak hour conversion factor of 0.0825, an auto occupancy factor of 1.178 and a modal split of 2% were applied. These revised volumes were input into the TransCAD model along with population and employment data from the 2011 census. The model outputs showed an increase of approximately 20% in total trips, with a reassignment across the network to reflect 2011 conditions.

Table 8: Existing Traffic Volumes – P.M. Peak Period

FROM \ TO	Sudbury	Nickel Centre	Capreol	Valley East	Rayside-Balfour	Onaping Falls	Walden
Sudbury	14,551	1,804	259	1,730	1,196	315	1,291
Nickel Centre	751	172	52	241	61	18	53
Capreol	23	13	13	147	30	8	6
Valley East	198	57	126	623	231	63	47
Rayside-Balfour	107	20	46	347	300	122	74
Onaping Falls	48	10	22	166	219	225	40
Walden	585	70	21	163	159	45	183

The map diagram in **Figure 5** shows trips to and from the former City of Sudbury. The thickness of the arrows is proportional to the traffic volumes into and out of the former City of Sudbury. Similarly, the bars to the right of the figure represent the internal trips within each area.



Legend

Direction of Trips

To Sudbury

From Sudbury

Figure 5

Key Traffic Flows - P.M. Peak Period

WSP | MMM GROUP

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It is important to understand the existing characteristics of the road network in the City of Greater Sudbury in order to plan the future transportation network. Volume to capacity plots have been created showing traffic volumes on each link within the network as well as an indication of the available spare capacity on that link.

In order to clearly show the traffic volumes for each link, three plots with different zoom levels were produced per alternative showing:

- Full study area (**Figure 6**);
- Area approximately bounded by Copper Cliff to the west, McCrea Heights to the north, Garson to the east and the Trans-Canada Highway to the south (**Figure 7**); and
- Downtown Sudbury and New Sudbury (**Figure 8**).

As indicated in the legend, the colour of each line corresponds to the volume/capacity ratio of that link, which in turn relates to the Level of Service of that link. **Table 9** below shows the relationship between the two variables, and the colour scheme matches that of the figures.

Table 9: Level of Service Designations

Level Of Service	V/C Ratio
A	≤ 0.26
B	>0.26 – 0.4
C	>0.4 - 0.6
D*	>0.6 - 0.8
E	>0.8 - 1.0
F	>1.0

* LOS D is the threshold for acceptable road performance

For each road in the transportation model, the model plots show the volume/capacity ratios for the peak travel direction. As this model represents the weekday p.m. commute, the peak direction typically is in the travel direction away from the city centre.

Figure 6: Volume to Capacity Plots - Existing (Overview)

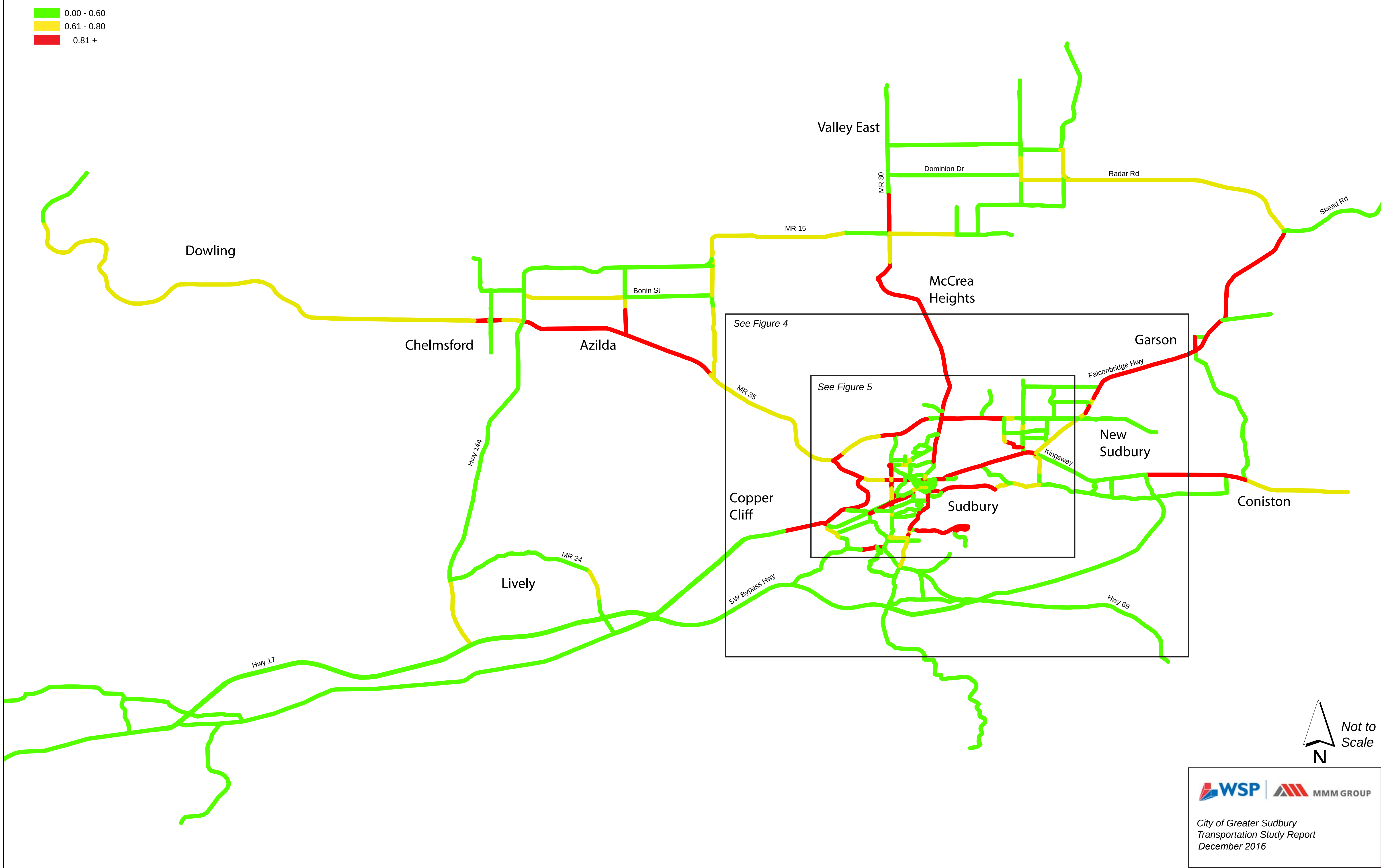

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Figure 7: Volume to Capacity Plots - Existing (Intermediate Zoom)

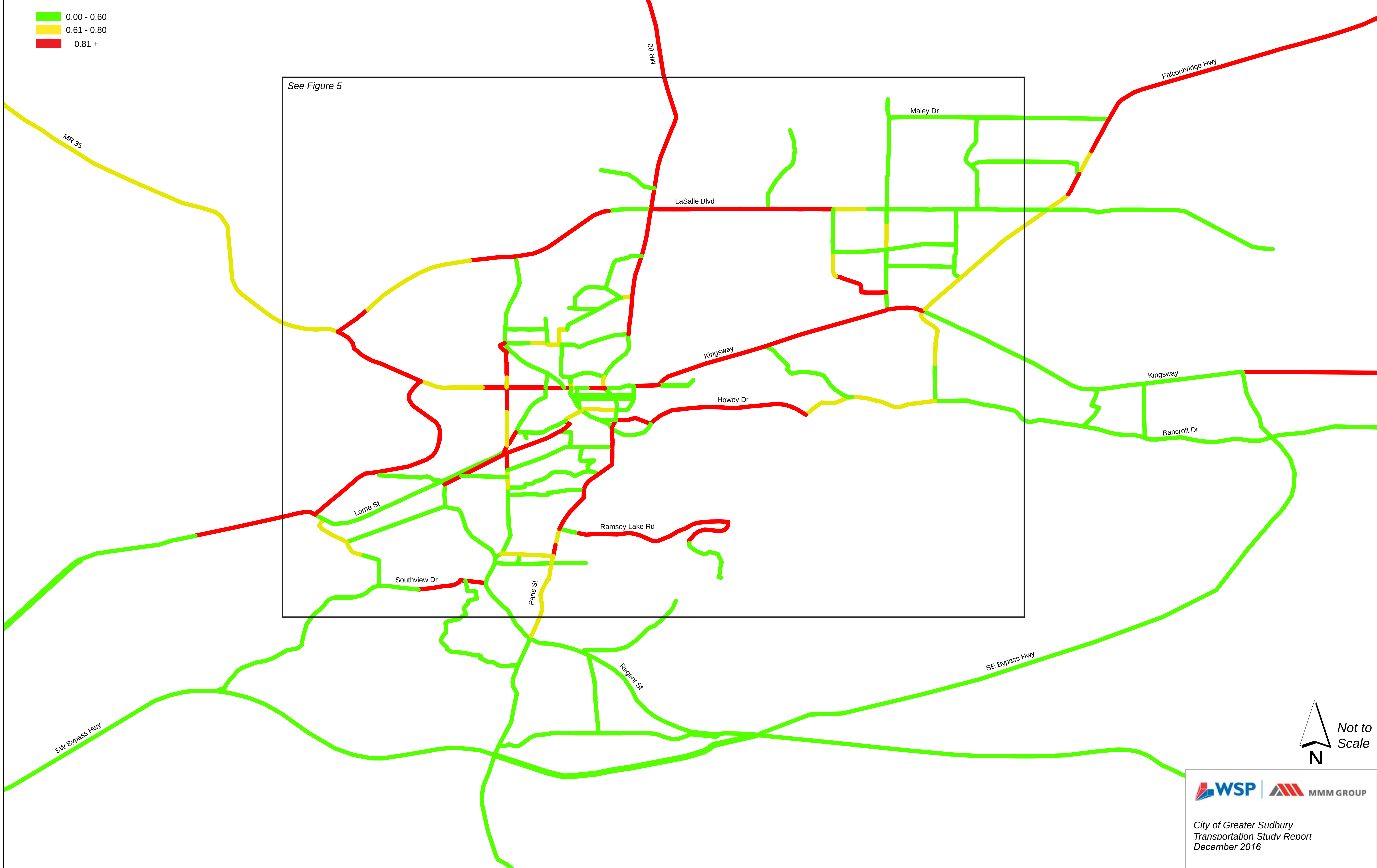
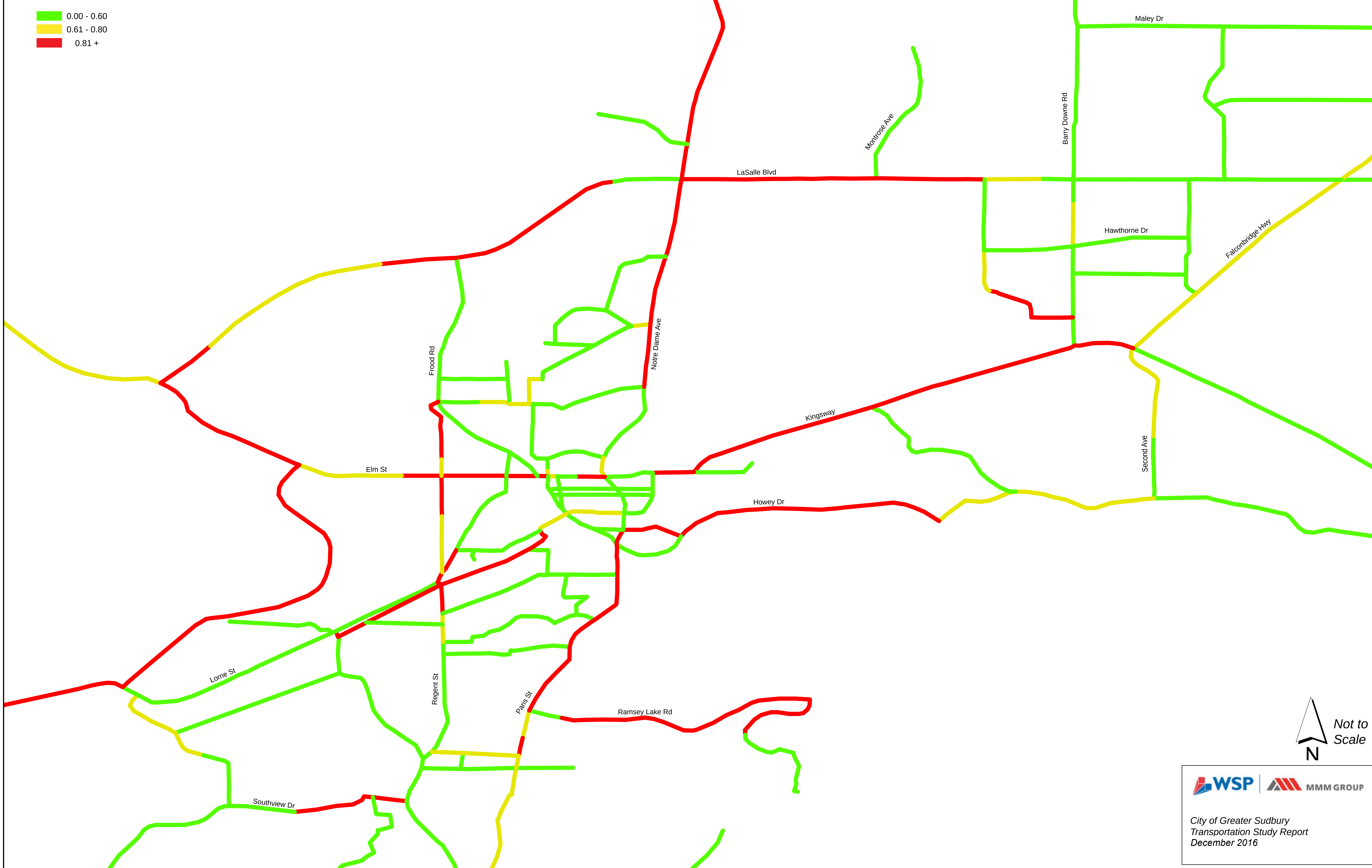


Figure 8: Volume to Capacity Plots - Existing (Downtown)



The following roadway sections have been identified as having a volume/capacity ratio of greater than 0.8 and are shown in red in **Figure 6, Figure 7** and **Figure 8**:

- Highway 144 between Isidore Street and Edward Avenue;
- M.R. 35 between M.R. 15 and Montee Rouleau;
- Montee Principale between M.R. 35 and Bonin Street;
- M.R. 80 / Notre Dame Avenue northbound between Kathleen Street and Valleyview Road, and between M.R. 15 and Campeau Street;
- Falconbridge Road / Falconbridge Highway / Skead Road northeastbound between Lasalle Boulevard and Radar Road;
- Trans-Canada Highway (17) east of the Kingsway to Garson Coniston Road;
- M.R. 55 between Balsam Street and Big Nickel Mine Drive;
- Big Nickel Drive between M.R. 55 and Elm Street;
- Elm Street between Lasalle Boulevard and Big Nickel Mine Drive, between Ethelbert Street and Elgin Street; and between Lisgar Street and Paris Street;
- Lasalle Boulevard on approach to M.R 35, between Crescent Park Road and west of Frood Road; and between Notre Dame Avenue and Attlee Avenue;
- The Kingsway / Lloyd Street between Brady Street and Falconbridge Road;
- Westmount Avenue / Attlee Avenue, between Beatrice Crescent and Barry Downe Road;
- Van Horne Street / Howey Drive, between Paris Street and Bellevue Avenue;
- Paris Street between Van Horne Street and Ramsey Lake Road, and between Paris Crescent / Centennial Drive and Walford Road;
- Regent Street between Lorne Street and Wembley Drive, on the approach to Elm Street,
- Beatty Street between Alder Street and Frood Road;
- Lorne Street between Regent Street and Douglas Street
- Riverside Drive / Ontario Street between Douglas Street / Edinburgh Street and Martindale Road;
- Southview Drive / Bouchard Street between Cranbrook Crescent and Regent Street; and
- Ramsey Lake Road between South Bay Road and Paris Crescent

The main travel flows out of Sudbury have the following destinations:

- **Nickel Centre:** This is the heaviest movement and causes eastbound congestion on the Kingsway and Howey Drive. This in turn affects the Falconbridge Road / Highway to Garson and, when commuters returning to Coniston are added to those on the Southeast Bypass, it also impacts the Trans-Canada Highway;
- **Valley East:** Almost all of these northbound vehicles use Notre Dame Avenue, which is consequently operating at close to its capacity;
- **Rayside-Balfour:** This northwestbound traffic is channelled along Municipal Road 35, which operates at an acceptable level of service between Lasalle Boulevard and Notre Dame Street East where there are two lanes westbound. However, capacity is constrained at Azilda west of Notre Dame Street East where this highway reduces to one lane in each direction; and

- **Walden:** Trips to this area to the southwest of Sudbury are distributed between M.R. 55 and the Trans-Canada Highway (17), both of which are operating at an acceptable level of service.

The principal movements into Sudbury originate in:

- **Nickel Centre:** There are three westbound routes into the centre of Sudbury, the Kingsway, Lasalle Boulevard and Howey Drive. The accumulation of internal Sudbury trips on top of those from Nickel Centre pushes both corridors over the 0.8 volume-to-capacity threshold; and
- **Walden:** As with the flow out of Sudbury, the distribution of trips between M.R. 55 and the Trans-Canada Highway (17) means that both are operating at an acceptable level of service. The exception is M.R. 55 east of Balsam Street, where traffic joining from Copper Cliff causes an increase in the volume-to-capacity ratio.

Internal trips within Sudbury represent the vast majority of journeys in the Greater Sudbury area. These include:

- Commuter and commercial trips between New Sudbury and the remainder of the City. These add to demand on the Kingsway, Lasalle Boulevard, and other links;
- Journeys along Paris Street to and from Laurentian University and Health Sciences North; and
- Commercial and retail trips to the Paris Street/Long Lake Road/Regent Street intersection, known locally as the Four Corners.

Volumes associated with trips within Greater Sudbury but not starting or ending in the City of Sudbury are relatively low. The only movements with volumes greater than 200 trips are between Valley East and Rayside-Balfour on M.R. 15, and heading into Valley East along the Radar Road / Skead Road corridor from Nickel Centre.

Overall, desire lines within Greater Sudbury reflect that the former City of Sudbury constitutes the urban core of the municipality. Within that area, development has occurred along two major axes – north/south, along Paris/Regent Streets, and east/west north of Ramsey Lake, along the Kingsway and Lasalle Boulevard. Development of land use and the transportation network is constrained by the rugged topography, which includes rock outcrops.

Most of the city's population is housed in this area. The outlying urban areas are home to significant industry as well as some housing. These areas are connected to the urban core by a very limited number of road links, which concentrate travel and funnel it through the urban core in many instances. Topography and distance will add to the cost and complexity of adding new connections or improving existing links.

3.2.3 Major Travel Flows – Truck Haulage

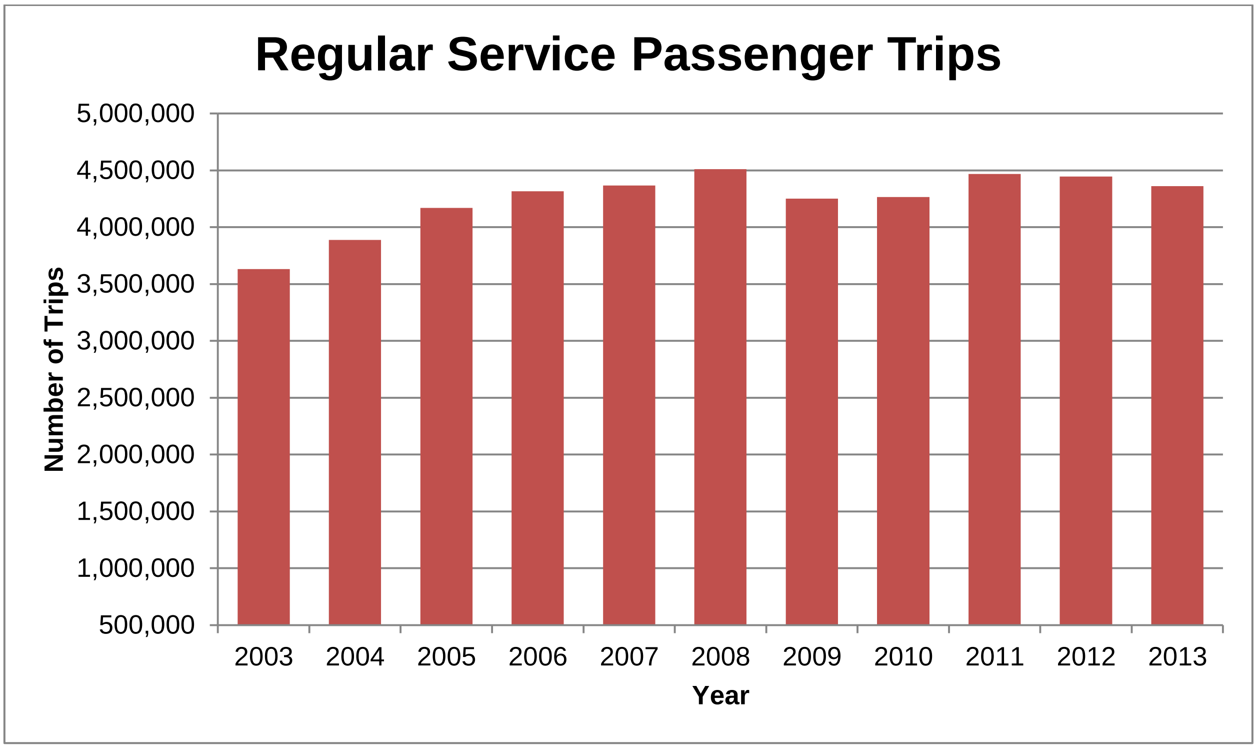
An important element of travel demand in Greater Sudbury is that associated with the mining and smelting industries. Consultation was begun with industry representatives in January 2012 to understand current and projected truck flows associated with industry. Truck flows are particularly important because of the travel characteristics of trucks (generally slower speeds with lower acceleration and deceleration rates) and because of their impact on the road structure.

A map of the current truck haulage routes is provided in **Appendix K**. The map also shows the typical volumes of mining related trucks on these routes. However, it is important to understand that there are numerous ancillary truck trips also associated with these uses, including contractor vehicles for construction and maintenance and employee trips. The future demands associated with industry are addressed in subsequent sections of the report.

3.2.4 Major Travel Flows – Transit

Transit ridership data for the years 2003 through 2013 were examined to determine major transit passenger volumes in Greater Sudbury. **Figure 9** below shows the number of passenger trips for all Greater Sudbury transit routes during that period. Compared to 2003, the annual transit ridership was approximately 25% higher in 2008 with around 4.5 million trips recorded. A decline of about 5% was registered in 2009, however this may be related to a background reduction in economic activity as ridership had almost recovered by 2011 and was near 2008 levels in 2013. From 2003 through 2013, transit ridership has grown about 20%.

Figure 9: Greater Sudbury Annual Transit Ridership, 2003 – 2013



The daily number of transit trips per capita increased by approximately 23% between 2003 and the time of the last census in 2011. Over the same period, population in the City increased by only 4,038 people, or 2.6%, as shown in **Table 10**. This indicates that there was a surge in transit ridership as an increasing proportion of the population views it as a viable travel mode. Part of the increase in ridership can be attributed to the introduction of the U-Pass, a transit pass that is part of the fees paid by all full-time undergraduate students at Laurentian University. The fee provides access to all transit services for the duration of the school year.

Table 10: Population of Greater Sudbury, 1971 - 2011

Year	Population
1971	169,580
1986	152,470
1996	164,049
2003	156,236
2006	157,857
2009	158,270
2011	160,274

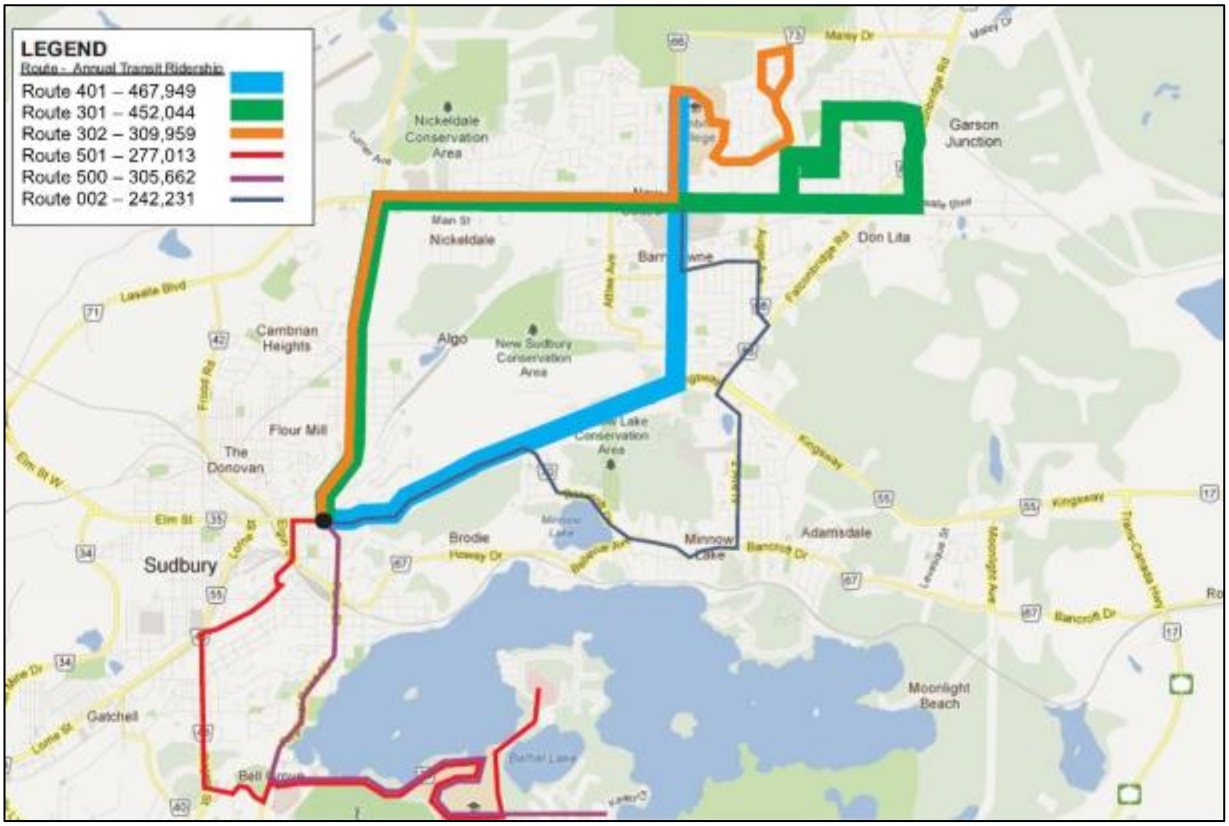
In **Table 11**, the six transit routes with ridership greater than 5% of the total system's ridership are listed and the corridors served by these routes are displayed in **Figure 10**.

Table 11: Transit Routes Accounting for 5% or More of Transit Trips in 2013

Route #	Route	Total Trips	% of Total
401	Barry Downe / Cambrian	467,949	11%
301	Lasalle / Madison	452,044	10%
302	Lasalle / Cambrian	309,959	7%
500	University via Paris	305,662	7%
501	Regent / University	277,013	6%
2	Second Avenue / Shopping Centre	242,231	6%

There are two routes that account for over 10% of the system's ridership: Route 401 (Barry Downe / Cambrian) and Route 301 (Lasalle / Madison). Four out of the six routes originate in the New Sudbury area and use either Notre Dame Avenue or the Kingsway to access Greater Sudbury's downtown transit terminal. The other two routes originate in the Laurentian University area and travel north along Regent Street and Paris Street to the downtown terminal. Overall, most transit-based trips are between New Sudbury or Laurentian University and the downtown core.

Figure 10: Most Traveled Transit Routes

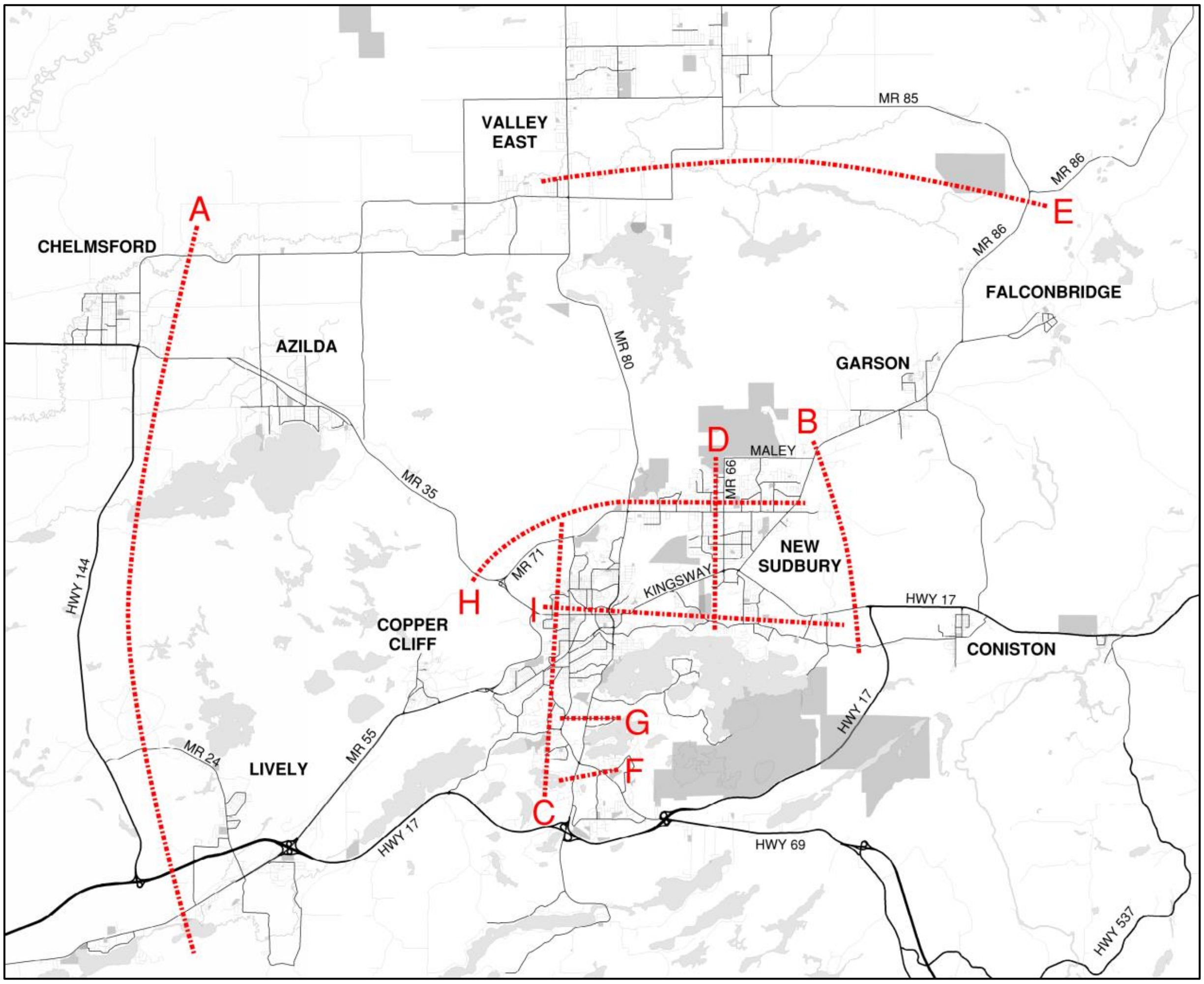


3.2.5 Screenlines

Screenlines are cordons drawn across a number of roads. They are often employed at 'pinch points' where the network is constrained by rivers, topography, freeways or railway corridors for example. All available traffic demand volume data for the points at which they intersect is aggregated and compared to the capacity of those roads.

The screenlines used in the 2005 Transportation Study were used as a starting point for the screenline analysis in this report. One screenline was added covering Regent and Paris Street to measure travel demands south of the Sudbury city centre. These two streets form an important travel corridor within the City, connecting a number of key employment, commercial and residential areas. The complete array of nine screenlines is shown in **Figure 11**.

Figure 11: Screenline Locations



Traffic demand at the screenlines was determined using annual average daily traffic (AADT), where available. In some other cases, volumes were extrapolated from turning movement count data. The calculated volumes and v/c ratios for each screenline and peak period are shown in **Table 12**.

It was found that during the a.m. peak period, all of the screenlines have an overall v/c ratio that is less than 0.8, with the highest v/c ratio being 0.71 (LOS C) across screenline E (trips from the Valley and Skead) in the southbound direction. Most of the screenlines during the p.m. peak have an overall v/c ratio less than 0.80, with the exception of screenline G (trips from the downtown south on Paris and Regent Streets) in the southbound direction which has a v/c ratio of 0.81 (LOS D). This indicates that the route exiting downtown Sudbury during the p.m. peak is approaching capacity. Individually, M.R. 24 westbound at Creighton and the southbound routes of Paris St at Walford Rd and Notre Dame Ave at Ste. Anne Road have a v/c ratio of 0.97 (LOS E).

The Kingsway was observed to be operating at capacity at Barry Downe Road, with at least one approach failing with a Level of Service F in the a.m. and p.m. peak periods. The existing operation of this and other key intersections is described in detail in **Section 3.2.6**.

Table 12: Existing Screenline Summary

Screenline	Screenline Name	A.M. Peak				
		Direction	Capacity	Volume	v/c ratio	LOS
A	External West Sudbury	Eastbound	6500	2282	0.35	B
		Westbound	6500	1683	0.26	B
B	Internal East Sudbury	Eastbound	3600	1441	0.40	B
		Westbound	3600	1861	0.52	C
C	Internal West Sudbury	Eastbound	4000	1974	0.49	C
		Westbound	4000	1926	0.48	C
D	Barry Downe Road	Eastbound	5100	2543	0.50	C
		Westbound	5100	3068	0.60	C
E	External North Sudbury	Northbound	2700	998	0.37	B
		Southbound	2700	1925	0.71	D
F	South Sudbury	Northbound	3600	2086	0.58	C
		Southbound	3600	1890	0.53	C
G	South of Downtown Sudbury	Northbound	4350	2962	0.68	D
		Southbound	4350	2655	0.61	D
H	Lasalle Boulevard	Northbound	6800	3087	0.45	C
		Southbound	6800	2771	0.41	C
I	Downtown Sudbury	Northbound	4500	2346	0.52	C
		Southbound	4500	1943	0.43	C
Screenline	**Screenline Name**	**P.M. Peak**				
		Direction	**Capacity**	**Volume**	**v/c ratio**	**LOS**
A	External West Sudbury	Eastbound	6500	2434	0.37	B
		Westbound	6500	2719	0.42	C
B	Internal East Sudbury	Eastbound	3600	1441	0.40	B
		Westbound	3600	1861	0.52	C
C	Internal West Sudbury	Eastbound	4000	1974	0.49	C
		Westbound	4000	1926	0.48	C
D	Barry Downe Road	Eastbound	5100	3872	0.76	D
		Westbound	5100	3676	0.72	D
E	External North Sudbury	Northbound	2700	2020	0.75	D
		Southbound	2700	1358	0.50	C
F	South Sudbury	Northbound	3600	2664	0.74	D
		Southbound	3600	2658	0.74	D
G	South of Downtown Sudbury	Northbound	4350	2695	0.62	D
		Southbound	4350	3516	0.81	E
H	Lasalle Boulevard	Northbound	6800	4137	0.61	D
		Southbound	6800	2777	0.41	C
I	Downtown Sudbury	Northbound	4500	2022	0.45	C
		Southbound	4500	2524	0.56	C

3.2.6 Existing Intersection Level of Service

One of the objectives of the Transportation Study is to assess the existing traffic conditions for the road corridors and intersections identified as areas of traffic congestion concern and make recommendations for immediate remedial improvements. The following thirteen intersections have been identified as areas of traffic congestion concern:

1. Main Street / M.R. 80;
2. Lasalle Boulevard / Barry Downe Road;
3. The Kingsway / Barry Downe Road;
4. The Kingsway / Silver Hills Drive;
5. The Kingsway / Bancroft Drive;
6. Bancroft Drive / Second Avenue;
7. Lloyd Street / Brady Street;
8. Lloyd Street / Elm Street / Notre Dame Avenue / Brady Street;
9. Paris Street / Brady Street;
10. Douglas Street / Regent Street;
11. Ramsey Lake Road / Paris Street;
12. Paris Street / Long Lake Road / Regent Street (locally known as the Four Corners); and
13. M.R. 24 / M.R. 55.

Findings presented in this report are based on the results of the intersection capacity analyses and site observations conducted on November 22 and 23, 2011. Intersection capacity analysis was undertaken using Synchro traffic analysis software in order to evaluate the existing traffic operations and to determine the existing levels of service during the a.m. and p.m. peak hours. The most recent turning movement counts and signal timing plans provided by the City were utilized in the analysis.

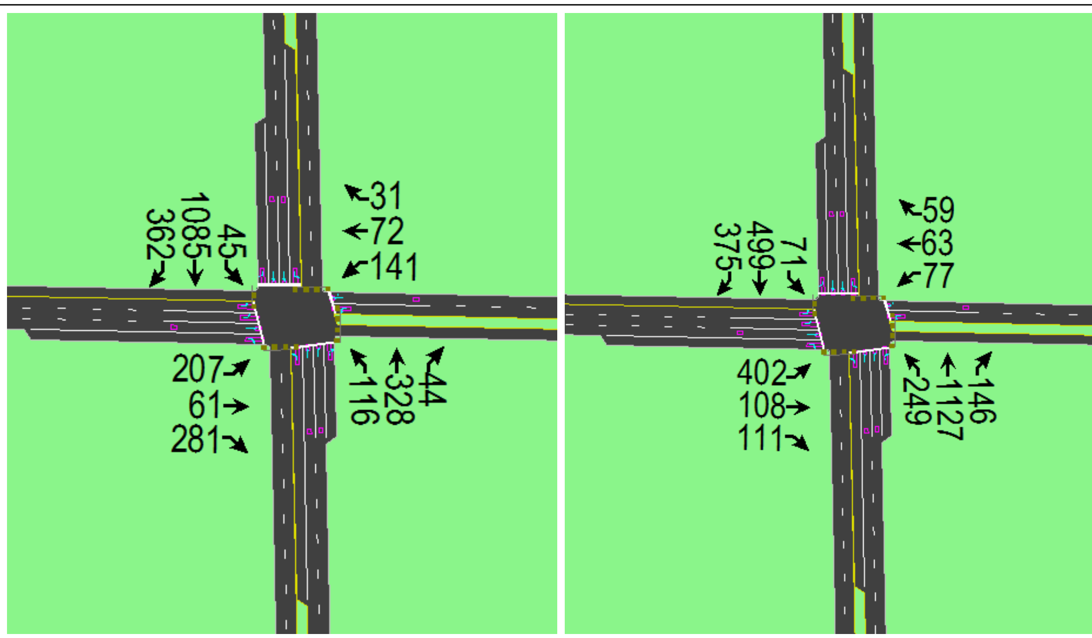
Main Street at M.R. 80 Intersection

The intersection of Main Street and M.R. 80 is a signalized four-legged intersection. Following reconstruction of the intersection in 2014, the lane configuration of each approach is as follows:

- Northbound: two through lanes, and exclusive left and right turn lanes;
- Southbound: two through lanes, an exclusive left turn lane, and an exclusive right turn lane;
- Eastbound: one through lane, two exclusive left turn lanes, and a right lane; and
- Westbound: one exclusive left turn lane and one shared through/right lane.

M.R. 80 primarily serves commuters travelling to and from work between Valley East and the former City of Sudbury. This is reflected in the existing turning movement counts which indicate a tidal pattern. Volumes in the southbound and northbound directions dominate in the a.m. and p.m. peak periods, respectively. The existing traffic volumes and lane configurations at this intersection are illustrated in **Figure 12** for the a.m. and p.m. peak hours.

Figure 12: Main Street at M.R. 80 Intersection Peak Hour Volumes and Lane Configuration



Existing A.M. Peak Volumes **Existing P.M. Peak Volumes**

Results of the capacity analysis indicate that this intersection operates at an overall acceptable level of service (LOS) during both the a.m. and p.m. peak hours. Almost all movements operate below the volume / capacity (v/c) ratio critical threshold of 0.85, including the eastbound left turn movement which has benefitted from the recent addition of a second left turn lane. The only exception is the northbound left turn in the PM peak with a modelled v/c of 1.08.

Theoretically, v/c ratios for existing conditions cannot be greater than 1.0 since the observed volumes used in the analysis represent 'supply' volumes that were served at the intersection and therefore must be at or below the capacity of the intersection. The high v/c ratios may be the result of the overly conservative parameters used in the Synchro analysis for the existing traffic conditions. In practice, northbound left-turning drivers may adjust their driving style and use an extra second of the intergreen period to perform their manoeuvre. If this is assumed, the v/c ratio for that movement is exactly 1.0.

Existing traffic conditions at this intersection are considered to be acceptable; however, given that population growth in Valley East is expected to continue, so too will the traffic demand at this intersection. The modelled timings in the a.m. peak hour were close to optimal; however, additional capacity and improved traffic operations at this intersection could be achieved by optimizing the green time split in the traffic signal timings for the p.m. peak hour. This reduces the v/c ratio for the aforementioned northbound left-turn to 0.74.

The results of the intersection capacity analysis based on the original timings (Scenario 1) and the optimized timings (Scenario 2) are summarized in **Table 13**.

Table 13: LOS Results – Main Street / M.R. 80 Intersection

Scenario	A.M. Peak Hour				P.M. Peak Hour			
	LOS (Delay in seconds)	**Movement**	**Volume to Capacity (V/C) Ratio**	**Percentile Queues 50th (95th)**	**LOS (Delay in seconds)**	**Movement**	**Volume to Capacity (V/C) Ratio**	**Percentile Queues 50th (95th)**
Scenario 1 = Existing Conditions	C (29)	NB-L	0.61	25 (#50)	C (34)	NB-L	**1.08**	~53 (#121)
		NB-TT	0.18	18 (32)		NB-TT	0.67	83 (115)
		NB-R	0.05	0 (0)		NB-R	0.19	8 (20)
		SB-L	0.43	10 (#26)		SB-L	0.65	13 (41)
		SB-TT	0.72	102 (142)		SB-TT	0.35	34 (50)
		SB-R	0.45	12 (40)		SB-R	0.46	0 (16)
		EB-LL	0.51	22 (37)		EB-LL	0.79	38 (#76)
		EB-T	0.22	12 (24)		EB-T	0.27	17 (35)
		EB-R	0.74	22 (51)		EB-R	0.25	0 (9)
		WB-L	0.67	30 (#65)		WB-L	0.71	15 (#45)
		WB-TR	0.37	17 (33)		WB-TR	0.50	15 (36)
Scenario 2 = Scenario 1 + Optimized Signal Timings	C (29)	NB-L	0.60	24 (#50)	C (29)	NB-L	0.74	50 (79)
		NB-TT	0.19	20 (34)		NB-TT	0.68	95 (132)
		NB-R	0.05	0 (0)		NB-R	0.19	2 (13)
		SB-L	0.35	10 (23)		SB-L	0.53	15 (#34)
		SB-TT	0.72	96 (143)		SB-TT	0.43	42 (66)
		SB-R	0.46	13 (41)		SB-R	0.51	0 (23)
		EB-LL	0.54	22 (38)		EB-LL	0.70	41 (61)
		EB-T	0.23	12 (24)		EB-T	0.26	20 (35)
		EB-R	0.73	20 (49)		EB-R	0.24	0 (9)
		WB-L	0.62	29 (#58)		WB-L	0.46	16 (32)
		WB-TR	0.35	17 (32)		WB-TR	0.51	17 (36)

#: 95th percentile volume exceeds capacity: queue may be longer. Queue shown is the maximum after two cycles.
~: Volume exceeds capacity, queue is theoretically infinite. Queue shown is the maximum after two cycles.

Lasalle Boulevard at Barry Downe Road Intersection

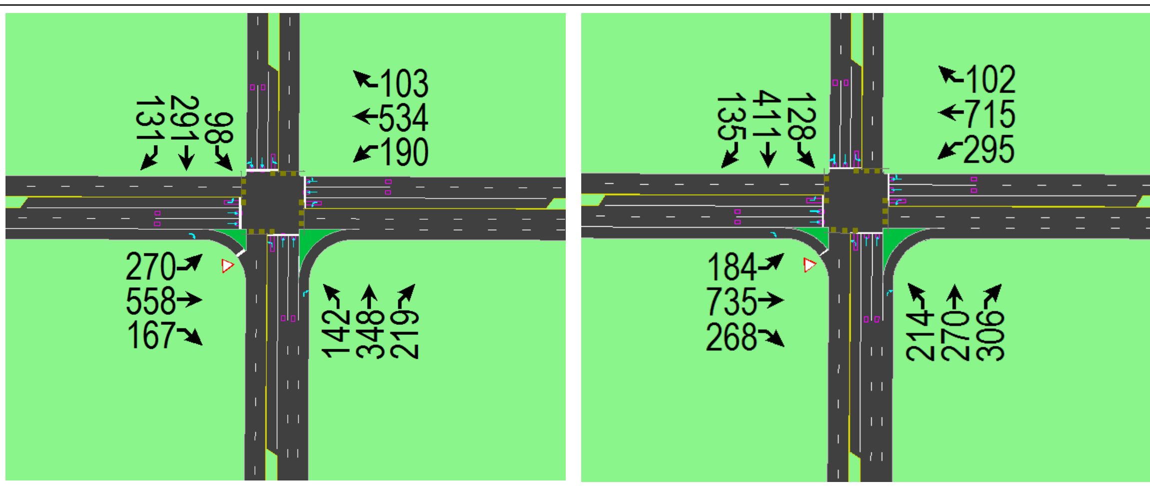
Lasalle Boulevard at Barry Downe Road is a signalized four-legged intersection. In 2014, the channelizing island on the northeast corner was removed and the channelizing island on southeast corner was reduced to allow for a second northbound through lane.

The lane configuration of each approach is as follows:

- Northbound: two through lanes, an exclusive left turn lane and an exclusive channelized right turn lane;
- Southbound: one through lane with a shared through/right lane and an exclusive left turn lane;
- Eastbound: two through lanes, an exclusive left turn lane, and an exclusive channelized right turn lane; and
- Westbound: two through lanes with a shared right turn movement, and an exclusive left turn lane.

The existing traffic volumes for the a.m. and p.m. peak hours and the lane configurations at this intersection are illustrated in **Figure 13**.

Figure 13: Lasalle Blvd at Barry Downe Road – Peak Hour Volumes / Lane Configuration



Existing A.M. Peak Volumes **Existing P.M. Peak Volumes**

The results of the capacity analysis for Scenario 1, with the existing timings, indicate that this intersection is currently operating at an acceptable LOS. The only movement with a volume/capacity ratio over 0.85 is the eastbound through movement, which registers a v/c ratio of 0.89 in the p.m. peak hour. By optimizing the signal timings, this can be reduced to 0.76, with the highest v/c ratio among the other movements being the westbound left turn (0.86) in the p.m. peak hour.

The results of the intersection capacity analysis are summarized in **Table 14**.

Table 14: LOS Results – Lasalle Boulevard / Barry Downe Road Intersection

Scenario	A.M. Peak Hour				P.M. Peak Hour			
	LOS (Delay in Seconds)	Movement	V/C Ratio	Percentile Queues 50th (95th)	LOS (Delay in Seconds)	Movement	V/C Ratio	Percentile Queues 50th (95th)
Scenario 1 = Existing Conditions	C (35)	NB-L	0.71	28 (#52)	D (44)	NB-L	0.75	49 (75)
		NB-TT	0.47	33 (46)		NB-TT	0.32	27 (41)
		NB-R	0.15	0 (0)		NB-R	0.21	0 (0)
		SB-L	0.53	19 (35)		SB-L	0.60	29 (48)
		SB-TTR	0.66	35 (49)		SB-TTR	0.80	61 (84)
		EB-L	0.81	51 (#87)		EB-L	0.69	42 (64)
		EB-TT	0.48	47 (72)		EB-TT	**0.89**	91 (#135)
		EB-R	0.28	0 (16)		EB-R	0.49	0 (22)
		WB-L	0.69	37 (56)		WB-L	0.84	66 (#111)
		WB-TTR	0.62	59 (82)		WB-TTR	0.84	93 (#155)
Scenario 2 = Scenario 1 + Optimized Signal Timings	C (35)	NB-L	0.74	28 (#55)	D (43)	NB-L	0.83	51 (#90)
		NB-TT	0.47	33 (46)		NB-TT	0.34	29 (43)
		NB-R	0.15	0 (0)		NB-R	0.21	0 (0)
		SB-L	0.58	19 (36)		SB-L	0.65	30 (50)
		SB-TTR	0.68	35 (50)		SB-TTR	0.84	65 (#92)
		EB-L	0.81	51 (#84)		EB-L	0.80	44 (#78)
		EB-TT	0.46	46 (68)		EB-TT	0.76	87 (110)
		EB-R	0.27	0 (15)		EB-R	0.45	0 (20)
		WB-L	0.70	37 (57)		WB-L	**0.86**	70 (#115)
		WB-TTR	0.60	57 (80)		WB-TTR	0.71	89 (112)

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

The Kingsway at Barry Downe Road Intersection

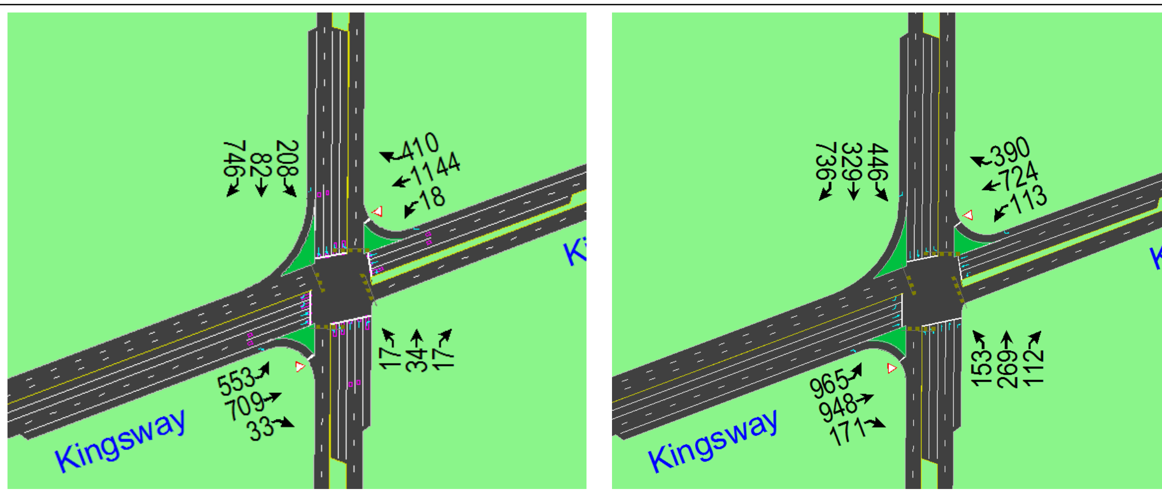
The Kingsway at Barry Downe Road is a signalized four-legged intersection northeast of the downtown core. The lane configuration of each approach is as follows:

- Northbound: dual left turn lanes, two through lanes and an exclusive right turn lane;
- Southbound: dual left turn lanes, dual through lanes and an exclusive channelized right turn lane;
- Eastbound: dual left turn lanes, dual through lanes and an exclusive channelized right turn lane; and
- Westbound: dual through lanes, an exclusive left turn lane and an exclusive channelized right turn lane.

The southbound right turn movement operates under free flow conditions, while a ‘no right turn on red’ restriction is in place for the northbound right turn movement.

The existing traffic volumes and lane configurations at this intersection are illustrated in **Figure 14**.

Figure 14: The Kingsway at Barry Downe Road – Peak Hour Volumes / Lane Configuration



Existing A.M. Peak Volumes **Existing P.M. Peak Volumes**

The traffic counts indicate significant eastbound left turn and southbound right turn demands at this intersection. 746 and 736 southbound right turns were observed during the a.m. and p.m. peak hours, respectively, along with and 553 and 965 eastbound left turns. This intersection experiences a very low demand to and from the south leg during the a.m. peak hour due to the fact that Barry Downe Road terminates just to the south of this intersection. Also, the southern leg serves as an access to commercial developments whose peak activity times do not coincide with the road a.m. peak hour traffic conditions.

This intersection currently operates at an overall acceptable LOS during both the a.m. and p.m. peak hours. However, the westbound through movement has a volume to capacity (v/c) ratio of 0.93 during the a.m. peak hour. During the p.m. peak hour, the southbound and eastbound left turn movements operate with v/c ratios of 0.86 and 1.07, respectively. Theoretically, v/c ratios for existing conditions cannot be greater than 1.0 since the observed volumes used in the analysis represent 'supply' volumes that were served at the intersection and therefore must be at or below the capacity of the intersection. The high v/c ratios may be the result of the overly conservative parameters used in the Synchro analysis for the existing traffic conditions.

The operation of this intersection was improved by optimizing the green time splits for each phase; the phasing plan and intersection cycle length were not adjusted. With these adjustments, the overall operation of the intersection will be acceptable with only select movements which already have two dedicated lanes each, approaching capacity. The results of the intersection capacity analysis are summarized in **Table 15**.

Table 15: LOS Results – The Kingsway / Barry Downe Road Intersection

Scenario	A.M. Peak Hour				P.M. Peak Hour			
	LOS (Delay in Seconds)	Movement	V/C Ratio	Percentile Queues 50th (95th)	LOS (Delay in Seconds)	Movement	V/C Ratio	Percentile Queues 50th (95th)
Scenario 1 = Existing Conditions	C (24)	NB-LL	0.07	2 (5)	D (44)	NB-LL	0.47	18 (29)
		NB-TT	0.10	3 (8)		NB-TT	0.55	31 (45)
		NB-R	0.12	3 (10)		NB-R	0.52	24 (43)
		SB-LL	0.46	18 (32)		SB-LL	**0.86**	53 (#85)
		SB-TT	0.14	6 (14)		SB-TT	0.47	36 (52)
		SB-R	0.49	0 (0)		SB-R	0.48	0 (0)
		EB-LL	0.69	48 (69)		EB-LL	**1.07**	~127 (#180)
		EB-TT	0.35	30 (64)		EB-TT	0.68	92 (135)
		EB-R	0.03	0 (0)		EB-R	0.23	0 (15)
		WB-L	0.13	3 (11)		WB-L	0.57	25 (44)
		WB-TT	**0.93**	~108 (#187)		WB-TT	0.81	83 (#115)
		WB-R	0.51	0 (22)		WB-R	0.60	8 (39)
Scenario 2 = Scenario 1 + Optimized Signal Timings	C (22)	NB-LL	0.09	2 (6)	D (41)	NB-LL	0.52	18 (30)
		NB-TT	0.12	4 (9)		NB-TT	0.55	31 (45)
		NB-R	0.14	4 (11)		NB-R	0.52	24 (43)
		SB-LL	0.66	23 (#38)		SB-LL	**0.93**	53 (#90)
		SB-TT	0.16	8 (16)		SB-TT	0.48	36 (50)
		SB-R	0.49	0 (0)		SB-R	0.48	0 (0)
		EB-LL	0.78	58 (79)		EB-LL	**0.96**	113 (#167)
		EB-TT	0.32	27 (52)		EB-TT	0.63	87 (120)
		EB-R	0.03	0 (0)		EB-R	0.22	0 (13)
		WB-L	0.19	4 (12)		WB-L	0.67	25 (#52)
		WB-TT	0.75	107 (138)		WB-TT	**0.87**	85 (#126)
		WB-R	0.45	0 (17)		WB-R	0.69	28 (67)

#: 95th percentile volume exceeds capacity: queue may be longer. Queue shown is the maximum after two cycles.
~: Volume exceeds capacity, queue is theoretically infinite. Queue shown is the maximum after two cycles.

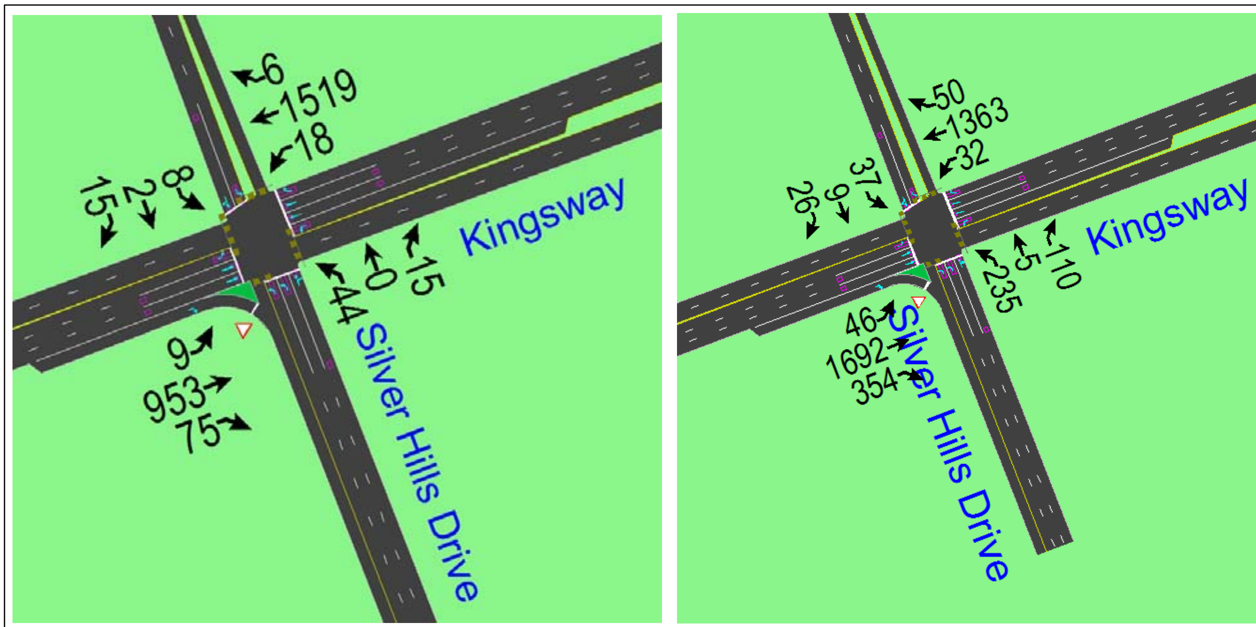
The Kingsway at Silver Hills Drive Intersection

The Kingsway at Silver Hills Drive is a signalized four-legged that provides access to a commercial development to the north and south. The lane configuration of each approach is as follows:

- Northbound: two exclusive left turn lanes and a shared through/right lane;
- Southbound: an exclusive left turn lane and a shared through/right lane
- Westbound: two through lanes, an exclusive left turn lane, and an exclusive right turn lane; and
- Eastbound: two through lanes, an exclusive left-turn lane, and an exclusive channelized right turn lane;

The existing a.m. and p.m. peak hour traffic volumes and the lane configurations at this intersection are illustrated in **Figure 15**.

Figure 15: The Kingsway at Silver Hills Drive – Peak Hour Volumes / Lane Configuration



Existing A.M. Peak Volumes | **Existing P.M. Peak Volumes**

The commercial development is not open for business during the a.m. peak hour, which is reflected in the very low turning traffic volumes reported. Significantly higher turning traffic volumes are observed during the p.m. peak hour with the majority of turning traffic going to and coming from the west. Currently, this intersection operates at an acceptable LOS during both the a.m. and p.m. peak hours, although the results show significant queuing on the eastbound approach during the p.m. peak hour. The results of the intersection capacity analysis are summarized in **Table 16**.

Pedestrian crosswalks have been provided at all legs of this intersection and are actuated with push-buttons to facilitate active movement around the intersection.

Table 16: LOS Results – The Kingsway at Silver Hills Drive Intersection

Scenario	A.M. Peak Hour				P.M. Peak Hour			
	LOS (Delay in Seconds)	Movement	V/C Ratio	Percentile Queues 50th (95th)	LOS (Delay in Seconds)	Movement	V/C Ratio	Percentile Queues 50th (95th)
Scenario 1 = Existing Conditions	A (10)	NB-LL	0.26	7.5 (12.6)	B (18)	NB-LL	0.63	33.6(46.2)
		NB-TR	0.05	0 (0)		NB-TR	0.43	1.3(19.1)
		EB-TT	0.37	56 (74)		EB-TT	0.7	159.9(218.9)
		EB-L	0.13	3.2(8.4)		EB-L	0.2	3.5(8.4)
		EB-R	0.07	0 (0.5)		EB-R	0.32	16.9(37.8)
		WB-L	0.06	1.4(2.7)		WB-L	0.18	2.2(6.0)
		WB-R	0.01	0(0)		WB-R	0.05	0(0)
		WB-TT	0.57	82.7(151.7)		WB-TT	0.58	109.7(152.1)
		SB-L	0.12	2.9(7.3)		SB-L	0.24	9.2(18.7)
		SB-TR	0.19	0.8(7.3)		SB-TR	0.3	2.7(14.2)

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

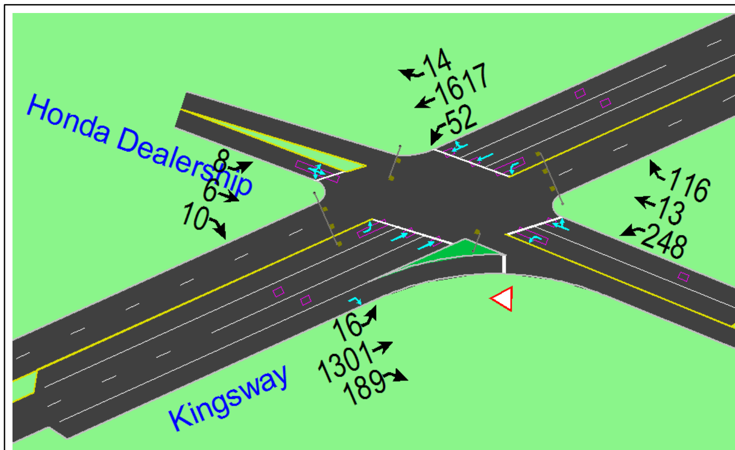
The Kingsway at Bancroft Drive Intersection

Site observations revealed extensive queuing on both of the Kingsway approaches to the Bancroft Drive intersection during both peak hours. In addition, City staff report long queues and long delays at this intersection. The lane configuration of the four approaches is as follows:

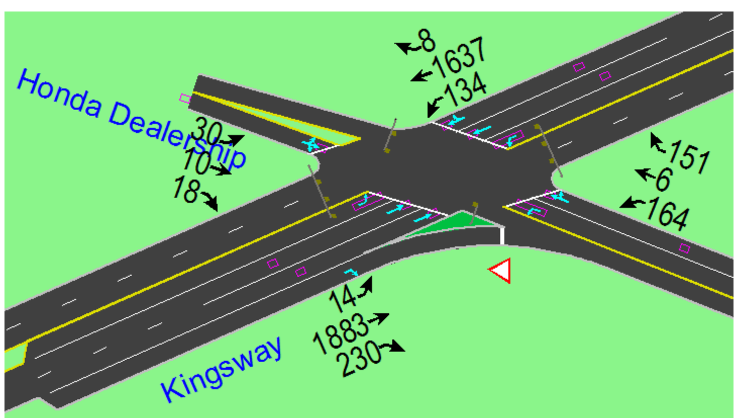
- Northbound: exclusive left turn lane and a shared through/right lane;
- Southbound: shared left/through/right lane;
- Eastbound: dual through lanes, an exclusive left turn lane, and an exclusive channelized right turn lane; and
- Westbound: dual through lanes with a shared right turn movement and an exclusive left turn lane.

The southbound approach serves as an access to a private car dealership and is not a public road. The existing a.m. and p.m. traffic volumes and the lane configurations at this intersection are illustrated in **Figure 16.**

Figure 16: The Kingsway at Bancroft Drive – Peak Hour Traffic Volumes / Lane Configuration



Existing A.M. Peak Volumes



Existing P.M. Peak Volumes

The modelling results for Scenario 1 suggest that under existing traffic conditions this intersection operates at acceptable levels of service. However, the theoretical analysis taken from the traffic analysis software only tells part of the story for this intersection. The eastbound through movement during the p.m. peak operates at a volume / capacity ratio of 0.90 and the 95^{th} percentile queue length exceeds the storage length programmed into the analysis software. The queues, delays and associated levels of service are longer than those being reported and are likely longer than what is considered acceptable for urban conditions.

In the event that eastbound through traffic demand increases during the p.m. peak hour, additional capacity for this movement could be provided by optimizing the signal timings, thus shortening the green time allocated to the protected westbound left turn phase. The results for the optimized Scenario 2 show that the v/c ratio for the eastbound through movement would reduce to 0.87, while that for the westbound left turn would only increase to 0.67. The eastbound through queue lengths still would be expected to be long, at over 200 metres, but would be expected to show an improvement over existing conditions. No other short-term improvements are recommended at this intersection.

The results of the intersection capacity analysis are summarized in **Table 17**.

Table 17: LOS Results – The Kingsway/Bancroft Drive Intersection

Scenario	A.M. Peak Hour				P.M. Peak Hour			
	LOS (Delay in Seconds)	**Movement**	**V/C Ratio**	**Percentile Queues 50^{th} (95^{th})**	**LOS (Delay in Seconds)**	**Movement**	**V/C Ratio**	**Percentile Queues 50^{th} (95^{th})**
Scenario 1 = Existing Conditions	B (19)	NB-L	0.74	39 (#98)	C (21)	NB-L	0.68	34 (57)
		NB-TR	0.27	2 (18)		NB-TR	0.41	4 (21)
		SB-LTR	0.06	2 (10)		SB-LTR	0.23	8 (19)
		EB-L	0.07	1 (3)		EB-L	0.06	1 (3)
		EB-TT	0.69	96 (121)		EB-TT	**0.90**	173 (#282)
		EB-R	0.13	0 (0)		EB-R	0.15	0 (0)
		WB-L	0.20	3 (7)		WB-L	0.58	12 (34)
		WB-TTR	0.79	106 (174)		WB-TTR	0.69	84 (175)
Scenario 2 = Scenario 1 + Optimized Signal Timings	B (19)	NB-L	0.71	39 (82)	B (19)	NB-L	0.70	36 (59)
		NB-TR	0.27	4 (20)		NB-TR	0.49	18 (39)
		SB-LTR	0.05	2 (9)		SB-LTR	0.24	8 (20)
		EB-L	0.09	1 (4)		EB-L	0.07	1 (2)
		EB-TT	0.69	90 (132)		EB-TT	**0.87**	167 (218)
		EB-R	0.13	0 (0)		EB-R	0.15	0 (0)
		WB-L	0.22	3 (8)		WB-L	0.67	13 (#43)
		WB-TTR	0.80	102 (190)		WB-TTR	0.68	87 (152)

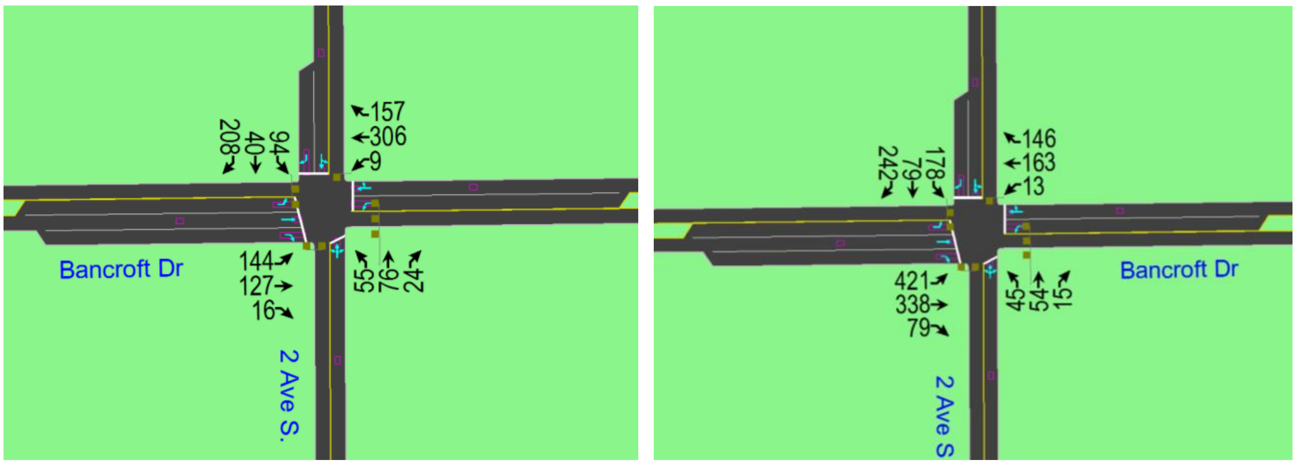
#: 95th percentile volume exceeds capacity: queue may be longer. Queue shown is the maximum after two cycles.

Bancroft Drive at Second Avenue Intersection

The existing peak hour traffic volumes and lane configurations for the signalized intersection of Bancroft Drive at Second Avenue are illustrated in **Figure 17**. The lane configuration of the four approaches is as follows:

- Northbound: shared left/through/right lane;
- Southbound: exclusive right turn lane, and a shared through/left lane;
- Eastbound: through lane, an exclusive left turn lane, and an exclusive right turn lane; and
- Westbound: shared through/right lane, and an exclusive left turn lane.

Figure 17: Bancroft Drive at Second Avenue – Peak Hour Volumes / Lane Configuration



Existing A.M. Peak Volumes **Existing P.M. Peak Volumes**

Under existing traffic conditions, this intersection operates at an acceptable level of service with no critical movements during either the a.m. or p.m. peak hours. The turning movement counts indicate a demand of 421 eastbound left turns during the p.m. peak hour. Although this movement operates with sufficient capacity, the results indicate that the 95th percentile queues extend beyond the available storage length. The operation of this intersection could be improved by optimizing the green time split for each signal phase. The phasing and the total cycle length for the intersection were not altered in the optimization process. The results of the intersection capacity analysis are summarized in **Table 18**.

Table 18: LOS Results – Bancroft Drive / Second Avenue Intersection

Scenario	A.M. Peak Hour				P.M. Peak Hour			
	LOS (Delay in Seconds)	Movement	V/C Ratio	Percentile Queues 50th (95th)	LOS (Delay in Seconds)	Movement	V/C Ratio	Percentile Queues 50th (95th)
Scenario 1 = Existing Conditions	B (19)	NB-LTR	0.48	19 (43)	C (20)	NB-LTR	0.30	13 (30)
		SB-LT	0.51	18 (40)		SB-LT	0.69	37 (72)
		SB-R	0.43	0 (16)		SB-R	0.44	8 (27)
		EB-L	0.32	7 (19)		EB-L	0.79	38 (#90)
		EB-T	0.12	7 (18)		EB-T	0.36	30 (57)
		EB-R	0.02	0 (0)		EB-R	0.10	0 (6)
		WB-L	0.02	1 (4)		WB-L	0.05	2 (6)
		WB-TR	0.41	53 (113)		WB-TR	0.61	39 (71)
Scenario 2 = Scenario 1 + Optimized Signal Timings	B (17)	NB-LTR	0.47	17 (42)	C (22)	NB-LTR	0.34	17 (34)
		SB-LT	0.49	16 (40)		SB-LT	0.75	47 (81)
		SB-R	0.42	0 (15)		SB-R	0.46	10 (31)
		EB-L	0.34	7 (20)		EB-L	0.71	42 (76)
		EB-T	0.13	6 (18)		EB-T	0.34	33 (55)
		EB-R	0.02	0 (0)		EB-R	0.10	0 (6)
		WB-L	0.02	1 (3)		WB-L	0.05	2 (7)
		WB-TR	0.67	46 (95)		WB-TR	0.66	51(84)

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

Lloyd Street at Brady Street Intersection

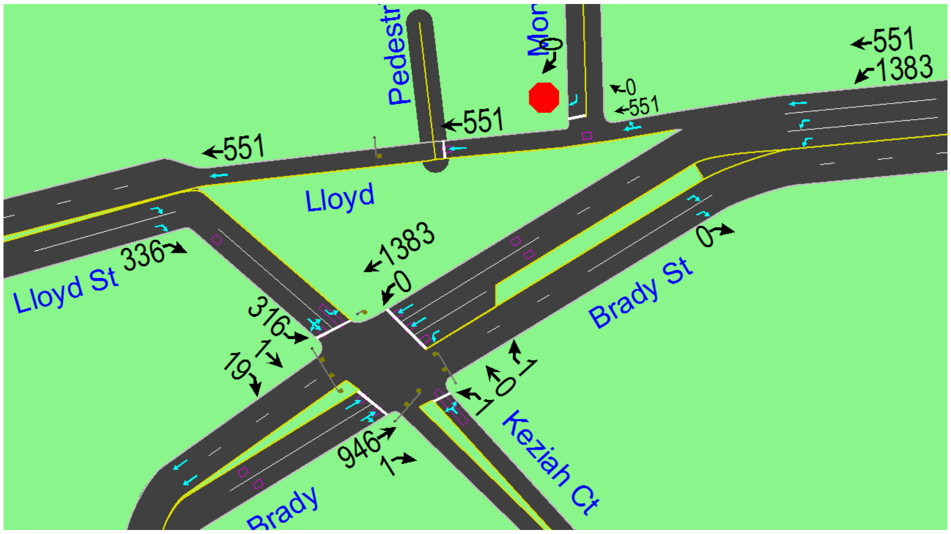
The intersection of Lloyd Street with Brady Street and Keziah Court has non-standard geometry and lane configurations, which are depicted in **Figure 18**.

At the Mathew Street intersection, the westbound lanes on Lloyd Street split into two lane groups. A westbound curb lane begins and continues as a single lane past the Brady Street intersection. The two southwest-bound lanes on the Kingsway become Lloyd Street at the Mathew Street intersection. At Mont Adam Street, they bend left and become Brady Street. Keziah Court is a cul-de-sac on the southeast corner of the intersection. The lane configurations at the Lloyd / Brady / Keziah intersection are as follows:

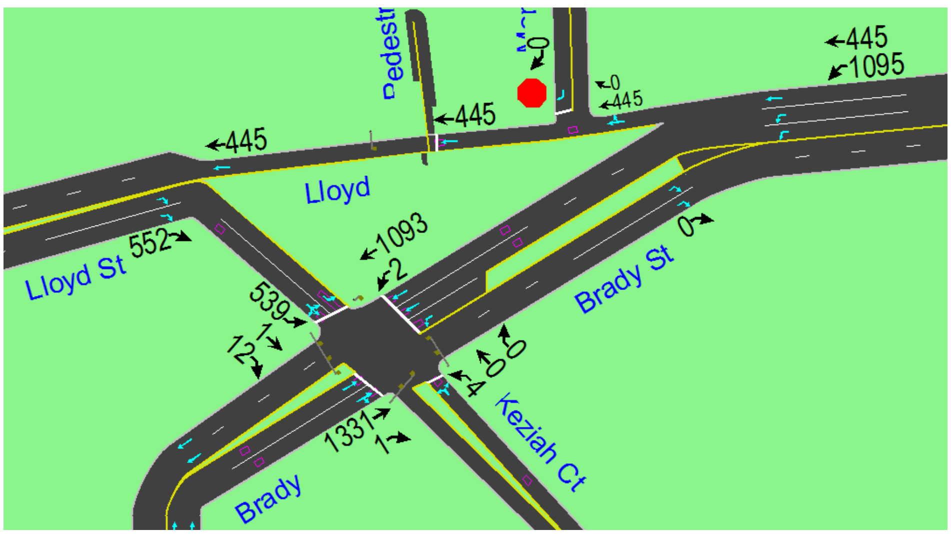
- Lloyd Street – Brady Street southwest-bound: dual through lanes and an exclusive left turn lane;
- Keziah Court: shared left/right lane;
- Brady Street northeast-bound: dual through lanes with a shared right turn movement; and
- Lloyd Street southeast-bound: shared left/through/right lane and an exclusive left turn lane.

A signalized pedestrian crossing is provided on the Lloyd Street single lane westbound ramp. Although connected to the same traffic signal controller, the pedestrian activated traffic signal located on the westbound ramp operates independently from traffic signals at this intersection. In addition to the lane configurations, existing traffic volumes are also shown in **Figure 18**.

Figure 18: Lloyd Street at Brady Street – Peak Hour Volumes / Lane Configuration



Existing A.M. Peak Volumes



Existing P.M. Peak Volumes

Site observations revealed that there can be queuing in the p.m. peak hour. However, the results of the capacity analysis indicate that this intersection operates at an acceptable LOS under existing traffic conditions, and that short term improvements are not required. The results of the intersection capacity analysis are summarized in **Table 19**.

Table 19: LOS Results – Lloyd Street and Brady Street / Keziah Court Intersection

Scenario	A.M. Peak Hour				P.M. Peak Hour			
	LOS (Delay in Seconds)	Movement	V/C Ratio	Percentile Queues 50th (95th)	LOS (Delay in Seconds)	Movement	V/C Ratio	Percentile Queues 50th (95th)
Scenario 1 = Existing Conditions	B (13)	NB-LTR	0.01	0 (0)	C (21)	NB-LTR	0.02	1 (3)
		SB-L	0.62	28 (49)		SB-L	0.75	51 (82)
		SB-LTR	0.63	28 (49)		SB-LTR	0.78	52 (83)
		EB-TTR	0.41	33 (60)		EB-TTR	0.64	82 (129)
		WB-L	0	0 (0)		WB-L	0.01	0 (1)
		WB-TT	0.60	59 (103)		WB-TT	0.52	61 (96)

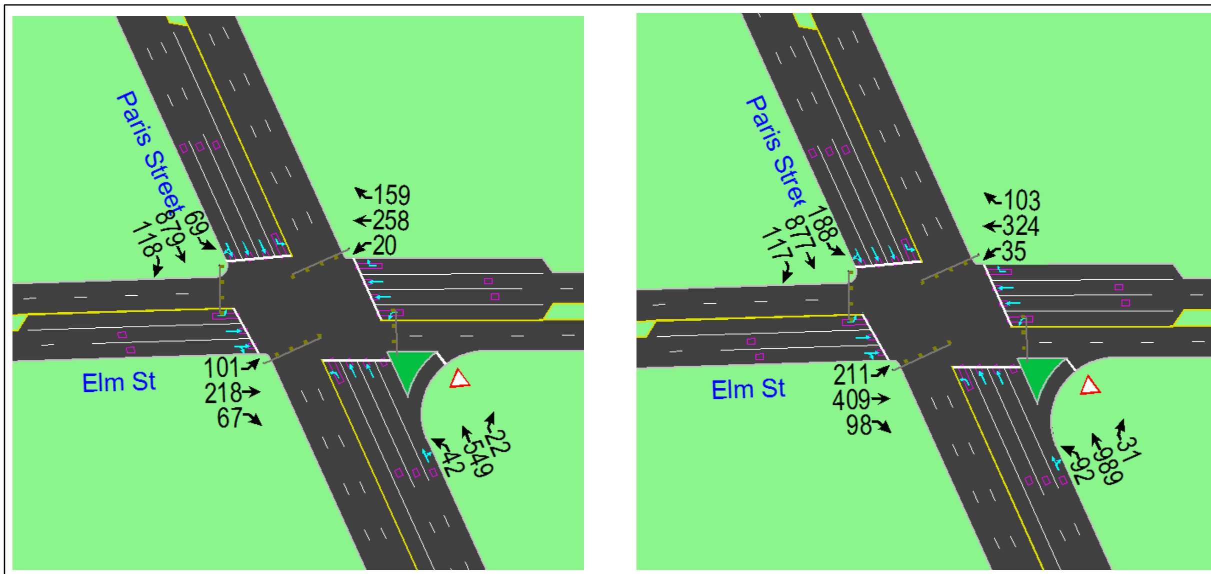
Lloyd Street / Elm Street at Notre Dame Avenue / Paris Street Intersection

The intersection of Lloyd Street / Elm Street and Notre Dame Avenue/Paris Street is signalized with four legs. The lane configuration of each approach is as follows:

- Northbound and southbound: three through lanes with a shared right turn movement and an exclusive left turn lane;
- Eastbound: two through lanes with a shared right turn movement and an exclusive left turn lane; and
- Westbound: two through lanes and exclusive left and right turn lanes.

The existing traffic volumes and lane configurations at this intersection are illustrated in **Figure** 19.

Figure 19: Lloyd Street / Elm Street at Notre Dame Avenue / Paris Street – Peak Hour Volumes / Configuration



Existing A.M. Peak Volumes **Existing P.M. Peak Volumes**

Results of the capacity analysis indicate that this intersection operates at an acceptable LOS and without critical movements in both the a.m. and p.m. peak hours. Moreover, the results suggest that the current lane configuration has sufficient capacity to accommodate considerable additional traffic demand, hence no improvements are currently required at this intersection.

The results of the intersection capacity analysis are summarized in **Table 20**.

Table 20: LOS Results – Lloyd Street / Elm Street and Notre Dame / Paris Street Intersection

Scenario	A.M. Peak Hour				P.M. Peak Hour			
	LOS (Delay in Seconds)	Movement	V/C Ratio	Percentile Queues 50th (95th)	LOS (Delay in Seconds)	Movement	V/C Ratio	Percentile Queues 50th (95th)
Scenario 1 = Existing Conditions	C (27)	NB-L	0.20	8 (12)	C (32)	NB-L	0.44	17 (22)
		NB-TTTR	0.34	41 (53)		NB-TTTR	0.72	83 (106)
		SB-L	0.20	9 (17)		SB-L	0.72	25 (49)
		SB-TTTR	0.58	67 (82)		SB-TTTR	0.61	67 (82)
		EB-L	0.21	13 (23)		EB-L	0.48	29 (45)
		EB-TTR	0.21	17 (26)		EB-TTR	0.37	37 (51)
		WB-L	0.07	3 (9)		WB-L	0.15	6 (14)
		WB-TT	0.24	23 (33)		WB-TT	0.30	29 (41)
		WB-R	0.28	0 (14)		WB-R	0.18	0 (5)

Paris Street at Brady Street Intersection

Paris Street at Brady Street is a major downtown intersection, with Tom Davies Square located on the northwest corner. The lane configuration of each approach is as follows:

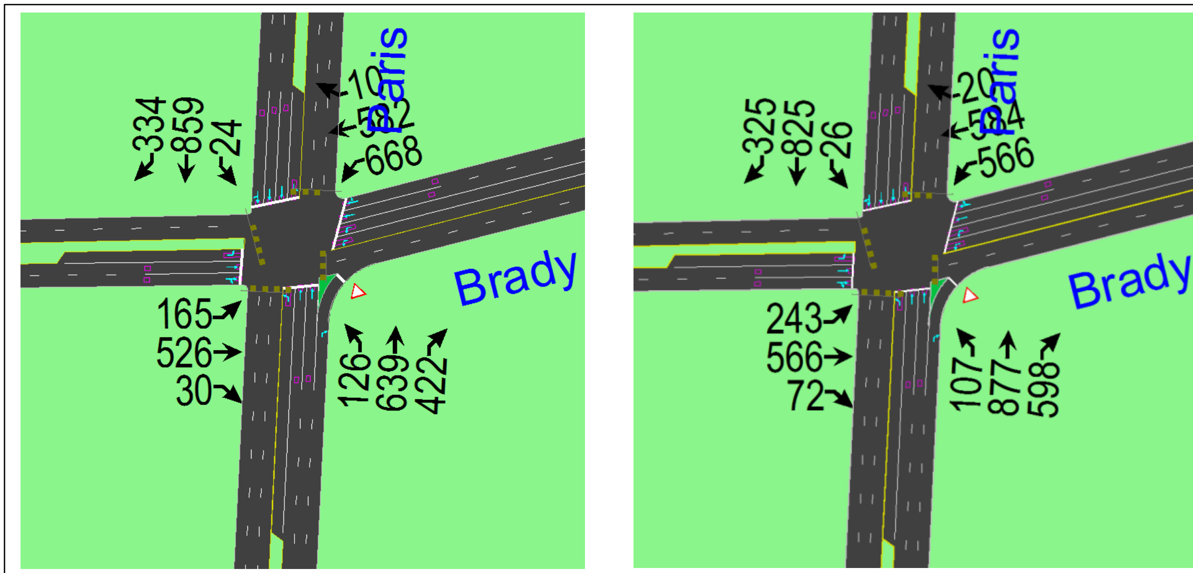
- Northbound and southbound: two through lanes plus a curbside lane that feeds into both a through lane and a channelized right turn lane, as well as an exclusive left turn lane;
- Westbound: two left turn lanes and two through lanes with a shared right turn movement; and
- Eastbound: two through lanes with a shared right through movement, and an exclusive left turn lane.

There are significant westbound left turn and northbound right turn demands at this intersection. Demands of 668 and 566 westbound left turns, and 422 and 598 northbound right turns were observed during the a.m. and p.m. peak hours, respectively.

The sum of the northbound through and right turn volumes is 1,061 and 1,475 in the a.m. and p.m. peak hours, respectively. When choosing a lane from multiple alternatives, drivers look for the lane that appears to be the least utilized, leading to an even distribution of volumes across the lanes. Based on this assumption, the expected volume for each of the three northbound lanes available to through traffic and right turners is 354 and 492 in the a.m. and p.m. peak hours, respectively.

The curbside lane is the only lane available to right turners, hence all vehicles making that movement use that lane. As the surveyed right turn volumes are in excess of the expected total volume (including through traffic) for the curbside lane, that lane operates as a de facto right turn only lane during both peak hours. In order to accurately represent the operation on the ground, the northbound movement has therefore been modelled with two through lanes and a channelized right turn lane. The existing traffic volumes and modelled lane configurations at this intersection are illustrated in **Figure 20**.

Figure 20: Paris Street at Brady Street – Peak Hour Volumes / Lane Configuration



Existing A.M. Peak Volumes **Existing P.M. Peak Volumes**

Under current conditions, this intersection operates at an overall acceptable LOS during both the a.m. and p.m. peak hours. However, the westbound left turn movement experiences capacity constraints, operating with v/c ratios of 1.04 and 0.93 during the a.m. peak and p.m. peak hours, respectively.

Theoretically, v/c ratios for existing conditions cannot be greater than 1.0 since the observed volumes used in the analysis represent 'supply' volumes that were served at the intersection and therefore must be at or below the capacity of the intersection. The high v/c ratios may be the result of the overly conservative parameters used in the Synchro analysis for the existing traffic conditions. In practice, westbound left-turning drivers may adjust their driving style and use an extra second of the intergreen period to perform their manoeuvre. If this is assumed, the v/c ratio for that movement is 0.99.

The existing intersection capacity deficiencies could be mitigated by optimizing the amount of green time given to each phase in the existing signal timing plans. Following this optimization, all intersection movements will operate with a v/c ratio at or below 0.9. The results of the intersection capacity analysis are summarized in **Table 21**.

Table 21: LOS Results – Paris Street / Brady Street Intersection

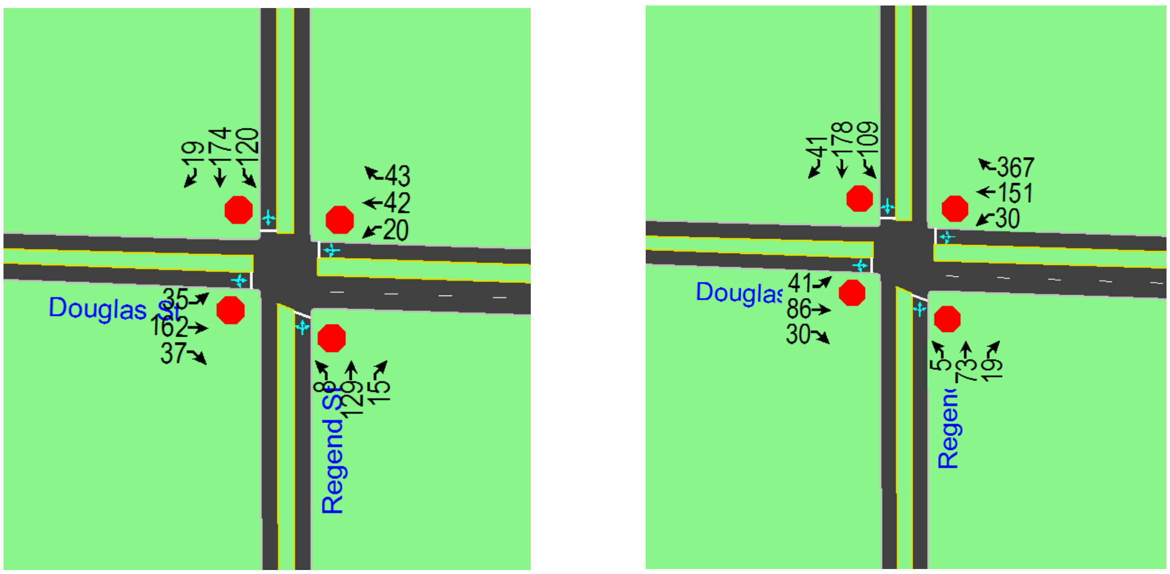
Scenario	A.M. Peak Hour				P.M. Peak Hour			
	LOS (Delay in Seconds)	Movement	V/C Ratio	Percentile Queues 50th (95th)	LOS (Delay in Seconds)	Movement	V/C Ratio	Percentile Queues 50th (95th)
Scenario 1 = Existing Conditions	D (43)	NB-L	0.58	27 (39)	D (37)	NB-L	0.51	16 (17)
		NB-TT	0.50	77 (77)		NB-TT	0.69	95 (95)
		NB-R	0.51	51 (55)		NB-R	0.69	43 (44)
		SB-L	0.08	1 (2)		SB-L	0.12	1 (2)
		SB-TTTR	0.79	89 (108)		SB-TTTR	0.76	86 (103)
		EB-L	0.71	35 (#80)		EB-L	0.79	55 (#124)
		EB-TTR	0.75	60 (77)		EB-TTR	0.82	70 (89)
		WB-LL	**1.04**	~90 (#158)		WB-LL	**0.93**	~73 (#131)
		WB-TTR	0.64	65 (83)		WB-TTR	0.76	66 (84)
Scenario 2 = Scenario 1 + Optimized Signal Timings	C (33)	NB-L	0.70	17 (#39)	D (38)	NB-L	0.59	14 (17)
		NB-TT	0.59	71 (94)		NB-TT	0.79	81 (98)
		NB-R	0.55	50 (86)		NB-R	0.76	24 (32)
		SB-L	0.10	1 (2)		SB-L	0.15	3 (7)
		SB-TTTR	**0.90**	91 (#117)		SB-TTTR	**0.85**	89 (105)
		EB-L	0.71	36 (57)		EB-L	**0.85**	53 (#92)
		EB-TTR	0.68	59 (77)		EB-TTR	0.70	69 (88)
		WB-LL	**0.89**	75 (#103)		WB-LL	0.88	64 (#91)
		WB-TTR	0.52	56 (74)		WB-TTR	0.60	64 (81)

#: 95th percentile volume exceeds capacity: queue may be longer. Queue shown is the maximum after two cycles.
~: Volume exceeds capacity, queue is theoretically infinite. Queue shown is the maximum after two cycles.

Douglas Street at Regent Street Intersection

The Douglas Street / Regent Street intersection is the only all-way stop controlled intersection in the list of those identified for inclusion in this analysis of existing conditions. One consideration is whether or not traffic signals are warranted. A single shared left/through/right lane is present on each of the approaches to this intersection. This is illustrated in **Figure 21,** along with the existing traffic volumes.

Figure 21: Douglas Street at Regent Street – Peak Hour Volumes / Lane Configuration



Existing A.M. Peak Volumes **Existing P.M. Peak Volumes**

The capacity analysis results indicate that this intersection is over capacity during the p.m. peak hour, with a LOS of F. This is caused by the heavy westbound demand, particularly vehicles turning out of Douglas Street to head north on Regent Street. On this approach, the volume / capacity ratio is shown as 1.00. The high v/c ratios are the result of the overly conservative parameters used in the Synchro analysis for the existing traffic conditions.

A traffic signal warrant analysis was conducted based on the methodology from Book 12 of the Ontario Traffic Manual (OTM). This analysis indicated that signalization of this intersection is appropriate; the detailed results are provided in **Appendix L**. It should be noted that, according to OTM Book 12, the turning movement count data used in the warrant analysis should cover 8 hours.

On the westbound approach, there is less than 105 metres of storage length available to accommodate vehicle queues without compromising the operation of the neighbouring Douglas Street / Lorne Street intersection. In order to minimize the risk of this occurring, utilization of a signal timing plan with a short cycle length is recommended. The results of the capacity analysis based on the existing lane configurations and a cycle length of 60 seconds indicate that traffic conditions would be acceptable during both the a.m. and p.m. peak hours.

It is our understanding that, if feasible, exclusive left turn lanes will be provided at all approaches of this intersection; these are typically provided to prevent blockage of through movements by a left turn vehicle waiting for a suitable gap in the opposing traffic. Adequate space is available to accommodate a left turn lane on the eastbound and westbound approaches, however the northbound and southbound approaches are constrained. Consequently, capacity analysis was undertaken for a third scenario assuming that, in addition to the signalization, a left turn lane will be provided on the eastbound and westbound approaches.

The results of the intersection capacity analysis are summarized in **Table 22**.

Table 22: LOS Results – Douglas Street / Regent Street Intersection

Scenario	A.M. Peak Hour				P.M. Peak Hour			
	LOS (Delay in Seconds)	**Movement**	**V/C Ratio**	**Percentile Queues 50th (95th)**	**LOS (Delay in Seconds)**	**Movement**	**V/C Ratio**	**Percentile Queues 50th (95th)**
Scenario 1 = Existing Conditions	C (16)	NB-LTR	0.30	-- (--)	F (85)	NB-LTR	0.24	-- (--)
		SB-LTR	0.58	-- (--)		SB-LTR	0.73	-- (--)
		EB-L	0.08	-- (--)		EB-L	0.11	-- (--)
		EB-TR	0.42	-- (--)		EB-TR	0.29	-- (--)
		WB-L	0.05	-- (--)		WB-L	0.07	-- (--)
		WB-TR	0.18	-- (--)		WB-TR	**1.00**	-- (--)
Scenario 2 = Scenario 1 + Signalization	B (14)	NB-LTR	0.26	8 (16)	B (16)	NB-LTR	0.16	6 (15)
		SB-LTR	0.65	22 (38)		SB-LTR	0.64	29 (57)
		EB-LTR	0.55	17 (36)		EB-LTR	0.32	9 (17)
		WB-LTR	0.25	4 (13)		WB-LTR	0.81	31 (51)
Scenario 3 = Scenario 2 + Exclusive EB and WB LT lanes	B (13)	NB-LTR	0.26	7 (16)	B (16)	NB-LTR	0.15	5 (14)
		SB-LTR	0.65	19 (38)		SB-LTR	0.57	27 (52)
		EB-L	0.12	2 (8)		EB-L	0.35	3 (9)
		EB-TR	0.45	13 (29)		EB-TR	0.20	6 (13)
		WB-L	0.08	1 (5)		WB-L	0.08	2 (6)
		WB-TR	0.20	3 (10)		WB-TR	0.80	28 (49)

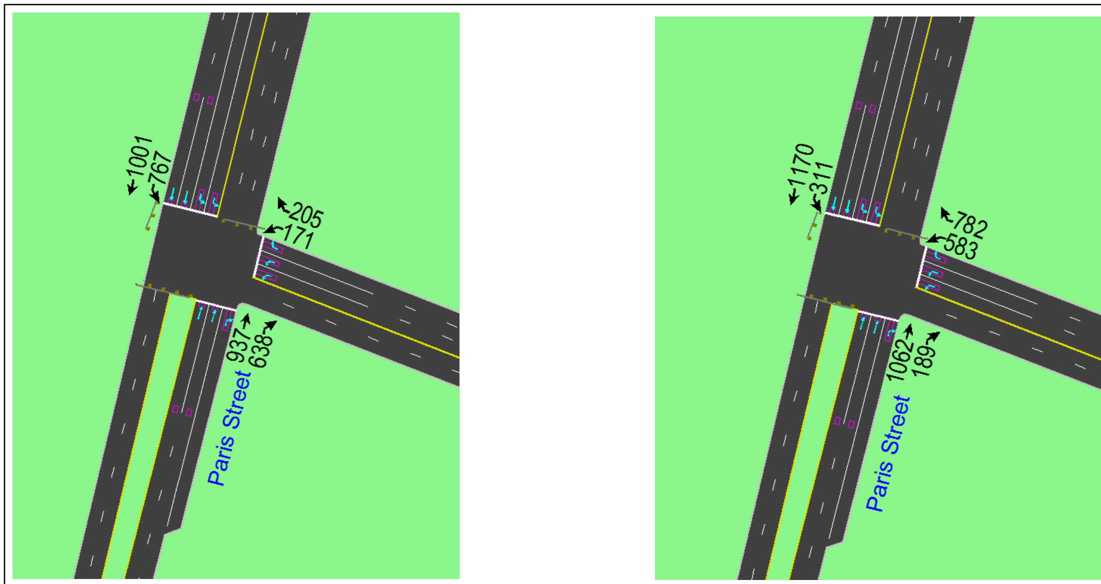
Ramsey Lake Road at Paris Street Intersection

The signalized intersection of Ramsey Lake Road and Paris Street provides access to Health Sciences North and Laurentian University. The lane configuration of each approach is as follows:

- Northbound: two through lanes and an exclusive right turn lane;
- Southbound: dual left turn lanes and two through lanes;
- Westbound: dual left turn lanes and an exclusive right turn lane; and
- There is no eastbound approach.

The traffic patterns observed at this intersection reflect its function providing access to the hospital and the university. There is a significant inbound traffic demand during the a.m. peak hour with the opposite occurring during the p.m. peak hour. The traffic counts indicate a demand of 767 southbound left turns and 638 northbound right turns during the a.m. peak hour; 583 left turns and 782 right turns were counted on the westbound approach during the p.m. peak hour. The existing traffic volumes and lane configurations are illustrated in **Figure 22**.

Figure 22: Ramsey Lake Road at Paris Street – Peak Hour Volumes / Lane Configuration



Existing A.M. Peak Volumes **Existing P.M. Peak Volumes**

While this intersection operates at an overall acceptable LOS during both the a.m. and p.m. peak hours, some individual movements experience capacity constraints. The northbound right turn movement operates with a v/c ratio of 1.01 during the a.m. peak hour, and the westbound right turn movement operates with a v/c ratio of 1.07 during the p.m. peak hour. Theoretically, v/c ratios for existing conditions cannot be greater than 1.0 since the observed volumes used in the analysis represent 'supply' volumes that were observed at the intersection and therefore must be at or below the capacity of the intersection. The high v/c ratios are the result of the overly conservative parameters used in the Synchro analysis for the existing traffic conditions.

Optimization of the existing traffic signal plans results in no significant improvements during the a.m. and p.m. peak hours. The results of the intersection capacity analysis are summarized in **Table 23**.

Table 23: LOS Results – Ramsey Lake Road / Paris Street Intersection

Scenario	A.M. Peak Hour				P.M. Peak Hour			
	LOS (Delay in Seconds)	Movement	V/C Ratio	Percentile Queues 50th (95th)	LOS (Delay in Seconds)	Movement	V/C Ratio	Percentile Queues 50th (95th)
Scenario 1 = Existing Conditions	C (29)	NB-TT	0.41	87 (109)	C (34)	NB-TT	0.80	106 (12)
		NB-R	**1.01**	~142 (#216)		NB-R	0.32	28 (45)
		SB-LL	0.66	56 (74)		SB-LL	0.71	35 (39)
		SB-TT	0.37	3 (7)		SB-TT	0.62	81 (90)
		WB-LL	0.42	18 (27)		WB-LL	0.48	53 (70)
		WB-R	0.28	19 (27)		WB-R	**1.07**	~177 (#213)
Scenario 2 = Scenario 1 + Optimized Signal Timings	C (32)	NB-TT	0.68	84 (117)	C (33)	NB-TT	**0.89**	115 (#145)
		NB-R	**1.03**	134 (#230)		NB-R	0.35	31 (50)
		SB-LL	0.65	91 (106)		SB-LL	**0.94**	32 (#49)
		SB-TT	0.37	48 (83)		SB-TT	0.70	30 (43)
		WB-LL	0.42	18 (27)		WB-LL	0.40	45 (60)
		WB-R	0.27	18 (32)		WB-R	**0.97**	142 (#211)

#: 95th percentile volume exceeds capacity: queue may be longer. Queue shown is the maximum after two cycles.
~: Volume exceeds capacity, queue is theoretically infinite. Queue shown is the maximum after two cycles.

Looking toward the long term accessibility of this area, a possible southern access to the University to better distribute traffic demand is shown in the City's Official Plan. That potential initiative is discussed in the analysis of future travel demands, provided in subsequent sections of the report.

Laurentian University prepared a Campus Plan in the fall of 2013, which identified future development levels and uses and planned for future growth in the student population. Additionally, 400 students from the Faculty of Architecture are now being housed in a building downtown, so improved linkages are required between that facility and the main campus.

Alternatives to the South Bay Road extension include a focus on improving transit and high occupancy vehicle access to this area in order to reduce growth in auto demand. Possible ways to accomplish this include: transit priority signals at the Ramsey Lake Road intersection, transit-only queue jump lanes; an increase in transit service frequency; and parking policies at the University and Hospital which support higher occupancy vehicle use and other travel demand management measures. A joint City/University/Hospital travel management committee should be considered to assist in managing demands to this area.

Cycling could also be part of the long term accessibility solution. The existing two-way cycle path along the northbound lanes of Paris Street should be connected to the multiuse path along the eastbound lanes of Ramsey Lake Road. Eliminating or minimizing this discontinuity should be considered in the planning of future improvements to this intersection.

The potential for a new road parallel to Ramsey Lake Road should also be considered. It is recommended that an Environmental Assessment be undertaken to review potential alignments and compare the costs and benefits those associated with the widening of Ramsey Lake Road and other measures. Modifications to the geometry, lane allocations and signal operation of the Ramsey Lake Road / Paris Street intersection, along with connections to Paris Crescent and Walford Road associated with the potential alignments, should be evaluated as part of this holistic review.

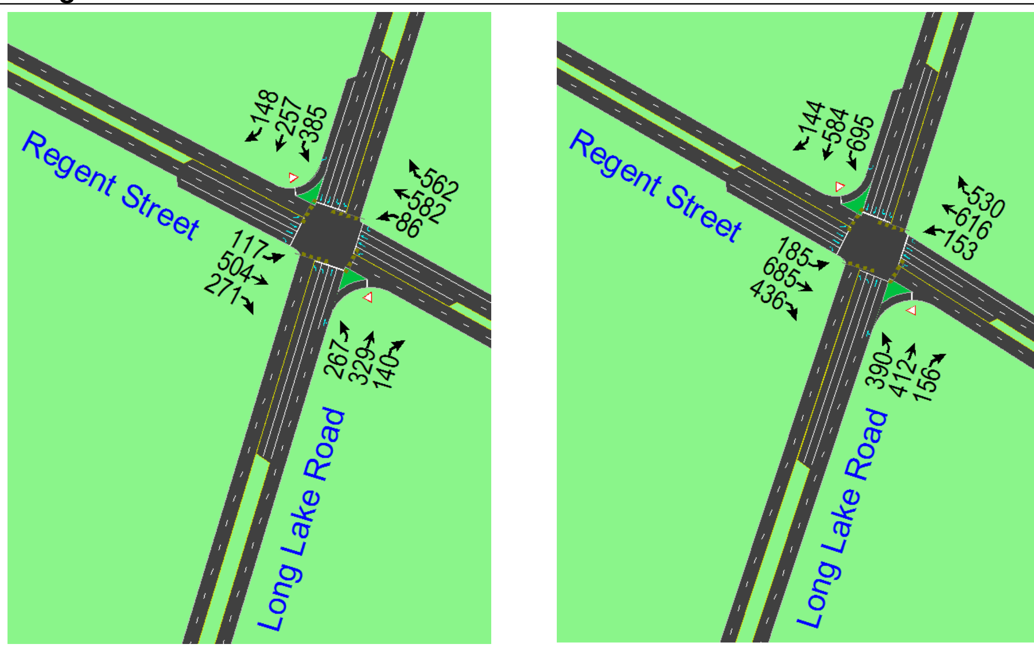
Regent Street at Paris Street / Long Lake Road Intersection (Four Corners)

The intersection of Regent Street and Paris Street / Long Lake Road, known locally as the Four Corners, is a major signalized intersection in the southern portion of the city with heavy traffic volumes in the a.m. and p.m. peak hours. The lane configuration of each approach is as follows:

- Northbound: dual left turn lanes, two through lanes with a shared right turn movement;
- Southbound: dual left turn lanes, two through lanes and a channelized right turn lane; and
- Westbound and eastbound: two through lanes, an exclusive left turn lane, and an exclusive right turn lane.

The existing traffic volumes and lane configurations at this intersection are illustrated in **Figure 23**.

Figure 23: Regent Street at Paris Street / Long Lake Road – Peak Hour Volumes / Lane Configuration



Existing A.M. Peak Volumes **Existing P.M. Peak Volumes**

Results of the capacity analysis indicate that that this intersection operates with an acceptable LOS and without critical movements during both the a.m. and p.m. peak hours. Moreover, it was confirmed that the existing traffic signal plans are currently adequate and that optimization will only result in nominal improvements to the levels of service, hence no short term improvements are required at this intersection. The results of the intersection capacity analysis are summarized in **Table 24**.

Table 24: LOS Results – Regent Street / Paris Street Intersection

Scenario	A.M. Peak Hour				P.M. Peak Hour			
	LOS (Delay in Seconds)	Movement	Volume to Capacity (V/C) Ratio	Percentile Queues 50th (95th)	LOS (Delay in Seconds)	Movement	V/C Ratio	Percentile Queues 50th (95th)
Scenario 1 = Existing Conditions	C (28)	NB-LL	0.37	26 (42)	D (38)	NB-LL	0.50	45 (61)
		NB-TTR	0.64	45 (69)		NB-TTR	0.73	67 (87)
		SB-LL	0.58	41 (60)		SB-LL	0.82	89 112)
		SB-TT	0.37	26 (41)		SB-TT	0.66	73 (93)
		SB-R	0.10	0 (0)		SB-R	0.10	0 (0)
		EB-L	0.38	15 (33)		EB-L	0.75	33 (#52)
		EB-TT	0.45	47 (79)		EB-TT	0.73	87 (109)
		EB-R	0.41	0 (21)		EB-R	0.63	7 (39)
		WB-L	0.24	11 (26)		WB-L	0.72	27 (#45)
		WB-TT	0.55	55 (90)		WB-TT	0.68	77 (97)
		WB-R	0.70	2 (39)		WB-R	0.71	3 (38)
Scenario 2 = Scenario 1 + Optimized Signal Timings	C (27)	NB-LL	0.37	26 (42)	D (38)	NB-LL	0.50	45 (61)
		NB-TTR	0.64	45 (69)		NB-TTR	0.73	67 (87)
		SB-LL	0.58	41 (60)		SB-LL	0.82	89 (112)
		SB-TT	0.37	26 (41)		SB-TT	0.66	73 (93)
		SB-R	0.10	0 (0)		SB-R	0.10	0 (0)
		EB-L	0.40	15 (33)		EB-L	0.75	33 (#52)
		EB-TT	0.42	44 (74)		EB-TT	0.73	87 (109)
		EB-R	0.39	0 (19)		EB-R	0.63	7 (39)
		WB-L	0.26	11 (26)		WB-L	0.72	27 (#45)
		WB-TT	0.53	53 (87)		WB-TT	0.68	77 (97)
		WB-R	0.69	1 (35)		WB-R	0.71	3 (38)

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

This intersection is built out and the scope for further expansion is constrained by existing properties and topography. However, substantial commercial development is proposed in the vicinity of this intersection, including the Southridge Mall Expansion, Long Lake Retail Centre and First Nickel Shopping Centre. This area was the subject of the *South End Traffic Studies Peer Review* completed by AECOM in December 2008, which indicated that the forecast traffic from the proposed commercial developments could not be accommodated at this intersection. In addition, the planned road improvements shown in the City's transportation master plan at the time of the 2008 report are not expected to alleviate traffic congestion at the intersection to a level that would support all proposed developments. In order to accommodate the forecast traffic, the 2008 report recommends that the intersection be reconstructed as an interchange, acknowledging that such a measure would involve acquisitions, controlled access to private property, significant utility relocations and considerable construction costs. This would also require an assessment to be undertaken in line with the Municipal Class EA Guideline for Schedule C road projects.

The report also suggested that the City consider the socio-economic needs of the community and long-term sustainable mobility solutions in this part of the city. Creating an interchange at this location would represent an erosion of the urban fabric of the City and could have a negative effect on the growth and development of the area. It is recommended that the City conduct an integrated urban design, land use and transportation study engaging developers and the local community to form a unified vision for the area. This would leverage the current dynamic activity to create a node for intensification with a focus on accommodating growth through non-auto modes to provide a more sustainable solution than the creation of a new interchange. The study would need to address opportunities for new road links as well as changes in density and urban form in the area.

Creating this multi-modal node would be a medium term solution for this intersection. In the short term, a traffic management association should be set up involving landowners, business operators, Greater Sudbury Transit and the city to explore ways to manage demand. For example, employees could park off-site and be shuttled to work; where possible, shift changes could be staggered to move traffic demand away from the network peak hours.

M.R. 24 at M.R. 55 Intersection

The signalized intersection of M.R. 24 and M.R. 55 has four legs and lies in the community of Lively, in the southwestern portion of Greater Sudbury. The lane configuration of each approach is as follows:

- Northbound: a single shared left/though/right lane;
- Eastbound: two through lanes, and exclusive left and right turn lanes;
- Westbound: two through lanes, an exclusive left turn lane, and a channelized right turn lane; and
- Southbound: an exclusive left turn lane and a shared through/right lane.

There is a two-stage signalized pedestrian crosswalk over the western leg; a crosswalk is marked over the southern leg, however no pedestrian signals are present.

The traffic counts indicate a demand of 544 and 387 southbound left turns during the a.m. and p.m. peak hours, respectively; the volume of westbound right turns observed was 332 and 698 in those periods. The existing traffic volumes and lane configurations at this intersection are illustrated in **Figure 24**.

Figure 24: M.R. 24 at M.R. 55 – Peak Hour Volumes / Lane Configuration

Existing A.M. Peak Volumes **Existing P.M. Peak Volume**

Currently, split phasing is provided for the northbound and southbound movements. Results of the capacity analysis indicate that the southbound movement experiences capacity constraints and long vehicle queues during the a.m. peak hour, which is consistent with traffic conditions observed during the site visit. This intersection operates at an acceptable LOS during the p.m. peak hour.

Approximately 90 metres north of this interaction along M.R. 24 there is a railway crossing. For a prolonged period of time during the a.m. peak hour, southbound vehicle queues were observed to extend beyond and block the railway crossing, as illustrated in **Figure 25**. A sign warning motorists not to do this is installed upstream of the crossing but compliance was observed to be very low. If a driver sitting on the crossing were not to notice the railway signals activating, or were blocked in and unable to exit the queue of traffic, a passing train may collide with that vehicle.

Figure 25: M.R. 24 at M.R. 55 – Southbound Queues Extending Beyond Railway Crossing

A safety review should be undertaken on the design of the crossing and the operation of the M.R. 24 / M.R. 55 intersection. The latter could be modified to minimize the risk of vehicle queues on the southbound approach stretching back as far as the railway crossing. Of the improvements considered, elimination of the existing split phasing arrangement and construction of a short exclusive northbound right turn lane were preferred. The greatest effect is likely to be attributable to the change in phasing. This cannot be combined with the potential conversion of the southbound curb lane to a shared left-through-right lane, for safety reasons and due to the likelihood of left-turners from that lane blocking other movements while waiting for a gap in opposing traffic. Results of the capacity analysis indicate that the available storage space between the intersection and the railway crossing would be sufficient to accommodate the projected 50th percentile queues. The results of the intersection capacity analysis are summarized in **Table 25**.

Table 25: LOS Results – M.R. 24 at M.R. 55 Intersection

Scenario	A.M. Peak Hour				P.M. Peak Hour			
	LOS (Delay in Seconds)	Movement	Volume to Capacity (V/C) Ratio	Percentile Queues 50th (95th)	LOS (Delay in Seconds)	Movement	V/C Ratio	Percentile Queues 50th (95th)
Scenario 1 = Existing Conditions	C (27)	NB-LT	0.32	10 (23)	C (21)	NB-LT	0.59	22 (47)
		NB-R	0.23	0 (0)		NB-R	0.59	22 (47)
		SB-L	0.76	62 (95)		SB-L	0.74	70 (108)
		SB-TR	0.11	3 (10)		SB-TR	0.56	30 (59)
		EB-L	**0.91**	31 (#77)		EB-L	0.62	20 (#55)
		EB-TT	0.28	20 (39)		EB-TT	0.20	14 (28)
		EB-R	0.02	0 (0)		EB-R	0.03	0 (0)
		WB-L	0.15	4 (11)		WB-L	0.55	13 (#40)
		WB-TT	0.10	6 (12)		WB-TT	0.46	26 (48)
		WB-R	0.58	0 (24)		WB-R	0.79	0 (#44)
Scenario 2 = Scenario 1 + Split Phasing + New Northbound Right Turn Lane	C (27)	NB-LT	0.32	10(23)	C (21)	NB-LT	0.44	13 (30)
		NB-R	0.23	0 (0)		NB-R	0.14	0 (0)
		SB-L	0.76	62 (95)		SB-L	0.61	40 (60)
		SB-TR	0.11	3 (10)		SB-TR	0.38	7 (19)
		EB-L	**0.91**	31 (#77)		EB-L	0.78	20 (#62)
		EB-TT	0.27	20 (39)		EB-TT	0.20	14 (28)
		EB-R	0.02	0 (0)		EB-R	0.03	0 (0)
		WB-L	0.17	4 (11)		WB-L	0.54	13 (#40)
		WB-TT	0.10	6 (12)		WB-TT	0.42	25 (47)
		WB-R	0.58	0 (24)		WB-R	0.77	0 (38)

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

Site observations suggested that the railway and traffic signals at this intersection operate completely independently without any type of coordination. When the signals at the railway crossing were in operation, the northbound and southbound traffic signal phases were still available even though northbound traffic had to stop at the railway crossing. This resulted in vehicle queues spilling back into the intersection, as illustrated in **Figure 26**. This could result in significant operational safety and operational concerns, especially when the railway crossing is closed for an extended period of time due to the passing of very long trains. It is recommended that the operation of the railway crossing and intersection traffic signals be coordinated using readily available pre-emptive signal technology. Only the eastbound and westbound through movements, which do not conflict with the railway crossing, should receive a green traffic signal indication while the railway crossing is in operation. For the same reason, the fully protected eastbound left turn should not coincide with the operation of the railway crossing. Consideration should be given to increasing the storage length for that movement to reduce the risk of the left-turn queue extending into the through lane and the potential occurrence of rear-end collisions with fast-moving through vehicles.

Figure 26: M.R. 24 at M.R. 55 – Northbound Queues Spilling Back into the Intersection

3.3 Existing Active Transportation Network

3.3.1 Existing Cycling and Pedestrian Networks

The first step in developing a successful Active Transportation (AT) network for the City of Greater Sudbury was to assemble and assess key background information, including existing and previously proposed pedestrian and cycling facilities. This was a crucial step, as it provided a detailed understanding of active transportation facilities currently on the ground or proposed for consideration by the City. This was the basis for identifying key missing links, spine connections and routes to key community destinations as part of an overall AT network.

City staff provided the study team with a Geographical Information System (GIS) database and digital aerial photography for the entire municipality. The information included:

- Existing and proposed roads;
- Posted speed limits;
- Existing sidewalks and walkways;
- Points of interest and attractions (including recreational facilities and schools);
- Existing and proposed on-road cycling routes;
- Existing and proposed trails; and
- Parks, lakes and watercourses.

In addition, a significant number of background materials, such as policies and plans, were reviewed to further inform the development of the inventory of existing conditions. The sources, that were considered when preparing the inventory mapping include:

- Ontario Provincial Policy Statement;
- Growth Plan for Northern Ontario;
- City of Greater Sudbury Official Plan;
- Sustainable Mobility Plan and Bicycling Technical Master Plan, prepared by volunteer groups and received by City Council but not formally adopted;
- Rainbow Routes Mapping;
- Trails for Active Transportation: City of Greater Sudbury Report;
- Downtown Sudbury: A Plan for the Future; and
- Pedestrian Crossing Policy Report.

For a more detailed description of these policies and plans, as well as a review of how they influence the development of active transportation facilities in Greater Sudbury please refer to **Section 4**. The AT related information presented in these documents was used to prepare context maps and served as the framework to guide the development of the AT Plan as a component of the City of Greater Sudbury's Transportation Master Plan.

Major Destinations and Attractions

When developing the AT Plan, major active recreation attractions and destinations were identified based on input from the Sustainable Mobility Advisory Panel, local agencies and stakeholders. Key attractions and destinations included but were not limited to:

- Major commercial and employment centres;
- Educational institutions;
- Municipal buildings and civic centres;
- Parks and trail areas;
- Public lands;

- Natural heritage areas; and
- Environmentally sensitive lands.

Responses from stakeholder consultation indicated that some key existing or future attractions and destinations in the City of Greater Sudbury include:

- Laurentian University;
- Cambrian College;
- Downtown Sudbury; and
- Science North.

Barriers

Another key element in assessing the existing AT conditions for the City of Greater Sudbury was the identification of real or perceived barriers. These can be defined as those things which could potentially interfere with the development of a well-connected and continuous network of AT facilities. Major barriers to walking and cycling in the City of Greater Sudbury include:

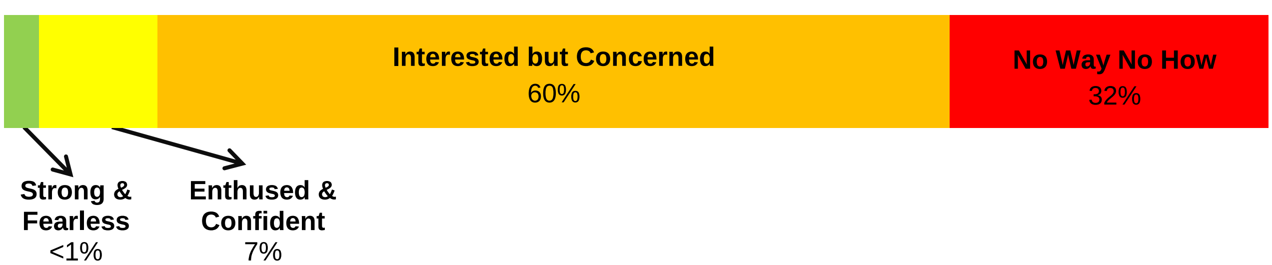
- Gaps in the sidewalk network;
- Physical barriers such as railways, hill topography, lakes and rivers;
- Lack of a “grid” road network in many areas;
- Large and complex intersections;
- Truck traffic;
- Accommodating the needs of a range of skill levels among users including experienced and casual cyclists; and
- Maintenance, including winter snow clearing and storage.

3.3.2 Pedestrian and Cycling Network User Groups

Cyclists

When developing a network of cycling facilities it is important to note that it is not a “one size fits all” approach. Cyclists come in all ages, shapes, sizes and skill levels and they have different reasons for cycling. The driving factors behind a person’s reason to cycle can be utilitarian, such as commuting, recreational or for touring.

According to Book 18 of the Ontario Traffic Manual, the population can generally be divided into four groups with the following approximate relative sizes and characteristics:



Group 1: "Strong and Fearless" (<1% of the population)

- Tend to ride more frequently;
- Will typically cycle for both utilitarian and recreational purposes;
- Have advanced cycling skills and are comfortable riding alongside motorized traffic; and
- Will cycle regardless of roadway conditions, although users in this group may prefer to use on-street bike lanes.

Group 2: "Enthused and Confident" (7% of the population)

- May share the roadway with vehicular traffic; but
- Prefer to have their own designated area.

Group 3: "Interested but Concerned" (60% of the population)

- Avoid cycling in areas with medium to high volumes of motor vehicle traffic;
- Become discouraged by high-speed traffic, extreme topographic conditions and inconsistent bicycle facilities;
- Ride infrequently, typically around their immediate neighbourhood but are curious about cycling and would like to ride more;
- Do not have their own car, for example children or teenagers who would like to cycle to school or other activities but they (or their parents) are concerned for their safety; and
- May be attracted to cycling by the implementation of designated facilities, particularly separated and in-boulevard bicycle facilities which provide more space between cyclists and motorists.

Group 4: "No Way, No How" (32% of the population)

- Are not, and may never be, interested in cycling;
- May live in an area whose topography is not suited to cycling;
- May lack the skills or capability to cycle; and
- Have not and would not consider cycling as a mode of transportation.

The 'Interested but Concerned' and the 'Enthused and Confident' groups are the ones containing those who may be encouraged to cycle more if better infrastructure were in place; together, these represent around two-thirds of the population. As such, the provision of a comprehensive network of cycling facilities has strong potential to lead to greater level of participation within the City of Greater Sudbury. A network of active transportation and trail facilities accommodating all potential cyclists is needed: one which overcomes barriers and creates key links within the City, thus facilitating community connectivity and continuity.

Pedestrians

Improving conditions for pedestrians requires more than the development of a network of connected sidewalks and trails. It is essential to create a system that "engages" pedestrians, makes them comfortable and allows them to feel as though they are a priority. As the City of Greater Sudbury continues to grow, this approach should be considered at all stages of development.

The concept that "every street should be viewed as a pedestrian street" is a notion that was adopted in the York Region Pedestrian and Cycling Master Plan and should be incorporated into the City's Active Transportation Master Plan (ATMP). The ATMP's primary goals include: improving the environment for pedestrians of all ages and fitness levels; creating a system that is accessible for all types of users; and encouraging more people to walk more often.

3.3.3 Identification of Missing Links in the Active Transportation Network

The sidewalk network is fairly well developed in the downtown core of the City Greater Sudbury; however, outside of this area pedestrian facilities are discontinuous with a number of significant gaps and missing links. A key step in improving conditions for walking in the City is the identification of missing links in the existing sidewalk system, particularly on local roads. These can act as barriers discouraging walking, an issue that is especially critical in the urban areas of Greater Sudbury.

The development of a comprehensive and connected sidewalk system is also necessary to promote other forms of active transportation and the use of public transit. Since passengers begin and end each trip as pedestrians, these two travel modes should be viewed as being mutually dependent upon one another and their networks should be planned on that basis.

Currently the cycling network within the City is limited, including some off-road trails but limited on-road facilities such as bike lanes or signed routes. The existing cycling network and development of future cycling infrastructure may be further limited by the presence of barriers. These highlight deficiencies in the cycling network, they adversely affect the ability of active transportation users to travel effectively from their origins to their destinations and they will dissuade others against transferring their trips from other modes.

The existing cycling priority network in the City is shown in **Figure 27.**

FIGURE 27 Existing Active Transportation Conditions