Drumheller Downtown Dike and Riverside Drive Closure Transportation Impact Assessment

Prepared for:

SWEETTECH ENGINEERING CONSULTANTS

By:

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April 12, 2022

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April 12, 2022

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Attn: Julia Tarnowski

Re: Transportation Impact Assessment – Downtown Dike and Riverside Drive Closure
Town of Drumheller, Alberta

JCB Engineering Ltd. is pleased to present our transportation impact assessment for the Downtown Dike and its corresponding closure of Riverside Drive in the town of Drumheller, Alberta. This report is to determine if the closure of Riverside Drive to accommodate the dike will result in impacts to the surrounding transportation network and to recommend mitigation to any identified impacts.

This document has been prepared by Justin Barrett, P. Eng., PTOE. If there are any questions regarding the findings in this document, please contact:

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12 April 2022

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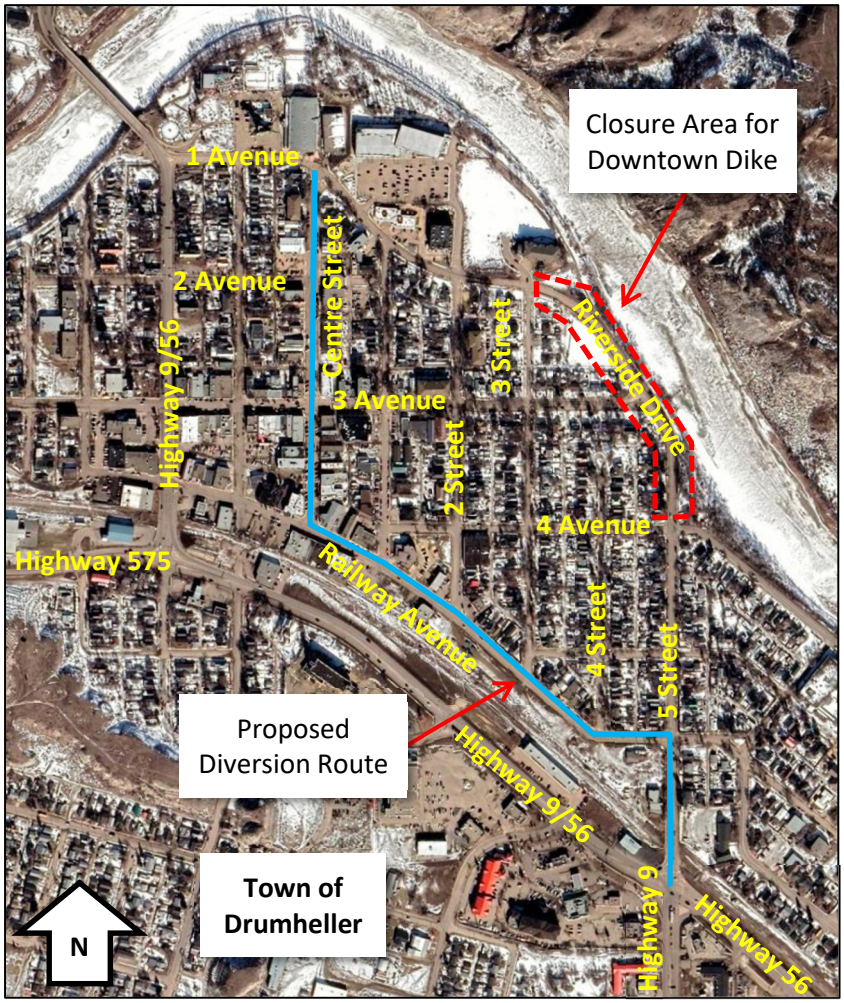
Downtown Dike and Riverside Drive Closure Transportation Impact Assessment

The purpose of this study is to conduct a transportation impact assessment (TIA) to determine if the closure of Riverside Drive to accommodate the proposed Downtown Dike will result in impacts to the surrounding transportation network and to recommend mitigation to any identified impacts. Preliminary traffic counts were conducted in August 2021 by JCB Engineering to review five options for changes to Riverside Drive with regards to the impact to the traffic operations. From that preliminary assessment and other input, it was decided to proceed with further analysis of Option 1, to fully close Riverside Drive from the intersection with 3 Street to the intersection with 4 Avenue / 5 Street to accommodate the Downtown Dike. A proposed route through the downtown of the town of Drumheller to divert around the Riverside Drive closure was analysed for this study. This is illustrated in the following figure and provided in ***Appendix A*** of this report is a plan illustrating the location of the dike and its impact on Riverside Drive.

Figure i-1: Riverside Drive Closure Section



(Image courtesy of Google)

In addition to determining the operational impacts on the transportation network created by the closure of Riverside Drive, a high level review will be provided for additional options to divert traffic around the residential area east of the downtown core of the town of Drumheller. An evaluation was conducted in this TIA to determine if the closure of Riverside Drive would impact emergency response times, in particular between the fire department in the downtown and the communities in east Drumheller.

1. Preliminary Assessment Summary

Preliminary traffic counts were conducted by JCB on behalf of SweetTech Engineering Consultants for the Town of Drumheller in August 2021. The purpose of these counts was to review the various options for accommodating the designs for the Downtown Dike and their impacts on the transportation network by comparing existing traffic volumes to the detoured traffic volumes after modification to Riverside Drive. The results showed that Option 1, chosen for this TIA, had the highest impact on the transportation network due to the full closure of Riverside Drive; the other options only considered partial closures (i.e., one way traffic flow) of the roadway. However, it was also noted that these partial closure options also had significant impacts to the network.

2. Traffic Volume Revision

As part of the preliminary assessment, traffic counts were conducted at several intersections around the section of Riverside Drive to be impacted by the Downtown Dike to get a baseline for the traffic in the area. Traffic volumes at the non-counted intersections were assumed based on traffic patterns at the adjacent counted intersections and balancing volumes on roadways between intersections. Traffic patterns were then modified by adding or subtracting volumes from movements based on the level of impact on Riverside Drive for each of the options to be analysed. For Option 1, traffic was assumed to be diverted along 3 Street and 4 Avenue due to the full closure of Riverside Drive (Option 1A). There was also a secondary option for traffic to be diverted along 3 Street and Railway Avenue, this is a longer and less direct diversion but may be used by drivers more familiar with the roadways in this area of the town of Drumheller (Option 1B).

Since the preliminary assessment was conducted, the Town of Drumheller asked that Option 1B be the primary option for analysis in the TIA as it is more desirable to divert traffic along Railway Avenue than 4 Avenue. The route using 4 Avenue results in more traffic travelling through a residential area, the use of Railway Avenue has less impact on the residences in this area of the town.

It was also decided prior to the analysis to modify the traffic volumes used in the preliminary assessment. The concern was that because the traffic counts were collected in 2021 during the COVID-19 pandemic the data may not entirely representative of both tourist and local traffic, and so should be supplemented from data collected prior to the pandemic. In ***Appendix B*** are traffic volumes provided by the Town of Drumheller and Alberta Transportation that were used to revise the traffic counts conducted for the preliminary assessment. Following was how this pre-pandemic traffic data was used to revise the traffic volumes collected for the preliminary assessment.

2.1. Alberta Transportation Data

Alberta Transportation had several counts at intersections along the highways within the town of Drumheller, but no counts at the intersections observed during the data collection for the preliminary

TIA. However, these counts did include some data that could be used for this study, there is an automated traffic reporting (ATR) station on Highway 9 near the Village of Beiseker that provided historical traffic volume data. This ATR station was chosen for growth rate data as it was one of the nearest to the town of Drumheller and the section of Highway 9 it is located on is a primary connection between the town and Highway 2, so traffic recorded at this location would be a good comparison to historical traffic patterns observed in the town.

From 2006 to 2019 (i.e., pre-pandemic data) the average annual daily traffic (AADT) volume increased by an average of 1.36% per year on this section of Highway 9. This was used to extrapolate the traffic volumes provided by the Town of Drumheller from 2006 to 2022, as is discussed later in this section of the report. Also, it was found that the greatest monthly traffic volume in a given year was either in July or August, the most recent data available from 2020 showed that August traffic volumes were 4.92% greater than in July, so this was also used to increase the traffic volumes used later in the analysis for this TIA.

2.2. Town of Drumheller Data

The data[1] provided by the Town of Drumheller contained counts at various intersections from May and July 2006. Because the July counts were greater than the May counts and were collected at approximately the same time of year as the preliminary traffic counts, the July count data from the report provided by the Town was used. Also, as was discussed previously in this section, traffic volumes in July and August are highest in the area around the town of Drumheller.

Within the scope of the section of the town being studied in this TIA, there were traffic counts from 2006 at the following intersections: 5 Street and Railway Avenue / 6 Avenue, 5 Street and Riverside Drive / 4 Avenue, and 5 Street / Riverside Drive and 3 Avenue. The data from these three locations was compared to the preliminary traffic count data, and it was found that the 2006 traffic volumes were greater than those collected in 2021. As was discussed previously, the data available from Alberta Transportation was used to extrapolate the 2006 traffic volumes to 2022 based on historical growth, and then further increased as traffic volumes were found to be the highest during the month of August in the most recent year.

The higher approach volumes based on the 2006 data, extrapolated to 2022, were distributed at the three intersections based on the 2021 patterns; this was done because it is likely that traffic patterns have changed in Drumheller between 2006 and 2020 (and thus reflected in the more recent counts), but the volumes based on these patterns would be greater. This provided traffic volumes for use in the analysis that take into account pre-pandemic volumes, historical growth assuming no impact from the pandemic, greater traffic volumes in the peak of the summer and reflect current traffic patterns in the town.

In ***Appendix C*** are schematics of the subject section of the transportation network that was analysed in this study, illustrating how the methodology of combining data from the preliminary counts, the town of Drumheller and Alberta Transportation was conducted. These base scenario traffic volumes were then diverted using the same methodology used in the preliminary study assuming the closure of Riverside Drive from 3 Street to 4 Avenue / 5 Street to create the diversion scenario for analysis.

[1] Town of Drumheller Transportation Study; iTrans Consulting Inc.; September 2007

3. Intersection Operation Analysis

The operational analysis for the subject intersections in this TIA was conducted using Synchro (version 8) software, by Trafficware; this software utilizes the Highway Capacity Manual 2010 methodology for determining the level of service of traffic operations. The parameters for Synchro used for this analysis were based on the Alberta Transportation guidelines[2] as the Town of Drumheller do not have their own guidelines for this type of analysis, if there was no guideline for a specific parameter then the default value in the software was utilized. The traffic volumes used for the all the analyses are provided in the transportation network schematics in ***Appendix C***, and the Synchro reports for all the analyses scenarios are provided in ***Appendix D***.

3.1. Pre-Closure Operations

In the following summary table for the Synchro results the level of service (LOS), control delay, maximum volume to capacity ratio (v/c), and longest queue length are provided for each intersection approach. Note that Synchro states the queue length in 'vehicles' for some reports, this is multiplied by 8 metres per vehicle (an average length for vehicles, and a parameter in Synchro) to provide the queue length in metres. If an intersection approach has unacceptable operations, it is highlighted in red in the summary table; the unacceptable operations are defined as follows.

- LOS of 'D' or worse; control delay greater than 25 seconds for a stop sign controlled intersection or greater than 35 seconds for an intersection controlled by a traffic signal
- V/C ratio of greater than 0.90 (volumes are 90% of capacity)
- A queue length for any movement that significantly blocks another movement, or exceeds storage requirements for the movement

For the pre-closure analysis it was assumed that the existing intersection layouts and control were present at each location.

Table 3-1: Pre-Closure Intersection Traffic Operations

Two Way Stop		Riverside Drive and 3 Street							
		AM Peak Hour				PM Peak Hour			
Direction	**Movement**	LOS	Delay (sec)	V/C Ratio	Queue (m)	LOS	Delay (sec)	V/C Ratio	Queue (m)
NB	All	B	10.8	0.02	8	B	12.1	0.04	8
EB	All	A	7.6	0	0	A	7.7	0	0
WB	All	A	0	0	0	A	7.7	0	0
SB	All	A	9.7	0.01	0	B	11.4	0.02	8

[2] Traffic Impact Assessment Guidelines, Section 4.2; Alberta Transportation; February 2021

Two Way Stop		3 Avenue and 3 Street							
		AM Peak Hour				PM Peak Hour			
Direction	Movement	LOS	Delay (sec)	V/C Ratio	Queue (m)	LOS	Delay (sec)	V/C Ratio	Queue (m)
NB	All	B	10.1	0.04	8	B	10.3	0.03	8
EB	All	A	7.4	0	0	A	7.4	0	0
WB	All	A	0	0	0	A	7.6	0	0
SB	All	A	9.2	0.01	0	A	9.9	0.02	0

Two Way Stop		Riverside Drive and 3 Avenue							
		AM Peak Hour				PM Peak Hour			
Direction	Movement	LOS	Delay (sec)	V/C Ratio	Queue (m)	LOS	Delay (sec)	V/C Ratio	Queue (m)
NB	All	A	7.7	0.03	8	A	7.8	0.03	8
EB	Left	B	11.1	0.02	8	B	11.9	0	0
	Right	A	9.8	0.15	8	B	10.2	0.16	8
SB	All	A	0	0	0	A	0	0	0

Two Way Stop		4 Avenue and 3 Street							
		AM Peak Hour				PM Peak Hour			
Direction	Movement	LOS	Delay (sec)	V/C Ratio	Queue (m)	LOS	Delay (sec)	V/C Ratio	Queue (m)
NB	All	A	9.5	0.08	8	A	9.4	0.03	8
EB	All	A	7.3	0	0	A	7.3	0	0
WB	All	A	0	0	0	A	7.4	0	0
SB	All	A	9.2	0.01	0	A	9.2	0.03	8

Two Way Stop		Riverside Drive and 4 Avenue / 5 Street							
		AM Peak Hour				PM Peak Hour			
Direction	Movement	LOS	Delay (sec)	V/C Ratio	Queue (m)	LOS	Delay (sec)	V/C Ratio	Queue (m)
NB	All	A	0	0	0	A	8.0	0.01	0
EB	All	B	12.4	0.11	8	B	14.4	0.13	8
WB	All	B	12.1	0.12	8	B	11.7	0.12	8
SB	All	A	7.8	0.02	8	A	7.8	0.04	8

Two Way Stop		5 Avenue and 5 Street							
		AM Peak Hour				PM Peak Hour			
Direction	Movement	LOS	Delay (sec)	V/C Ratio	Queue (m)	LOS	Delay (sec)	V/C Ratio	Queue (m)
NB	All	A	0	0	0	A	7.9	0.01	0
EB	All	B	10.5	0.04	8	B	13.4	0.03	8
WB	All	B	12.0	0.05	8	B	11.2	0.05	8
SB	All	A	7.9	0.02	8	A	7.9	0.02	8

Two Way Stop		Railway Avenue and 3 Street							
		AM Peak Hour				PM Peak Hour			
Direction	Movement	LOS	Delay (sec)	V/C Ratio	Queue (m)	LOS	Delay (sec)	V/C Ratio	Queue (m)
EB	All	A	7.7	0	0	A	7.8	0	0
WB	All	A	0	0	0	A	0	0	0
SB	All	B	10.8	0.01	0	B	11.7	0.04	8

Four Way Stop		Railway Avenue and 5 Street / 6 Avenue							
		AM Peak Hour				PM Peak Hour			
Direction	Movement	LOS	Delay (sec)	V/C Ratio	Queue (m)	LOS	Delay (sec)	V/C Ratio	Queue (m)
NB	All	C	20.4	0.67	41	C	22.0	0.73	49
EB	All	B	13.7	0.42	17	B	13.4	0.44	18
WB	All	B	12.6	0.31	10	B	10.8	0.13	8
SB	All	C	15.1	0.49	22	B	14.6	0.50	22

There are no operational issues to note at the subject intersections under pre-closure conditions. It should be noted that at the intersection of Railway Avenue and 5 Street there are some potential issues in the pre-closure scenario, highlighted in yellow in the previous table. This intersection does have significant traffic volumes because it is adjacent to the highway and provides connection to businesses at the south end of downtown; also, the four way stop traffic control results in every vehicle approaching the intersection stopping, adding a small delay for every vehicle. The result of these issues is that the northbound movements are approximately 70% capacity and have a queue that reaches a quarter of the way back to the intersection with the highway, 200 metres to the south.

3.2. Post-Closure Operations

The same intersections were analysed with the traffic volumes diverted from the closure of Riverside Drive, no changes were assumed to the intersection layouts or control except for at the intersection of 4 Avenue and 5 Street. With the closure of Riverside Drive there will no longer be a public roadway for the north leg of this intersection, it will now be for local access and parking only; this creates a T-intersection for the public roadways. Typically, it is the base of the 'T' that is controlled with a stop sign, which would be 5 Street at this intersection and would also result in the now local roadway on the north leg to also be controlled with a stop sign. This adjustment to the stop signs provides through traffic on 4 Avenue with free passage through the intersection.

It was considered to adjust the controls at other intersections due to the closure of Riverside Drive, in particular at the intersection of Riverside Drive and 3 Street, as the east leg of this intersection would also be reduced to only local access and parking. However, the north leg of this intersection is a driveway, so there are legs in conflicting directions that are not main roadways. Adjusting the stop signs from north-south to east-west at the Riverside Drive and 3 Street intersection would only swap convenience for one direction over the other, so to make a more direct comparison of the operational results with the pre-closure scenario, no changes were made.

It should also be noted that the intersection of Riverside Drive and 3 Avenue was not analysed in the post-closure scenario as this intersection would no longer exist. 3 Avenue is proposed to end in a cul-de-sac where it currently intersects Riverside Drive.

Table 3-2: Post-Closure Intersection Traffic Operations

Two Way Stop		Riverside Drive and 3 Street							
		AM Peak Hour				PM Peak Hour			
Direction	Movement	LOS	Delay (sec)	V/C Ratio	Queue (m)	LOS	Delay (sec)	V/C Ratio	Queue (m)
NB	All	B	10.3	0.23	8	B	10.8	0.27	9
EB	All	A	7.3	0	0	A	7.3	0	0
WB	All	A	0	0	0	A	0	0	0
SB	All	A	8.8	0.01	0	A	9.6	0.01	0

Two Way Stop		3 Avenue and 3 Street							
		AM Peak Hour				PM Peak Hour			
Direction	Movement	LOS	Delay (sec)	V/C Ratio	Queue (m)	LOS	Delay (sec)	V/C Ratio	Queue (m)
NB	All	B	12.0	0.34	12	B	12.6	0.37	15
EB	All	A	7.3	0	0	A	7.3	0	0
WB	All	A	0	0	0	A	0	0	0
SB	All	B	11.2	0.21	8	B	12.1	0.30	10

Two Way Stop		4 Avenue and 3 Street							
		AM Peak Hour				PM Peak Hour			
Direction	Movement	LOS	Delay (sec)	V/C Ratio	Queue (m)	LOS	Delay (sec)	V/C Ratio	Queue (m)
NB	All	B	14.3	0.45	20	B	12.2	0.29	10
EB	All	A	7.4	0.02	8	A	7.4	0.01	0
WB	All	A	0	0	0	A	7.4	0	0
SB	All	B	13.8	0.43	17	B	14.9	0.50	22

Two Way Stop		Riverside Drive and 4 Avenue / 5 Street							
		AM Peak Hour				PM Peak Hour			
Direction	Movement	LOS	Delay (sec)	V/C Ratio	Queue (m)	LOS	Delay (sec)	V/C Ratio	Queue (m)
NB	All	A	8.5	0.01	0	A	8.9	0.03	8
EB	All	A	0	0	0	A	0	0	0
WB	All	A	7.4	0.02	8	A	7.4	0.01	0
SB	All	A	9.9	0	0	A	9.8	0	0

Two Way Stop		5 Avenue and 5 Street							
		AM Peak Hour				PM Peak Hour			
Direction	**Movement**	LOS	Delay (sec)	V/C Ratio	Queue (m)	LOS	Delay (sec)	V/C Ratio	Queue (m)
NB	All	A	0	0	0	A	7.3	0.01	0
EB	All	A	8.8	0.03	8	A	9.5	0.02	8
WB	All	A	9.7	0.03	8	B	10.3	0.04	8
SB	All	A	7.3	0.02	8	A	7.5	0.02	8

Two Way Stop		Railway Avenue and 3 Street							
		AM Peak Hour				PM Peak Hour			
Direction	**Movement**	LOS	Delay (sec)	V/C Ratio	Queue (m)	LOS	Delay (sec)	V/C Ratio	Queue (m)
EB	All	A	8.3	0	0	A	8.2	0	0
WB	All	A	0	0	0	A	0	0	0
SB	All	D	25.1	0.66	37	D	34.0	0.78	55

Four Way Stop		Railway Avenue and 5 Street / 6 Avenue							
		AM Peak Hour				PM Peak Hour			
Direction	**Movement**	LOS	Delay (sec)	V/C Ratio	Queue (m)	LOS	Delay (sec)	V/C Ratio	Queue (m)
NB	All	C	24.0	0.72	45	D	26.2	0.76	56
EB	All	D	34.8	0.86	83	D	31.6	0.86	81
WB	All	B	13.0	0.32	12	B	10.6	0.12	8
SB	All	B	11.6	0.13	8	A	9.5	0.03	8

In the pre-closure scenario, there was a concern about the operation of the Railway Avenue and 5 Street intersection, and when Riverside Drive is closed resulting in more traffic being diverted onto Railway Avenue at the intersection with 5 Street the operation of the intersection becomes unacceptable. The northbound and eastbound directions are nearly at capacity, and this results in unacceptable delays for these movements; this is all caused by the additional traffic diverted onto Railway Avenue instead of travelling north and using Riverside Drive.

A new operational issue due to the diverted traffic on Railway Avenue has appeared at the intersection with 3 Street, the increase in southbound traffic waiting at the stop sign for a gap to turn left onto Railway Avenue which has also had an increase in traffic, has resulted in unacceptable delay.

As mentioned at the start of ***Section 3***, the operational issues noted are assuming that traffic will divert using Railway Avenue and 3 Street. As will be discussed in the following sections of this report there will be a mitigation options to encourage drivers to use Centre Street instead of 3 Street. Any mitigation required to resolve operational issues at Railway Avenue and 3 Street would therefore be required at Railway Avenue and Centre Street, as this higher volume of traffic will now occur at that intersection further to the west.

The other intersections analysed have increased traffic volumes as well, but all still operate at a high level of service. These intersections had adequate capacity and the higher volume traffic movements do not conflict with each other as they travel through the intersections.

3.3. Options to Mitigate Operational Issues

To resolve the operational issues noted in the previous section of this report due to the diversion of traffic onto Railway Avenue from the closure of Riverside Drive, the following options were reviewed at the subject intersections.

3.3.1. Railway Avenue and Centre Street

This operational issue is the result of greater southbound traffic volumes turning left off of Centre Street onto Railway Avenue eastbound; the greater volumes on Railway Avenue result in few gaps for this southbound left turn movement. Creating a westbound right turn lane that is channelized with an island helps to mitigate this issue as now the southbound traffic will now be able to observe if the approaching westbound traffic is going to go through the intersection or turning right. By separating the approaching westbound traffic in through or right lanes instead of combined in one lane, the southbound traffic can find more gaps and turn onto Railway Avenue. It is possible to create these modifications within the existing footprint of the intersection. Some on-street parking along the north Railway Avenue and east side of Centre Street would have to be removed for allow for the proposed right turn movement. This would need to be confirmed at a more detailed design stage.

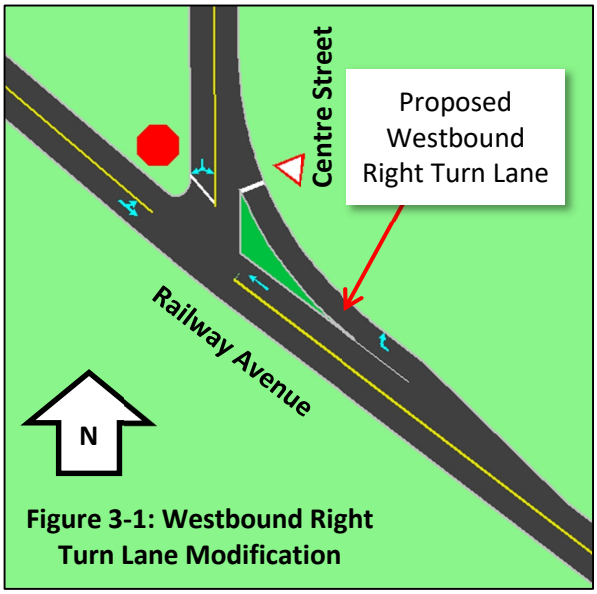


Figure 3-1: Westbound Right Turn Lane Modification

The adjacent figure is an initial concept of the modification proposed at this intersection and following are the operational analysis results for this new layout. This modification of adding a separate right turn lane improves the operation of this intersection to below the acceptable threshold. Note that the analysis is for the Railway Avenue and 3 Street intersection, not at Centre Street, this is due to the analysis for this study initially only being conducted for 3 Street as the post-closure route. Because traffic volumes along Centre Street were not collected in 2021, an operational analysis could not be conducted along this corridor for this study. However, because the intersections of Railway Avenue and 3 Street, and Railway Avenue and Centre Street are similar, it was assumed that the operations would be similar as well. The post-closure intersection of Railway Avenue and 3 Street becomes the south end of a north-south diversion of traffic around the closed section of Riverside Drive. The intersection of Railway Avenue and Centre Street is also the south end of a north-south route through the downtown of the town of Drumheller, and for both intersections Railway Avenue provides a connection back to Highway 9/56. Therefore, it is

reasonable to assume that traffic patterns would be similar at both intersections and consequently, the intersections would operate similarly.

Table 3-3: Westbound Right Turn Lane Modification

Two Way Stop		Railway Avenue and 3 Street							
		AM Peak Hour				PM Peak Hour			
Direction	Movement	LOS	Delay (sec)	V/C Ratio	Queue (m)	LOS	Delay (sec)	V/C Ratio	Queue (m)
EB	All	A	7.5	0	0	A	7.7	0	0
WB	Through	A	0	0	0	A	0	0	0
	Right	A	0	0	0	A	0	0	0
SB	All	C	17.4	0.54	26	C	24.0	0.68	41

3.3.2. Railway Avenue and 5 Street / 6 Avenue

This intersection requires more modifications than at Railway Avenue and Centre Street.

- Addition of an eastbound right turn lane and northbound left turn lane
- A southbound right turn island
- Conversion from a four way stop to a two way stop with north-south being the major direction

These modifications are illustrated in the following figure and the analysis results are also provided to demonstrate how these modifications improve the operations of the intersection. The largest improvement to the operations is the conversion from four-way to a two-way stop control. It was observed from the analysis that locating the stop signs north-south provided overall better operations at the intersection. Even with the northbound left turn movement increasing significantly due to the closure of Riverside Drive, the closure also results in there being significantly less southbound traffic on 5 Street. As a result, the northbound left turn movement operates with low delay even though it must stop before proceeding. The addition of a northbound left turn lane helps to further support this movement.

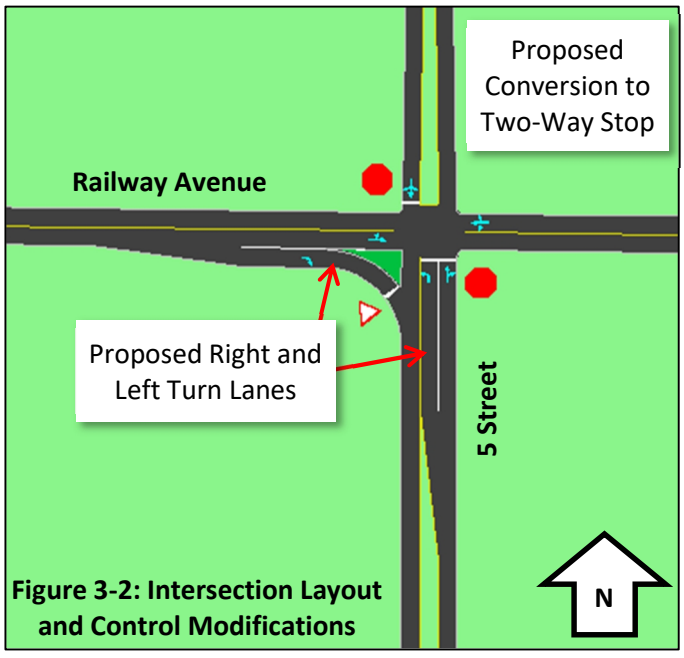


Figure 3-2: Intersection Layout and Control Modifications

As with the intersection at Railway Avenue and Centre Street, it may also be possible to create these modifications within the existing footprint of the intersection. Again, there would be

restrictions for on-street parking to use the existing pavement width for the new auxiliary lanes. This would need to be confirmed at a more detailed design stage.

Even though the eastbound approach no longer has a stop sign controlling it, having a separate right turn lane allows this movement to operate at an even higher level of service and reduces conflict with other movements at the intersection. This provides an overall increase to the level of service for the other movements.

As will be discussed in ***Section 4***, there is an option to further modify this intersection to encourage drivers to divert from 5 Street onto Railway Avenue while still providing local access to the residential area to the north.

Table 3-4: Intersection Layout and Control Modifications

Two Way Stop		Railway Avenue and 5 Street / 6 Avenue							
		AM Peak Hour				PM Peak Hour			
Direction	Movement	LOS	Delay (sec)	V/C Ratio	Queue (m)	LOS	Delay (sec)	V/C Ratio	Queue (m)
NB	Left	C	20.6	0.61	32	B	14.0	0.47	20
	Thru / Right	B	10.1	0.08	8	B	10.4	0.14	8
EB	Left / Thru	A	0	0	0	A	7.4	0.01	0
	Right	A	0	0	0	A	0	0	0
WB	All	A	7.6	0.05	8	A	7.4	0.01	0
SB	All	B	12.6	0.12	8	A	8.8	0.02	8

4. Additional Traffic Diversion Options

With the closure of Riverside Drive, there is a desire by the Town of Drumheller to make Railway Avenue the primary connection between Highways 9 and 56 in the southeast of the town to downtown along Centre Street. However, there is a residential area to the east of downtown that the Town also wants to minimize the impact of through traffic on. To make the Railway Avenue and Centre Street route more desirable to travellers, additional options are being considered to assist in diverting traffic around the residential area to the east of downtown.

4.1. Diversion at the Intersection of 5 Street and Railway Avenue / 6 Avenue

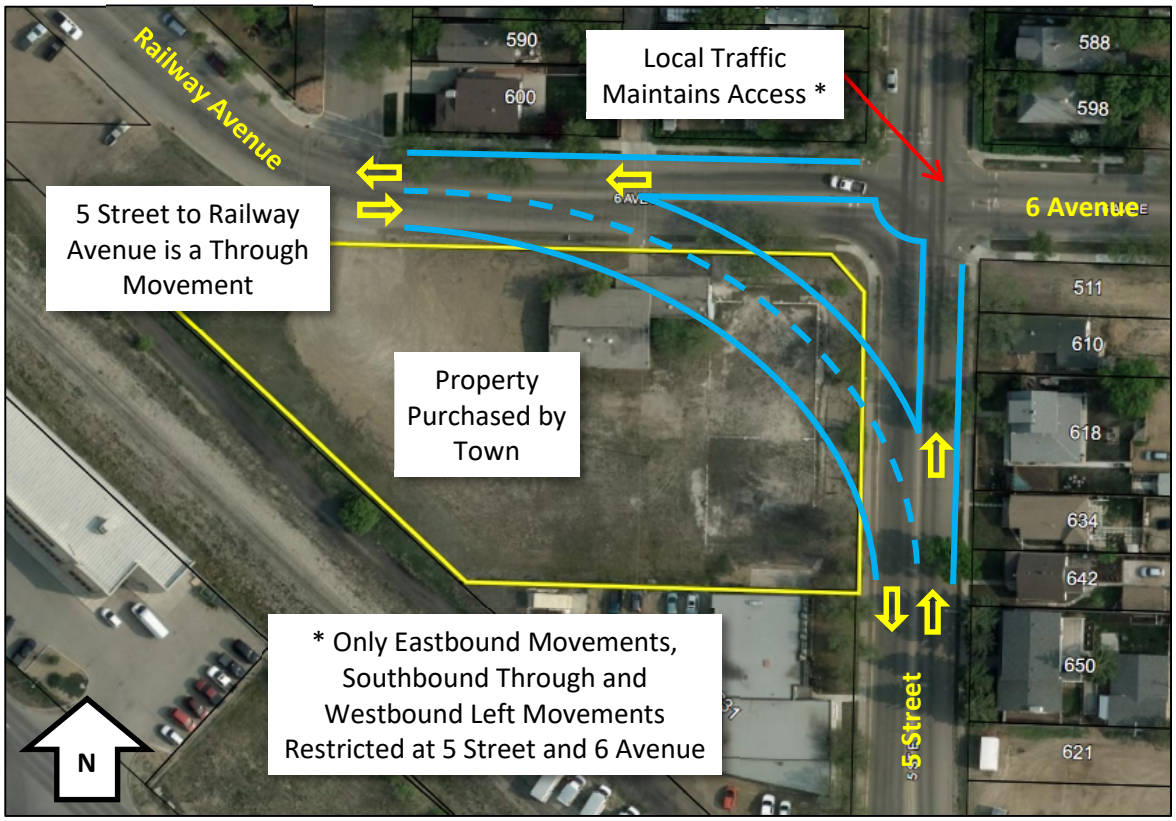
In addition to the modifications discussed in ***Section 3*** of this report for the intersection of 5 Street and Railway Avenue / 6 Avenue to improve its operation with the new traffic patterns created by the closure of Riverside Drive, there was a request to review a modification to divert traffic from travelling north along 5 Street, north of Railway Avenue.

As shown on the schematics in ***Appendix C***, even with Riverside Drive being closed between 3 Street and 4 Avenue, there is still a significant volume of traffic that desires to travel north on 5 Street from Railway Avenue to 4 Avenue. These may be residents who live in the surrounding area taking a direct route to and from home, or travelers just using taking advantage of the town of Drumheller's downtown grid system to travel to a business or other destination on a particular roadway. It is this grid system of roadways in this area of the town that would limit the effectiveness of a full roadway

closure at the intersection of 5 Street and 6 Avenue. As with the Riverside Drive closure, traffic is diverted to adjacent roadways and then impacts their operations; further closures would just push more traffic onto the adjacent roadways. So, closing 5 Street northbound, north of Railway Avenue would likely divert more traffic to 4 Street or 6 Street and then onto 5 Avenue or 4 Avenue to go around the closure on 5 Street. The problem of traffic through the residential area would not be resolved, the issue would just be moved to different impacted roadways. As a result, there must be local access still provided and not fully close 5 Street north of Railway Avenue. Also, other options should be considered to make other routes preferable to drivers, which will be reviewed later in this section of the report.

It should be mentioned that this further modification to the intersection of 5 Street and Railway Avenue is not required to achieve acceptable operations, as demonstrated in ***Section 3***. The Town of Drumheller has recently purchased property in the southwest quadrant of this intersection which, although not necessary to achieve the intersection modifications shown in ***Figure 3-2***, could be used to create various additional options for changing the layout of this intersection. This additional space could be used to realign this intersection to divert drivers from 5 Street onto Railway Avenue and keep the 5 Street and 6 Avenue intersection separate. This would support the desired traffic pattern change from 5 Street northbound to Railway Avenue eastbound but would also significantly disrupt other traffic movements in the area. One possible layout option to achieve this is illustrated in the following figure.

Figure 4-1: 5 Street and Railway Avenue Modification



Traffic from 5 Street is encouraged to travel directly onto Railway Avenue, while still allowing local access to the intersection of 5 Street and 6 Avenue. There are some movements restricted at the 5 Street and 6 Avenue intersection but there are alternative routes, such as along 5 Avenue, to access the residential area.

4.2. Diversions Along Railway Avenue

As stated previously, a diversion at the intersection of 5 Street and Railway Avenue / 6 Avenue to change traffic patterns may not be as effective due to the grid system in this area of Drumheller. However, if multiple diversions were used along Railway Avenue between 5 Street and Centre Street, then traffic patterns could be modified. These diversions would be designed to discourage westbound right turns and eastbound left turns from Railway Avenue onto the side streets; a curb build out that would make these movements difficult to accomplish would be the most likely type of diversion strategy. A sample curb build out is provided in the inset to the right, these devices can be laid out to discourage turn movements while providing minimal disruption to drainage and still allowing pedestrians to cross at the intersection.

If traffic were discouraged to travel north on 5 Street at the intersection with Railway Avenue, as discussed previously, combined with additional modifications to discourage turning to the north at the other streets between 5 Street and Centre Street, then drivers would not be able to utilise the grid system to drive around any one specific diversion. As discussed in the next section of this report, combining these additional diversions along with increasing the preference for drivers to use Centre Street between Railway Avenue and Riverside Drive would benefit each other. Drivers exiting from Highway 9/56 onto 5 Street northbound would be discouraged to continue traveling north and would be diverted to using Railway Avenue westbound. Then at each cross street the drivers would be encouraged to remain on Railway Avenue until Centre Street, where they would find an intersection laid out to encourage them to turn northbound onto Centre Street. This scenario works most effectively if the modifications in ***Sections 3.3.2 (or 4.1), 4.2 and 4.3*** are all utilised together.

There are some existing wayfinding signs along 5 Street and Railway Avenue towards Centre Street, directing travelers to the downtown commercial area. The Town of Drumheller will be working to update these signs and to collaborate with Alberta Transportation to add wayfinding and information signs along Highway 9/56 to improve directions for travelers, especially tourists, to locate the downtown of Drumheller.

4.3. Increasing Preference for Centre Street

Drivers have several options to travel north-south between Riverside Drive (the section east of 3 Street not being closed) and Railway Avenue; 3 Street, 2 Street, 1 Street and Centre Street all provide connections. The Town has expressed interest in directing drivers to use Centre Street as this is the main commercial north-south route through the downtown and would reduce the impact of additional traffic through the adjacent residential areas.

Currently the following intersections are controlled along Centre Street: Railway Avenue (3 way stop), 3 Avenue (4 way stop), 2 Avenue (stop on 2 Avenue only), Riverside Drive (stop on Centre Street only). 1 Street, 2 Street and 3 Street all have stop signs at the intersections with Railway Avenue, 4 Avenue, 3 Avenue and Riverside Drive; at all of these intersections it is 1 Street, 2 Street and 3 Street that are controlled by stop signs.

By making the following modifications, Centre Street could be made into a more desirable route for drivers between Railway Avenue and Riverside Drive.

- The modification to the intersection of Railway Avenue and 3 Street illustrated in ***Figure 3-1*** should be constructed at the intersection of Railway Avenue and Centre Street instead. In the analysis it was assumed that drivers would use 3 Street to travel between Railway Avenue and Riverside Drive as this was the most direct route around the section of Riverside Drive that is proposed to be closed. But, if the westbound right turn lane was added to the intersection at Centre Street and Railway Avenue, then drivers would likely prefer Centre Street instead of 3 Street. The lack of improvements at the Railway Avenue and 3 Street intersection would result in an unacceptable level of service as the post-closure analysis demonstrated, and drivers would tend to use Centre Street instead as it would have the modifications resulting in less delay for the westbound right turn and southbound left turn movements.

- Removing the 4 way stop control at the intersection of Centre Street and 3 Avenue would result in Centre Street being the only roadway with no stop signs along it between Railway Avenue and Riverside Drive. With north-south traffic being diverted due to the closed section of Riverside Drive, having no stop signs for north-south traffic would be a major factor in making Centre Street a preferred route for these diverted drivers. The delay for 3 Avenue would increase as Centre Street traffic would have priority at this intersection, but with Riverside Drive closed at the east end of 3 Avenue there would be less through traffic along 3 Avenue. As illustrated in the schematics in ***Appendix C***, much of this traffic turns south to divert around the closed section of Riverside Drive, and so would turn south at Centre Street instead of waiting for a gap to drive through and turn south at another intersection where additional stop signs would be encountered before Railway Avenue was reached. Also, with the modification to the intersection of Railway Avenue and Centre Street mentioned previously, this would be the intersection with the least delay to turn left onto Railway Avenue.

With these modifications drivers will likely find Centre Street to be the preferred route between Riverside Drive and Railway Avenue, thus resulting in traffic traveling through the commercial area and avoiding the adjacent residential area to the east. As noted previously, this scenario works most effectively if the modifications in ***Sections 3.3.2 (or 4.1), 4.2 and 4.3*** are all utilised together.

Another issue to address is that even though the roadways in this area of the town of Drumheller have on-street parking, Centre Street has angled parking instead of parallel parking resulting in more parking per block. This does create more potential conflicts between traffic on this roadway and vehicles making parking maneuvers. However, as downtown is a destination for many travelers in this area of the town, it is expected that much of the traffic along Centre Street would be destined for this commercial corridor regardless of what route was taken to arrive. Therefore, by making it more convenient for the use of Centre Street as a connection between Railway Avenue and Riverside Drive,

traffic is kept to this corridor instead of using adjacent roadways in the more residential areas and then eventually diverting to Centre Street as a final destination. The traffic is focussed on one corridor, increasing the potential for conflicts on Centre Street, but reducing traffic on the adjacent roadways, lowering the potential for conflicts on those more residential roadways.

It is understood that during Christmas a tree is installed in the intersection of Centre Street and 3 Avenue and temporary roundabout signs are installed in all four approach directions in addition to the 4-way stop signs. The proposed changes to the traffic control from a 4-way stop to a 2-way stop would still be compatible with the installation of the tree every year. When the roundabout signs are installed, the intersection can be converted back to a 4-way stop, with the intersection reverting to a 2-way stop after the tree is removed. Having a hybrid 2-way stop / roundabout could be confusing for some drivers, it would be preferable to have all four directions of traffic stop before proceeding through the intersection and around the tree. As noted, the traffic control is already modified when the tree is installed, the existing 4-way stop is essentially converted to a roundabout; the conversion from a 2-way stop to a roundabout would not be much different. This would only occur during the Christmas season when the tree is installed, which is a unique situation and is not during the peak of the tourist season in the summer, so it is local drivers that would have to navigate this intersection. This situation may also be resolved as the Town of Drumheller is investigating an option to install the Christmas tree on a new off-street plaza.

4.4. New Connection Between Highway 9/56 and Railway Avenue

With the removal of the rail line between Highway 9/56 and Railway Avenue, there is the possibility of creating a new connection between Highway 9/56 and Railway Avenue, between the junctions with Highway 9 and Highway 575. This connection between Highway 9/56 and Railway Avenue was identified in the Town of Drumheller Downtown Area Revitalization Plan (DARP). It has been proposed to create this connection at the intersection of Highway 9/56 and 6 Avenue, which is the entrance to the shopping centre where the Canadian Tire is located. This intersection is already signalised and has a stub for a north leg which is currently connected to a gravel frontage roadway; this stub could be continued almost directly north to become the south leg of the Railway Avenue and 2 Street intersection. This would likely impact the waste and recycling drop off centre at this intersection, which would have to be moved east to accommodate this south leg.

The figure on the following page illustrates this proposed connection. This connection would be approximately 100 metres in length and would be controlled by a stop sign at the north end where it intersects with Railway Avenue, and by the existing traffic signal where it intersects Highway 9/56.

Figure 4-2: Proposed Connection Between Highway 9/56 and Railway Avenue

(Image courtesy of Google)

This connection would create an alternate route for drivers coming from the southeast on the highway and wanting to go to downtown or the adjacent residential area to the east. However, it is unlikely to result in much travel time savings over using 5 Street and then Railway Avenue, especially if the modifications proposed in ***Figure 3-2*** are constructed and the previously mentioned modifications are made to Centre Street to make it the preferred north-south route between Railway Avenue and Riverside Drive. Drivers would have to travel almost the same distance between 5 Street and Centre Street, and navigate an additional traffic signal on Highway 9/56, whereas the parallel section of Railway Avenue has no east-west traffic control. Also, a direct connection from Highway 9/56 to the south end of 2 Street may result in this roadway becoming the preferred north-south route over Centre Street. This would result in more traffic travelling through the residential area instead of the downtown commercial area along Centre Street.

If the diversions along Railway Avenue that were discussed previously instituted, then all northbound traffic on the new connection would have to turn at Railway Avenue; resulting in drivers having to take the same route as if they had used 5 Street to access Railway Avenue. Therefore, if the diversions at the cross streets along Railway Avenue are implemented, the value of this new connection would be reduced.

5. Evaluation of Impact on Emergency Response Times

The Fire Department for the Town of Drumheller is located at Centre Street and 2 Avenue, and according to information from the Fire Department, approximately 50% of trips use Riverside Drive to travel to and from their main hall and the southeast of the town. The closure of Riverside Drive between 3 Street and 5 Street / 4 Avenue raised a concern about response times for the Fire Department and the southeast of Drumheller. This section of the report will review the options that the emergency services have with regards to travel between downtown and the southeast of town. The closure of Riverside Drive does not impact the ability for emergency services to respond to calls to the north, west or direct south, these routes will not be reviewed.

The figure and table on the following page illustrate the routes and distances that emergency services would use after the closure of Riverside Drive. These routes will be compared under pre and post-closure conditions for their response times along with the use of Riverside Drive for emergency response.

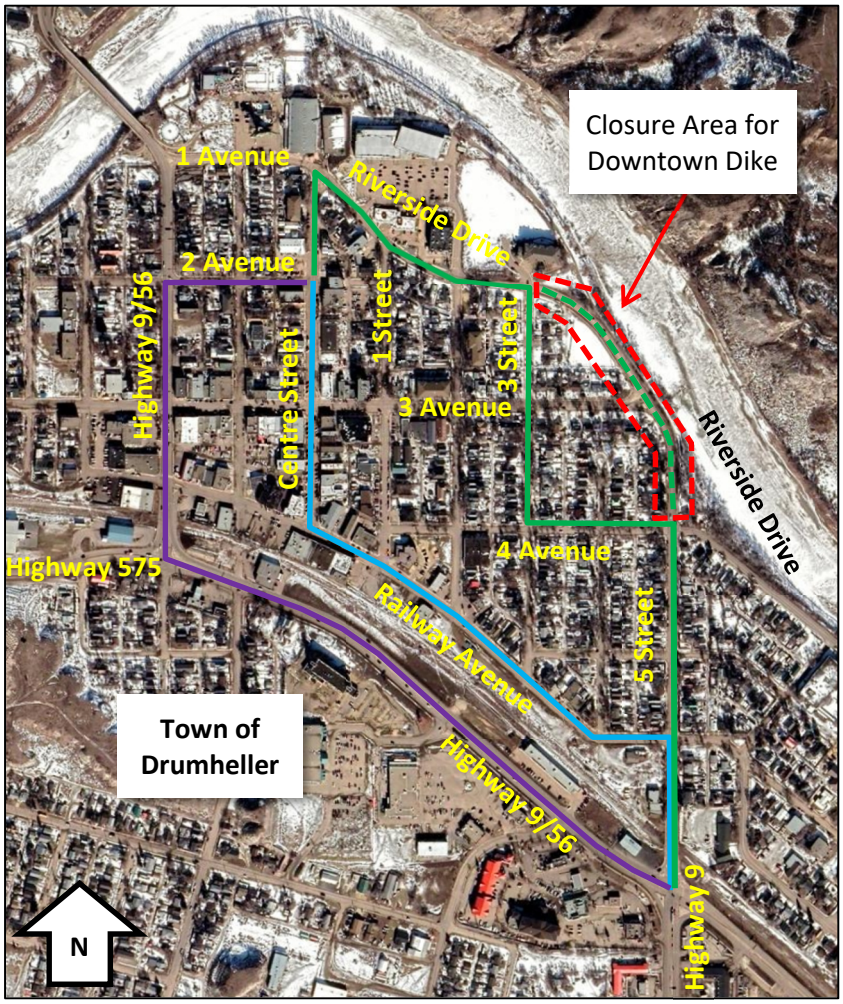
The Green Route is most similar to the existing route using Riverside Drive, shown in dashed green. The Green Route could use 1 Street, 2 Street or 3 Street to travel to and from 4 Avenue, each option would be approximately the same. All of these options for this route provide direct bypasses around the closure of Riverside Drive.

The Blue Route is provided based on the discussion in ***Section 4*** to make Centre Street a preferred route to avoid the residential areas to the east of downtown. This route will be analysed to determine what impacts the proposed modifications will have on using this route for emergency response.

The Purple Route was requested to be reviewed to compare the use of the highway to reach the same destination by emergency services. The Town installed an emergency stop light at the intersection of Highway 9/56 and 2 Avenue to assist emergency services with turning onto the highway from 2 Avenue, making this a preferred route by the Town.

The routes all provide the distance from the fire department to the intersection where Highway 9 joins Highway 56, the reason for this is to provide response times to reach a common location for all routes.

Figure 5-1: Emergency Response Routes



(Image courtesy of Google)

Table 5-1: Emergency Response Route Descriptions and Distances

Route	Description	Roadways Used	Distance
Green Dashed	Existing route using Riverside Drive, no closure	Centre Street, Riverside Drive, 5 Street	1,450 m
Green	Most direct detour around closed section of Riverside Drive	Centre Street, Riverside Drive, 3 Street, 4 Avenue, 5 Street	1,550 m
Blue	Route via commercial area	Centre Street, Railway Avenue, 5 Street	1,150 m
Purple	Route using Highway 9/56 instead of municipal roadways	2 Avenue, Highway 9/56	1,450 m

As can be seen, there is not a significant difference in the length of routes between the Fire Hall at Centre Street and 2 Avenue, and the intersection of Highway 9 and Highway 56. At 50 km/h (13.89 metres per second), the travel time difference between the Green and Blue Routes over 400 metres would be just

under 30 seconds. However, it is understood that Riverside Drive is a more desirable route for emergency services to use because there are fewer traffic controls (i.e., stop signs and traffic signals) than would be encountered using the other routes. It should be noted though that with the closure of Riverside Drive north of 4 Avenue, the traffic control at the intersection of 4 Avenue and 5 Street will change to making 4 Avenue the through (uncontrolled) roadway as mentioned previously. This removes at one stop sign from the Green Route and improves the response time along this section of 4 Avenue.

To get a more accurate estimate of the time it would take to travel from the Fire Hall location on Centre Street at 2 Avenue to the junction of Highway 9 and Highway 56 the following procedure was used.

- The distance from the two subject locations along each route was divided by 13.89 metres per second to determine a base time to travel each route.

- The delay at each intersection where traffic control would be encountered along the route (i.e., when a driver would encounter a stop sign) is added based on the analysis conducted in ***Section 3*** of this report. This was done based on both the pre and post-diversion scenarios. It is noted that in an emergency situation, the emergency vehicles would have priority over other traffic at intersections but in a worst case scenario some vehicles may not yield and so this was assumed.

- The changes proposed at the intersections of 4 Avenue and 5 Street, Railway Avenue and Centre Street, and Railway Avenue and 5 Street as noted in ***Section 3*** for the post-diversion scenarios were assumed to be implemented. The change of traffic control for the intersection of Centre Street and 3 Avenue was also assumed to be implemented, essentially removing the delay for north-south traffic through that intersection. This change to the stop signs was assumed in both the pre and post-diversion scenarios. The other options for the network discussed in ***Section 4*** were not assumed to be implemented.

- For intersections that were not analysed in ***Section 3***, delay at stop signs was assumed to be similar to a nearby intersection that was analysed with a similar traffic control layout.

- For the traffic signals on Highway 9/56 it was assumed that emergency vehicles would have priority travelling through the intersection and not be subject to the same delay as other vehicles. This is a reasonable assumption as there are multiple lanes on Highway 9/56, allowing other vehicles to pull to the side to allow an emergency vehicle to pass. Some delay was still assumed as emergency vehicles typically slow as they drive through traffic signals, either maneuvering around other vehicles or driving through a red light. The traffic signal at the intersection of Highway 9 and Highway 56 was not included as this is a common end point on every route.

- At the emergency pre-emption stop light at the intersection of Highway 9/56 and 2 Avenue it was also assumed that emergency vehicles would not experience the same delay as other vehicles stopped on 2 Avenue waiting to turn onto the highway. The emergency light puts the entire intersection into a 4-way stop and allows emergency vehicles to turn onto the highway without having to wait for a gap in traffic. Some delay still had to be assumed as the emergency vehicle would still have to slow to make sure it was safe to proceed through the stop sign on 2 Avenue.

Adding the base times to the traffic control times provided total travel time along each route for each peak hour, the results are summarised in the following tables.

Table 5-1: Emergency Route Travel Times – Pre-Diversion AM Peak

Route	Base Time (s)	Traffic Control Time (s)					Total Time (s)
Green Dash	104.4	1 Ave	6 Ave				130.3
		10.8	15.1				
Green	111.6	1 Ave	3 Ave	4 Ave	5 St	6 Ave	168.3
		10.8	9.2	9.2	12.4	15.1	
Blue	82.8	3 Ave	Rail	5 St			**107.3**
		0.0	10.8	13.7			
Purple	104.4	Hwy 9/56	Hwy 575	6 Ave			119.4
		5.0	5.0	5.0			

Table 5-2: Emergency Route Travel Times – Pre-Diversion PM Peak

Route	Base Time (s)	Traffic Control Time (s)					Total Time (s)
Green Dash	104.4	1 Ave	6 Ave				131.1
		12.1	14.6				
Green	111.6	1 Ave	3 Ave	4 Ave	5 St	6 Ave	171.8
		12.1	9.9	9.2	14.4	14.6	
Blue	82.8	3 Ave	Rail	5 St			**107.9**
		0.0	11.7	13.4			
Purple	104.4	Hwy 9/56	Hwy 575	6 Ave			119.4
		5.0	5.0	5.0			

These results demonstrate that the existing route (Green Dashed) along Riverside Drive between the Fire Hall and the junction of Highway 9 and Highway 56 has the least traffic control with stop signs at the intersections with 1 Avenue and 6 Avenue. This results in significant travel time savings from the Green Route bypassing the section of Riverside Drive to be closed. However, it should be noted that the Blue Route has an additional stop sign but is a shorter travel time, and the Purple Route also has a lower travel time even with more traffic control along the highway. This is assuming that the emergency vehicles take advantage of bypassing other traffic at those intersections.

Due to higher traffic volumes along the routes, the travel times are greater in the PM peak hour but only by an average of 2 seconds. The rankings of the routes do not change between the peak hours, with the existing route having a lower travel time than the Green and Purple Routes in both peaks, but the Blue Route also having the overall lowest travel time in both peak hours. Based on this data, the route with the lowest travel time from the Fire Hall at Centre Street and 2 Avenue to the junction of Highway 9 and Highway 56 in the southeast is using Centre Street, Railway Avenue and 5 Street.

For the post-diversion scenarios, the existing route along Riverside Drive was removed as it would now be closed between 3 Street and 4 Avenue / 5 Street. In these tables, there are green highlights where traffic control delay has been reduced and yellow when delays are increased from the pre-diversion scenarios. Along the Purple Route it was assumed that the traffic control delay would not change, the emergency vehicles would still bypass other traffic at those intersections as in the pre-diversion scenarios.

Table 5-3: Emergency Route Travel Times – Post-Diversion AM Peak

Route	Base Time (s)	Traffic Control Time (s)					Total Time (s)
Green	111.6	1 Ave	3 Ave	4 Ave	5 St	6 Ave	159.5
		10.3	11.2	13.8	0.0	12.6	
Blue	82.8	3 Ave	Rail	5 St			**100.2**
		0.0	17.4	0.0			
Purple	104.4	Hwy 9/56	Hwy 575	6 Ave			119.4
		5.0	5.0	5.0			

Table 5-4: Emergency Route Travel Times – Post-Diversion PM Peak

Route	Base Time (s)	Traffic Control Time (s)					Total Time (s)
Green	111.6	1 Ave	3 Ave	4 Ave	5 St	6 Ave	158.2
		10.8	12.1	14.9	0.0	8.8	
Blue	82.8	3 Ave	Rail	5 St			**106.8**
		0.0	24.0	0.0			
Purple	104.4	Hwy 9/56	Hwy 575	6 Ave			119.4
		5.0	5.0	5.0			

The Green Route has a significant decrease in travel time primarily due to the removal of the east-west stop sign at the intersection of 5 Street and 4 Avenue, as discussed in ***Section 3***. The modifications to the intersection of 5 Street and Railway Avenue / 6 Avenue also reduce delay at this intersection along both the Green and Blue Routes. The modifications proposed at the intersection of Railway Avenue and Centre Street, while they allow the intersection to operate at acceptable levels with the increased traffic volumes, do not improve travel times along the Blue Route. This is still the route with the lowest travel time in both peak hours even with the diversion of traffic around the closed section of Riverside Drive.

The following table compares the total travel time results from all of the analysed scenarios. This summary of the results shows that the Green Dash Route using the subject section of Riverside Drive proposed to be closed is not the route with the lowest travel time under pre-closure conditions, the route with the lowest travel time is Blue Route. In the post-closure scenarios both the Blue Route has an even lower travel time than the Green Dash Route due to modifications to the network to accommodate the diverted traffic around the closed section of Riverside Drive.

It should also be noted that the route using Highway 9/56 also has a significantly shorter travel time than the route using Riverside Drive. It is approximately the same distance as traveling along Riverside Drive, but due to emergency vehicles having a pre-emption stop light at the intersection of Highway 9/56 and 2 Avenue and being able to maneuver around vehicles using the additional lanes on the highway, emergency vehicles would have less delay at the traffic control along this route.

Table 5-5: Summary Comparison of Emergency Route Travel Times

Route	Pre-Closure Travel Time (s)		Post-Closure Travel Time (s)	
	AM Peak	PM Peak	AM Peak	PM Peak
Green Dash	130.3	131.1		
Green	168.3	171.8	159.5	158.2
Blue	**107.3**	**107.9**	**100.2**	**106.8**
Purple	119.4	119.4	119.4	119.4

An analysis of non-emergency travel times was not conducted for this study, but there are results from the emergency travel time analysis that can also be applied to local and tourist trips in this area of the town of Drumheller. As discussed previously, emergency pre-emption was only assumed on the Purple Route as the highway has signal controlled intersections and auxiliary lanes that allow emergency vehicles to bypass traffic queues; on all other routes the emergency vehicles were assumed to have the same delay as non-emergency vehicles. The Green Dashed Route (i.e., Existing Riverside Drive Route), Green Route and Blue Route travel times from the previous table are the same for all travellers, so the travel time savings are also the same for all travellers with the modifications recommended from this study.

6. Recommendations and Cost Estimates

The table on the following page summarises the recommended modifications for the transportation network of the town of Drumheller to accommodate the new traffic patterns created after the closure of Riverside Drive from 3 Street to 4 Avenue / 5 Street for the Downtown Dike.

Table 6-1: Recommended Modifications

Location	Modifications	Reason
Railway Avenue and Centre Street	Westbound right turn lane with yield condition to northbound lane	Greater traffic volumes at this intersection turning right need to be accommodated; also provides more gaps for southbound left turns
Railway Avenue and 5 Street / 6 Avenue	Convert from 4-way stop to 2-way North-South stop control	Reduces overall delay for intersection by not requiring all traffic movements to stop
	Northbound left turn lane	Greater traffic volumes at this intersection turning right need to be accommodated; also provides more gaps for northbound left turns
	Eastbound right turn lane with yield condition to southbound lane	
4 Avenue and 5 Street	East-West stop control converted to North-South stop control	North leg of intersection closed (local access only); traffic control now for a T-intersection

Further modification from what is listed in the previous table to the intersection, such as restrictions to specific movements, of Railway Avenue and 5 Street / 6 Avenue would have limited impact in diverting traffic away from the residential area east of downtown. In order to assist in diverting traffic along Railway Avenue, changes are recommended to the intersection layout and control of this intersection, combined with modifications at the intersections along Railway Avenue from 5 Street to Centre Street to further discourage drivers from travelling northbound until they reach Centre Street. Drivers exiting from Highway 9/56 onto 5 Street northbound would be discouraged to continue traveling north and would be diverted to using Railway Avenue westbound. Then at each cross street the drivers would be encouraged to remain on Railway Avenue until Centre Street, where they would find an intersection laid out to

encourage them to turn northbound onto Centre Street. A further modification is recommended to the traffic control on Centre Street from Railway Avenue to Riverside Drive, the intersection with 3 Avenue should be converted from a 4-way to a 2-way stop with control on the east and west approaches.

These additional modifications would help to make Centre Street a more preferred route between Railway Avenue and Riverside Drive, helping to direct traffic into the commercial area of downtown and away from the residential area to the east. Adding the modifications to discourage the use of the other side streets northbound from Railway Avenue would increase the effectiveness in encouraging drivers to use the route through the commercial area.

A new connection between Highway 9/56 and Railway Avenue would also have limited effectiveness on travel times between downtown and the highway if the modifications listed in the previous table and to Centre Street are implemented. There would not be significant travel time improvements for drivers travelling between Highway 9/56 and the downtown, and as this new connection would likely be in line with 2 Street it would encourage drivers to use this route instead of Centre Street to connect to Riverside Drive.

The closure of Riverside Drive between 3 Street and 4 Avenue / 5 Street would not result in an increase in emergency response times between the Fire Hall located on Centre Street and 2 Avenue, and the junction of Highway 9 and Highway 56 in the southeast. There are already two routes with less travel times than using Riverside Drive between these points: (1) Centre Street, Railway Avenue, and 5 Street route, and (2) 2 Avenue and Highway 9/56 route. When the subject section of Riverside Drive is closed, the modifications listed above will result in travel time reductions for alternate routes for emergency services to use. The Centre Street, Railway Avenue and 5 Street route will still be overall the lowest travel time route post-closure. The travel times reductions will also be realised by non-emergency traffic, such as local and tourist traffic, making trips through this area of Drumheller.

Following are some cost estimates provided to implement the modifications to the transportation network. These costs do not include the costs to construct the Downtown Dike or the closure of Riverside Drive, these are only for the modifications recommended in the transportation impact assessment. Also, important to note that it is assumed that all of these modifications can be accomplished within the existing roadway right-of-way, so no property acquisition is required. There are two sets of cost estimates: (1) the recommended modifications based on the operational analysis, and (2) the additional modifications to encourage drivers to use Railway Avenue and Centre Street as the preferred diversion route. It is recommended that the Town of Drumheller proceed with the modifications in ***Table 6-2*** as these can be completed without the need to construct new infrastructure, only new traffic signs and pavement markings are required. If additional modifications are required to the transportation network after these recommended modifications are made to achieve satisfactory levels of service, then the Town should proceed with the optional modifications in ***Table 6-3***. A cost estimate for the new connection between Highway 9/56 and Railway Avenue was not included as this was not a recommended modification to the network to address the issues analysed in this study, nor was it an additional modification to encourage drivers to use the Railway Avenue and Centre Street diversion route.

Table 6-2: Recommended Modifications Cost Estimates

Location	Modifications	Cost Estimate
Railway Avenue and Centre Street	Develop westbound right turn lane	$2,000
	Change traffic control signs	$1,000
Railway Avenue and 5 Street / 6 Avenue	Change traffic control signs	$1,000
	Develop northbound left turn lane	$2,000
	Develop eastbound right turn lane	$2,000
4 Avenue and 5 Street	Change traffic control signs	$1,000
Railway Avenue and 1 Street, 2 Street, 3 Street, 4 Street	Add traffic control signs to discourage northbound turns	$4,000
Centre Street and 3 Avenue	Change traffic control signs	$1,000
Total Estimated Costs for Recommended Modifications		**$14,000**

Table 6-3: Optional Future Modifications Cost Estimates

Location	Modifications	Cost Estimate
Railway Avenue and 1 Street, 2 Street, 3 Street, 4 Street	Add curb bulbs to discourage northbound turns	$20,000
Railway Avenue and 5 Street / 6 Avenue	Construct new roadway connection	$100,000
	Channelize existing intersection	$10,000
Total Estimated Costs for Additional Modifications		**$130,000**

These cost estimates were developed without topographic survey or functional planning, they are high level estimates for discussion purposes. For the Railway Avenue and Centre Street, and Railway Avenue and 5 Street / 6 Avenue modifications in ***Table 6-2*** it is assumed that all work will be completed within the existing footprint of the intersection using only new traffic signs and pavement markings.

Appendix A

Downtown Dike and Riverside Drive Closure Plan

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Paper Size = ANSI D
At Full Size, this border measures 520 mm x 800 mm

millimeters 0 10 50 100

Option	Total Cost	6m Crest Width	3:1 Slope River	3:1 Slope Land
1	$1.7 M	Yes	Yes	No
2	$2.3 M	Yes	Yes	No
3	$3.1 M	Yes	Yes	No
4	$2.2 M	Yes	No	No
5	-	Yes	Yes	Yes

RED DEER RIVER

A L-803

B L-803

POTENTIAL LARGER PARKING LOT

RIVERSIDE DR

LOCAL TRAFFIC ONLY, OR COULD ALSO BE AN ENLARGED PARKING LOT

LOCAL TRAFFIC / PARKING LOT

3 ST

15m RADIUS MIN.

3 AVE

CUL-DE-SAC / LOCAL TRAFFIC

MIN 8m

RESIDENT / VISITOR PARKING

MINIMUM 8m FIRE LANE / LOCAL TRAFFIC

FIRE LANE / LOCAL TRAFFIC

4 AVE

0 5 10 15m

DRUMHELLER

RESILIENCY AND FLOOD MITIGATION OFFICE

DRUMHELLER VALLEY

IBI GROUP
3rd Floor – 227 11 Avenue SW
Calgary AB T2R 1R9 Canada
tel 403 270 5600 fax 403 270 5610
ibigroup.com

Seal:

Rev	Date	Des	Dwn	Chk	Description
A					

DRUMHELLER RESILIENCY & FLOOD MITIGATION OFFICE
DIKE D

LANDSCAPE CONCEPT PLAN

OPTION 1

Project No. 133142
Group LANDSCAPE
Drawing No. L-105
Rev. ----

Appendix B

Background Traffic Volumes

LEGEND:

AM (PM)

Downtown Drumheller

Existing Traffic Volumes
Intersectional Turning Movements
Figure 3 - 3
May 2006 Counts

LEGEND:

AM (PM)

Downtown Drumheller

Existing Traffic Volumes
Intersectional Turning Movements
Figure 3 - 11
July 2006 Counts

Turning Movement Summary Diagram

Reference No.: 70000497

Intersection of:
9 & 1 AVE DRUMHELLER 11-29-20-4007050795

2020 AADT / ASDT ESTIMATES

North On 9		
Vehicle Type	**Vol**	**%**
A: Passenger Vehicle	7760	92.4
B: Recreational Vehicle	313	3.7
C: Bus	32	0.4
D: Single Unit Truck	122	1.5
E: Tractor Trailer Unit	173	2.1
ASDT 9240	**AADT** 8400	

West 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
ASDT	**AADT** 0	

East On 1 Ave		
Vehicle Type	**Vol**	**%**
A: Passenger Vehicle	1429	96.6
B: Recreational Vehicle	33	2.2
C: Bus	11	0.7
D: Single Unit Truck	5	0.3
E: Tractor Trailer Unit	2	0.1
ASDT 1630	**AADT** 1480	

South On 9		
Vehicle Type	**Vol**	**%**
A: Passenger Vehicle	7077	91.9
B: Recreational Vehicle	308	4.0
C: Bus	25	0.3
D: Single Unit Truck	119	1.5
E: Tractor Trailer Unit	171	2.2
ASDT 8470	**AADT** 7700	

TURNING MOVEMENT ABBREVIATIONS

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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: Annual Average Daily Traffic
Average daily traffic expressed as vehicles per day fo
period of January 1 to December 31 (365 days)

ASDT: Average Summer Daily Traffic
Average daily traffic expressed as vehicles per day fo
period of May 1 to September 30 (153 days)

Turning Movement Summary Diagram

Reference No.: 70000497

Intersection of:
9 & 1 AVE DRUMHELLER 11-29-20-4007050795

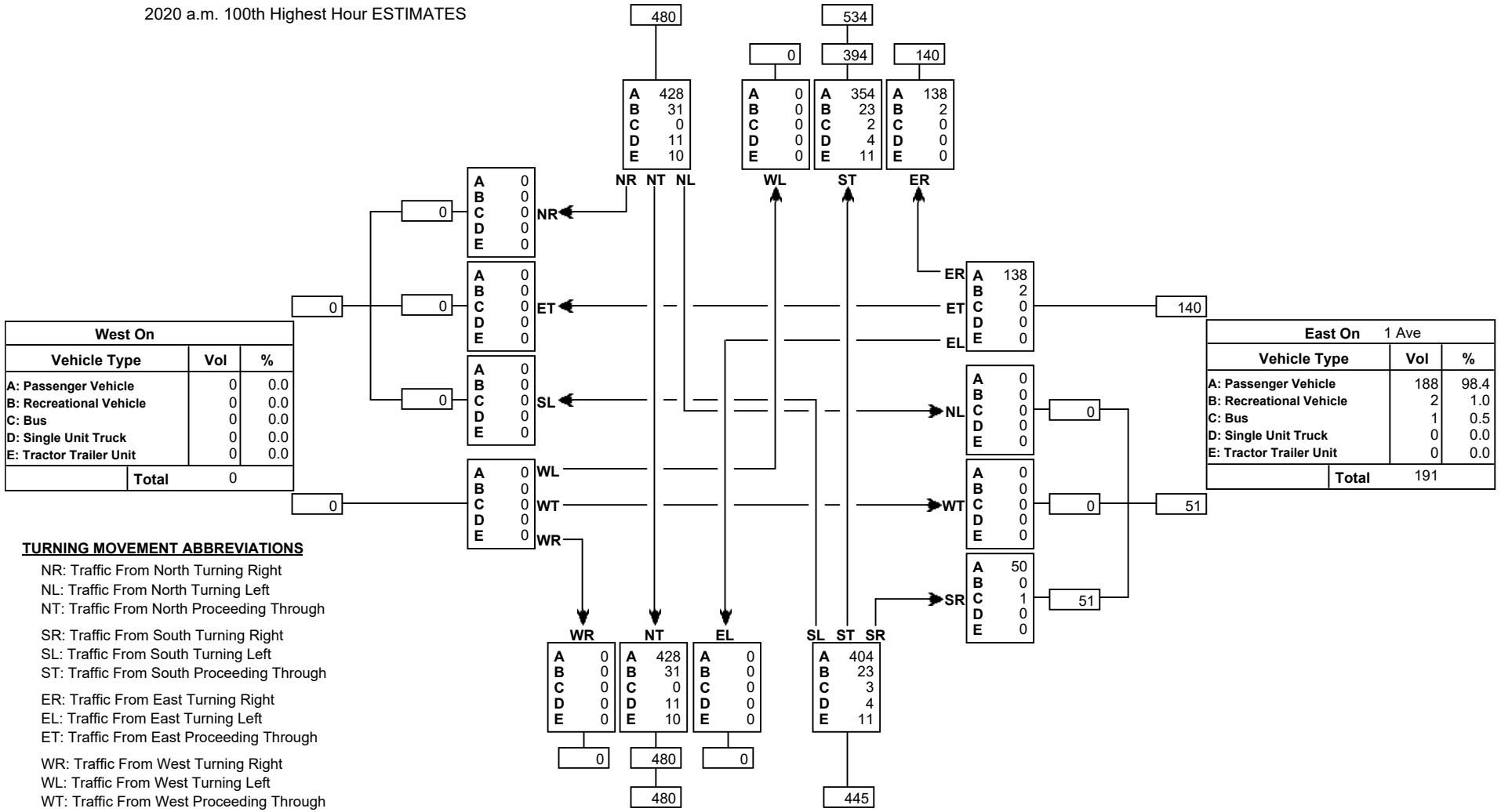
2020 a.m. 100th Highest Hour ESTIMATES

North On 9		
Vehicle Type	**Vol**	**%**
A: Passenger Vehicle	920	90.7
B: Recreational Vehicle	56	5.5
C: Bus	2	0.2
D: Single Unit Truck	15	1.5
E: Tractor Trailer Unit	21	2.1
Total	1014	

West 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
Total	0	

East On 1 Ave		
Vehicle Type	**Vol**	**%**
A: Passenger Vehicle	188	98.4
B: Recreational Vehicle	2	1.0
C: Bus	1	0.5
D: Single Unit Truck	0	0.0
E: Tractor Trailer Unit	0	0.0
Total	191	

South On 9		
Vehicle Type	**Vol**	**%**
A: Passenger Vehicle	832	89.9
B: Recreational Vehicle	54	5.8
C: Bus	3	0.3
D: Single Unit Truck	15	1.6
E: Tractor Trailer Unit	21	2.3
Total	925	



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WT: Traffic From West Proceeding Through

Turning Movement Summary Diagram

Reference No.: 70000497

Intersection of:
9 & 1 AVE DRUMHELLER 11-29-20-4007050795

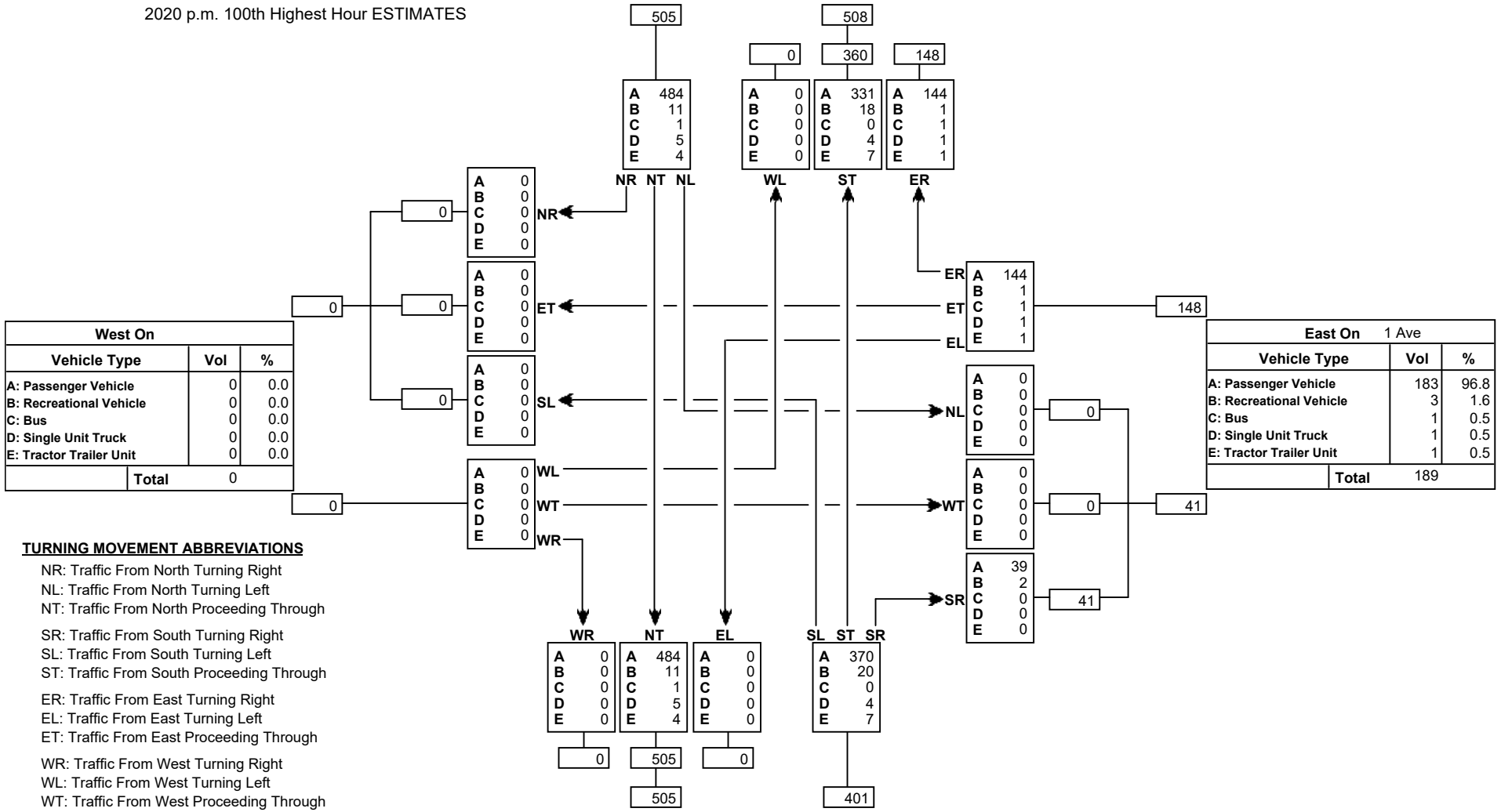
2020 p.m. 100th Highest Hour ESTIMATES

North On 9		
Vehicle Type	**Vol**	**%**
A: Passenger Vehicle	959	94.7
B: Recreational Vehicle	30	3.0
C: Bus	2	0.2
D: Single Unit Truck	10	1.0
E: Tractor Trailer Unit	12	1.2
Total	1013	

West 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
Total	0	

East On 1 Ave		
Vehicle Type	**Vol**	**%**
A: Passenger Vehicle	183	96.8
B: Recreational Vehicle	3	1.6
C: Bus	1	0.5
D: Single Unit Truck	1	0.5
E: Tractor Trailer Unit	1	0.5
Total	189	

South On 9		
Vehicle Type	**Vol**	**%**
A: Passenger Vehicle	854	94.3
B: Recreational Vehicle	31	3.4
C: Bus	1	0.1
D: Single Unit Truck	9	1.0
E: Tractor Trailer Unit	11	1.2
Total	906	



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ET: Traffic From East Proceeding Through

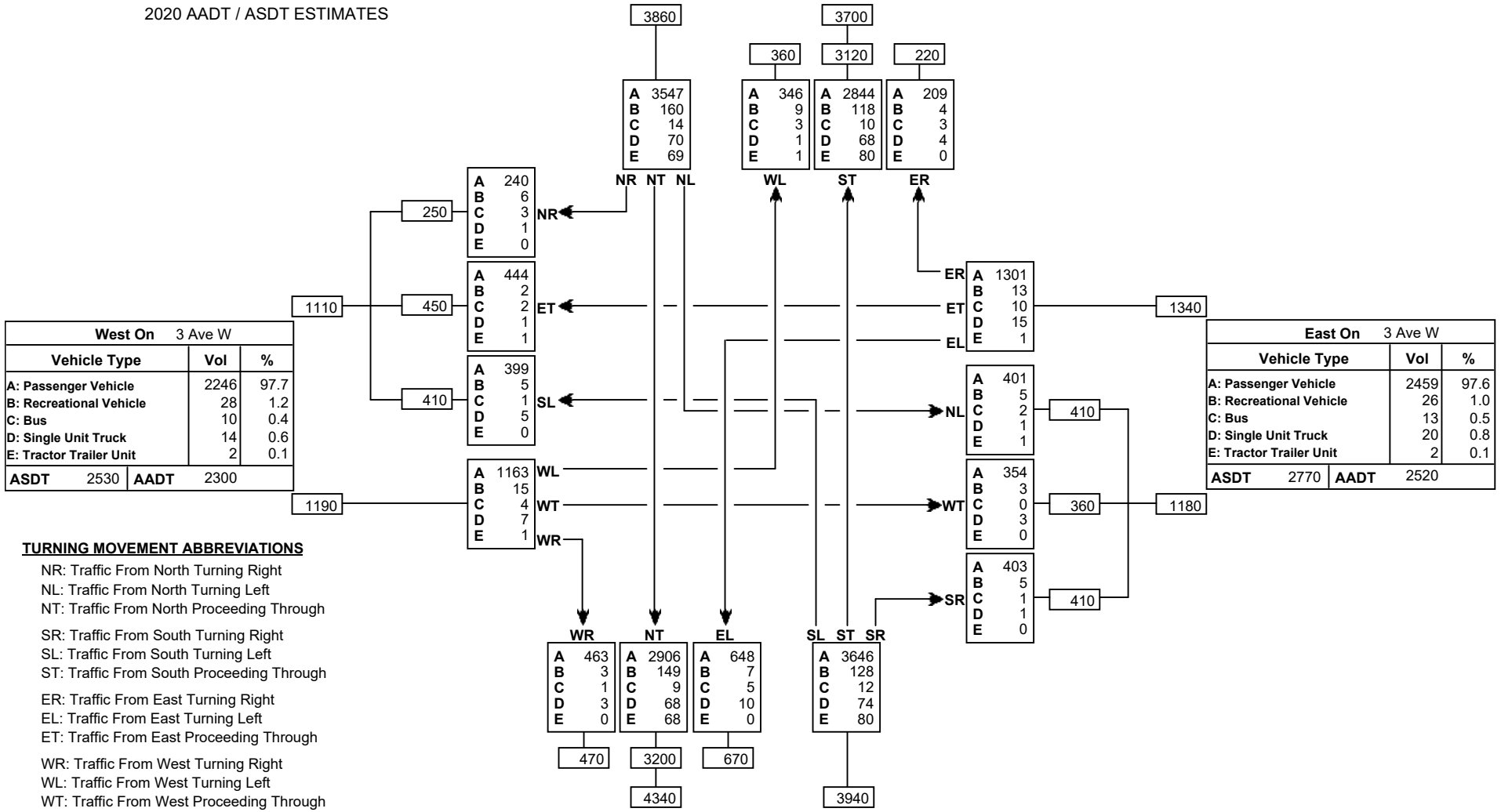
WR: Traffic From West Turning Right
WL: Traffic From West Turning Left
WT: Traffic From West Proceeding Through

Turning Movement Summary Diagram

Reference No.: 70000069

Intersection of:
9 & 3 AVE W IN DRUMHELLER 11-29-20-408001350

2020 AADT / ASDT ESTIMATES



West On 3 Ave W		
Vehicle Type	**Vol**	**%**
A: Passenger Vehicle	2246	97.7
B: Recreational Vehicle	28	1.2
C: Bus	10	0.4
D: Single Unit Truck	14	0.6
E: Tractor Trailer Unit	2	0.1
ASDT 2530	**AADT** 2300	

East On 3 Ave W		
Vehicle Type	**Vol**	**%**
A: Passenger Vehicle	2459	97.6
B: Recreational Vehicle	26	1.0
C: Bus	13	0.5
D: Single Unit Truck	20	0.8
E: Tractor Trailer Unit	2	0.1
ASDT 2770	**AADT** 2520	

North On 9		
Vehicle Type	**Vol**	**%**
A: Passenger Vehicle	6946	91.9
B: Recreational Vehicle	291	3.8
C: Bus	30	0.4
D: Single Unit Truck	143	1.9
E: Tractor Trailer Unit	150	2.0
ASDT 8320	**AADT** 7560	

South On 9		
Vehicle Type	**Vol**	**%**
A: Passenger Vehicle	7663	92.5
B: Recreational Vehicle	287	3.5
C: Bus	27	0.3
D: Single Unit Truck	155	1.9
E: Tractor Trailer Unit	148	1.8
ASDT 9110	**AADT** 8280	

TURNING MOVEMENT ABBREVIATIONS

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WT: Traffic From West Proceeding Through

TURNING MOVEMENT ABBREVIATIONS

AADT: Annual Average Daily Traffic
Average daily traffic expressed as vehicles per day fo
period of January 1 to December 31 (365 days)

ASDT: Average Summer Daily Traffic
Average daily traffic expressed as vehicles per day fo
period of May 1 to September 30 (153 days)

Turning Movement Summary Diagram

Reference No.: 70000069

Intersection of:
9 & 3 AVE W IN DRUMHELLER 11-29-20-408001350

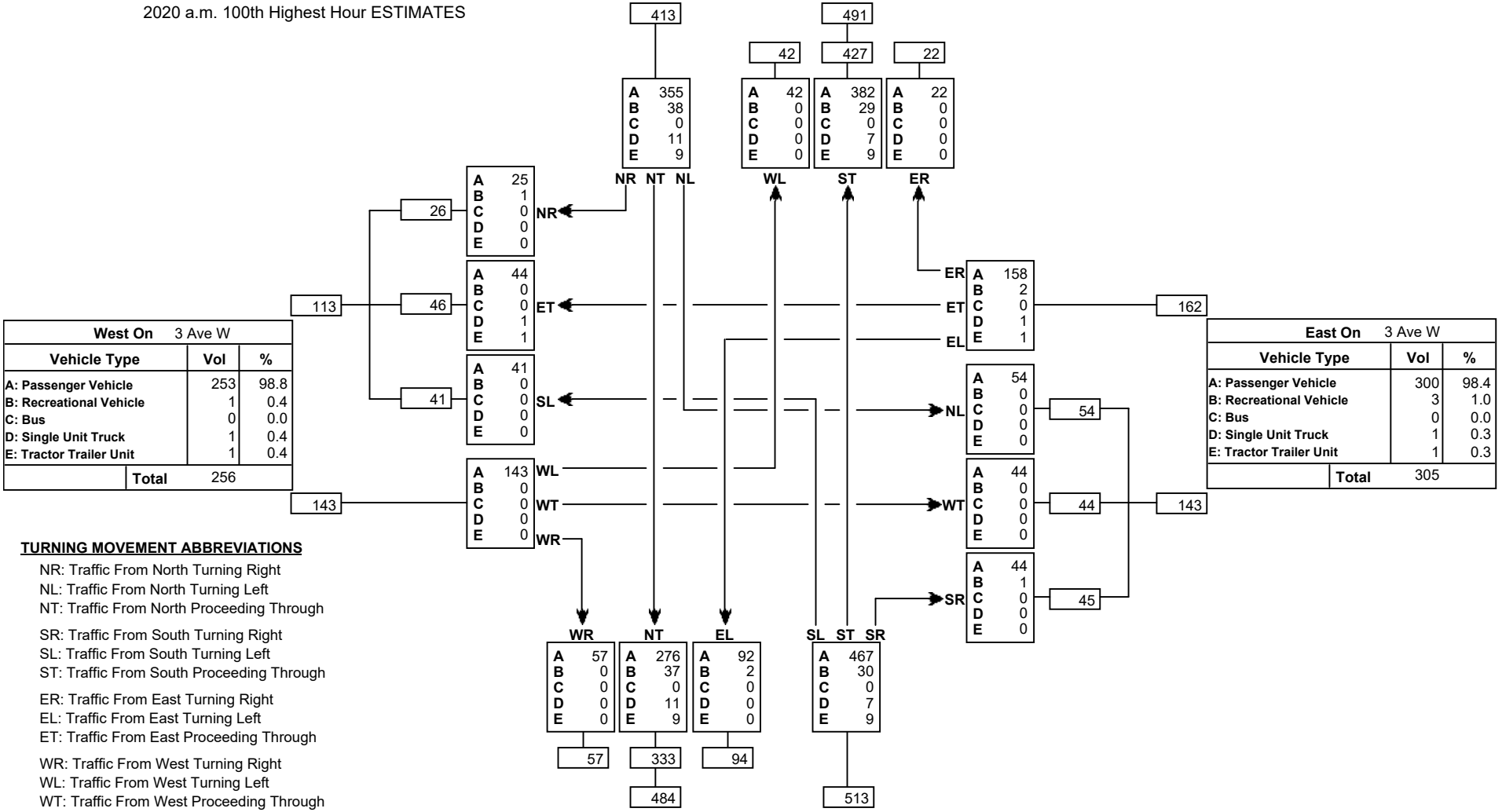
2020 a.m. 100th Highest Hour ESTIMATES

North On 9		
Vehicle Type	**Vol**	**%**
A: Passenger Vehicle	801	88.6
B: Recreational Vehicle	67	7.4
C: Bus	0	0.0
D: Single Unit Truck	18	2.0
E: Tractor Trailer Unit	18	2.0
Total	904	

West On 3 Ave W		
Vehicle Type	**Vol**	**%**
A: Passenger Vehicle	253	98.8
B: Recreational Vehicle	1	0.4
C: Bus	0	0.0
D: Single Unit Truck	1	0.4
E: Tractor Trailer Unit	1	0.4
Total	256	

East On 3 Ave W		
Vehicle Type	**Vol**	**%**
A: Passenger Vehicle	300	98.4
B: Recreational Vehicle	3	1.0
C: Bus	0	0.0
D: Single Unit Truck	1	0.3
E: Tractor Trailer Unit	1	0.3
Total	305	

South On 9		
Vehicle Type	**Vol**	**%**
A: Passenger Vehicle	892	89.5
B: Recreational Vehicle	69	6.9
C: Bus	0	0.0
D: Single Unit Truck	18	1.8
E: Tractor Trailer Unit	18	1.8
Total	997	



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WT: Traffic From West Proceeding Through

Turning Movement Summary Diagram

Reference No.: 70000069

Intersection of:
9 & 3 AVE W IN DRUMHELLER 11-29-20-408001350

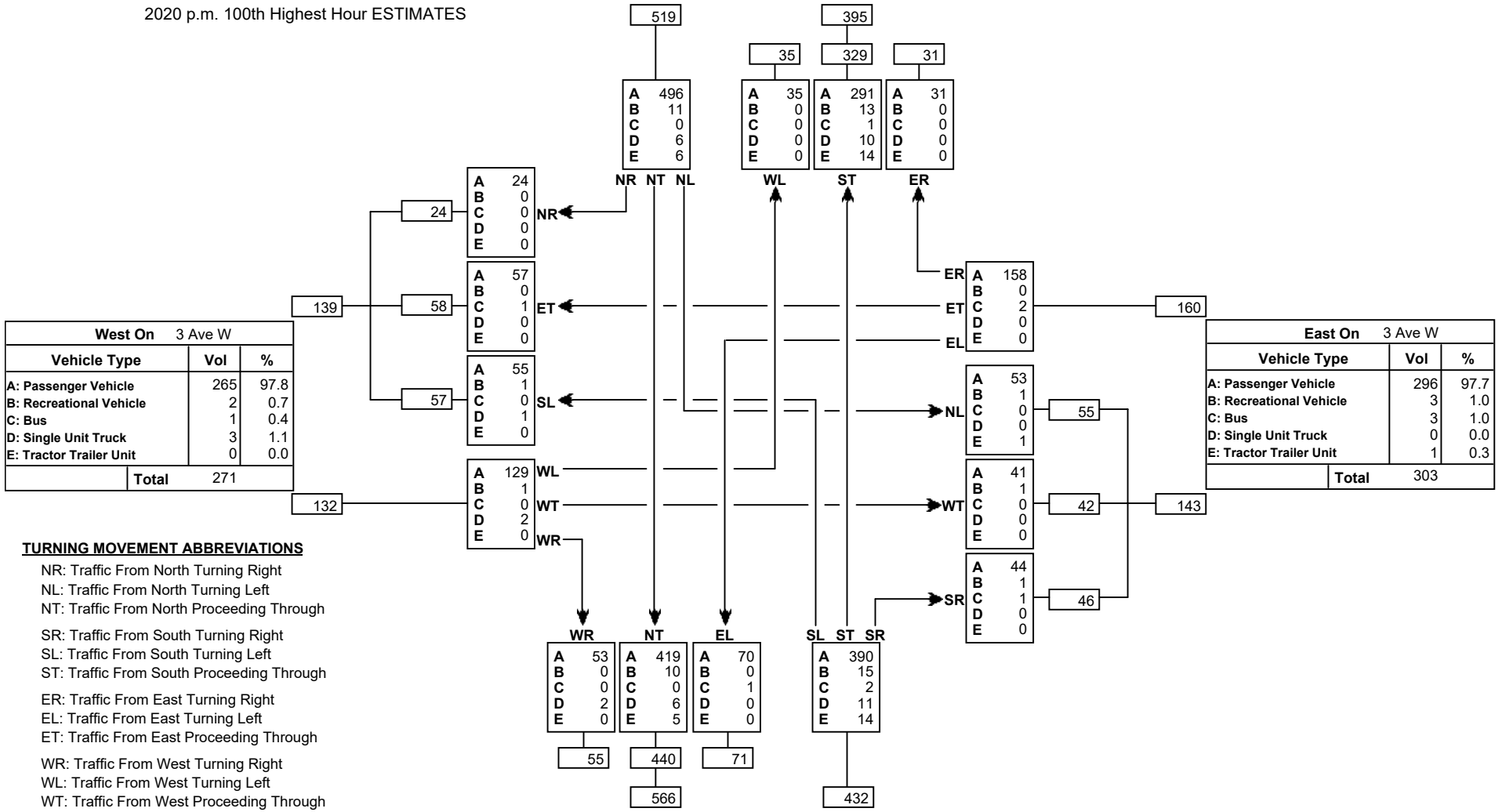
2020 p.m. 100th Highest Hour ESTIMATES

North On 9		
Vehicle Type	**Vol**	**%**
A: Passenger Vehicle	853	93.3
B: Recreational Vehicle	24	2.6
C: Bus	1	0.1
D: Single Unit Truck	16	1.8
E: Tractor Trailer Unit	20	2.2
Total	914	

West On 3 Ave W		
Vehicle Type	**Vol**	**%**
A: Passenger Vehicle	265	97.8
B: Recreational Vehicle	2	0.7
C: Bus	1	0.4
D: Single Unit Truck	3	1.1
E: Tractor Trailer Unit	0	0.0
Total	271	

East On 3 Ave W		
Vehicle Type	**Vol**	**%**
A: Passenger Vehicle	296	97.7
B: Recreational Vehicle	3	1.0
C: Bus	3	1.0
D: Single Unit Truck	0	0.0
E: Tractor Trailer Unit	1	0.3
Total	303	

South On 9		
Vehicle Type	**Vol**	**%**
A: Passenger Vehicle	932	93.4
B: Recreational Vehicle	25	2.5
C: Bus	3	0.3
D: Single Unit Truck	19	1.9
E: Tractor Trailer Unit	19	1.9
Total	998	



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WL: Traffic From West Turning Left
WT: Traffic From West Proceeding Through

Turning Movement Summary Diagram

Reference No.: 997194

Intersection of:
9 & 10 AT DRUMHELLER

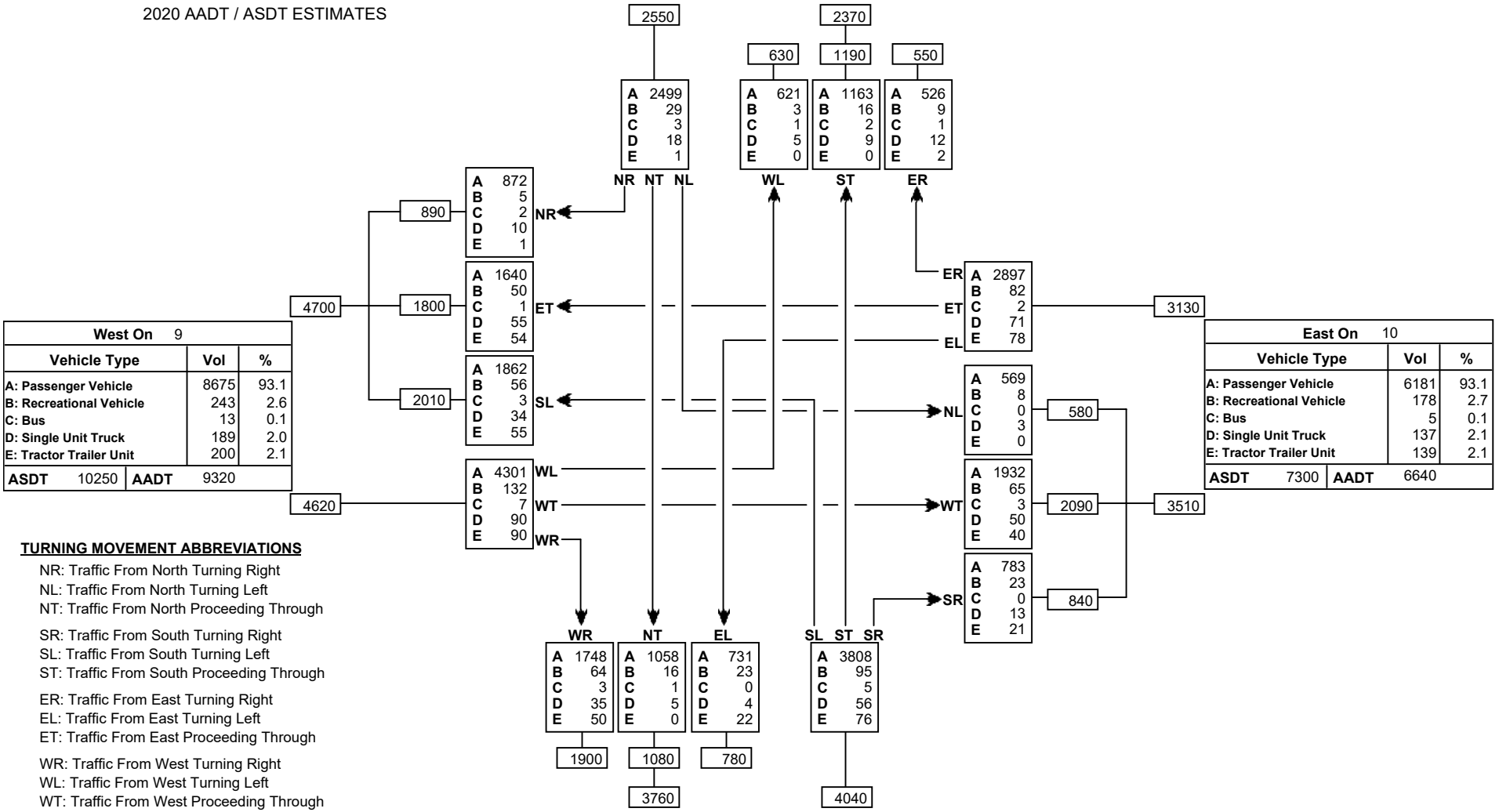
2020 AADT / ASDT ESTIMATES

North On 5 St E		
Vehicle Type	**Vol**	**%**
A: Passenger Vehicle	4809	97.7
B: Recreational Vehicle	57	1.2
C: Bus	7	0.1
D: Single Unit Truck	44	0.9
E: Tractor Trailer Unit	3	0.1
ASDT 5410	**AADT** 4920	

West On 9		
Vehicle Type	**Vol**	**%**
A: Passenger Vehicle	8675	93.1
B: Recreational Vehicle	243	2.6
C: Bus	13	0.1
D: Single Unit Truck	189	2.0
E: Tractor Trailer Unit	200	2.1
ASDT 10250	**AADT** 9320	

East On 10		
Vehicle Type	**Vol**	**%**
A: Passenger Vehicle	6181	93.1
B: Recreational Vehicle	178	2.7
C: Bus	5	0.1
D: Single Unit Truck	137	2.1
E: Tractor Trailer Unit	139	2.1
ASDT 7300	**AADT** 6640	

South On 9		
Vehicle Type	**Vol**	**%**
A: Passenger Vehicle	7345	94.2
B: Recreational Vehicle	198	2.5
C: Bus	9	0.1
D: Single Unit Truck	100	1.3
E: Tractor Trailer Unit	148	1.9
ASDT 8580	**AADT** 7800	



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TURNING MOVEMENT ABBREVIATIONS

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Average daily traffic expressed as vehicles per day fo
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ASDT: Average Summer Daily Traffic
Average daily traffic expressed as vehicles per day fo
period of May 1 to September 30 (153 days)

Turning Movement Summary Diagram

Reference No.: 997194

Intersection of:
9 & 10 AT DRUMHELLER

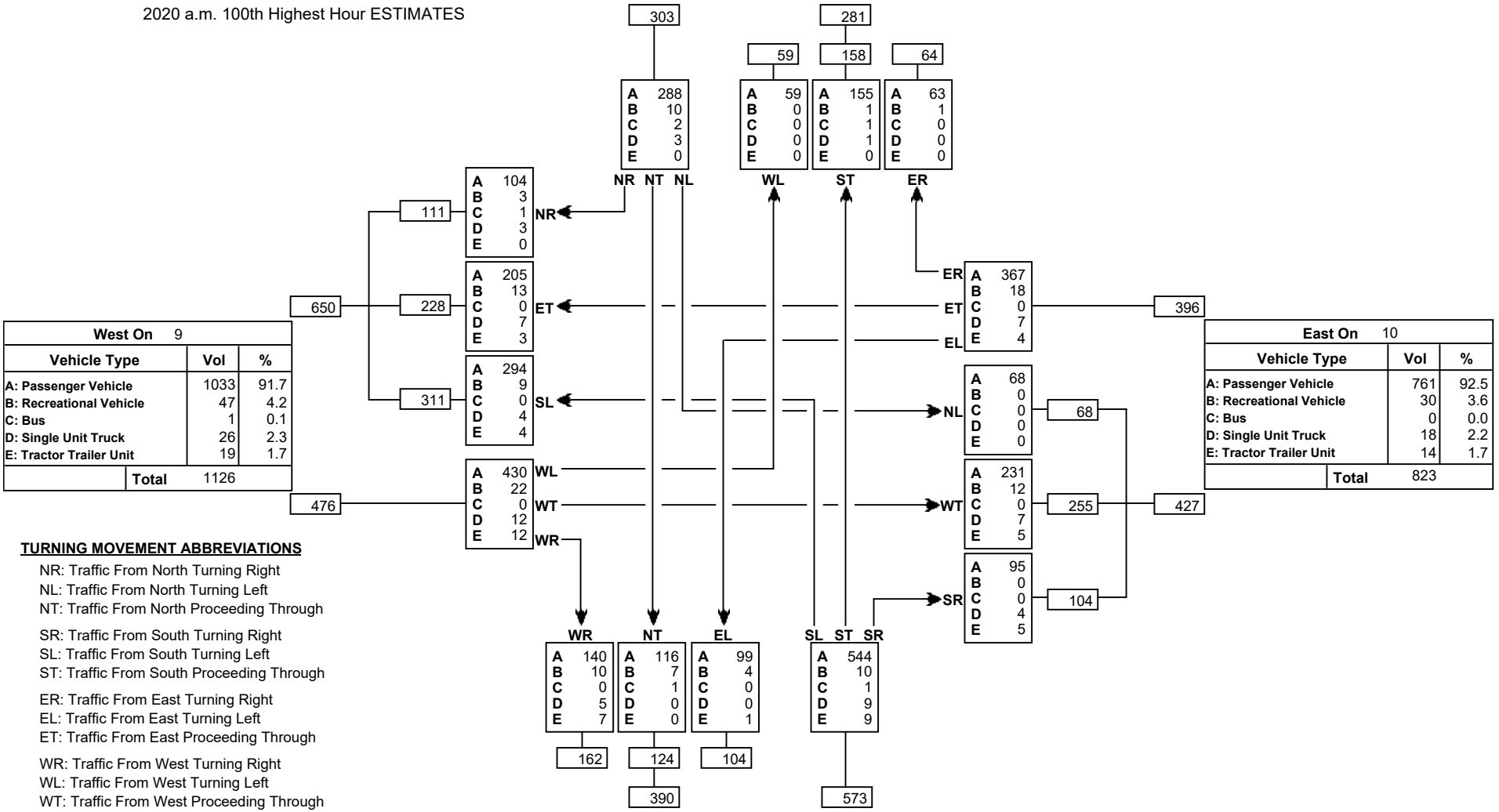
2020 a.m. 100th Highest Hour ESTIMATES

North On 5 St E		
Vehicle Type	**Vol**	**%**
A: Passenger Vehicle	565	96.7
B: Recreational Vehicle	12	2.1
C: Bus	3	0.5
D: Single Unit Truck	4	0.7
E: Tractor Trailer Unit	0	0.0
Total	584	

West On 9		
Vehicle Type	**Vol**	**%**
A: Passenger Vehicle	1033	91.7
B: Recreational Vehicle	47	4.2
C: Bus	1	0.1
D: Single Unit Truck	26	2.3
E: Tractor Trailer Unit	19	1.7
Total	1126	

East On 10		
Vehicle Type	**Vol**	**%**
A: Passenger Vehicle	761	92.5
B: Recreational Vehicle	30	3.6
C: Bus	0	0.0
D: Single Unit Truck	18	2.2
E: Tractor Trailer Unit	14	1.7
Total	823	

South On 9		
Vehicle Type	**Vol**	**%**
A: Passenger Vehicle	899	93.4
B: Recreational Vehicle	31	3.2
C: Bus	2	0.2
D: Single Unit Truck	14	1.5
E: Tractor Trailer Unit	17	1.8
Total	963	



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Turning Movement Summary Diagram

Reference No.: 997194

Intersection of:
9 & 10 AT DRUMHELLER

2020 p.m. 100th Highest Hour ESTIMATES

North On 5 St E		
Vehicle Type	**Vol**	**%**
A: Passenger Vehicle	561	98.2
B: Recreational Vehicle	6	1.1
C: Bus	0	0.0
D: Single Unit Truck	4	0.7
E: Tractor Trailer Unit	0	0.0
Total	571	

West On 9		
Vehicle Type	**Vol**	**%**
A: Passenger Vehicle	1050	93.7
B: Recreational Vehicle	27	2.4
C: Bus	0	0.0
D: Single Unit Truck	13	1.2
E: Tractor Trailer Unit	31	2.8
Total	1121	

East On 10		
Vehicle Type	**Vol**	**%**
A: Passenger Vehicle	728	92.0
B: Recreational Vehicle	27	3.4
C: Bus	0	0.0
D: Single Unit Truck	14	1.8
E: Tractor Trailer Unit	22	2.8
Total	791	

South On 9		
Vehicle Type	**Vol**	**%**
A: Passenger Vehicle	843	94.6
B: Recreational Vehicle	24	2.7
C: Bus	0	0.0
D: Single Unit Truck	5	0.6
E: Tractor Trailer Unit	19	2.1
Total	891	

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Highway: 9

Control Section: 06

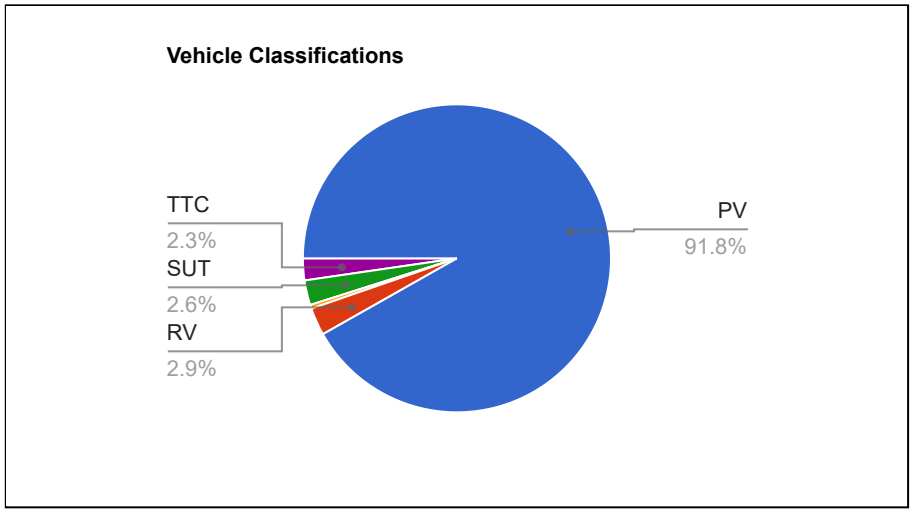
Traffic Control Section: 04

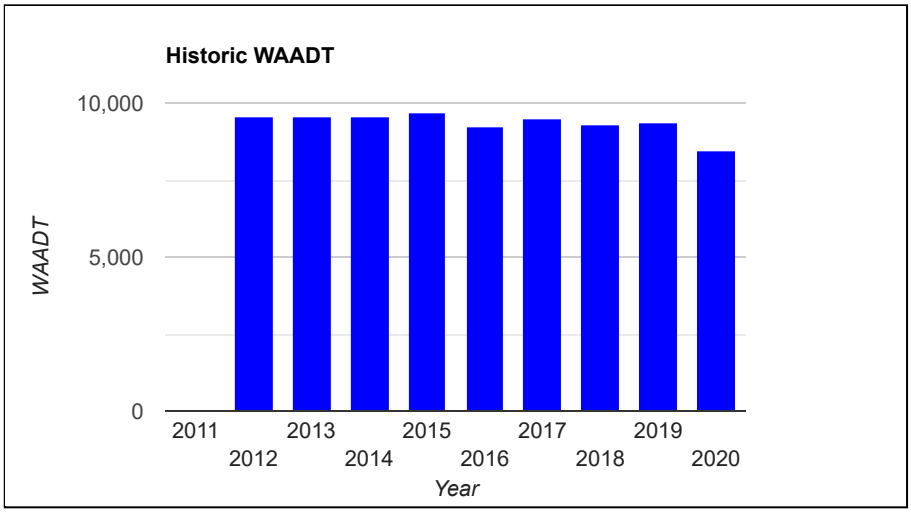
From KM: 0.000

To KM: 1.979

2020 WAADT: 8420

2020 ESAL/day/direction: 297.1





Year	WAADT
2012	9570
2013	9570
2014	9570
2015	9670
2016	9240
2017	9460
2018	9310
2019	9350
2020	8420

Annual ATR Report

Highway: 9
Control Section: 04
ATR Number: 50090450
Location Description: 1.6 KM E OF 9 & 21 BEISEKER
Year: 2019
ATR Efficiency: 100.0 %

Produced: 20-Feb-2020 By CornerStone Solutions Inc.

	Two-Way	Westbound	Eastbound
Annual Average Daily Traffic	2442	1220	1222
Average Summer Daily Traffic	3174	1588	1586
Average Daily Traffic by Month			
January	1666	827	839
February	1587	791	796
March	1914	956	958
April	2260	1125	1135
May	2507	1243	1264
June	2990	1482	1508
July	3753	1897	1856
August	3966	1986	1980
September	2631	1321	1310
October	2197	1095	1102
November	1911	956	955
December	1839	923	916

Peak Hour Traffic	Year	Month	Day	Hour	Two-Way	Westbound	Eastbound
30th Highest Hour	2019	08	10	1200	429	116	313
100th Highest Hour	2019	07	12	1600	374	188	186
90th %ile Hour	2019	07	13	1000	225	83	142

Annual ATR Report

Highway: 9
Control Section: 04
ATR Number: 50090450
Location Description: 1.6 KM E OF 9 & 21 BEISEKER
Year: 2020
ATR Efficiency: 100.0 %

Produced: 18-Feb-2021 By CornerStone Solutions Inc.

	Two-Way	Westbound	Eastbound
Annual Average Daily Traffic	2009	1003	1006
Average Summer Daily Traffic	2590	1298	1292
Average Daily Traffic by Month			
January	1603	795	808
February	1897	946	951
March	1391	689	702
April	1126	554	572
May	1761	872	889
June	2322	1164	1158
July	3011	1507	1504
August	3159	1603	1556
September	2692	1342	1350
October	2154	1074	1080
November	1613	802	811
December	1360	675	685

Peak Hour Traffic	Year	Month	Day	Hour	Two-Way	Westbound	Eastbound
30th Highest Hour	2020	08	23	1400	353	191	162
100th Highest Hour	2020	07	24	1600	306	158	148
90th %ile Hour	2020	09	24	1600	191	122	69

Highway : 9
Control Section : 04
ATR Number : 50090450
Location Description : 1.6 KM E OF 9 & 21 BEISEKER
Year : 2006
ATR Efficiency : 100.0 %

Produced : 02-Mar-2007 By CornerStone Solutions Inc.

	Two Way	Westbound	Eastbound
Average Annual Daily Traffic	2074	1012	1062
Average Summer Daily Traffic	2732	1332	1400
Average Daily Traffic by Month			
January	1362	662	700
February	1461	713	748
March	1431	695	736
April	1870	908	962
May	2153	1049	1104
June	2408	1158	1250
July	3493	1719	1774
August	3233	1574	1659
September	2349	1148	1201
October	1929	947	982
November	1543	756	787
December	1593	783	810

Peak Hour Traffic	Year Mo Da Hour	Two Way	Westbound	Eastbound
30th Highest Hour	2006.07.08.1200	365	103	262
100th Highest Hour	2006.08.12.1200	322	93	229
90th %ile Hour	2006.04.26.1700	187	109	78

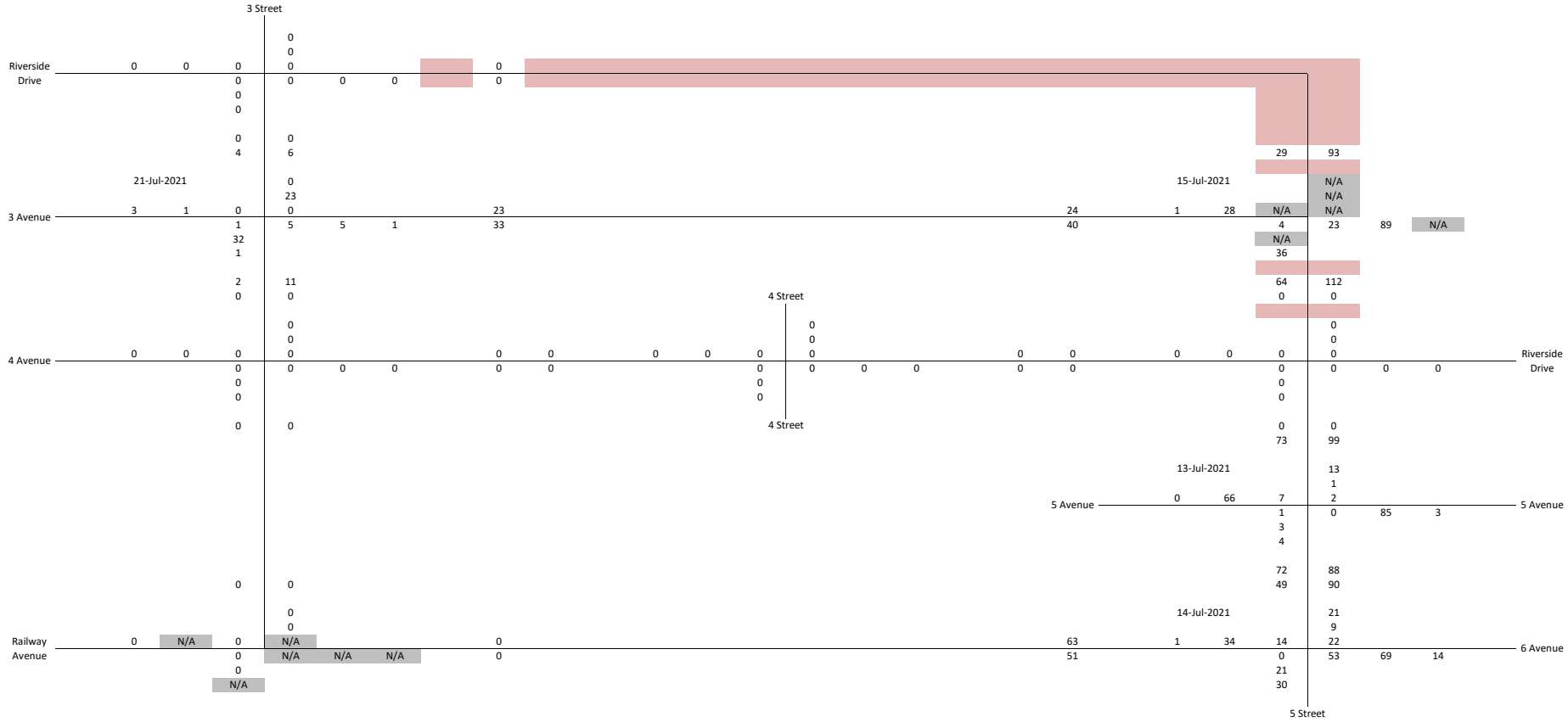
Appendix C

Transportation Network Schematics

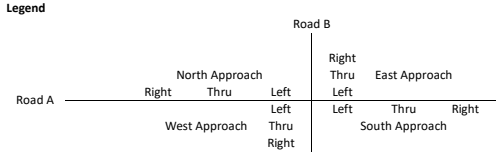
Peak Hour Traffic Volumes

Scenario: Traffic Counts Year: 2021

AM Peak Hour



Legend



100 Total traffic volume for movement

N/A Movement does not exist

Notes and Assumptions

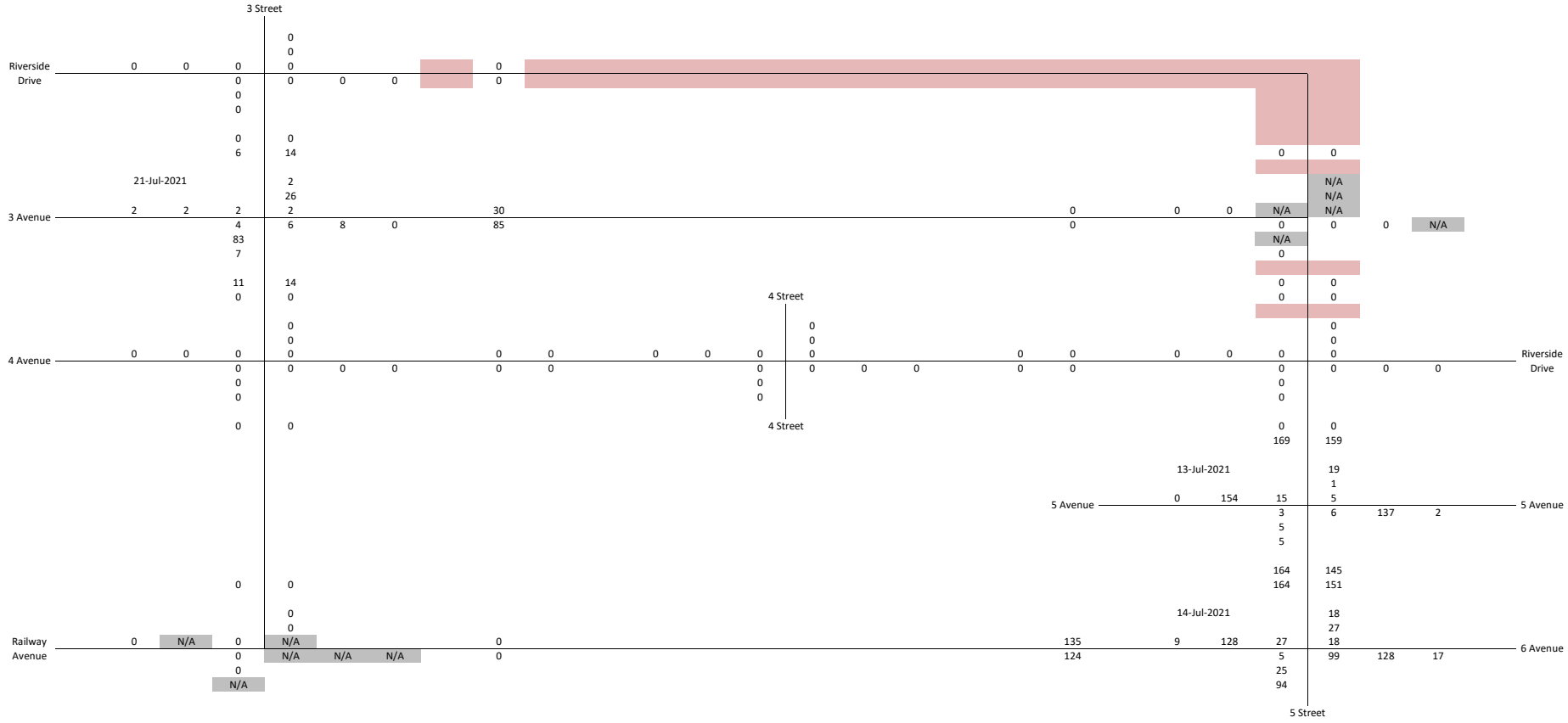
Section of Riverside Drive to be impacted

Traffic counts conducted at subject intersections between July 12 and 23, 2021 (specific dates for each intersection provided)

Peak Hour Traffic Volumes

Scenario: Traffic Counts Year: 2021

PM Peak Hour



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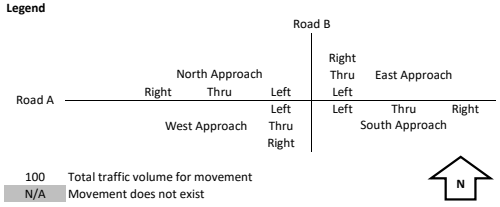


100 Total traffic volume for movement

N/A Movement does not exist

Notes and Assumptions

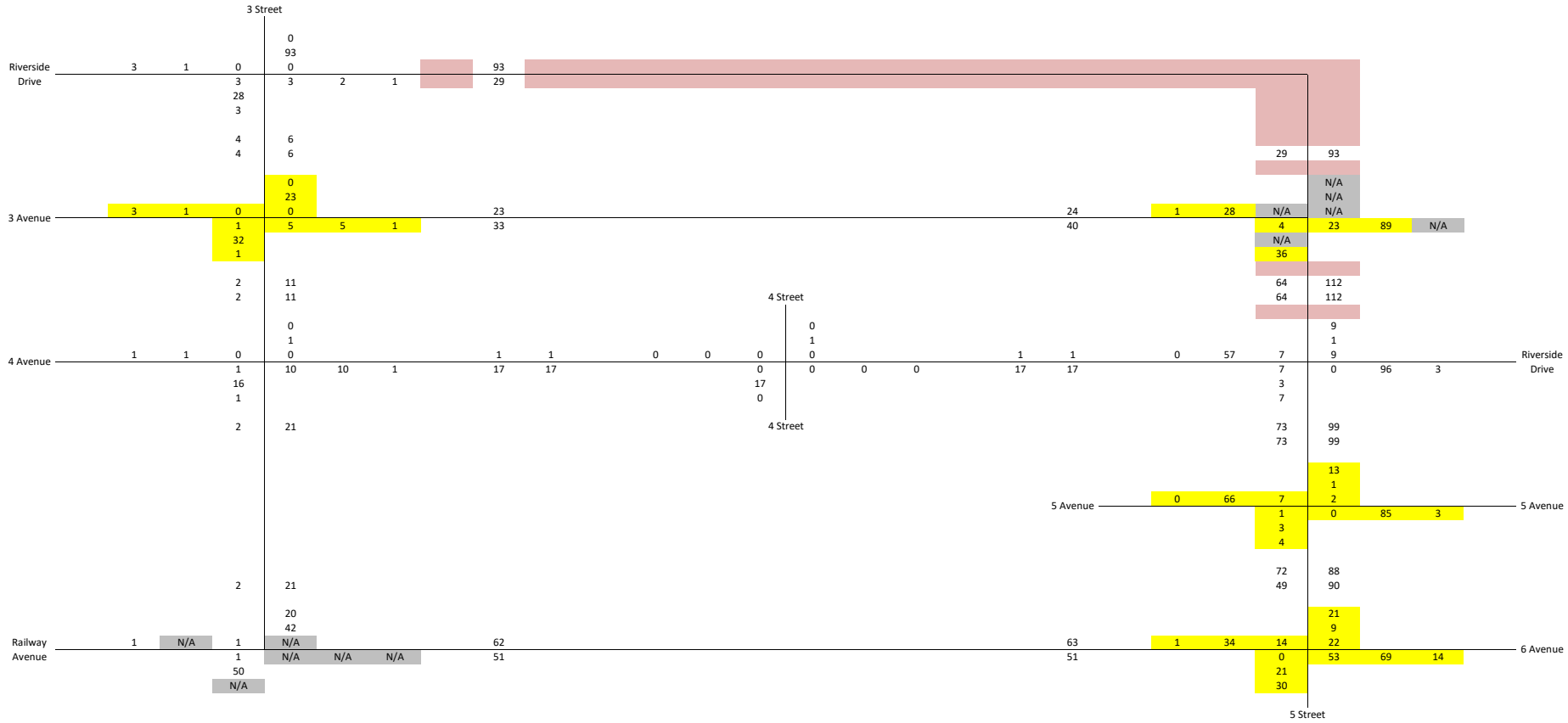
Section of Riverside Drive to be impacted

Traffic counts conducted at subject intersections between July 12 and 23, 2021 (specific dates for each intersection provided)

Peak Hour Traffic Volumes

Scenario: Traffic Volume Assumptions Year: 2021

AM Peak Hour



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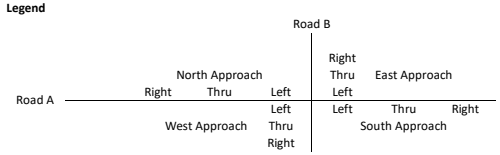


100 Total traffic volume for movement

N/A Movement does not exist

Notes and Assumptions

Section of Riverside Drive to be impacted

Observed traffic volume from counts

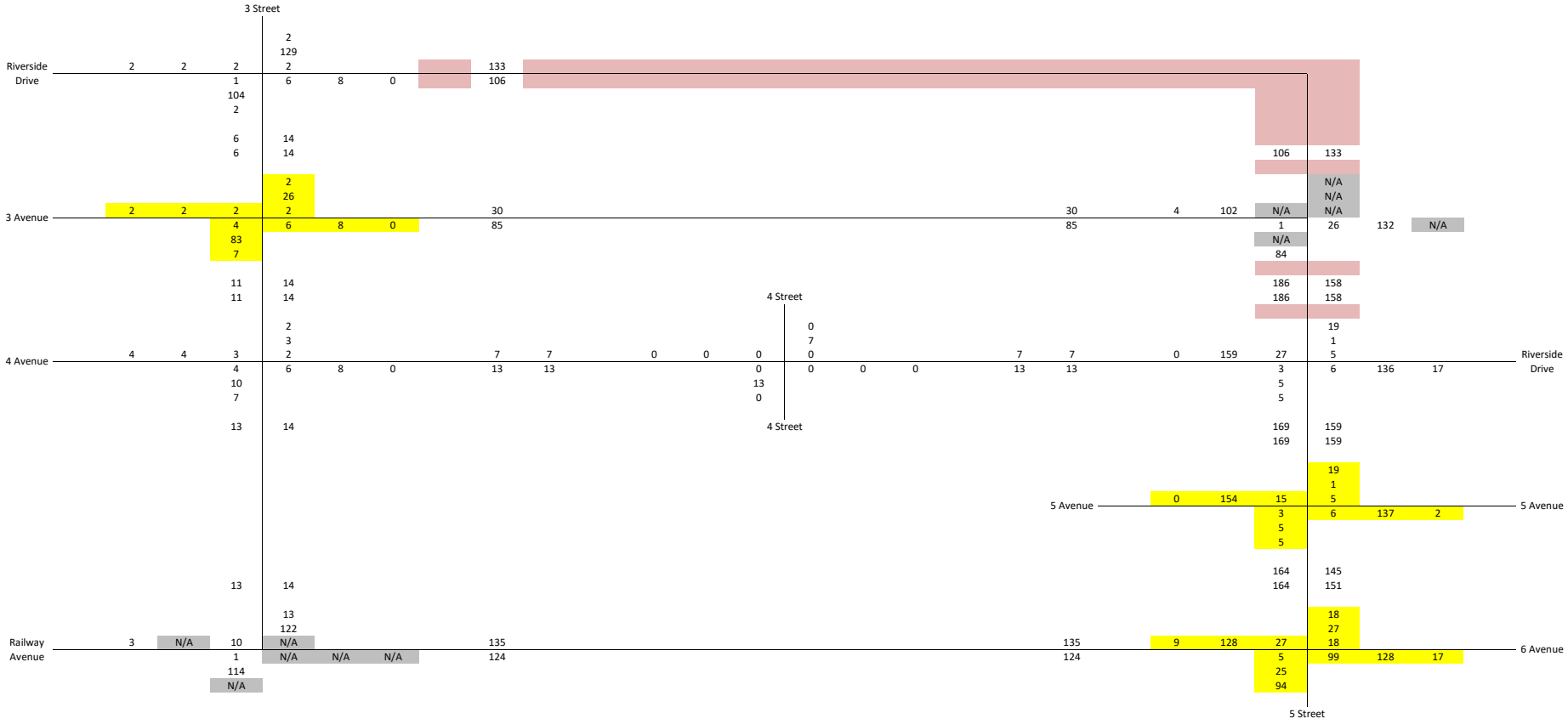
Not every intersection within the scope of the model was counted, so assumptions have to be made for traffic volumes at the uncounted intersections

Traffic volumes at uncounted intersections are balanced with adjacent observed counts; similar traffic patterns used between uncounted and observed intersections

Peak Hour Traffic Volumes

Scenario: Traffic Volume Assumptions Year: 2021

PM Peak Hour



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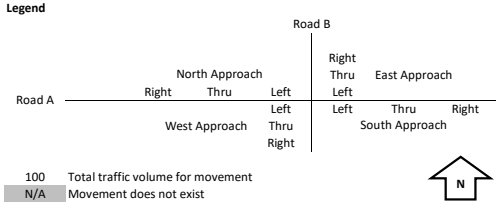

100 Total traffic volume for movement

N/A Movement does not exist

Notes and Assumptions

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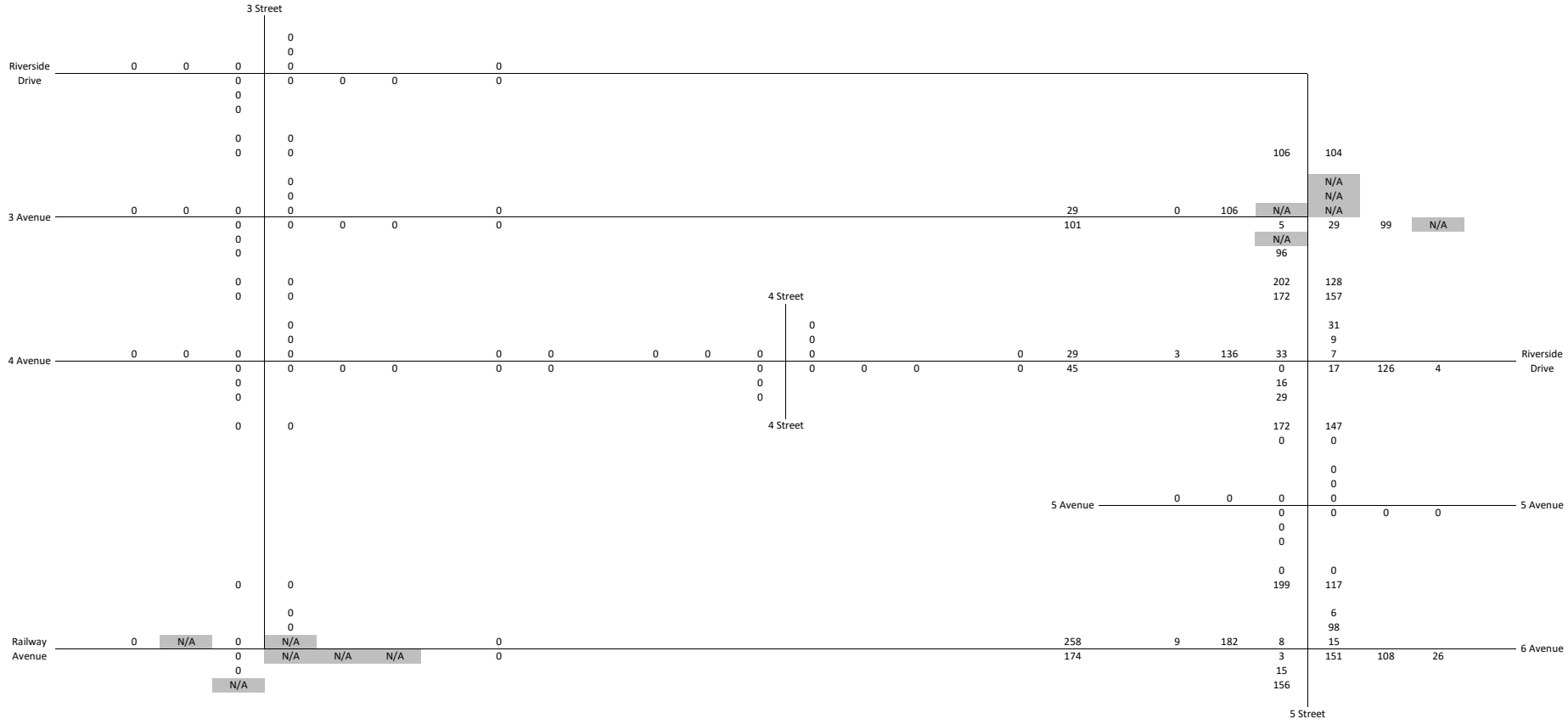
Peak Hour Traffic Volumes

Scenario: iTrans July Traffic Counts Year: 2006

AM Peak Hour



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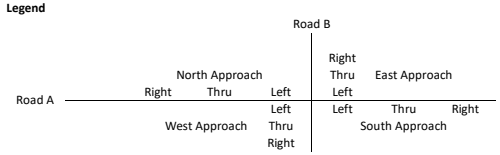


100 Total traffic volume for movement

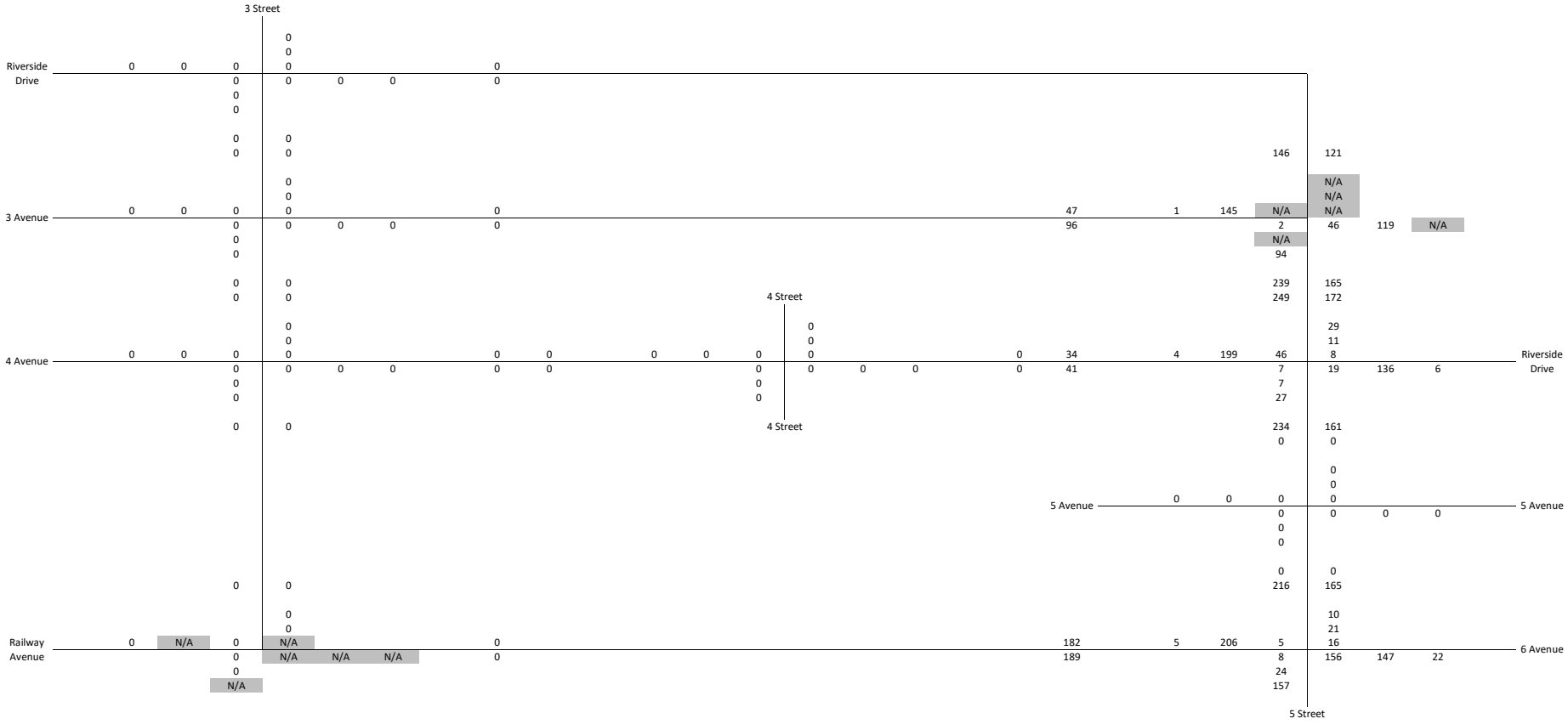
N/A Movement does not exist

Notes and Assumptions

Peak Hour Traffic Volumes

Scenario: iTrans July Traffic Counts Year: 2006

PM Peak Hour



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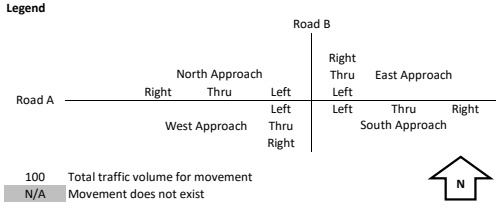


100 Total traffic volume for movement

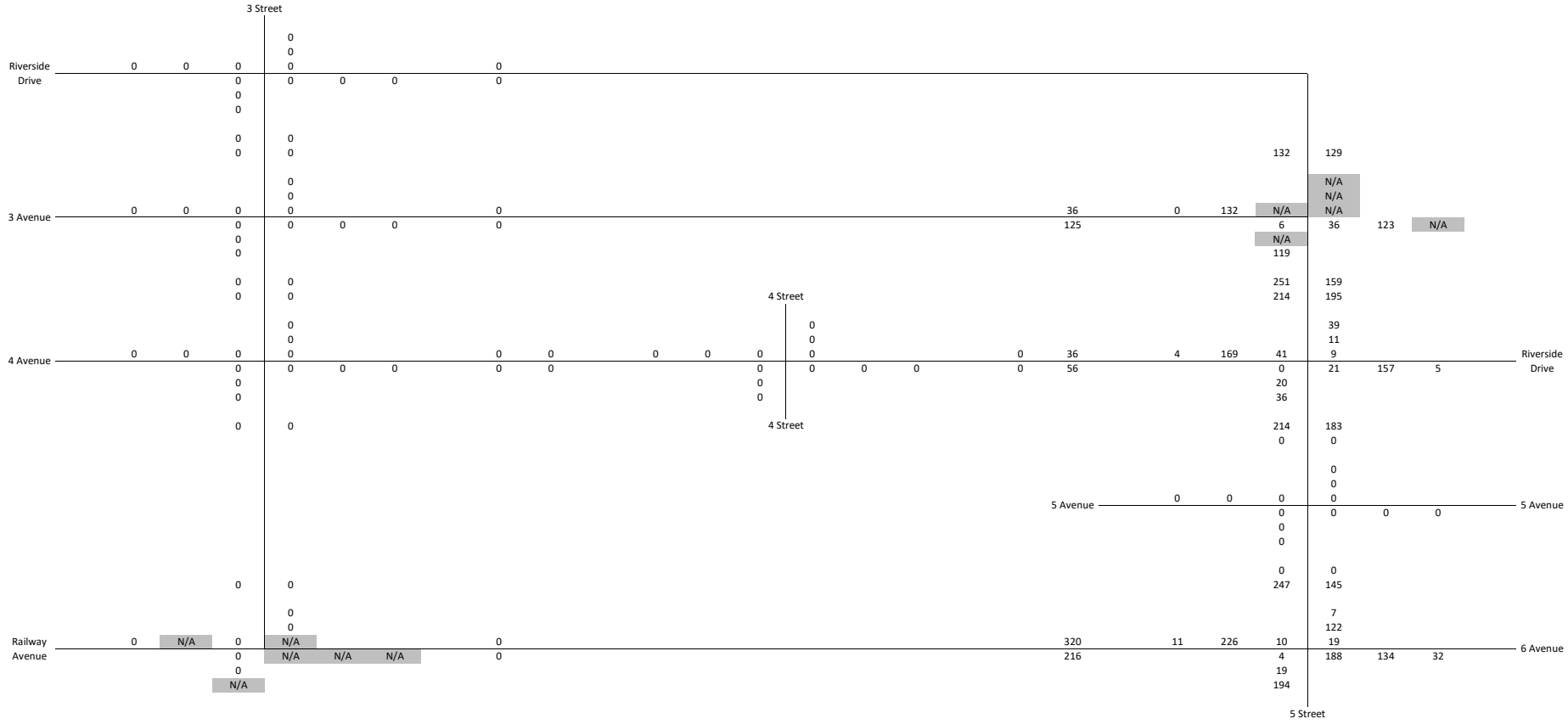
N/A Movement does not exist

Notes and Assumptions

Peak Hour Traffic Volumes

Scenario: iTrans July Traffic Counts Year: 2022

AM Peak Hour



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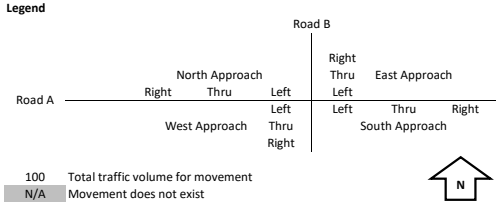


100 Total traffic volume for movement

N/A Movement does not exist

Notes and Assumptions

Traffic volumes increased based on growth at Alberta Transportation ATR 50090450 from 2006 to 2019

Year	AADT
2006	2,074
2019	2,442

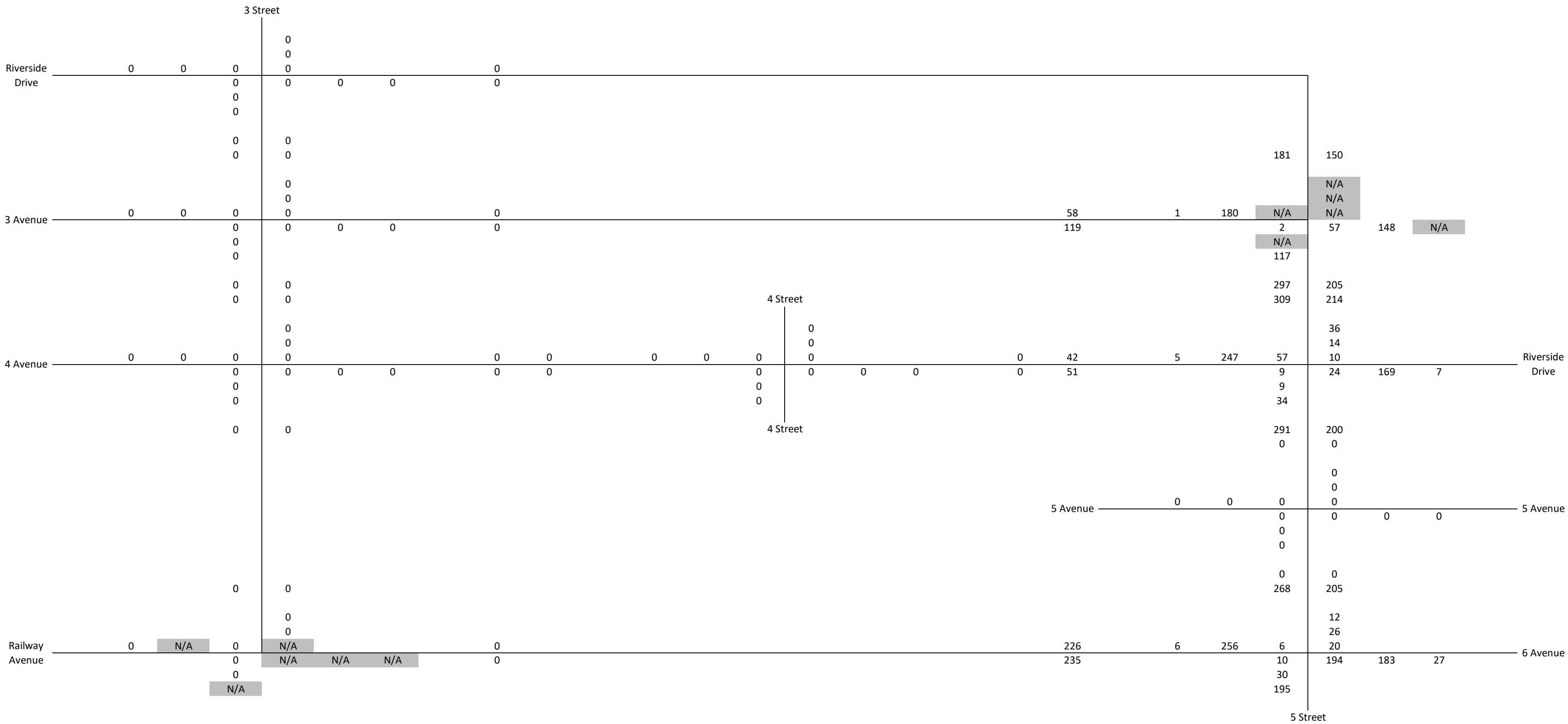
1.36% /year

1.24 Total Growth

Peak Hour Traffic Volumes

Scenario: iTrans July Traffic Counts   Year: 2022

PM Peak Hour



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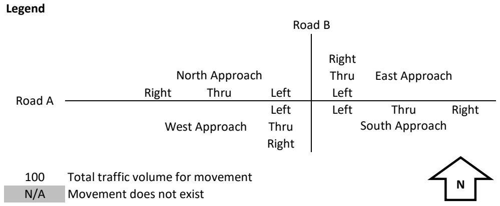


100 Total traffic volume for movement
N/A Movement does not exist

Notes and Assumptions

Traffic volumes increased based on growth at Alberta Transportation ATR 50090450 from 2006 to 2019

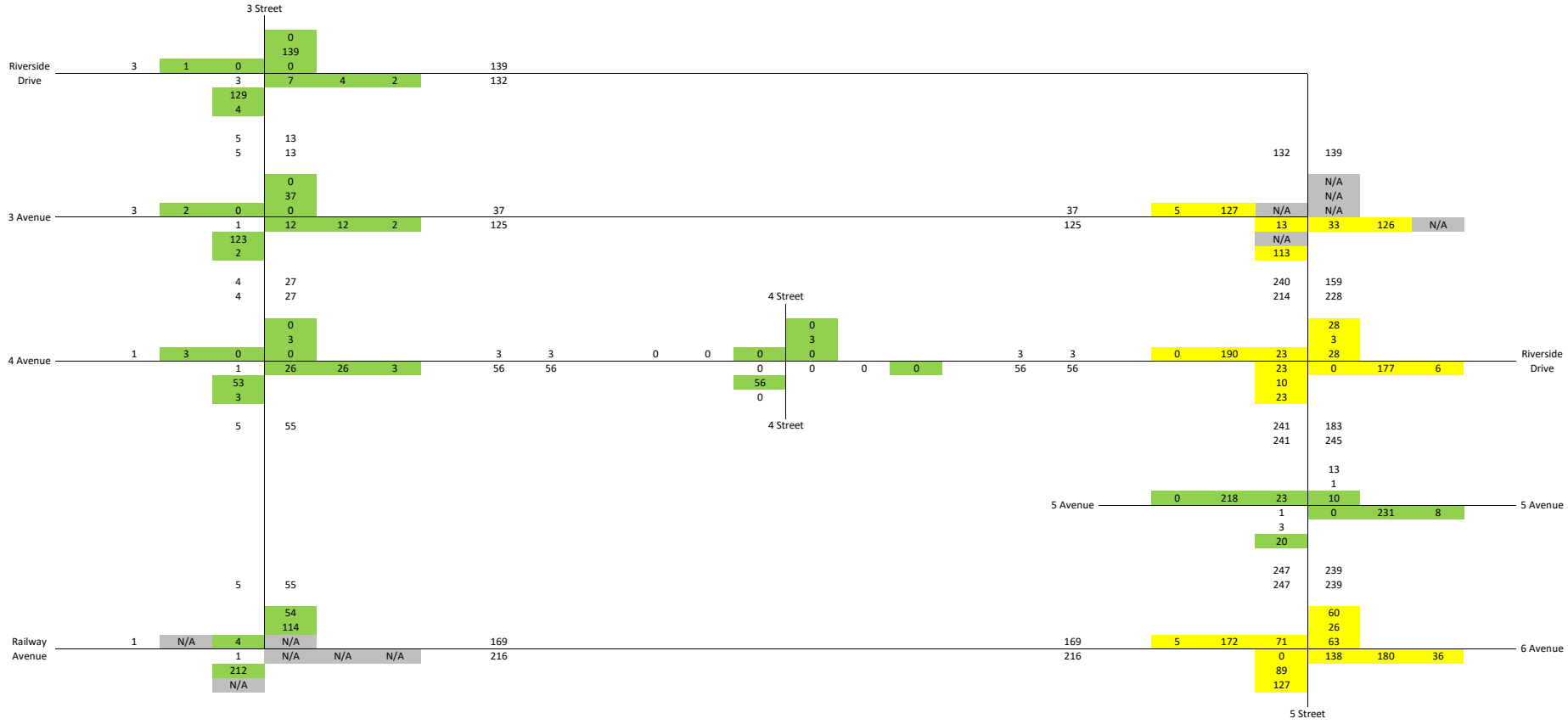
Year	AADT
2006	2,074
2019	2,442

1.36% /year
1.24 Total Growth

Peak Hour Traffic Volumes

Scenario: iTrans and JCB Balanced Counts Year: 2022

AM Peak Hour



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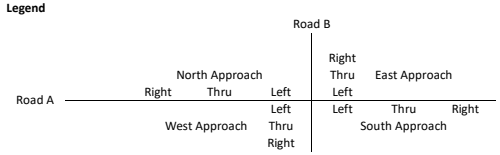


100 Total traffic volume for movement

N/A Movement does not exist

Notes and Assumptions

The 2022 traffic volumes based on extrapolating the iTrans counts reassigned, weighted by JCB counts

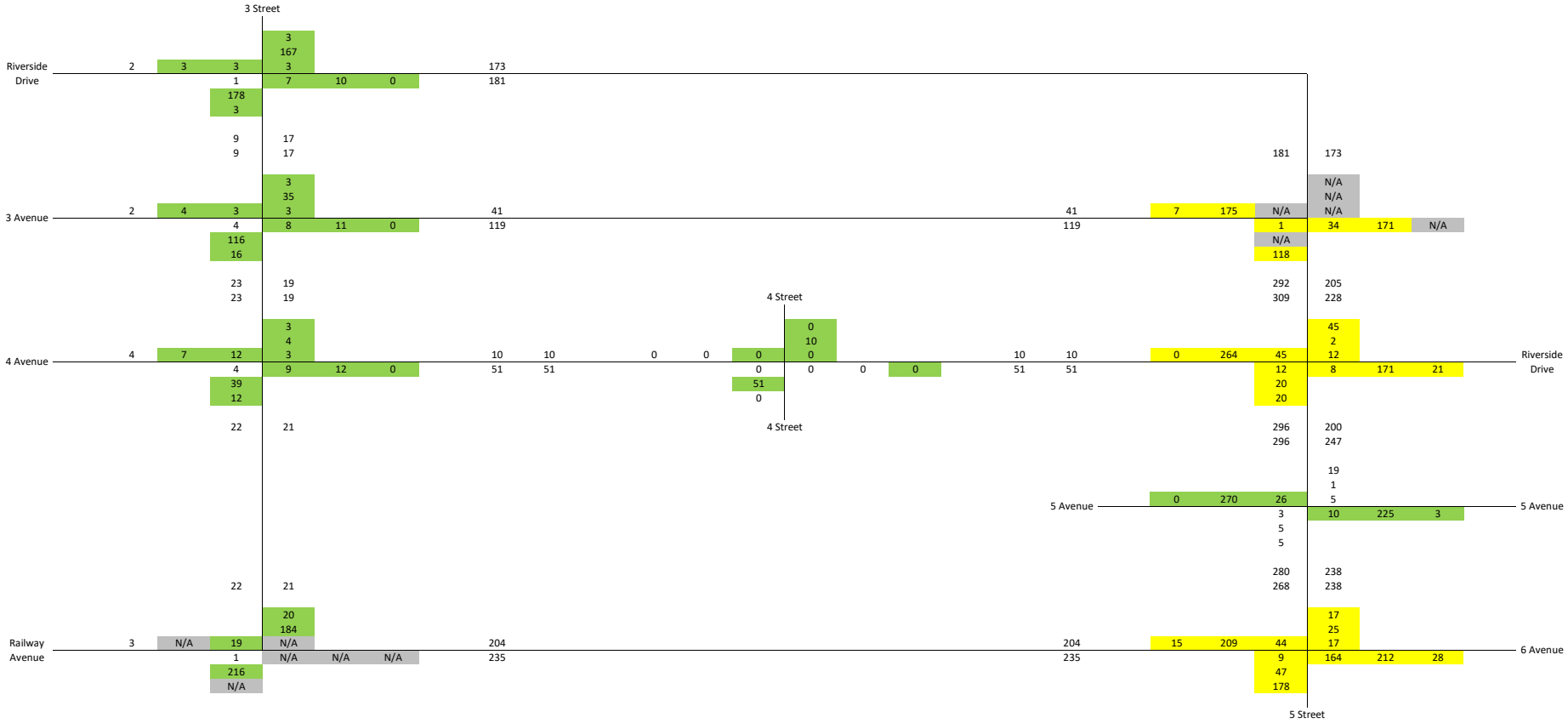
Traffic volumes increased to balance with adjacent intersections, weighted by JCB counts

Due to imbalances between observed counts and rounding errors, some traffic volumes do not balance between intersections

Peak Hour Traffic Volumes

Scenario: iTrans and JCB Balanced Counts Year: 2022

PM Peak Hour



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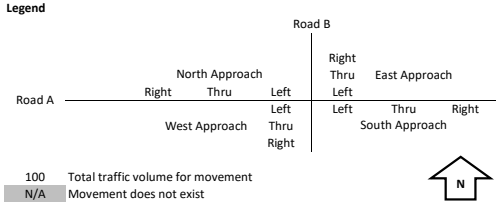

100 Total traffic volume for movement

N/A Movement does not exist

Notes and Assumptions

The 2022 traffic volumes based on extrapolating the iTrans counts reassigned, weighted by JCB counts

Traffic volumes increased to balance with adjacent intersections, weighted by JCB counts

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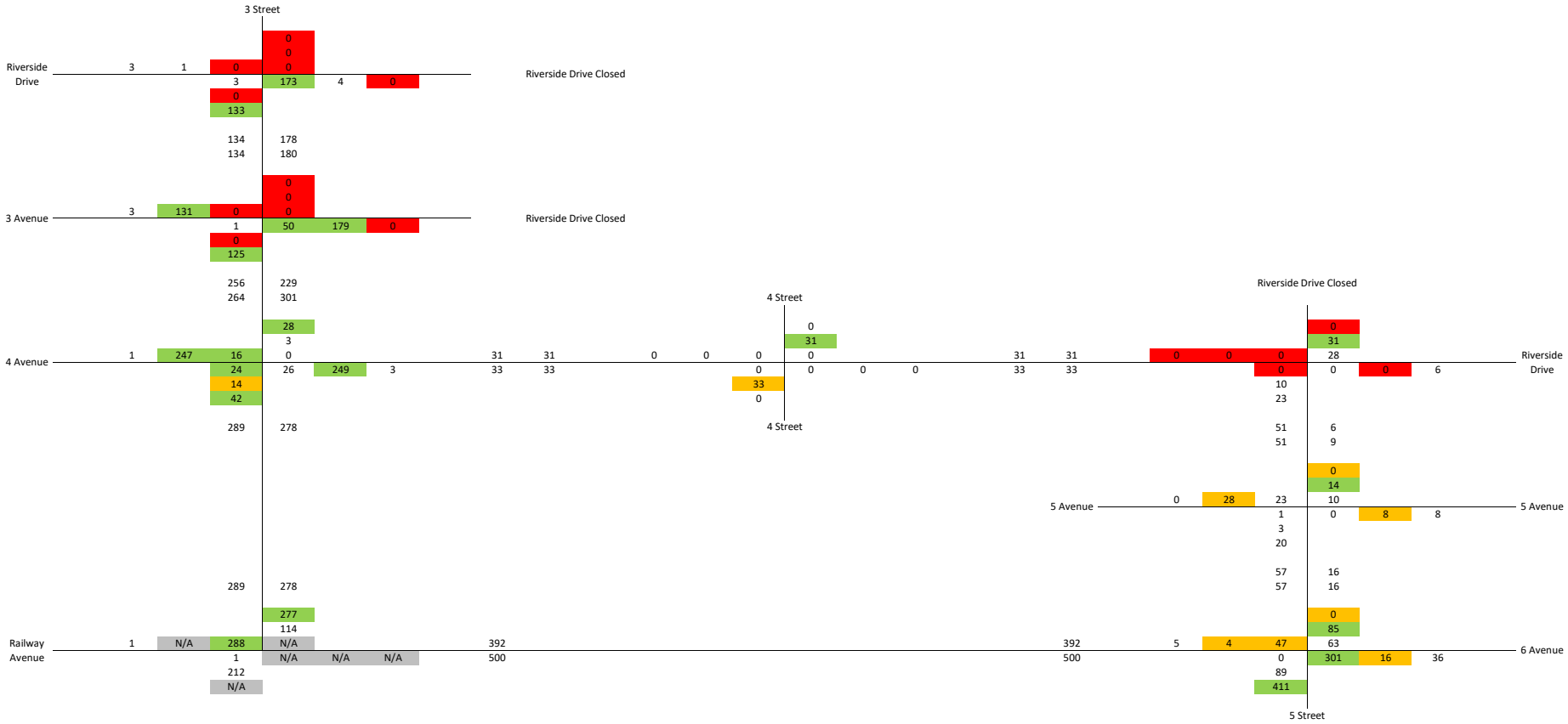
Peak Hour Traffic Volumes

Scenario: Option 1 B Year: 2022

AM Peak Hour



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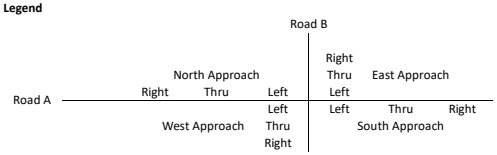


100 Total traffic volume for movement

N/A Movement does not exist

Notes and Assumptions

This option assumes closure of Riverside Drive from east of the intersection of Riverside Drive and 3 Street to north of the intersection of Riverside Drive and 5 Street / 4 Avenue

Movement where traffic volumes are reduced due to closure of Riverside Drive

Movement where traffic volumes are increased due to closure of Riverside Drive

Movement set to '0' due to closure of Riverside Drive (i.e. only local traffic)

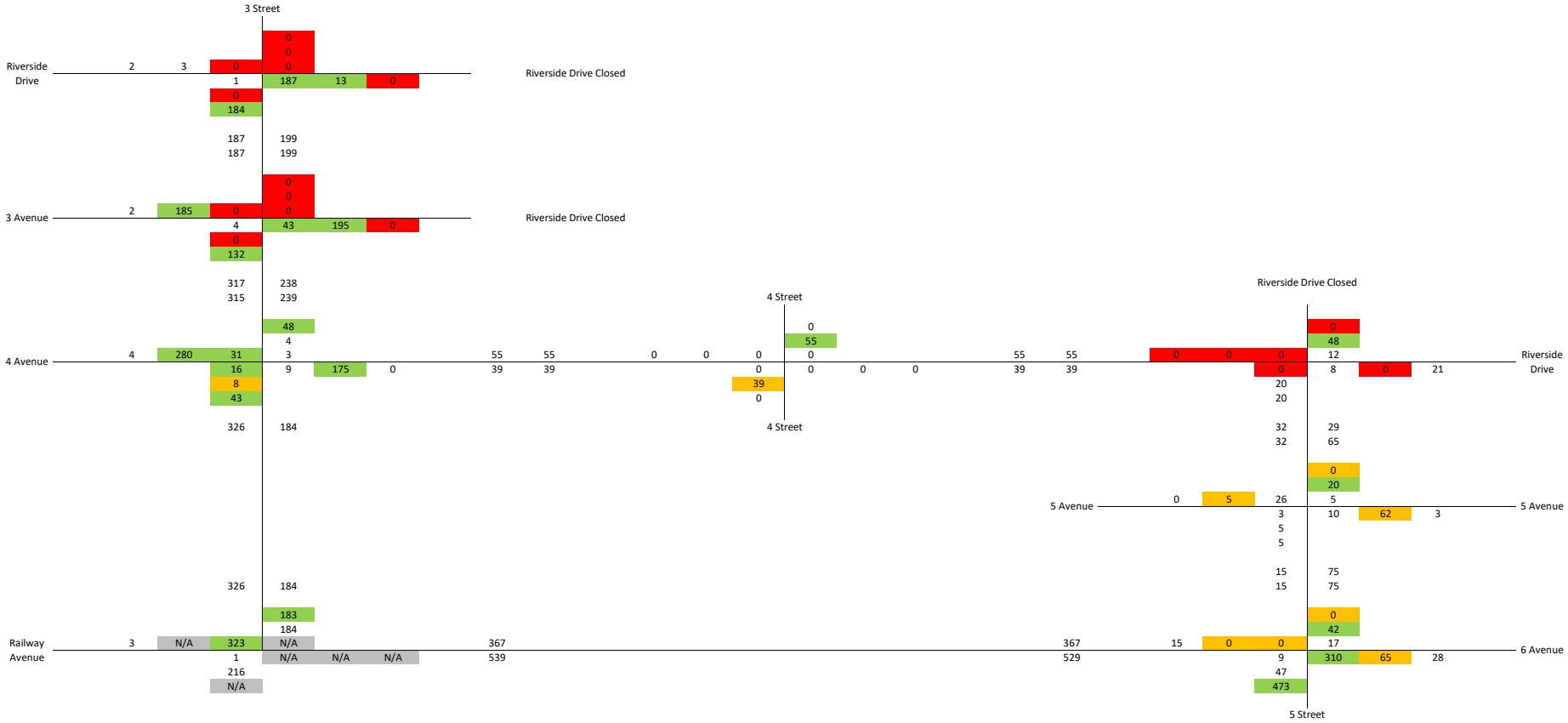
Traffic volumes will be diverted to using 3 Street and Railway Avenue to provide a through connection between Riverside Drive and 3 Street, and Riverside Drive and 5 Street / 4 Avenue

Due to imbalances between observed counts and rounding errors, some traffic volumes do not balance between intersections

Peak Hour Traffic Volumes

Scenario: Option 1 B Year: 2022

PM Peak Hour



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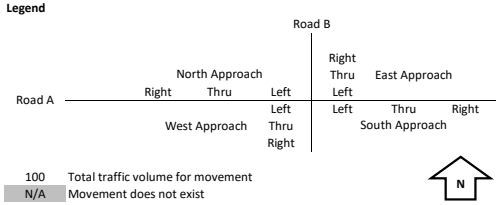

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N/A Movement does not exist

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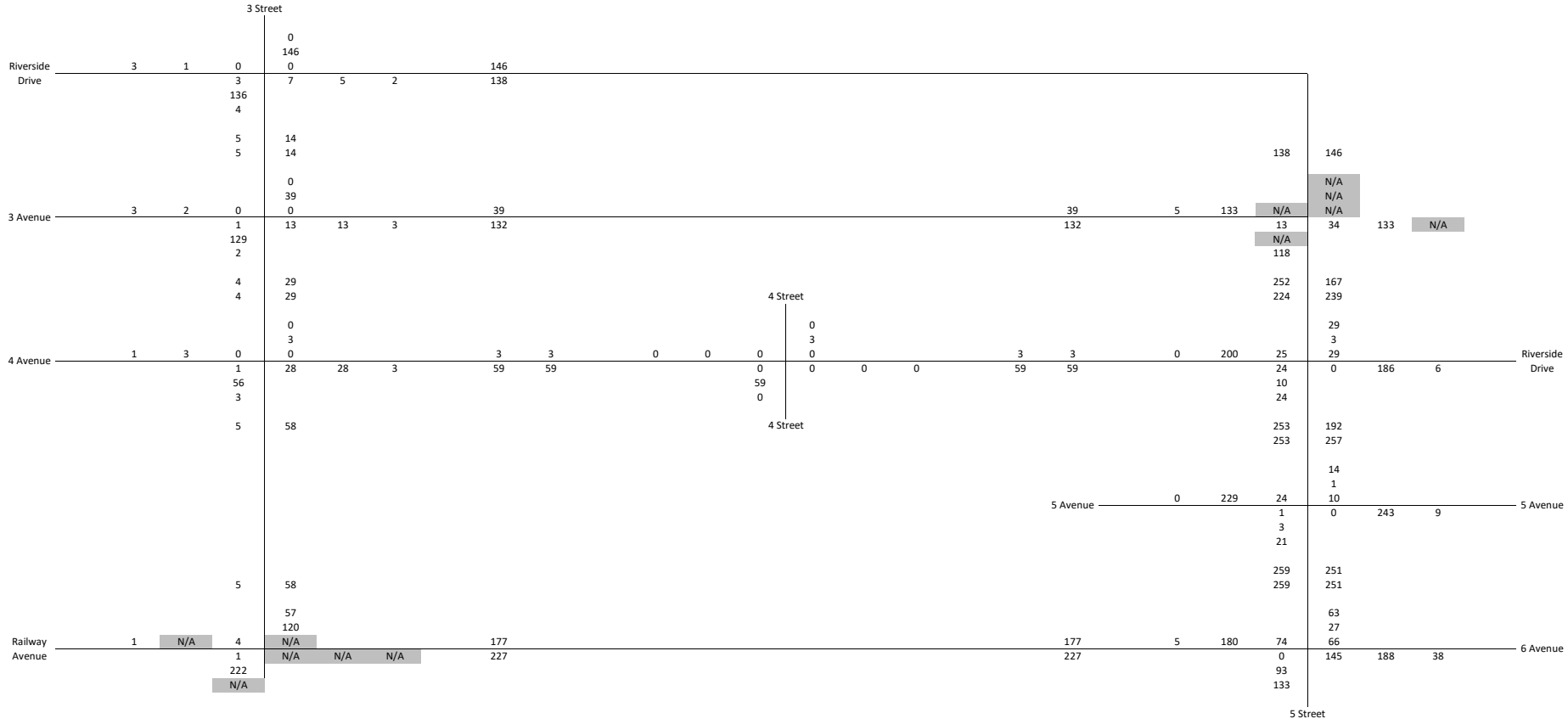
Peak Hour Traffic Volumes

Scenario: Pre-Closure, August Year: 2022

AM Peak Hour



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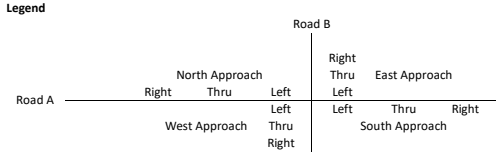


100 Total traffic volume for movement

N/A Movement does not exist

Notes and Assumptions

Based on Alberta Transportation 2020 counts, August is the highest traffic volume month

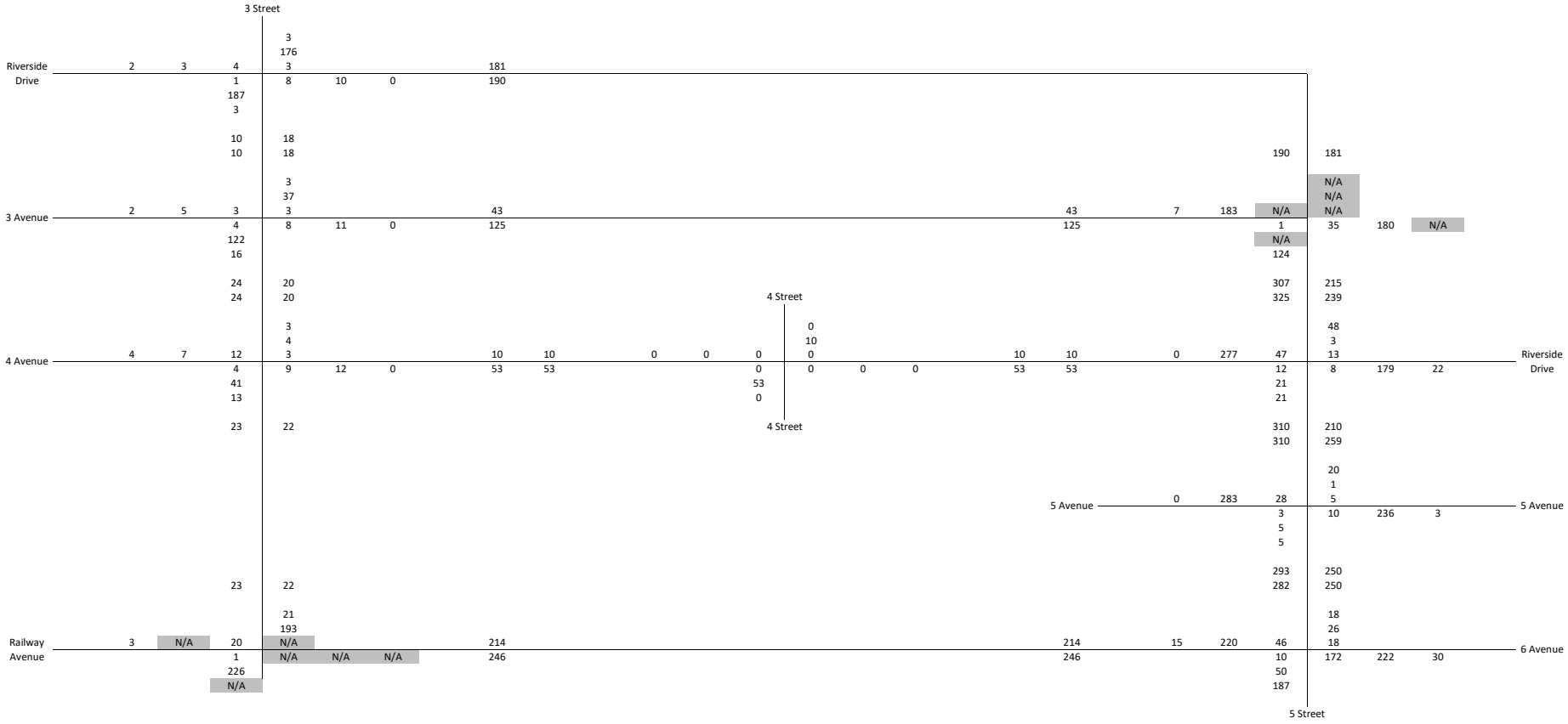
Month	AADT
July	3,011
August	3,159

4.92% greater between July and August traffic volumes

Peak Hour Traffic Volumes

Scenario: Pre-Closure, August Year: 2022

PM Peak Hour



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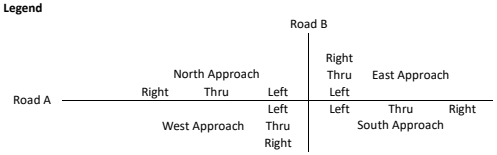


100 Total traffic volume for movement

N/A Movement does not exist

Notes and Assumptions

Based on Alberta Transportation 2020 counts, August is the highest traffic volume month

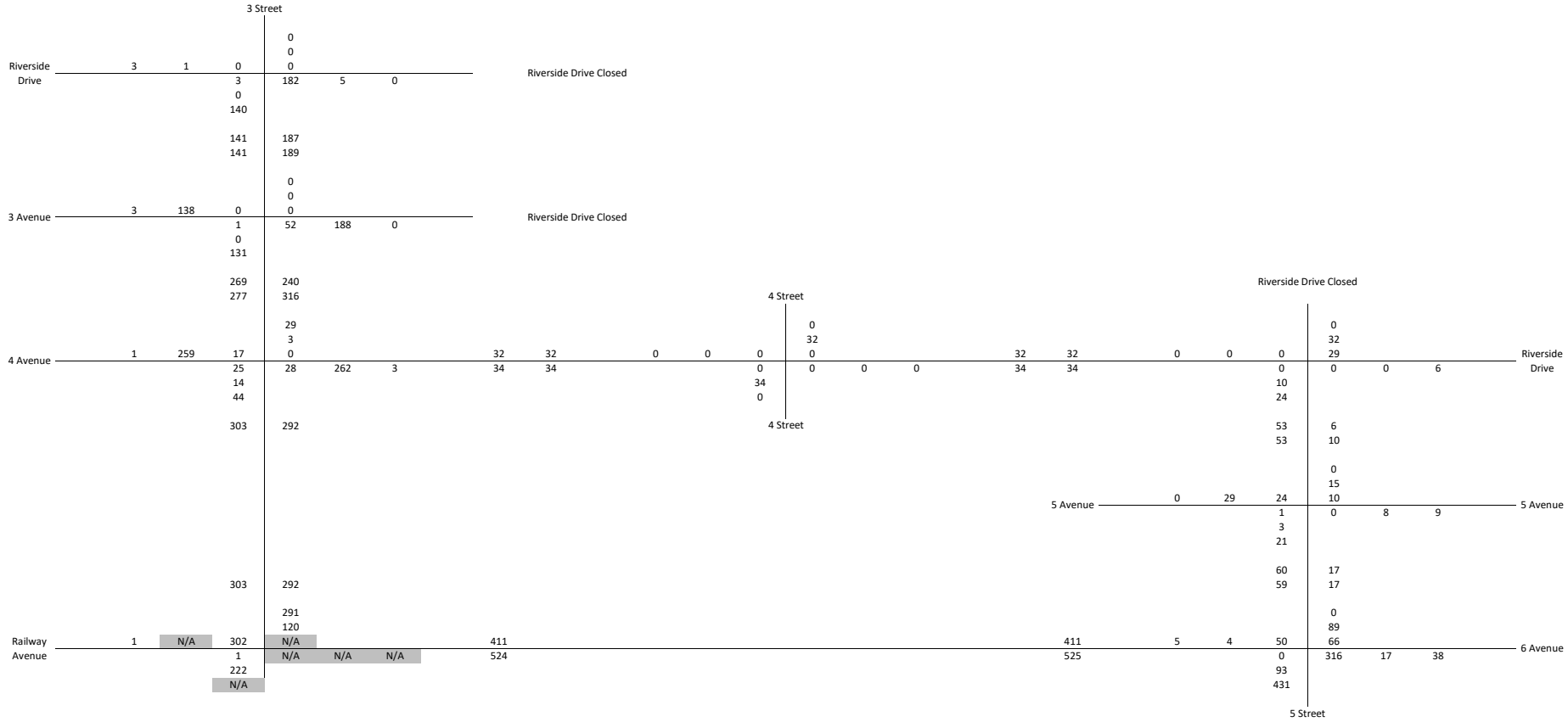
Month	AADT
July	3,011
August	3,159

4.92% greater between July and August traffic volumes

Peak Hour Traffic Volumes

Scenario: Post-Closure, August Year: 2022

AM Peak Hour



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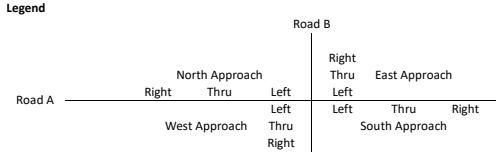

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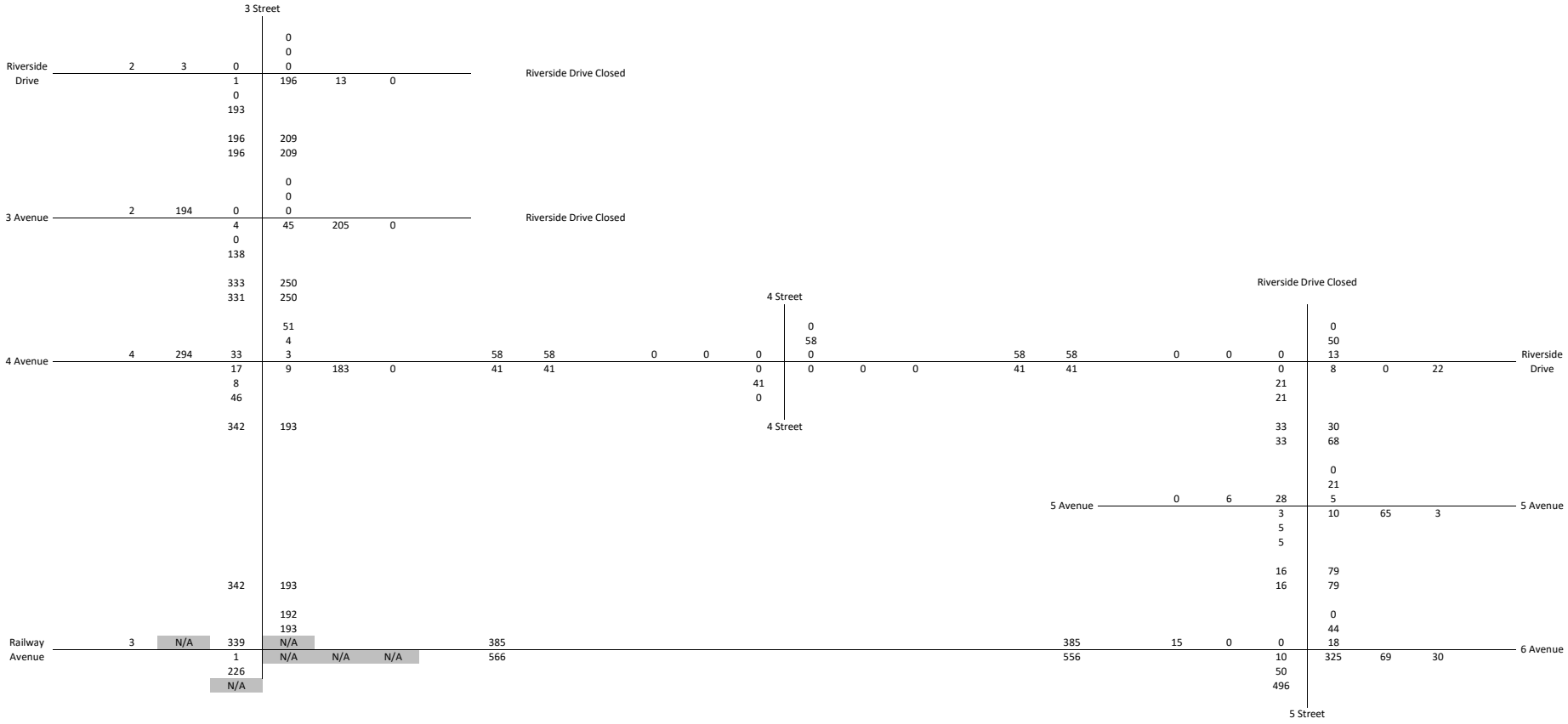

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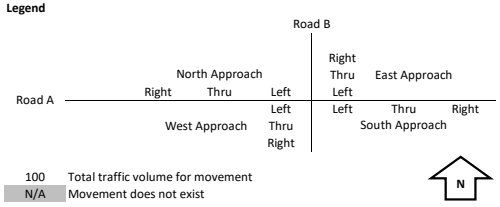

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Notes and Assumptions

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4.92% greater between July and August traffic volumes

Appendix D

Operational Analysis Reports

Intersection	
Int Delay, s/veh	3.6

Movement	EBL	EBR	NBL	NBT	SBT	SBR
Vol, veh/h	13	118	34	133	133	5
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	Yield	-	None	-	None
Storage Length	0	100	-	-	-	-
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	92	92	92	92	92	92
Heavy Vehicles, %	8	8	8	8	8	8
Mvmt Flow	14	128	37	145	145	5

Major/Minor	Minor2		Major1		Major2	
Conflicting Flow All	365	147	150	0	-	0
Stage 1	147	-	-	-	-	-
Stage 2	218	-	-	-	-	-
Critical Hdwy	6.48	6.28	4.18	-	-	-
Critical Hdwy Stg 1	5.48	-	-	-	-	-
Critical Hdwy Stg 2	5.48	-	-	-	-	-
Follow-up Hdwy	3.572	3.372	2.272	-	-	-
Pot Cap-1 Maneuver	623	884	1395	-	-	-
Stage 1	866	-	-	-	-	-
Stage 2	804	-	-	-	-	-
Platoon blocked, %				-	-	-
Mov Cap-1 Maneuver	605	884	1395	-	-	-
Mov Cap-2 Maneuver	605	-	-	-	-	-
Stage 1	866	-	-	-	-	-
Stage 2	781	-	-	-	-	-

Approach	EB	NB	SB
HCM Control Delay, s	9.9	1.6	0
HCM LOS	A		

Minor Lane/Major Mvmt	NBL	NBT	EBLn1	EBLn2	SBT	SBR
Capacity (veh/h)	1395	-	605	884	-	-
HCM Lane V/C Ratio	0.026	-	0.023	0.145	-	-
HCM Control Delay (s)	7.7	0	11.1	9.8	-	-
HCM Lane LOS	A	A	B	A	-	-
HCM 95th %tile Q(veh)	0.1	-	0.1	0.5	-	-

Intersection	
Int Delay, s/veh	1.7

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Vol, veh/h	1	129	2	0	39	0	13	13	3	0	2	3
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Free	Free	Stop	Stop	Stop	Stop	Stop	Stop
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	-	-	-	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	92	92	92	92	92	92	92	92	92	92	92	92
Heavy Vehicles, %	8	8	8	8	8	8	8	8	8	8	8	8
Mvmt Flow	1	140	2	0	42	0	14	14	3	0	2	3

Major/Minor	Major1			Major2			Minor1			Minor2		
Conflicting Flow All	42	0	0	142	0	0	188	185	141	194	187	42
Stage 1	-	-	-	-	-	-	143	143	-	42	42	-
Stage 2	-	-	-	-	-	-	45	42	-	152	145	-
Critical Hdwy	4.18	-	-	4.18	-	-	7.18	6.58	6.28	7.18	6.58	6.28
Critical Hdwy Stg 1	-	-	-	-	-	-	6.18	5.58	-	6.18	5.58	-
Critical Hdwy Stg 2	-	-	-	-	-	-	6.18	5.58	-	6.18	5.58	-
Follow-up Hdwy	2.272	-	-	2.272	-	-	3.572	4.072	3.372	3.572	4.072	3.372
Pot Cap-1 Maneuver	1529	-	-	1405	-	-	759	699	891	752	697	1012
Stage 1	-	-	-	-	-	-	846	767	-	957	848	-
Stage 2	-	-	-	-	-	-	954	848	-	836	766	-
Platoon blocked, %		-	-		-	-						
Mov Cap-1 Maneuver	1529	-	-	1405	-	-	754	698	891	737	696	1012
Mov Cap-2 Maneuver	-	-	-	-	-	-	754	698	-	737	696	-
Stage 1	-	-	-	-	-	-	845	766	-	956	848	-
Stage 2	-	-	-	-	-	-	948	848	-	817	765	-

Approach	EB	WB	NB	SB
HCM Control Delay, s	0.1	0	10.1	9.2
HCM LOS			B	A

Minor Lane/Major Mvmt	NBLn1	EBL	EBT	EBR	WBL	WBT	WBR	SBLn1
Capacity (veh/h)	739	1529	-	-	1405	-	-	856
HCM Lane V/C Ratio	0.043	0.001	-	-	-	-	-	0.006
HCM Control Delay (s)	10.1	7.4	0	-	0	-	-	9.2
HCM Lane LOS	B	A	A	-	A	-	-	A
HCM 95th %tile Q(veh)	0.1	0	-	-	0	-	-	0

Intersection	
Int Delay, s/veh	0.7

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Vol, veh/h	3	136	4	0	146	0	7	5	2	0	1	3
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Free	Free	Stop	Stop	Stop	Stop	Stop	Stop
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	-	-	-	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	92	92	92	92	92	92	92	92	92	92	92	92
Heavy Vehicles, %	8	8	8	8	8	8	8	8	8	8	8	8
Mvmt Flow	3	148	4	0	159	0	8	5	2	0	1	3

Major/Minor	Major1			Major2			Minor1			Minor2		
Conflicting Flow All	159	0	0	152	0	0	318	316	150	319	318	159
Stage 1	-	-	-	-	-	-	157	157	-	159	159	-
Stage 2	-	-	-	-	-	-	161	159	-	160	159	-
Critical Hdwy	4.18	-	-	4.18	-	-	7.18	6.58	6.28	7.18	6.58	6.28
Critical Hdwy Stg 1	-	-	-	-	-	-	6.18	5.58	-	6.18	5.58	-
Critical Hdwy Stg 2	-	-	-	-	-	-	6.18	5.58	-	6.18	5.58	-
Follow-up Hdwy	2.272	-	-	2.272	-	-	3.572	4.072	3.372	3.572	4.072	3.372
Pot Cap-1 Maneuver	1385	-	-	1393	-	-	623	590	881	622	589	871
Stage 1	-	-	-	-	-	-	831	756	-	829	755	-
Stage 2	-	-	-	-	-	-	827	755	-	828	755	-
Platoon blocked, %		-	-		-	-						
Mov Cap-1 Maneuver	1385	-	-	1393	-	-	619	589	881	615	588	871
Mov Cap-2 Maneuver	-	-	-	-	-	-	619	589	-	615	588	-
Stage 1	-	-	-	-	-	-	829	754	-	827	755	-
Stage 2	-	-	-	-	-	-	823	755	-	818	753	-

Approach	EB	WB	NB	SB
HCM Control Delay, s	0.2	0	10.8	9.7
HCM LOS			B	A

Minor Lane/Major Mvmt	NBLn1	EBL	EBT	EBR	WBL	WBT	WBR	SBLn1
Capacity (veh/h)	634	1385	-	-	1393	-	-	777
HCM Lane V/C Ratio	0.024	0.002	-	-	-	-	-	0.006
HCM Control Delay (s)	10.8	7.6	0	-	0	-	-	9.7
HCM Lane LOS	B	A	A	-	A	-	-	A
HCM 95th %tile Q(veh)	0.1	0	-	-	0	-	-	0

Intersection	
Int Delay, s/veh	0.1

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Vol, veh/h	1	222	120	57	4	1
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	-	-	0	-
Veh in Median Storage, #	-	0	0	-	0	-
Grade, %	-	0	0	-	0	-
Peak Hour Factor	92	92	92	92	92	92
Heavy Vehicles, %	8	8	8	8	8	8
Mvmt Flow	1	241	130	62	4	1

Major/Minor	Major1		Major2		Minor2	
Conflicting Flow All	192	0	-	0	404	161
Stage 1	-	-	-	-	161	-
Stage 2	-	-	-	-	243	-
Critical Hdwy	4.18	-	-	-	6.48	6.28
Critical Hdwy Stg 1	-	-	-	-	5.48	-
Critical Hdwy Stg 2	-	-	-	-	5.48	-
Follow-up Hdwy	2.272	-	-	-	3.572	3.372
Pot Cap-1 Maneuver	1346	-	-	-	591	869
Stage 1	-	-	-	-	853	-
Stage 2	-	-	-	-	784	-
Platoon blocked, %		-	-	-		
Mov Cap-1 Maneuver	1346	-	-	-	590	869
Mov Cap-2 Maneuver	-	-	-	-	590	-
Stage 1	-	-	-	-	853	-
Stage 2	-	-	-	-	783	-

Approach	EB	WB	SB
HCM Control Delay, s	0	0	10.8
HCM LOS			B

Minor Lane/Major Mvmt	EBL	EBT	WBT	WBR	SBLn1
Capacity (veh/h)	1346	-	-	-	630
HCM Lane V/C Ratio	0.001	-	-	-	0.009
HCM Control Delay (s)	7.7	0	-	-	10.8
HCM Lane LOS	A	A	-	-	B
HCM 95th %tile Q(veh)	0	-	-	-	0

Intersection	
Int Delay, s/veh	4.8

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Vol, veh/h	1	56	3	0	3	0	28	28	3	0	3	1
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Free	Free	Stop	Stop	Stop	Stop	Stop	Stop
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	-	-	-	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	92	92	92	92	92	92	92	92	92	92	92	92
Heavy Vehicles, %	8	8	8	8	8	8	8	8	8	8	8	8
Mvmt Flow	1	61	3	0	3	0	30	30	3	0	3	1

Major/Minor	Major1			Major2			Minor1			Minor2		
Conflicting Flow All	3	0	0	64	0	0	70	68	63	85	69	3
Stage 1	-	-	-	-	-	-	65	65	-	3	3	-
Stage 2	-	-	-	-	-	-	5	3	-	82	66	-
Critical Hdwy	4.18	-	-	4.18	-	-	7.18	6.58	6.28	7.18	6.58	6.28
Critical Hdwy Stg 1	-	-	-	-	-	-	6.18	5.58	-	6.18	5.58	-
Critical Hdwy Stg 2	-	-	-	-	-	-	6.18	5.58	-	6.18	5.58	-
Follow-up Hdwy	2.272	-	-	2.272	-	-	3.572	4.072	3.372	3.572	4.072	3.372
Pot Cap-1 Maneuver	1580	-	-	1501	-	-	907	811	985	887	810	1064
Stage 1	-	-	-	-	-	-	931	829	-	1004	881	-
Stage 2	-	-	-	-	-	-	1002	881	-	912	828	-
Platoon blocked, %		-	-		-	-						
Mov Cap-1 Maneuver	1580	-	-	1501	-	-	903	810	985	858	809	1064
Mov Cap-2 Maneuver	-	-	-	-	-	-	903	810	-	858	809	-
Stage 1	-	-	-	-	-	-	930	828	-	1003	881	-
Stage 2	-	-	-	-	-	-	997	881	-	875	827	-

Approach	EB	WB	NB	SB
HCM Control Delay, s	0.1	0	9.5	9.2
HCM LOS			A	A

Minor Lane/Major Mvmt	NBLn1	EBL	EBT	EBR	WBL	WBT	WBR	SBLn1
Capacity (veh/h)	860	1580	-	-	1501	-	-	861
HCM Lane V/C Ratio	0.075	0.001	-	-	-	-	-	0.005
HCM Control Delay (s)	9.5	7.3	0	-	0	-	-	9.2
HCM Lane LOS	A	A	A	-	A	-	-	A
HCM 95th %tile Q(veh)	0.2	0	-	-	0	-	-	0

Intersection	
Int Delay, s/veh	3.1

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Vol, veh/h	24	10	24	29	3	29	0	186	6	25	200	0
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop	Free	Free	Free	Free	Free	Free
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	-	-	-	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	92	92	92	92	92	92	92	92	92	92	92	92
Heavy Vehicles, %	8	8	8	8	8	8	8	8	8	8	8	8
Mvmt Flow	26	11	26	32	3	32	0	202	7	27	217	0

Major/Minor	Minor2			Minor1			Major1			Major2		
Conflicting Flow All	495	481	217	495	477	205	217	0	0	209	0	0
Stage 1	272	272	-	205	205	-	-	-	-	-	-	-
Stage 2	223	209	-	290	272	-	-	-	-	-	-	-
Critical Hdwy	7.18	6.58	6.28	7.18	6.58	6.28	4.18	-	-	4.18	-	-
Critical Hdwy Stg 1	6.18	5.58	-	6.18	5.58	-	-	-	-	-	-	-
Critical Hdwy Stg 2	6.18	5.58	-	6.18	5.58	-	-	-	-	-	-	-
Follow-up Hdwy	3.572	4.072	3.372	3.572	4.072	3.372	2.272	-	-	2.272	-	-
Pot Cap-1 Maneuver	475	476	808	475	478	821	1318	-	-	1327	-	-
Stage 1	721	674	-	783	721	-	-	-	-	-	-	-
Stage 2	766	718	-	705	674	-	-	-	-	-	-	-
Platoon blocked, %								-	-		-	-
Mov Cap-1 Maneuver	446	465	808	444	467	821	1318	-	-	1327	-	-
Mov Cap-2 Maneuver	446	465	-	444	467	-	-	-	-	-	-	-
Stage 1	721	658	-	783	721	-	-	-	-	-	-	-
Stage 2	733	718	-	656	658	-	-	-	-	-	-	-

Approach	EB	WB	NB	SB
HCM Control Delay, s	12.4	12.1	0	0.9
HCM LOS	B	B		

Minor Lane/Major Mvmt	NBL	NBT	NBR	EBLn1	WBLn1	SBL	SBT	SBR
Capacity (veh/h)	1318	-	-	552	570	1327	-	-
HCM Lane V/C Ratio	-	-	-	0.114	0.116	0.02	-	-
HCM Control Delay (s)	0	-	-	12.4	12.1	7.8	0	-
HCM Lane LOS	A	-	-	B	B	A	A	-
HCM 95th %tile Q(veh)	0	-	-	0.4	0.4	0.1	-	-

Intersection	
Int Delay, s/veh	1.4

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Vol, veh/h	1	3	21	10	1	14	0	243	9	24	229	0
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop	Free	Free	Free	Free	Free	Free
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	-	-	-	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	92	92	92	92	92	92	92	92	92	92	92	92
Heavy Vehicles, %	8	8	8	8	8	8	8	8	8	8	8	8
Mvmt Flow	1	3	23	11	1	15	0	264	10	26	249	0

Major/Minor	Minor2			Minor1			Major1			Major2		
Conflicting Flow All	578	575	249	583	570	269	249	0	0	274	0	0
Stage 1	301	301	-	269	269	-	-	-	-	-	-	-
Stage 2	277	274	-	314	301	-	-	-	-	-	-	-
Critical Hdwy	7.18	6.58	6.28	7.18	6.58	6.28	4.18	-	-	4.18	-	-
Critical Hdwy Stg 1	6.18	5.58	-	6.18	5.58	-	-	-	-	-	-	-
Critical Hdwy Stg 2	6.18	5.58	-	6.18	5.58	-	-	-	-	-	-	-
Follow-up Hdwy	3.572	4.072	3.372	3.572	4.072	3.372	2.272	-	-	2.272	-	-
Pot Cap-1 Maneuver	418	420	775	415	423	755	1282	-	-	1255	-	-
Stage 1	695	654	-	724	676	-	-	-	-	-	-	-
Stage 2	716	672	-	684	654	-	-	-	-	-	-	-
Platoon blocked, %								-	-		-	-
Mov Cap-1 Maneuver	401	410	775	393	413	755	1282	-	-	1255	-	-
Mov Cap-2 Maneuver	401	410	-	393	413	-	-	-	-	-	-	-
Stage 1	695	638	-	724	676	-	-	-	-	-	-	-
Stage 2	700	672	-	645	638	-	-	-	-	-	-	-

Approach	EB	WB	NB	SB
HCM Control Delay, s	10.5	12	0	0.8
HCM LOS	B	B		

Minor Lane/Major Mvmt	NBL	NBT	NBR	EBLn1	WBLn1	SBL	SBT	SBR
Capacity (veh/h)	1282	-	-	677	539	1255	-	-
HCM Lane V/C Ratio	-	-	-	0.04	0.05	0.021	-	-
HCM Control Delay (s)	0	-	-	10.5	12	7.9	0	-
HCM Lane LOS	A	-	-	B	B	A	A	-
HCM 95th %tile Q(veh)	0	-	-	0.1	0.2	0.1	-	-

Intersection	
Intersection Delay, s/veh	16.3
Intersection LOS	C

Movement	EBU	EBL	EBT	EBR	WBU	WBL	WBT	WBR	NBU	NBL	NBT	NBR	SBU	SBL	SBT	SBR
Vol, veh/h	0	0	93	133	0	66	27	63	0	145	188	38	0	74	180	5
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	0.92	0.92	0.92	0.92
Heavy Vehicles, %	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8
Mvmt Flow	0	0	101	145	0	72	29	68	0	158	204	41	0	80	196	5
Number of Lanes	0	0	1	0	0	0	1	0	0	0	1	0	0	0	1	0

Approach	EB	WB	NB	SB
Opposing Approach	WB	EB	SB	NB
Opposing Lanes	1	1	1	1
Conflicting Approach Left	SB	NB	EB	WB
Conflicting Lanes Left	1	1	1	1
Conflicting Approach Right	NB	SB	WB	EB
Conflicting Lanes Right	1	1	1	1
HCM Control Delay	13.7	12.6	20.4	15.1
HCM LOS	B	B	C	C

Lane	NBLn1	EBLn1	WBLn1	SBLn1
Vol Left, %	39%	0%	42%	29%
Vol Thru, %	51%	41%	17%	69%
Vol Right, %	10%	59%	40%	2%
Sign Control	Stop	Stop	Stop	Stop
Traffic Vol by Lane	371	226	156	259
LT Vol	145	0	66	74
Through Vol	188	93	27	180
RT Vol	38	133	63	5
Lane Flow Rate	403	246	170	282
Geometry Grp	1	1	1	1
Degree of Util (X)	0.67	0.422	0.309	0.488
Departure Headway (Hd)	5.981	6.185	6.566	6.238
Convergence, Y/N	Yes	Yes	Yes	Yes
Cap	605	582	546	577
Service Time	4.021	4.232	4.619	4.283
HCM Lane V/C Ratio	0.666	0.423	0.311	0.489
HCM Control Delay	20.4	13.7	12.6	15.1
HCM Lane LOS	C	B	B	C
HCM 95th-tile Q	5.1	2.1	1.3	2.7

Intersection	
Int Delay, s/veh	2.9

Movement	EBL	EBR	NBL	NBT	SBT	SBR
Vol, veh/h	2	124	35	180	183	7
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	Yield	-	None	-	None
Storage Length	0	100	-	-	-	-
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	92	92	92	92	92	92
Heavy Vehicles, %	8	8	8	8	8	8
Mvmt Flow	2	135	38	196	199	8

Major/Minor	Minor2		Major1		Major2	
Conflicting Flow All	475	203	207	0	-	0
Stage 1	203	-	-	-	-	-
Stage 2	272	-	-	-	-	-
Critical Hdwy	6.48	6.28	4.18	-	-	-
Critical Hdwy Stg 1	5.48	-	-	-	-	-
Critical Hdwy Stg 2	5.48	-	-	-	-	-
Follow-up Hdwy	3.572	3.372	2.272	-	-	-
Pot Cap-1 Maneuver	538	823	1329	-	-	-
Stage 1	817	-	-	-	-	-
Stage 2	760	-	-	-	-	-
Platoon blocked, %				-	-	-
Mov Cap-1 Maneuver	521	823	1329	-	-	-
Mov Cap-2 Maneuver	521	-	-	-	-	-
Stage 1	817	-	-	-	-	-
Stage 2	736	-	-	-	-	-

Approach	EB	NB	SB
HCM Control Delay, s	10.2	1.3	0
HCM LOS	B		

Minor Lane/Major Mvmt	NBL	NBT	EBLn1	EBLn2	SBT	SBR
Capacity (veh/h)	1329	-	521	823	-	-
HCM Lane V/C Ratio	0.029	-	0.004	0.164	-	-
HCM Control Delay (s)	7.8	0	11.9	10.2	-	-
HCM Lane LOS	A	A	B	B	-	-
HCM 95th %tile Q(veh)	0.1	-	0	0.6	-	-

Intersection	
Int Delay, s/veh	1.6

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Vol, veh/h	4	122	16	3	37	3	8	11	0	3	5	2
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Free	Free	Stop	Stop	Stop	Stop	Stop	Stop
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	-	-	-	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	92	92	92	92	92	92	92	92	92	92	92	92
Heavy Vehicles, %	8	8	8	8	8	8	8	8	8	8	8	8
Mvmt Flow	4	133	17	3	40	3	9	12	0	3	5	2

Major/Minor	Major1			Major2			Minor1			Minor2		
Conflicting Flow All	43	0	0	150	0	0	202	200	141	204	207	42
Stage 1	-	-	-	-	-	-	150	150	-	48	48	-
Stage 2	-	-	-	-	-	-	52	50	-	156	159	-
Critical Hdwy	4.18	-	-	4.18	-	-	7.18	6.58	6.28	7.18	6.58	6.28
Critical Hdwy Stg 1	-	-	-	-	-	-	6.18	5.58	-	6.18	5.58	-
Critical Hdwy Stg 2	-	-	-	-	-	-	6.18	5.58	-	6.18	5.58	-
Follow-up Hdwy	2.272	-	-	2.272	-	-	3.572	4.072	3.372	3.572	4.072	3.372
Pot Cap-1 Maneuver	1528	-	-	1395	-	-	743	685	891	741	679	1012
Stage 1	-	-	-	-	-	-	838	762	-	950	843	-
Stage 2	-	-	-	-	-	-	946	842	-	832	755	-
Platoon blocked, %		-	-		-	-						
Mov Cap-1 Maneuver	1528	-	-	1395	-	-	734	682	891	728	676	1012
Mov Cap-2 Maneuver	-	-	-	-	-	-	734	682	-	728	676	-
Stage 1	-	-	-	-	-	-	835	760	-	947	841	-
Stage 2	-	-	-	-	-	-	936	840	-	816	753	-

Approach	EB	WB	NB	SB
HCM Control Delay, s	0.2	0.5	10.3	9.9
HCM LOS			B	A

Minor Lane/Major Mvmt	NBLn1	EBL	EBT	EBR	WBL	WBT	WBR	SBLn1
Capacity (veh/h)	703	1528	-	-	1395	-	-	741
HCM Lane V/C Ratio	0.029	0.003	-	-	0.002	-	-	0.015
HCM Control Delay (s)	10.3	7.4	0	-	7.6	0	-	9.9
HCM Lane LOS	B	A	A	-	A	A	-	A
HCM 95th %tile Q(veh)	0.1	0	-	-	0	-	-	0

Intersection	
Int Delay, s/veh	0.8

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Vol, veh/h	1	187	3	3	176	3	8	10	0	4	3	2
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Free	Free	Stop	Stop	Stop	Stop	Stop	Stop
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	-	-	-	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	92	92	92	92	92	92	92	92	92	92	92	92
Heavy Vehicles, %	8	8	8	8	8	8	8	8	8	8	8	8
Mvmt Flow	1	203	3	3	191	3	9	11	0	4	3	2

Major/Minor	Major1			Major2			Minor1			Minor2		
Conflicting Flow All	195	0	0	207	0	0	409	408	205	412	408	193
Stage 1	-	-	-	-	-	-	207	207	-	199	199	-
Stage 2	-	-	-	-	-	-	202	201	-	213	209	-
Critical Hdwy	4.18	-	-	4.18	-	-	7.18	6.58	6.28	7.18	6.58	6.28
Critical Hdwy Stg 1	-	-	-	-	-	-	6.18	5.58	-	6.18	5.58	-
Critical Hdwy Stg 2	-	-	-	-	-	-	6.18	5.58	-	6.18	5.58	-
Follow-up Hdwy	2.272	-	-	2.272	-	-	3.572	4.072	3.372	3.572	4.072	3.372
Pot Cap-1 Maneuver	1343	-	-	1329	-	-	542	524	821	540	524	833
Stage 1	-	-	-	-	-	-	781	719	-	789	725	-
Stage 2	-	-	-	-	-	-	786	724	-	776	718	-
Platoon blocked, %		-	-		-	-						
Mov Cap-1 Maneuver	1343	-	-	1329	-	-	536	522	821	530	522	833
Mov Cap-2 Maneuver	-	-	-	-	-	-	536	522	-	530	522	-
Stage 1	-	-	-	-	-	-	780	718	-	788	723	-
Stage 2	-	-	-	-	-	-	778	722	-	763	717	-

Approach	EB	WB	NB	SB
HCM Control Delay, s	0	0.1	12.1	11.4
HCM LOS			B	B

Minor Lane/Major Mvmt	NBLn1	EBL	EBT	EBR	WBL	WBT	WBR	SBLn1
Capacity (veh/h)	528	1343	-	-	1329	-	-	573
HCM Lane V/C Ratio	0.037	0.001	-	-	0.002	-	-	0.017
HCM Control Delay (s)	12.1	7.7	0	-	7.7	0	-	11.4
HCM Lane LOS	B	A	A	-	A	A	-	B
HCM 95th %tile Q(veh)	0.1	0	-	-	0	-	-	0.1

Intersection	
Int Delay, s/veh	0.6

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Vol, veh/h	1	226	193	21	20	3
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	-	-	0	-
Veh in Median Storage, #	-	0	0	-	0	-
Grade, %	-	0	0	-	0	-
Peak Hour Factor	92	92	92	92	92	92
Heavy Vehicles, %	8	8	8	8	8	8
Mvmt Flow	1	246	210	23	22	3

Major/Minor	Major1		Major2		Minor2	
Conflicting Flow All	233	0	-	0	469	221
Stage 1	-	-	-	-	221	-
Stage 2	-	-	-	-	248	-
Critical Hdwy	4.18	-	-	-	6.48	6.28
Critical Hdwy Stg 1	-	-	-	-	5.48	-
Critical Hdwy Stg 2	-	-	-	-	5.48	-
Follow-up Hdwy	2.272	-	-	-	3.572	3.372
Pot Cap-1 Maneuver	1300	-	-	-	542	804
Stage 1	-	-	-	-	802	-
Stage 2	-	-	-	-	779	-
Platoon blocked, %		-	-	-		
Mov Cap-1 Maneuver	1300	-	-	-	541	804
Mov Cap-2 Maneuver	-	-	-	-	541	-
Stage 1	-	-	-	-	802	-
Stage 2	-	-	-	-	778	-

Approach	EB	WB	SB
HCM Control Delay, s	0	0	11.7
HCM LOS			B

Minor Lane/Major Mvmt	EBL	EBT	WBT	WBR	SBLn1
Capacity (veh/h)	1300	-	-	-	565
HCM Lane V/C Ratio	0.001	-	-	-	0.044
HCM Control Delay (s)	7.8	0	-	-	11.7
HCM Lane LOS	A	A	-	-	B
HCM 95th %tile Q(veh)	0	-	-	-	0.1

Intersection	
Int Delay, s/veh	4.1

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Vol, veh/h	4	41	13	3	4	3	9	12	0	12	7	4
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Free	Free	Stop	Stop	Stop	Stop	Stop	Stop
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	-	-	-	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	92	92	92	92	92	92	92	92	92	92	92	92
Heavy Vehicles, %	8	8	8	8	8	8	8	8	8	8	8	8
Mvmt Flow	4	45	14	3	4	3	10	13	0	13	8	4

Major/Minor	Major1			Major2			Minor1			Minor2		
Conflicting Flow All	8	0	0	59	0	0	78	74	52	80	80	6
Stage 1	-	-	-	-	-	-	60	60	-	13	13	-
Stage 2	-	-	-	-	-	-	18	14	-	67	67	-
Critical Hdwy	4.18	-	-	4.18	-	-	7.18	6.58	6.28	7.18	6.58	6.28
Critical Hdwy Stg 1	-	-	-	-	-	-	6.18	5.58	-	6.18	5.58	-
Critical Hdwy Stg 2	-	-	-	-	-	-	6.18	5.58	-	6.18	5.58	-
Follow-up Hdwy	2.272	-	-	2.272	-	-	3.572	4.072	3.372	3.572	4.072	3.372
Pot Cap-1 Maneuver	1574	-	-	1507	-	-	896	805	999	894	799	1059
Stage 1	-	-	-	-	-	-	937	833	-	992	873	-
Stage 2	-	-	-	-	-	-	986	872	-	929	827	-
Platoon blocked, %		-	-		-	-						
Mov Cap-1 Maneuver	1574	-	-	1507	-	-	882	801	999	880	795	1059
Mov Cap-2 Maneuver	-	-	-	-	-	-	882	801	-	880	795	-
Stage 1	-	-	-	-	-	-	934	831	-	989	871	-
Stage 2	-	-	-	-	-	-	971	870	-	912	825	-

Approach	EB	WB	NB	SB
HCM Control Delay, s	0.5	2.2	9.4	9.2
HCM LOS			A	A

Minor Lane/Major Mvmt	NBLn1	EBL	EBT	EBR	WBL	WBT	WBR	SBLn1
Capacity (veh/h)	834	1574	-	-	1507	-	-	877
HCM Lane V/C Ratio	0.027	0.003	-	-	0.002	-	-	0.029
HCM Control Delay (s)	9.4	7.3	0	-	7.4	0	-	9.2
HCM Lane LOS	A	A	A	-	A	A	-	A
HCM 95th %tile Q(veh)	0.1	0	-	-	0	-	-	0.1

Intersection	
Int Delay, s/veh	3

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Vol, veh/h	12	21	21	13	3	48	8	179	22	47	277	0
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop	Free	Free	Free	Free	Free	Free
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	-	-	-	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	92	92	92	92	92	92	92	92	92	92	92	92
Heavy Vehicles, %	8	8	8	8	8	8	8	8	8	8	8	8
Mvmt Flow	13	23	23	14	3	52	9	195	24	51	301	0

Major/Minor	Minor2			Minor1			Major1			Major2		
Conflicting Flow All	655	639	301	650	627	207	301	0	0	218	0	0
Stage 1	403	403	-	224	224	-	-	-	-	-	-	-
Stage 2	252	236	-	426	403	-	-	-	-	-	-	-
Critical Hdwy	7.18	6.58	6.28	7.18	6.58	6.28	4.18	-	-	4.18	-	-
Critical Hdwy Stg 1	6.18	5.58	-	6.18	5.58	-	-	-	-	-	-	-
Critical Hdwy Stg 2	6.18	5.58	-	6.18	5.58	-	-	-	-	-	-	-
Follow-up Hdwy	3.572	4.072	3.372	3.572	4.072	3.372	2.272	-	-	2.272	-	-
Pot Cap-1 Maneuver	371	386	725	374	392	818	1227	-	-	1317	-	-
Stage 1	612	589	-	765	707	-	-	-	-	-	-	-
Stage 2	739	699	-	595	589	-	-	-	-	-	-	-
Platoon blocked, %								-	-		-	-
Mov Cap-1 Maneuver	331	365	725	331	371	818	1227	-	-	1317	-	-
Mov Cap-2 Maneuver	331	365	-	331	371	-	-	-	-	-	-	-
Stage 1	607	561	-	759	701	-	-	-	-	-	-	-
Stage 2	683	693	-	527	561	-	-	-	-	-	-	-

Approach	EB	WB	NB	SB
HCM Control Delay, s	14.4	11.7	0.3	1.1
HCM LOS	B	B		

Minor Lane/Major Mvmt	NBL	NBT	NBR	EBLn1	WBLn1	SBL	SBT	SBR
Capacity (veh/h)	1227	-	-	440	604	1317	-	-
HCM Lane V/C Ratio	0.007	-	-	0.133	0.115	0.039	-	-
HCM Control Delay (s)	8	0	-	14.4	11.7	7.8	0	-
HCM Lane LOS	A	A	-	B	B	A	A	-
HCM 95th %tile Q(veh)	0	-	-	0.5	0.4	0.1	-	-

Intersection	
Int Delay, s/veh	1.3

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Vol, veh/h	3	5	5	5	1	20	10	236	3	28	283	0
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop	Free	Free	Free	Free	Free	Free
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	-	-	-	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	92	92	92	92	92	92	92	92	92	92	92	92
Heavy Vehicles, %	8	8	8	8	8	8	8	8	8	8	8	8
Mvmt Flow	3	5	5	5	1	22	11	257	3	30	308	0

Major/Minor	Minor2			Minor1			Major1			Major2		
Conflicting Flow All	659	650	308	654	648	258	308	0	0	260	0	0
Stage 1	368	368	-	280	280	-	-	-	-	-	-	-
Stage 2	291	282	-	374	368	-	-	-	-	-	-	-
Critical Hdwy	7.18	6.58	6.28	7.18	6.58	6.28	4.18	-	-	4.18	-	-
Critical Hdwy Stg 1	6.18	5.58	-	6.18	5.58	-	-	-	-	-	-	-
Critical Hdwy Stg 2	6.18	5.58	-	6.18	5.58	-	-	-	-	-	-	-
Follow-up Hdwy	3.572	4.072	3.372	3.572	4.072	3.372	2.272	-	-	2.272	-	-
Pot Cap-1 Maneuver	369	381	718	372	382	766	1219	-	-	1270	-	-
Stage 1	640	611	-	714	668	-	-	-	-	-	-	-
Stage 2	704	667	-	635	611	-	-	-	-	-	-	-
Platoon blocked, %								-	-		-	-
Mov Cap-1 Maneuver	347	366	718	354	367	766	1219	-	-	1270	-	-
Mov Cap-2 Maneuver	347	366	-	354	367	-	-	-	-	-	-	-
Stage 1	633	594	-	706	661	-	-	-	-	-	-	-
Stage 2	675	660	-	607	594	-	-	-	-	-	-	-

Approach	EB	WB	NB	SB
HCM Control Delay, s	13.4	11.2	0.3	0.7
HCM LOS	B	B		

Minor Lane/Major Mvmt	NBL	NBT	NBR	EBLn1	WBLn1	SBL	SBT	SBR
Capacity (veh/h)	1219	-	-	444	605	1270	-	-
HCM Lane V/C Ratio	0.009	-	-	0.032	0.047	0.024	-	-
HCM Control Delay (s)	8	0	-	13.4	11.2	7.9	0	-
HCM Lane LOS	A	A	-	B	B	A	A	-
HCM 95th %tile Q(veh)	0	-	-	0.1	0.1	0.1	-	-

Intersection	
Intersection Delay, s/veh	17.2
Intersection LOS	C

Movement	EBU	EBL	EBT	EBR	WBU	WBL	WBT	WBR	NBU	NBL	NBT	NBR	SBU	SBL	SBT	SBR
Vol, veh/h	0	10	50	187	0	18	26	18	0	172	222	30	0	46	220	15
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	0.92	0.92	0.92	0.92
Heavy Vehicles, %	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8
Mvmt Flow	0	11	54	203	0	20	28	20	0	187	241	33	0	50	239	16
Number of Lanes	0	0	1	0	0	0	1	0	0	0	1	0	0	0	1	0

Approach	EB	WB	NB	SB
Opposing Approach	WB	EB	SB	NB
Opposing Lanes	1	1	1	1
Conflicting Approach Left	SB	NB	EB	WB
Conflicting Lanes Left	1	1	1	1
Conflicting Approach Right	NB	SB	WB	EB
Conflicting Lanes Right	1	1	1	1
HCM Control Delay	13.4	10.8	22	14.6
HCM LOS	B	B	C	B

Lane	NBLn1	EBLn1	WBLn1	SBLn1
Vol Left, %	41%	4%	29%	16%
Vol Thru, %	52%	20%	42%	78%
Vol Right, %	7%	76%	29%	5%
Sign Control	Stop	Stop	Stop	Stop
Traffic Vol by Lane	424	247	62	281
LT Vol	172	10	18	46
Through Vol	222	50	26	220
RT Vol	30	187	18	15
Lane Flow Rate	461	268	67	305
Geometry Grp	1	1	1	1
Degree of Util (X)	0.72	0.436	0.127	0.495
Departure Headway (Hd)	5.628	5.848	6.799	5.834
Convergence, Y/N	Yes	Yes	Yes	Yes
Cap	636	609	530	614
Service Time	3.703	3.935	4.799	3.919
HCM Lane V/C Ratio	0.725	0.44	0.126	0.497
HCM Control Delay	22	13.4	10.8	14.6
HCM Lane LOS	C	B	B	B
HCM 95th-tile Q	6.1	2.2	0.4	2.7

Intersection	
Int Delay, s/veh	8.7

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Vol, veh/h	1	0	131	0	1	0	52	188	0	0	138	3
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Free	Free	Stop	Stop	Stop	Stop	Stop	Stop
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	-	-	-	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	92	92	92	92	92	92	92	92	92	92	92	92
Heavy Vehicles, %	8	8	8	8	8	8	8	8	8	8	8	8
Mvmt Flow	1	0	142	0	1	0	57	204	0	0	150	3

Major/Minor	Major1			Major2			Minor1			Minor2		
Conflicting Flow All	1	0	0	142	0	0	151	74	71	177	146	1
Stage 1	-	-	-	-	-	-	73	73	-	1	1	-
Stage 2	-	-	-	-	-	-	78	1	-	176	145	-
Critical Hdwy	4.18	-	-	4.18	-	-	7.18	6.58	6.28	7.18	6.58	6.28
Critical Hdwy Stg 1	-	-	-	-	-	-	6.18	5.58	-	6.18	5.58	-
Critical Hdwy Stg 2	-	-	-	-	-	-	6.18	5.58	-	6.18	5.58	-
Follow-up Hdwy	2.272	-	-	2.272	-	-	3.572	4.072	3.372	3.572	4.072	3.372
Pot Cap-1 Maneuver	1583	-	-	1405	-	-	803	805	975	772	734	1066
Stage 1	-	-	-	-	-	-	922	823	-	1007	883	-
Stage 2	-	-	-	-	-	-	916	883	-	812	766	-
Platoon blocked, %		-	-		-	-						
Mov Cap-1 Maneuver	1583	-	-	1405	-	-	674	804	975	620	733	1066
Mov Cap-2 Maneuver	-	-	-	-	-	-	674	804	-	620	733	-
Stage 1	-	-	-	-	-	-	921	822	-	1006	883	-
Stage 2	-	-	-	-	-	-	758	883	-	610	765	-

Approach	EB	WB	NB	SB
HCM Control Delay, s	0.1	0	12	11.2
HCM LOS			B	B

Minor Lane/Major Mvmt	NBLn1	EBL	EBT	EBR	WBL	WBT	WBR	SBLn1
Capacity (veh/h)	772	1583	-	-	1405	-	-	738
HCM Lane V/C Ratio	0.338	0.001	-	-	-	-	-	0.208
HCM Control Delay (s)	12	7.3	0	-	0	-	-	11.2
HCM Lane LOS	B	A	A	-	A	-	-	B
HCM 95th %tile Q(veh)	1.5	0	-	-	0	-	-	0.8

Intersection	
Int Delay, s/veh	5.9

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Vol, veh/h	3	0	140	0	1	0	182	5	0	0	1	3
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Free	Free	Stop	Stop	Stop	Stop	Stop	Stop
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	-	-	-	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	92	92	92	92	92	92	92	92	92	92	92	92
Heavy Vehicles, %	8	8	8	8	8	8	8	8	8	8	8	8
Mvmt Flow	3	0	152	0	1	0	198	5	0	0	1	3

Major/Minor	Major1			Major2			Minor1			Minor2		
Conflicting Flow All	1	0	0	152	0	0	86	84	76	86	160	1
Stage 1	-	-	-	-	-	-	83	83	-	1	1	-
Stage 2	-	-	-	-	-	-	3	1	-	85	159	-
Critical Hdwy	4.18	-	-	4.18	-	-	7.18	6.58	6.28	7.18	6.58	6.28
Critical Hdwy Stg 1	-	-	-	-	-	-	6.18	5.58	-	6.18	5.58	-
Critical Hdwy Stg 2	-	-	-	-	-	-	6.18	5.58	-	6.18	5.58	-
Follow-up Hdwy	2.272	-	-	2.272	-	-	3.572	4.072	3.372	3.572	4.072	3.372
Pot Cap-1 Maneuver	1583	-	-	1393	-	-	886	795	969	886	721	1066
Stage 1	-	-	-	-	-	-	910	814	-	1007	883	-
Stage 2	-	-	-	-	-	-	1004	883	-	908	755	-
Platoon blocked, %		-	-		-	-						
Mov Cap-1 Maneuver	1583	-	-	1393	-	-	881	793	969	880	720	1066
Mov Cap-2 Maneuver	-	-	-	-	-	-	881	793	-	880	720	-
Stage 1	-	-	-	-	-	-	908	812	-	1005	883	-
Stage 2	-	-	-	-	-	-	1000	883	-	900	753	-

Approach	EB	WB	NB	SB
HCM Control Delay, s	0.2	0	10.3	8.8
HCM LOS			B	A

Minor Lane/Major Mvmt	NBLn1	EBL	EBT	EBR	WBL	WBT	WBR	SBLn1
Capacity (veh/h)	878	1583	-	-	1393	-	-	952
HCM Lane V/C Ratio	0.232	0.002	-	-	-	-	-	0.005
HCM Control Delay (s)	10.3	7.3	0	-	0	-	-	8.8
HCM Lane LOS	B	A	A	-	A	-	-	A
HCM 95th %tile Q(veh)	0.9	0	-	-	0	-	-	0

Intersection	
Int Delay, s/veh	8.1

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Vol, veh/h	1	222	120	291	302	1
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	-	-	0	-
Veh in Median Storage, #	-	0	0	-	0	-
Grade, %	-	0	0	-	0	-
Peak Hour Factor	92	92	92	92	92	92
Heavy Vehicles, %	8	8	8	8	8	8
Mvmt Flow	1	241	130	316	328	1

Major/Minor	Major1		Major2		Minor2	
Conflicting Flow All	447	0	-	0	532	289
Stage 1	-	-	-	-	289	-
Stage 2	-	-	-	-	243	-
Critical Hdwy	4.18	-	-	-	6.48	6.28
Critical Hdwy Stg 1	-	-	-	-	5.48	-
Critical Hdwy Stg 2	-	-	-	-	5.48	-
Follow-up Hdwy	2.272	-	-	-	3.572	3.372
Pot Cap-1 Maneuver	1082	-	-	-	498	736
Stage 1	-	-	-	-	747	-
Stage 2	-	-	-	-	784	-
Platoon blocked, %		-	-	-		
Mov Cap-1 Maneuver	1082	-	-	-	498	736
Mov Cap-2 Maneuver	-	-	-	-	498	-
Stage 1	-	-	-	-	747	-
Stage 2	-	-	-	-	783	-

Approach	EB	WB	SB
HCM Control Delay, s	0	0	25.1
HCM LOS			D

Minor Lane/Major Mvmt	EBL	EBT	WBT	WBR	SBLn1
Capacity (veh/h)	1082	-	-	-	499
HCM Lane V/C Ratio	0.001	-	-	-	0.66
HCM Control Delay (s)	8.3	0	-	-	25.1
HCM Lane LOS	A	A	-	-	D
HCM 95th %tile Q(veh)	0	-	-	-	4.8

Intersection	
Int Delay, s/veh	12

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Vol, veh/h	25	14	44	0	3	29	28	262	3	17	259	1
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Free	Free	Stop	Stop	Stop	Stop	Stop	Stop
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	-	-	-	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	92	92	92	92	92	92	92	92	92	92	92	92
Heavy Vehicles, %	8	8	8	8	8	8	8	8	8	8	8	8
Mvmt Flow	27	15	48	0	3	32	30	285	3	18	282	1

Major/Minor	Major1			Major2			Minor1			Minor2		
Conflicting Flow All	35	0	0	63	0	0	253	128	39	257	136	19
Stage 1	-	-	-	-	-	-	93	93	-	19	19	-
Stage 2	-	-	-	-	-	-	160	35	-	238	117	-
Critical Hdwy	4.18	-	-	4.18	-	-	7.18	6.58	6.28	7.18	6.58	6.28
Critical Hdwy Stg 1	-	-	-	-	-	-	6.18	5.58	-	6.18	5.58	-
Critical Hdwy Stg 2	-	-	-	-	-	-	6.18	5.58	-	6.18	5.58	-
Follow-up Hdwy	2.272	-	-	2.272	-	-	3.572	4.072	3.372	3.572	4.072	3.372
Pot Cap-1 Maneuver	1538	-	-	1502	-	-	688	752	1016	684	744	1042
Stage 1	-	-	-	-	-	-	899	806	-	985	868	-
Stage 2	-	-	-	-	-	-	828	854	-	752	787	-
Platoon blocked, %		-	-		-	-						
Mov Cap-1 Maneuver	1538	-	-	1502	-	-	475	738	1016	471	731	1042
Mov Cap-2 Maneuver	-	-	-	-	-	-	475	738	-	471	731	-
Stage 1	-	-	-	-	-	-	883	791	-	967	868	-
Stage 2	-	-	-	-	-	-	559	854	-	471	773	-

Approach	EB	WB	NB	SB
HCM Control Delay, s	2.2	0	14.3	13.8
HCM LOS			B	B

Minor Lane/Major Mvmt	NBLn1	EBL	EBT	EBR	WBL	WBT	WBR	SBLn1
Capacity (veh/h)	703	1538	-	-	1502	-	-	708
HCM Lane V/C Ratio	0.453	0.018	-	-	-	-	-	0.425
HCM Control Delay (s)	14.3	7.4	0	-	0	-	-	13.8
HCM Lane LOS	B	A	A	-	A	-	-	B
HCM 95th %tile Q(veh)	2.4	0.1	-	-	0	-	-	2.1

Intersection	
Int Delay, s/veh	2.7

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Vol, veh/h	0	10	24	29	32	0	0	0	6	0	1	0
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Free	Free	Stop	Stop	Stop	Stop	Stop	Stop
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	-	-	-	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	92	92	92	92	92	92	92	92	92	92	92	92
Heavy Vehicles, %	8	8	8	8	8	8	8	8	8	8	8	8
Mvmt Flow	0	11	26	32	35	0	0	0	7	0	1	0

Major/Minor	Major1			Major2			Minor1			Minor2		
Conflicting Flow All	35	0	0	37	0	0	122	122	24	125	135	35
Stage 1	-	-	-	-	-	-	24	24	-	98	98	-
Stage 2	-	-	-	-	-	-	98	98	-	27	37	-
Critical Hdwy	4.18	-	-	4.18	-	-	7.18	6.58	6.28	7.18	6.58	6.28
Critical Hdwy Stg 1	-	-	-	-	-	-	6.18	5.58	-	6.18	5.58	-
Critical Hdwy Stg 2	-	-	-	-	-	-	6.18	5.58	-	6.18	5.58	-
Follow-up Hdwy	2.272	-	-	2.272	-	-	3.572	4.072	3.372	3.572	4.072	3.372
Pot Cap-1 Maneuver	1538	-	-	1536	-	-	839	757	1035	835	745	1021
Stage 1	-	-	-	-	-	-	979	863	-	894	802	-
Stage 2	-	-	-	-	-	-	894	802	-	975	852	-
Platoon blocked, %		-	-		-	-						
Mov Cap-1 Maneuver	1538	-	-	1536	-	-	825	741	1035	816	729	1021
Mov Cap-2 Maneuver	-	-	-	-	-	-	825	741	-	816	729	-
Stage 1	-	-	-	-	-	-	979	863	-	894	785	-
Stage 2	-	-	-	-	-	-	874	785	-	969	852	-

Approach	EB	WB	NB	SB
HCM Control Delay, s	0	3.5	8.5	9.9
HCM LOS			A	A

Minor Lane/Major Mvmt	NBLn1	EBL	EBT	EBR	WBL	WBT	WBR	SBLn1
Capacity (veh/h)	1035	1538	-	-	1536	-	-	729
HCM Lane V/C Ratio	0.006	-	-	-	0.021	-	-	0.001
HCM Control Delay (s)	8.5	0	-	-	7.4	0	-	9.9
HCM Lane LOS	A	A	-	-	A	A	-	A
HCM 95th %tile Q(veh)	0	0	-	-	0.1	-	-	0

Intersection	
Int Delay, s/veh	5.3

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Vol, veh/h	1	3	21	10	15	0	0	8	9	24	29	0
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop	Free	Free	Free	Free	Free	Free
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	-	-	-	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	92	92	92	92	92	92	92	92	92	92	92	92
Heavy Vehicles, %	8	8	8	8	8	8	8	8	8	8	8	8
Mvmt Flow	1	3	23	11	16	0	0	9	10	26	32	0

Major/Minor	Minor2			Minor1			Major1			Major2		
Conflicting Flow All	106	102	32	111	98	14	32	0	0	18	0	0
Stage 1	84	84	-	14	14	-	-	-	-	-	-	-
Stage 2	22	18	-	97	84	-	-	-	-	-	-	-
Critical Hdwy	7.18	6.58	6.28	7.18	6.58	6.28	4.18	-	-	4.18	-	-
Critical Hdwy Stg 1	6.18	5.58	-	6.18	5.58	-	-	-	-	-	-	-
Critical Hdwy Stg 2	6.18	5.58	-	6.18	5.58	-	-	-	-	-	-	-
Follow-up Hdwy	3.572	4.072	3.372	3.572	4.072	3.372	2.272	-	-	2.272	-	-
Pot Cap-1 Maneuver	859	777	1025	853	781	1049	1542	-	-	1561	-	-
Stage 1	909	814	-	991	872	-	-	-	-	-	-	-
Stage 2	981	869	-	895	814	-	-	-	-	-	-	-
Platoon blocked, %								-	-		-	-
Mov Cap-1 Maneuver	834	764	1025	821	768	1049	1542	-	-	1561	-	-
Mov Cap-2 Maneuver	834	764	-	821	768	-	-	-	-	-	-	-
Stage 1	909	800	-	991	872	-	-	-	-	-	-	-
Stage 2	963	869	-	857	800	-	-	-	-	-	-	-

Approach	EB	WB	NB	SB
HCM Control Delay, s	8.8	9.7	0	3.3
HCM LOS	A	A		

Minor Lane/Major Mvmt	NBL	NBT	NBR	EBLn1	WBLn1	SBL	SBT	SBR
Capacity (veh/h)	1542	-	-	976	788	1561	-	-
HCM Lane V/C Ratio	-	-	-	0.028	0.034	0.017	-	-
HCM Control Delay (s)	0	-	-	8.8	9.7	7.3	0	-
HCM Lane LOS	A	-	-	A	A	A	A	-
HCM 95th %tile Q(veh)	0	-	-	0.1	0.1	0.1	-	-

Intersection	
Intersection Delay, s/veh	26.9
Intersection LOS	D

Movement	EBU	EBL	EBT	EBR	WBU	WBL	WBT	WBR	NBU	NBL	NBT	NBR	SBU	SBL	SBT	SBR
Vol, veh/h	0	0	93	431	0	66	89	0	0	316	17	38	0	50	4	5
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	0.92	0.92	0.92	0.92
Heavy Vehicles, %	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8
Mvmt Flow	0	0	101	468	0	72	97	0	0	343	18	41	0	54	4	5
Number of Lanes	0	0	1	0	0	0	1	0	0	0	1	0	0	0	1	0

Approach	EB	WB	NB	SB
Opposing Approach	WB	EB	SB	NB
Opposing Lanes	1	1	1	1
Conflicting Approach Left	SB	NB	EB	WB
Conflicting Lanes Left	1	1	1	1
Conflicting Approach Right	NB	SB	WB	EB
Conflicting Lanes Right	1	1	1	1
HCM Control Delay	34.8	13	24	11.6
HCM LOS	D	B	C	B

Lane	NBLn1	EBLn1	WBLn1	SBLn1
Vol Left, %	85%	0%	43%	85%
Vol Thru, %	5%	18%	57%	7%
Vol Right, %	10%	82%	0%	8%
Sign Control	Stop	Stop	Stop	Stop
Traffic Vol by Lane	371	524	155	59
LT Vol	316	0	66	50
Through Vol	17	93	89	4
RT Vol	38	431	0	5
Lane Flow Rate	403	570	168	64
Geometry Grp	1	1	1	1
Degree of Util (X)	0.713	0.874	0.319	0.132
Departure Headway (Hd)	6.51	5.525	6.819	7.411
Convergence, Y/N	Yes	Yes	Yes	Yes
Cap	561	661	529	484
Service Time	4.51	3.539	4.847	5.464
HCM Lane V/C Ratio	0.718	0.862	0.318	0.132
HCM Control Delay	24	34.8	13	11.6
HCM Lane LOS	C	D	B	B
HCM 95th-tile Q	5.8	10.3	1.4	0.5

Intersection	
Int Delay, s/veh	9.4

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Vol, veh/h	4	0	138	0	1	0	45	205	0	0	194	2
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Free	Free	Stop	Stop	Stop	Stop	Stop	Stop
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	-	-	-	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	92	92	92	92	92	92	92	92	92	92	92	92
Heavy Vehicles, %	8	8	8	8	8	8	8	8	8	8	8	8
Mvmt Flow	4	0	150	0	1	0	49	223	0	0	211	2

Major/Minor	Major1			Major2			Minor1			Minor2		
Conflicting Flow All	1	0	0	150	0	0	192	85	75	196	160	1
Stage 1	-	-	-	-	-	-	84	84	-	1	1	-
Stage 2	-	-	-	-	-	-	108	1	-	195	159	-
Critical Hdwy	4.18	-	-	4.18	-	-	7.18	6.58	6.28	7.18	6.58	6.28
Critical Hdwy Stg 1	-	-	-	-	-	-	6.18	5.58	-	6.18	5.58	-
Critical Hdwy Stg 2	-	-	-	-	-	-	6.18	5.58	-	6.18	5.58	-
Follow-up Hdwy	2.272	-	-	2.272	-	-	3.572	4.072	3.372	3.572	4.072	3.372
Pot Cap-1 Maneuver	1583	-	-	1395	-	-	755	794	970	750	721	1066
Stage 1	-	-	-	-	-	-	909	814	-	1007	883	-
Stage 2	-	-	-	-	-	-	883	883	-	793	755	-
Platoon blocked, %		-	-		-	-						
Mov Cap-1 Maneuver	1583	-	-	1395	-	-	581	792	970	586	719	1066
Mov Cap-2 Maneuver	-	-	-	-	-	-	581	792	-	586	719	-
Stage 1	-	-	-	-	-	-	906	812	-	1004	883	-
Stage 2	-	-	-	-	-	-	671	883	-	574	753	-

Approach	EB	WB	NB	SB
HCM Control Delay, s	0.2	0	12.6	12.1
HCM LOS			B	B

Minor Lane/Major Mvmt	NBLn1	EBL	EBT	EBR	WBL	WBT	WBR	SBLn1
Capacity (veh/h)	743	1583	-	-	1395	-	-	721
HCM Lane V/C Ratio	0.366	0.003	-	-	-	-	-	0.295
HCM Control Delay (s)	12.6	7.3	0	-	0	-	-	12.1
HCM Lane LOS	B	A	A	-	A	-	-	B
HCM 95th %tile Q(veh)	1.7	0	-	-	0	-	-	1.2

Intersection	
Int Delay, s/veh	5.6

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Vol, veh/h	1	0	193	0	1	0	196	13	0	0	3	2
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Free	Free	Stop	Stop	Stop	Stop	Stop	Stop
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	-	-	-	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	92	92	92	92	92	92	92	92	92	92	92	92
Heavy Vehicles, %	8	8	8	8	8	8	8	8	8	8	8	8
Mvmt Flow	1	0	210	0	1	0	213	14	0	0	3	2

Major/Minor	Major1			Major2			Minor1			Minor2		
Conflicting Flow All	1	0	0	210	0	0	111	108	105	115	213	1
Stage 1	-	-	-	-	-	-	107	107	-	1	1	-
Stage 2	-	-	-	-	-	-	4	1	-	114	212	-
Critical Hdwy	4.18	-	-	4.18	-	-	7.18	6.58	6.28	7.18	6.58	6.28
Critical Hdwy Stg 1	-	-	-	-	-	-	6.18	5.58	-	6.18	5.58	-
Critical Hdwy Stg 2	-	-	-	-	-	-	6.18	5.58	-	6.18	5.58	-
Follow-up Hdwy	2.272	-	-	2.272	-	-	3.572	4.072	3.372	3.572	4.072	3.372
Pot Cap-1 Maneuver	1583	-	-	1326	-	-	853	771	933	848	674	1066
Stage 1	-	-	-	-	-	-	884	795	-	1007	883	-
Stage 2	-	-	-	-	-	-	1003	883	-	876	716	-
Platoon blocked, %		-	-		-	-						
Mov Cap-1 Maneuver	1583	-	-	1326	-	-	847	770	933	835	673	1066
Mov Cap-2 Maneuver	-	-	-	-	-	-	847	770	-	835	673	-
Stage 1	-	-	-	-	-	-	883	794	-	1006	883	-
Stage 2	-	-	-	-	-	-	997	883	-	860	715	-

Approach	EB	WB	NB	SB
HCM Control Delay, s	0	0	10.8	9.6
HCM LOS			B	A

Minor Lane/Major Mvmt	NBLn1	EBL	EBT	EBR	WBL	WBT	WBR	SBLn1
Capacity (veh/h)	842	1583	-	-	1326	-	-	789
HCM Lane V/C Ratio	0.27	0.001	-	-	-	-	-	0.007
HCM Control Delay (s)	10.8	7.3	0	-	0	-	-	9.6
HCM Lane LOS	B	A	A	-	A	-	-	A
HCM 95th %tile Q(veh)	1.1	0	-	-	0	-	-	0

Intersection	
Int Delay, s/veh	12.2

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Vol, veh/h	1	226	193	192	339	3
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	-	-	0	-
Veh in Median Storage, #	-	0	0	-	0	-
Grade, %	-	0	0	-	0	-
Peak Hour Factor	92	92	92	92	92	92
Heavy Vehicles, %	8	8	8	8	8	8
Mvmt Flow	1	246	210	209	368	3

Major/Minor	Major1		Major2		Minor2	
Conflicting Flow All	418	0	-	0	562	314
Stage 1	-	-	-	-	314	-
Stage 2	-	-	-	-	248	-
Critical Hdwy	4.18	-	-	-	6.48	6.28
Critical Hdwy Stg 1	-	-	-	-	5.48	-
Critical Hdwy Stg 2	-	-	-	-	5.48	-
Follow-up Hdwy	2.272	-	-	-	3.572	3.372
Pot Cap-1 Maneuver	1110	-	-	-	478	713
Stage 1	-	-	-	-	727	-
Stage 2	-	-	-	-	779	-
Platoon blocked, %		-	-	-		
Mov Cap-1 Maneuver	1110	-	-	-	478	713
Mov Cap-2 Maneuver	-	-	-	-	478	-
Stage 1	-	-	-	-	727	-
Stage 2	-	-	-	-	778	-

Approach	EB	WB	SB
HCM Control Delay, s	0	0	34
HCM LOS			D

Minor Lane/Major Mvmt	EBL	EBT	WBT	WBR	SBLn1
Capacity (veh/h)	1110	-	-	-	479
HCM Lane V/C Ratio	0.001	-	-	-	0.776
HCM Control Delay (s)	8.2	0	-	-	34
HCM Lane LOS	A	A	-	-	D
HCM 95th %tile Q(veh)	0	-	-	-	6.9

Intersection	
Int Delay, s/veh	11.4

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Vol, veh/h	17	8	46	3	4	51	9	183	0	33	294	4
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Free	Free	Stop	Stop	Stop	Stop	Stop	Stop
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	-	-	-	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	92	92	92	92	92	92	92	92	92	92	92	92
Heavy Vehicles, %	8	8	8	8	8	8	8	8	8	8	8	8
Mvmt Flow	18	9	50	3	4	55	10	199	0	36	320	4

Major/Minor	Major1			Major2			Minor1			Minor2		
Conflicting Flow All	60	0	0	59	0	0	272	137	34	209	135	32
Stage 1	-	-	-	-	-	-	71	71	-	39	39	-
Stage 2	-	-	-	-	-	-	201	66	-	170	96	-
Critical Hdwy	4.18	-	-	4.18	-	-	7.18	6.58	6.28	7.18	6.58	6.28
Critical Hdwy Stg 1	-	-	-	-	-	-	6.18	5.58	-	6.18	5.58	-
Critical Hdwy Stg 2	-	-	-	-	-	-	6.18	5.58	-	6.18	5.58	-
Follow-up Hdwy	2.272	-	-	2.272	-	-	3.572	4.072	3.372	3.572	4.072	3.372
Pot Cap-1 Maneuver	1506	-	-	1507	-	-	668	743	1022	736	745	1025
Stage 1	-	-	-	-	-	-	924	824	-	961	851	-
Stage 2	-	-	-	-	-	-	787	828	-	818	804	-
Platoon blocked, %		-	-		-	-						
Mov Cap-1 Maneuver	1506	-	-	1507	-	-	435	733	1022	576	735	1025
Mov Cap-2 Maneuver	-	-	-	-	-	-	435	733	-	576	735	-
Stage 1	-	-	-	-	-	-	913	814	-	949	849	-
Stage 2	-	-	-	-	-	-	488	826	-	611	794	-

Approach	EB	WB	NB	SB
HCM Control Delay, s	1.8	0.4	12.2	14.9
HCM LOS			B	B

Minor Lane/Major Mvmt	NBLn1	EBL	EBT	EBR	WBL	WBT	WBR	SBLn1
Capacity (veh/h)	710	1506	-	-	1507	-	-	718
HCM Lane V/C Ratio	0.294	0.012	-	-	0.002	-	-	0.501
HCM Control Delay (s)	12.2	7.4	0	-	7.4	0	-	14.9
HCM Lane LOS	B	A	A	-	A	A	-	B
HCM 95th %tile Q(veh)	1.2	0	-	-	0	-	-	2.8

Intersection	
Int Delay, s/veh	2.7

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Vol, veh/h	0	21	21	13	50	0	8	0	22	0	1	0
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Free	Free	Stop	Stop	Stop	Stop	Stop	Stop
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	-	-	-	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	92	92	92	92	92	92	92	92	92	92	92	92
Heavy Vehicles, %	8	8	8	8	8	8	8	8	8	8	8	8
Mvmt Flow	0	23	23	14	54	0	9	0	24	0	1	0

Major/Minor	Major1			Major2			Minor1			Minor2		
Conflicting Flow All	54	0	0	46	0	0	117	117	34	129	129	54
Stage 1	-	-	-	-	-	-	34	34	-	83	83	-
Stage 2	-	-	-	-	-	-	83	83	-	46	46	-
Critical Hdwy	4.18	-	-	4.18	-	-	7.18	6.58	6.28	7.18	6.58	6.28
Critical Hdwy Stg 1	-	-	-	-	-	-	6.18	5.58	-	6.18	5.58	-
Critical Hdwy Stg 2	-	-	-	-	-	-	6.18	5.58	-	6.18	5.58	-
Follow-up Hdwy	2.272	-	-	2.272	-	-	3.572	4.072	3.372	3.572	4.072	3.372
Pot Cap-1 Maneuver	1514	-	-	1524	-	-	845	762	1022	830	751	996
Stage 1	-	-	-	-	-	-	967	855	-	910	814	-
Stage 2	-	-	-	-	-	-	910	814	-	953	845	-
Platoon blocked, %		-	-		-	-						
Mov Cap-1 Maneuver	1514	-	-	1524	-	-	838	755	1022	805	744	996
Mov Cap-2 Maneuver	-	-	-	-	-	-	838	755	-	805	744	-
Stage 1	-	-	-	-	-	-	967	855	-	910	807	-
Stage 2	-	-	-	-	-	-	901	807	-	931	845	-

Approach	EB	WB	NB	SB
HCM Control Delay, s	0	1.5	8.9	9.8
HCM LOS			A	A

Minor Lane/Major Mvmt	NBLn1	EBL	EBT	EBR	WBL	WBT	WBR	SBLn1
Capacity (veh/h)	965	1514	-	-	1524	-	-	744
HCM Lane V/C Ratio	0.034	-	-	-	0.009	-	-	0.001
HCM Control Delay (s)	8.9	0	-	-	7.4	0	-	9.8
HCM Lane LOS	A	A	-	-	A	A	-	A
HCM 95th %tile Q(veh)	0.1	0	-	-	0	-	-	0

Intersection	
Int Delay, s/veh	4.5

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Vol, veh/h	3	5	5	5	21	0	10	65	3	28	6	0
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop	Free	Free	Free	Free	Free	Free
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	-	-	-	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	92	92	92	92	92	92	92	92	92	92	92	92
Heavy Vehicles, %	8	8	8	8	8	8	8	8	8	8	8	8
Mvmt Flow	3	5	5	5	23	0	11	71	3	30	7	0

Major/Minor	Minor2			Minor1			Major1			Major2		
Conflicting Flow All	172	163	7	167	161	72	7	0	0	74	0	0
Stage 1	67	67	-	94	94	-	-	-	-	-	-	-
Stage 2	105	96	-	73	67	-	-	-	-	-	-	-
Critical Hdwy	7.18	6.58	6.28	7.18	6.58	6.28	4.18	-	-	4.18	-	-
Critical Hdwy Stg 1	6.18	5.58	-	6.18	5.58	-	-	-	-	-	-	-
Critical Hdwy Stg 2	6.18	5.58	-	6.18	5.58	-	-	-	-	-	-	-
Follow-up Hdwy	3.572	4.072	3.372	3.572	4.072	3.372	2.272	-	-	2.272	-	-
Pot Cap-1 Maneuver	778	719	1058	784	721	974	1575	-	-	1488	-	-
Stage 1	929	827	-	898	806	-	-	-	-	-	-	-
Stage 2	886	804	-	922	827	-	-	-	-	-	-	-
Platoon blocked, %								-	-		-	-
Mov Cap-1 Maneuver	743	700	1058	759	702	974	1575	-	-	1488	-	-
Mov Cap-2 Maneuver	743	700	-	759	702	-	-	-	-	-	-	-
Stage 1	922	810	-	892	800	-	-	-	-	-	-	-
Stage 2	855	798	-	893	810	-	-	-	-	-	-	-

Approach	EB	WB	NB	SB
HCM Control Delay, s	9.5	10.3	0.9	6.2
HCM LOS	A	B		

Minor Lane/Major Mvmt	NBL	NBT	NBR	EBLn1	WBLn1	SBL	SBT	SBR
Capacity (veh/h)	1575	-	-	817	712	1488	-	-
HCM Lane V/C Ratio	0.007	-	-	0.017	0.04	0.02	-	-
HCM Control Delay (s)	7.3	0	-	9.5	10.3	7.5	0	-
HCM Lane LOS	A	A	-	A	B	A	A	-
HCM 95th %tile Q(veh)	0	-	-	0.1	0.1	0.1	-	-

Intersection	
Intersection Delay, s/veh	27.9
Intersection LOS	D

Movement	EBU	EBL	EBT	EBR	WBU	WBL	WBT	WBR	NBU	NBL	NBT	NBR	SBU	SBL	SBT	SBR
Vol, veh/h	0	10	50	496	0	18	44	0	0	325	69	30	0	0	0	15
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	0.92	0.92	0.92	0.92
Heavy Vehicles, %	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8
Mvmt Flow	0	11	54	539	0	20	48	0	0	353	75	33	0	0	0	16
Number of Lanes	0	0	1	0	0	0	1	0	0	0	1	0	0	0	1	0

Approach	EB	WB	NB	SB
Opposing Approach	WB	EB	SB	NB
Opposing Lanes	1	1	1	1
Conflicting Approach Left	SB	NB	EB	WB
Conflicting Lanes Left	1	1	1	1
Conflicting Approach Right	NB	SB	WB	EB
Conflicting Lanes Right	1	1	1	1
HCM Control Delay	31.6	10.6	26.2	9.5
HCM LOS	D	B	D	A

Lane	NBLn1	EBLn1	WBLn1	SBLn1
Vol Left, %	77%	2%	29%	0%
Vol Thru, %	16%	9%	71%	0%
Vol Right, %	7%	89%	0%	100%
Sign Control	Stop	Stop	Stop	Stop
Traffic Vol by Lane	424	556	62	15
LT Vol	325	10	18	0
Through Vol	69	50	44	0
RT Vol	30	496	0	15
Lane Flow Rate	461	604	67	16
Geometry Grp	1	1	1	1
Degree of Util (X)	0.767	0.861	0.123	0.029
Departure Headway (Hd)	5.991	5.126	6.58	6.325
Convergence, Y/N	Yes	Yes	Yes	Yes
Cap	604	701	540	569
Service Time	4.046	3.191	4.679	4.325
HCM Lane V/C Ratio	0.763	0.862	0.124	0.028
HCM Control Delay	26.2	31.6	10.6	9.5
HCM Lane LOS	D	D	B	A
HCM 95th-tile Q	7	10.1	0.4	0.1

Intersection	
Int Delay, s/veh	5.6

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Vol, veh/h	1	222	120	291	302	1
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	Yield	-	None
Storage Length	-	-	-	300	0	-
Veh in Median Storage, #	-	0	0	-	0	-
Grade, %	-	0	0	-	0	-
Peak Hour Factor	92	92	92	92	92	92
Heavy Vehicles, %	8	8	8	8	8	8
Mvmt Flow	1	241	130	316	328	1

Major/Minor	Major1		Major2		Minor2	
Conflicting Flow All	130	0	-	0	373	130
Stage 1	-	-	-	-	130	-
Stage 2	-	-	-	-	243	-
Critical Hdwy	4.18	-	-	-	6.48	6.28
Critical Hdwy Stg 1	-	-	-	-	5.48	-
Critical Hdwy Stg 2	-	-	-	-	5.48	-
Follow-up Hdwy	2.272	-	-	-	3.572	3.372
Pot Cap-1 Maneuver	1419	-	-	-	616	904
Stage 1	-	-	-	-	881	-
Stage 2	-	-	-	-	784	-
Platoon blocked, %		-	-	-		
Mov Cap-1 Maneuver	1419	-	-	-	615	904
Mov Cap-2 Maneuver	-	-	-	-	615	-
Stage 1	-	-	-	-	881	-
Stage 2	-	-	-	-	783	-

Approach	EB	WB	SB
HCM Control Delay, s	0	0	17.4
HCM LOS			C

Minor Lane/Major Mvmt	EBL	EBT	WBT	WBR	SBLn1
Capacity (veh/h)	1419	-	-	-	616
HCM Lane V/C Ratio	0.001	-	-	-	0.535
HCM Control Delay (s)	7.5	0	-	-	17.4
HCM Lane LOS	A	A	-	-	C
HCM 95th %tile Q(veh)	0	-	-	-	3.2

Intersection	
Int Delay, s/veh	7.5

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Vol, veh/h	0	93	431	66	89	0	316	17	38	50	4	5
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Free	Free	Stop	Stop	Stop	Stop	Stop	Stop
RT Channelized	-	-	Yield	-	-	None	-	-	None	-	-	None
Storage Length	-	-	300	-	-	-	300	-	-	-	-	-
Veh in Median Storage, #	-	1	-	-	1	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	92	92	92	92	92	92	92	92	92	92	92	92
Heavy Vehicles, %	8	8	8	8	8	8	8	8	8	8	8	8
Mvmt Flow	0	101	468	72	97	0	343	18	41	54	4	5

Major/Minor	Major1			Major2			Minor1			Minor2		
Conflicting Flow All	97	0	0	101	0	0	346	341	101	371	341	97
Stage 1	-	-	-	-	-	-	101	101	-	240	240	-
Stage 2	-	-	-	-	-	-	245	240	-	131	101	-
Critical Hdwy	4.18	-	-	4.18	-	-	7.18	6.58	6.28	7.18	6.58	6.28
Critical Hdwy Stg 1	-	-	-	-	-	-	6.18	5.58	-	6.18	5.58	-
Critical Hdwy Stg 2	-	-	-	-	-	-	6.18	5.58	-	6.18	5.58	-
Follow-up Hdwy	2.272	-	-	2.272	-	-	3.572	4.072	3.372	3.572	4.072	3.372
Pot Cap-1 Maneuver	1460	-	-	1455	-	-	597	571	938	575	571	943
Stage 1	-	-	-	-	-	-	891	800	-	750	696	-
Stage 2	-	-	-	-	-	-	746	696	-	858	800	-
Platoon blocked, %		-	-		-	-						
Mov Cap-1 Maneuver	1460	-	-	1455	-	-	567	541	938	514	541	943
Mov Cap-2 Maneuver	-	-	-	-	-	-	567	541	-	514	541	-
Stage 1	-	-	-	-	-	-	891	800	-	750	660	-
Stage 2	-	-	-	-	-	-	699	660	-	801	800	-

Approach	EB	WB	NB	SB
HCM Control Delay, s	0	3.2	19	12.6
HCM LOS			C	B

Minor Lane/Major Mvmt	NBLn1	NBLn2	EBL	EBT	EBR	WBL	WBT	WBR	SBLn1
Capacity (veh/h)	567	765	1460	-	-	1455	-	-	536
HCM Lane V/C Ratio	0.606	0.078	-	-	-	0.049	-	-	0.12
HCM Control Delay (s)	20.6	10.1	0	-	-	7.6	0	-	12.6
HCM Lane LOS	C	B	A	-	-	A	A	-	B
HCM 95th %tile Q(veh)	4	0.3	0	-	-	0.2	-	-	0.4

Intersection	
Int Delay, s/veh	8.6

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Vol, veh/h	1	226	193	192	339	3
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	Yield	-	None
Storage Length	-	-	-	300	0	-
Veh in Median Storage, #	-	0	0	-	0	-
Grade, %	-	0	0	-	0	-
Peak Hour Factor	92	92	92	92	92	92
Heavy Vehicles, %	8	8	8	8	8	8
Mvmt Flow	1	246	210	209	368	3

Major/Minor	Major1		Major2		Minor2	
Conflicting Flow All	210	0	-	0	458	210
Stage 1	-	-	-	-	210	-
Stage 2	-	-	-	-	248	-
Critical Hdwy	4.18	-	-	-	6.48	6.28
Critical Hdwy Stg 1	-	-	-	-	5.48	-
Critical Hdwy Stg 2	-	-	-	-	5.48	-
Follow-up Hdwy	2.272	-	-	-	3.572	3.372
Pot Cap-1 Maneuver	1326	-	-	-	550	815
Stage 1	-	-	-	-	811	-
Stage 2	-	-	-	-	779	-
Platoon blocked, %		-	-	-		
Mov Cap-1 Maneuver	1326	-	-	-	549	815
Mov Cap-2 Maneuver	-	-	-	-	549	-
Stage 1	-	-	-	-	811	-
Stage 2	-	-	-	-	778	-

Approach	EB	WB	SB
HCM Control Delay, s	0	0	24
HCM LOS			C

Minor Lane/Major Mvmt	EBL	EBT	WBT	WBR	SBLn1
Capacity (veh/h)	1326	-	-	-	551
HCM Lane V/C Ratio	0.001	-	-	-	0.675
HCM Control Delay (s)	7.7	0	-	-	24
HCM Lane LOS	A	A	-	-	C
HCM 95th %tile Q(veh)	0	-	-	-	5.1

Intersection	
Int Delay, s/veh	5.6

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Vol, veh/h	10	50	496	18	44	0	325	69	30	0	1	15
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Free	Free	Stop	Stop	Stop	Stop	Stop	Stop
RT Channelized	-	-	Yield	-	-	None	-	-	None	-	-	None
Storage Length	-	-	300	-	-	-	300	-	-	-	-	-
Veh in Median Storage, #	-	1	-	-	1	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	92	92	92	92	92	92	92	92	92	92	92	92
Heavy Vehicles, %	8	8	8	8	8	8	8	8	8	8	8	8
Mvmt Flow	11	54	539	20	48	0	353	75	33	0	1	16

Major/Minor	Major1			Major2			Minor1			Minor2		
Conflicting Flow All	48	0	0	54	0	0	172	163	54	217	163	48
Stage 1	-	-	-	-	-	-	76	76	-	87	87	-
Stage 2	-	-	-	-	-	-	96	87	-	130	76	-
Critical Hdwy	4.18	-	-	4.18	-	-	7.18	6.58	6.28	7.18	6.58	6.28
Critical Hdwy Stg 1	-	-	-	-	-	-	6.18	5.58	-	6.18	5.58	-
Critical Hdwy Stg 2	-	-	-	-	-	-	6.18	5.58	-	6.18	5.58	-
Follow-up Hdwy	2.272	-	-	2.272	-	-	3.572	4.072	3.372	3.572	4.072	3.372
Pot Cap-1 Maneuver	1521	-	-	1514	-	-	778	719	996	727	719	1004
Stage 1	-	-	-	-	-	-	918	820	-	906	811	-
Stage 2	-	-	-	-	-	-	896	811	-	859	820	-
Platoon blocked, %		-	-		-	-						
Mov Cap-1 Maneuver	1521	-	-	1514	-	-	749	700	996	633	700	1004
Mov Cap-2 Maneuver	-	-	-	-	-	-	749	700	-	633	700	-
Stage 1	-	-	-	-	-	-	907	810	-	895	800	-
Stage 2	-	-	-	-	-	-	868	800	-	745	810	-

Approach	EB	WB	NB	SB
HCM Control Delay, s	0.1	2.2	13.2	8.8
HCM LOS			B	A

Minor Lane/Major Mvmt	NBLn1	NBLn2	EBL	EBT	EBR	WBL	WBT	WBR	SBLn1
Capacity (veh/h)	749	769	1521	-	-	1514	-	-	977
HCM Lane V/C Ratio	0.472	0.14	0.007	-	-	0.013	-	-	0.018
HCM Control Delay (s)	14	10.4	7.4	0	-	7.4	0	-	8.8
HCM Lane LOS	B	B	A	A	-	A	A	-	A
HCM 95th %tile Q(veh)	2.5	0.5	0	-	-	0	-	-	0.1