WATT Consulting Group
Since 1983

LONG TERM TRANSPORTATION NETWORK REVIEW OF HIGHWAY 11A

Final Report

30 years

#310, 3016 - 5th Avenue NE
Calgary, AB T2A 6K4
Phone: 403.273.9001
Fax: 403.273.3440
wattconsultinggroup.com

LONG TERM TRANSPORTATION NETWORK REVIEW NORTH OF HIGHWAY 11A

Final Report

September 23, 2014

PERMIT TO PRACTICE
D. A. WATT CONSULTING GROUP LTD.
Signature
Date September 23, 2014
PERMIT NUMBER: P 3818
The Association of Professional Engineers, Geologists and Geophysicists of Alberta

Prepared for:	**The City of Red Deer, Engineering Services**
Prepared by:	**Watt Consulting Group**
Our File:	**3126.T01**
Date:	**September 23, 2014**

TABLE OF CONTENTS

LIST OF FIGURES

LIST OF TABLES

1.0 INTRODUCTION/BACKGROUND

The City of Red Deer is currently undertaking the development of a Major Area Structure Plan (MASP) in the area bounded by Blindman River, Highway 2, and the Red Deer River to the north Highway 11A. Although this area has some country residential, industrial, and agricultural uses, a great majority of the area is largely undeveloped but is foreseen to experience long-term growth. Growth in the area means that it that will see a mix of residential, commercial, and industrial land uses developed within the area boundaries. In order to plan for future growth, the MASP will provide a framework for future development in this area. Watt Consulting Group (WCG) was retained by The City of Red Deer to carry out a high level transportation planning review of the future transportation network in the area in the context of the considered land uses. The base for the analysis was formed by the City's traffic forecasting model for the 188,000 population horizon. The transportation network identified for this horizon included an additional Red Deer River crossing that will provide access to the study area north of the already planned Highway 11A river crossing.

During the Kick-off Meeting for this project on March 10, 2014, it was confirmed with City staff that the main objective of the study is to identify the long term transportation network for the study area while addressing locations and intensities of the land uses, additional access to Highway 11A and Highway 2, as well as the need for CP Rail line crossings.

This report summarizes the study assumptions, methodology and findings as well as conclusions and recommendations stemming from the analysis.

1.1 Study Area

The study area is located north of Highway 11A and is bounded by Highway 2 to the west, Blindman River to the north and Red Deer River to the east. **Figure 1** illustrates the location of the study area and highlights the existing major roads in the area. A portion of the study area is outside of the current City limits, and is indicated by a different colour on **Figure 1**. The rationale for including the area north of the City limits was to include existing uses in the study area north of the City limits and also to evaluate the impact of potential future growth into this area.

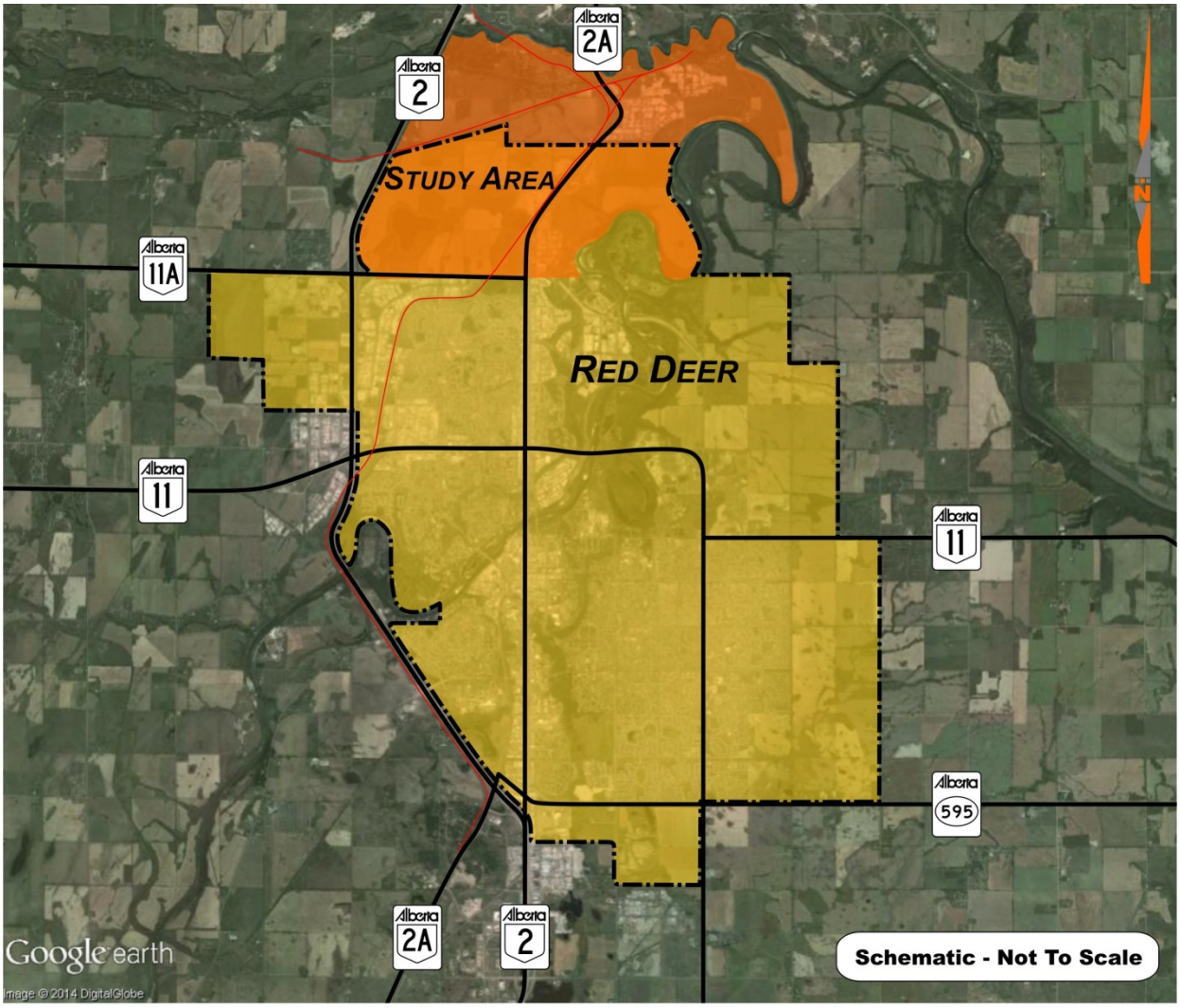


Figure 1: Site Context

1.2 Road Network

1.2.1 Existing Road Network

Highway 2 (QE2) is under the jurisdiction, management and control of Alberta Transportation and is not the subject of this study. It is a major north-south provincial highway on the west boundary of the study area. It was constructed as a divided highway with 2 lanes in each direction.

Highway 11A within city limits is also currently under the jurisdiction, management and control of Alberta Transportation and it is classified as a multi-lane facility within the provincial functional

classification system. It is a major east-west connection on the south side of the study area. It operates currently as a divided road with either one or two travel lanes in each direction, depending on the location. Highway 11A within the study area will be widened to a 4-lane urban cross-section in the future. Once the facility is widened, its jurisdiction will be transferred from Alberta Transportation to the City of Red Deer. Under the City of Red Deer Road Classification System, Highway 11A is classified as an expressway and will ultimately be constructed to an urban divided 6-lane cross-section.

Highway 2A within city limits is currently under the jurisdiction, management and control of Alberta Transportation and is classified as a multi-lane facility within the provincial functional classification system. It has been constructed as a two-lane undivided highway except for the portion north of the intersection with Highway 11A, where it has four through lanes (two in each direction of travel) to match up with the existing lane configuration on the south leg of the intersection. There are plans by Alberta Transportation to widen Highway 2A to from the existing two-lane to a four-lane facility. Similar to Highway 11A, the jurisdiction of the facility (the portion that is within City limits) will be transferred to the City of Red Deer after it is widened. Highway 2A will be classified as an arterial within the City of Red Deer Road Classification System.

Figure 2 shows the existing major road network in the study area.

Figure 2: Existing Road Network

1.3 Study Objectives and Scope

1.3.1 Objectives

The primary objective of this study was to carry out a high level review of the future transportation network in the study area in the context of the land uses considered by the City within the study area. The base for the analysis was defined by the City transportation forecast model for the 188,000 population horizon and corresponding transportation network at this horizon, which included an additional Red Deer River crossing north of the proposed river crossing at Highway 11A.

The study objectives also included identification of the expected long term traffic volumes based on the land use concept identified by the City, development of the long term network concept for the area addressing specifically the need for an additional access to QE2 and Highway 11A between QE2 and Taylor Drive as well as addressing issues related to CP Rail line crossings.

1.3.2 Scope

The scope of this study included the following:

1. Provide high level input to the City's preliminary land use concepts, specifically the order of magnitude amount of commercial supportable by the proposed transportation system, such that the City can come up with the Preferred Land Use Concept.
2. Determination of the future traffic volumes using the City of Red Deer forecasting model for 188,000 population horizon, Preferred Land Use Concept, and transportation network concept.
3. Identification of the future skeletal transportation network in the study area (including intersections that access the study area) including functional street designation, intersectional traffic controls, number of lanes and right-of-way requirements based on the future forecast traffic volumes.
4. Review the expected operating conditions at the key intersections within the study area.
5. Review the necessity, feasibility and impact of an additional access to QE2 and Highway 11A.
6. Evaluate the intensification of the land uses in the study area north of the existing City limits to understand if the intensification of this area can be supported by the transportation network.
7. Preparation of a report summarizing results of the study.

2.0 STUDY METHODOLOGY

The work program associated with the project was carried out in two stages. These included a preliminary analysis of the City's land uses and transportation network concepts for the study area, and a detailed analysis of the City's Preferred Land Use Concept. These two stages are discussed in more detail as follows:

- **Stage 1: Preliminary Analysis**. A number of preliminary land use concepts were analyzed during this stage of the project in order to provide useful input to the City as to the locations of commercial development, supportable order of magnitude development intensities, and road network options. The analyses included transportation modelling of the study area using the City's transportation forecasting model as a base. The results of the Stage 1 analysis were presented to the City, which facilitated the development of the Preferred Land Use Concept for detailed analysis in Stage 2. A summary was produced and provided to the City staff to document high level results of the preliminary analysis, such that a City staff report could be produced for the Development Prioritization Study.

- **Stage 2: Detailed Analysis**. The Preferred Land Use Concept determined by the City was informed by the results of the modelling in Stage 1. This Preferred Land Use Concept was provided to WCG for detailed analysis. WCG was involved in the forecast of the future volumes associated with this preferred concept using the version of the the City's transportation forecasting model updated by WCG specifically for this study. Once the forecast traffic volumes were determined, operational analyses were carried out to determine road network, intersection lane configuration and traffic control requirements in the study area to support the level of development envisioned by the Preferred Land Use Concept.

2.1 Stage 1: Preliminary Analysis

As noted, a number of land use and road network concepts were analyzed during the Preliminary Analysis Stage (Stage 1) in order to provide input for the City regarding the transportation network concepts' ability to realistically accommodate the land use concepts. The land use concepts analyzed during this stage included an initial concept that was provided at the outset of the study and subsequent concepts that had adjusted the locations and areas of the specific land uses.

The different road network concepts analyzed different options of road connections to the study area from the QE2 and Highway 11A. The different options of road connections to the study area included the following:

- Flyover (east-west connection) at QE2 to connect the study area to the area west of the QE2, but no access from QE2
- Full interchange at QE2
- No connection to QE2
- Additional connection to the study area on Highway 11A between Highway 2 and Taylor Drive

Whilst not every road connection option was evaluated in detail with every land use concept, the results from the combinations analyzed provided the team with the necessary detail to answer questions about the proposed concepts. Further modifications to both the land use and road network alternatives were carried out to test the effects of having different levels of development and/or additional internal roadway links within the study area. For each road network and land use combination analyzed, link volumes were produced using the VISUM traffic forecasting model. Intersection volumes were also produced for most of the land use – road network concept combinations with the exception of the earliest combinations tested which had intensified land uses in the study area north of the existing City limits. No further assessments was deemed necessary in these cases since it was apparent that the traffic volumes on certain links on Highway 2A and Taylor Drive were well beyond the link capacities.

Based on the link volumes and/or intersection operating conditions, WCG provided general inputs to the City regarding the land use concepts and transportation network concepts tested. These are noted below:

- The tested transportation network appears to be unable to accommodate the land use concepts with the intensification of the study area north of the existing City limits in place.
- The commercial gross floor area, totaling approximately 6.88 million square feet, contained in the initial land use concept was determined to not be supportable with the transportation network even with no intensification in the study area north of the existing City limits.
- A substantial 50% reduction in the commercial floor area from the initial land use concept was tested along with road network changes. From the results, further reduction in the commercial floor areas should be contemplated by the City to develop the Preferred Land Use Concept.
- In all scenarios analyzed, Highway 11A / Taylor Drive will not operate satisfactorily as an at-grade signalized intersection. Therefore, a grade-separated interchange should be planned for at this location.

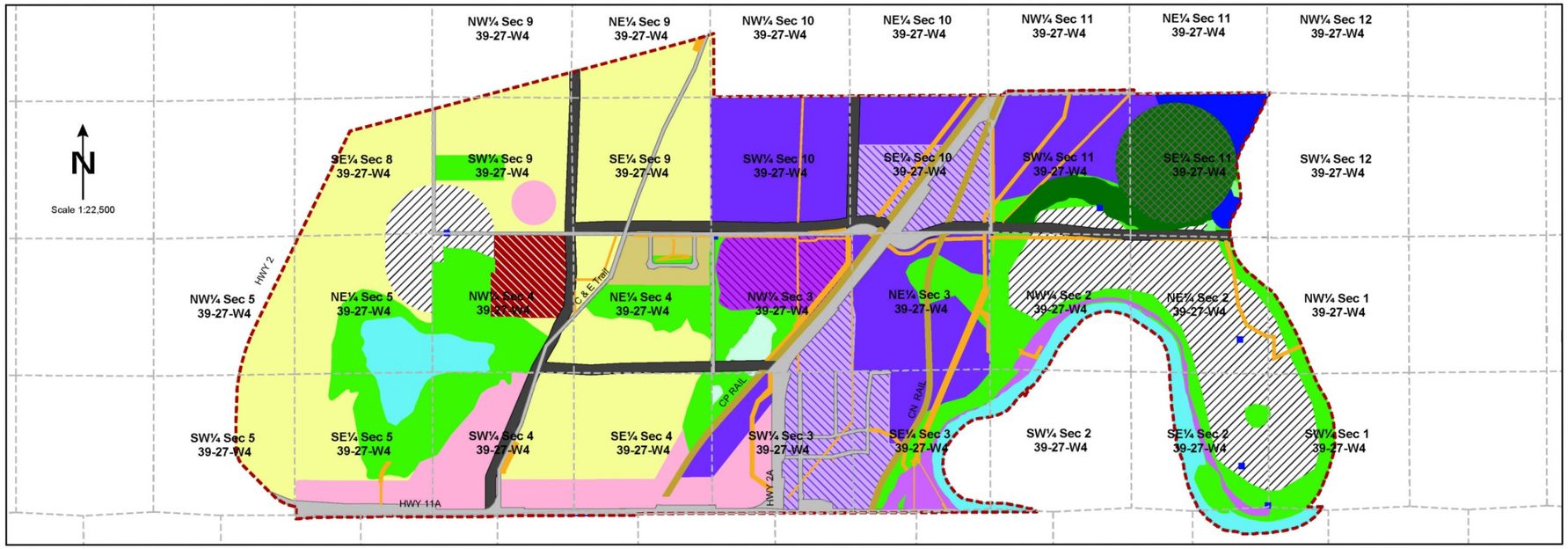
The results of the analyses were discussed with the City of Red Deer staff and lead to the development of the preferred land use and road network concept that have been analyzed in greater detail in Stage 2.

2.2 Stage 2: Detailed Analysis

The main objective of this stage of the study was to ascertain the ability of the proposed road network concept to accommodate the projected traffic generation of the Preferred Land Use Concept. The Preferred Land Use Concept was developed by the City is based partially on the results during Preliminary Analysis Stage (Stage 1) and planning considerations. The final road network concept was a revised version of the initial road network concept provided from the City at the outset of the project. The evolution of the road network concept was also based on the results of Stage 1 and consultations with City of Red Deer staff. The preferred land use and road network concept used for detailed analysis are illustrated in the following sub-sections.

2.2.1 Preferred Land Use and Road Network Concept

Figure 3 shows the Preferred Land Use Concept plan assessed for the study area inside the existing City limits, as received on June 16, 2014 from the City. The preferred land use concept plan is also included in Appendix A. As shown, the land use concept includes a mix of different residential, commercial, and industrial uses, as well as park and open space. The Preferred Land Use Concept has approximately 2.377 million square feet of commercial gross floor area, or approximately 35% of the commercial floor space in the initial land use concept that was provided by the City at the outset of the study. As noted, the results of the analysis carried out during Stage 1 review indicated that the level of traffic generated by the initial land use concept would have been too great for the road network to accommodate. Consequently, the Preferred Land Use Concept has more residential and less commercial land use, which lowered overall trip generation of the study area and provided some relief to the proposed transportation network.



North of Highway 11A MASP Developable Land

- Proposed Commercial
- Proposed Industrial
- Proposed Residential
- To Be Determined
- Major Park
- Regional Community Facility
- Business Service Industrial
- Heavy Industrial
- County Residential
- Oil Well/Facility Setback
- Utility Right of Way
- Road Right of Way
- Proposed Road Right of Way
- Rail Right of Way
- Environmental Reserve
- Open Space
- Escarpment (>15% slope + 10 m buffer)
- 100 Year Flood
- Waterbody
- Wetland
- North of 11A MASP Boundary

THE CITY OF Red Deer

June 16, 2014
Version: 8
File: North of 11A Developable Land by Quarter Section.gws

Developable and Undevelopable Area by Quarter Section (in hectares)
Note: Areas where ROW intersect are counted once only

Township	Quarter Section	Qsec Total	Qsec within MASP	Developable Land	Proposed Commercial	Proposed Industrial	Proposed Residential	Existing Commercial	Business Service Industrial	Heavy Industrial	To Be Determined	Major Park	Regional Community Facility	Existing County Residential	Existing Open Space	Existing Waterbody	Existing Wetland	Existing Road	Proposed Road	Existing Rail	Utility	Oil Well/Facility Setback	Environmental Reserve	100 Yr Flood	Escarpment
39-27-W4	NE¼ Sec 10	65.9	0.07	0.06	0	0.06	0	0	0	0	0	0	0	0	0	0	0	0.01	0	0	0	0	0	0	0
39-27-W4	NE¼ Sec 11	64.88	0.06	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.06	0	0	0	0	0	0	0
39-27-W4	NE¼ Sec 2	64.67	55.08	42.03	0	0	0	0	0	0	42.03	0	0	0	6.64	3.26	0	0	1.46	0	1.05	0.09	0.04	0.51	0
39-27-W4	NE¼ Sec 3	64.96	64.96	43.27	0	43.27	0	0	0.31	0.04	0	0	0	0	9.93	0	0	4.45	0.03	3.2	3.72	0	0	0	0
38-27-W4	NE¼ Sec 31	64.39	1.02	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1.02	0	0	0	0	0	0	0
38-27-W4	NE¼ Sec 32	64.19	0.01	0.01	0.01	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
38-27-W4	NE¼ Sec 33	64.52	0.8	0	0	0	0	0	0	0	0	0	0	0	0	0.64	0	0.15	0	0	0	0	0	0	0
38-27-W4	NE¼ Sec 34	65.07	7.91	0	0	0	0	0	0	0	0	0	0	0	1.85	5.47	0	0	0	0	0	0.01	0	0.57	0
39-27-W4	NE¼ Sec 4	66	66	27.06	0	0	27.06	0	0	0	0	0	0	12.36	17.4	0	0	3.15	5.18	0	0.85	0	0	0	0
39-27-W4	NE¼ Sec 5	65.72	65.65	42.29	0	0	31.12	0	0	0	11.17	0	0	0	0	11.98	0	0	0	0	0	0	0	0	0
39-27-W4	NE¼ Sec 9	65.99	21.05	19.15	0	0	19.15	0	0	0	0	0	0	0	0	0	0	0.8	0.81	0	0.3	0	0	0	0
39-27-W4	NW¼ Sec 1	66.31	7.64	3.38	0	0	0	0	0	0	3.38	0	0	0	3.7	0	0	0	0	0	0.53	0	0	0	0
39-27-W4	NW¼ Sec 10	66.56	0.88	0.78	0	0.05	0.73	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
39-27-W4	NW¼ Sec 11	66.69	1.8	0.01	0	0.01	0	0	0	0	0	0	0	0	0	0	0	1.8	0	0	0	0	0	0	0
39-27-W4	NW¼ Sec 2	66.38	53.2	25.65	0	0.01	0	0	0	0	25.64	0	0	0	16.82	5.15	0	0.02	0.81	0	1.54	0	0	3.21	0
39-27-W4	NW¼ Sec 3	66.99	66.99	0.01	0	0.01	0	0	9.2	28.81	0	0	0	0	9.27	0	5.15	7.21	2.02	2.21	3.1	0.02	0	0	0
38-27-W4	NW¼ Sec 31	66.1	0.57	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.57	0	0	0	0	0	0	0
38-27-W4	NW¼ Sec 32	66.85	1.61	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1.61	0	0	0	0	0	0	0
38-27-W4	NW¼ Sec 33	65.96	0.03	0	0	0	0	0	0.02	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
39-27-W4	NW¼ Sec 4	67.83	67.83	28.32	0	0	3.75	0	0	0	4.01	0	20.56	0	0	7.12	0	1.65	5.01	0	0	0.01	0	0	0
39-27-W4	NW¼ Sec 5	66.95	13.58	13.5	0	0	13.5	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
39-27-W4	NW¼ Sec 9	66.3	4.13	4.01	0	0	4.01	0	0	0	0	0	0	0	0	0	0	0	0.12	0	0	0	0	0	0
39-27-W4	SE¼ Sec 10	66.02	66.02	16.74	0	16.74	0	0	0	28.27	0	0	0	0	0	0	0	7.84	6.57	4.69	1.91	0	0	0	0
39-27-W4	SE¼ Sec 11	67.92	56.09	39.75	0	1.71	0	0	0	0	0.5	37.54	0	0	0.46	0	0	0	2.07	0	0	10.76	0.69	0	2.35
39-27-W4	SE¼ Sec 2	64.64	41.81	20.16	0	0	0	0	0	0	20.16	0	0	0	11.71	8.08	0	0	0	0	0	0.14	0	1.71	0
39-27-W4	SE¼ Sec 3	66.95	55.83	11.82	0	11.82	0	0	14.22	0	0	0	0	0	9.06	5.92	0	2.65	0	2.74	3.14	0	0	6.28	0
39-27-W4	SE¼ Sec 4	66.58	66.58	57.15	15.44	2.67	39.04	0	0	0	0	0	0	0	5	0	0.03	2.72	0.22	1.46	0	0	0	0	0
39-27-W4	SE¼ Sec 5	67.36	67.32	34.47	11.69	0	22.78	0	0	0	0	0	0	0	0	6.88	0	5.44	0	0	0.37	0	0	0	0
39-27-W4	SE¼ Sec 8	64.87	41.4	41.4	0	0	35.15	0	0	0	6.25	0	0	0	0	0	0	0	0	0	0	0	0	0	0
39-27-W4	SE¼ Sec 9	65.63	65.63	55.62	0	0	55.62	0	0	0	0	0	0	0	0	0	0	2.93	7.07	0	0	0	0	0	0
39-27-W4	SW¼ Sec 1	65.71	26.97	17.07	0	0	0	0	0	0	17.07	0	0	0	9.67	0.14	0	0	0	0	0	0.03	0	0	0
39-27-W4	SW¼ Sec 10	66.43	66.43	58.74	0	58.74	0	0	0	0	0	0	0	0	0	0	0	1.53	5.59	0	0.56	0	0	0	0
39-27-W4	SW¼ Sec 11	67.71	67.71	44.83	0	37.01	0	0	0	0	4.89	2.93	0	0	3.64	0	0	2.08	4.05	0.48	2.6	0.09	0	0	9.94
39-27-W4	SW¼ Sec 12	69.47	0.02	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.02	0	0	0
39-27-W4	SW¼ Sec 2	67.83	6.06	0	0	0	0	0	0	0	0	0	0	0	1.75	3.7	0	0	0	0	0	0	0	0.61	0
39-27-W4	SW¼ Sec 3	68.48	68.48	20.44	12.46	7.98	0	0	26.6	0	0	0	0	0	3.28	0	0.71	14.03	0	1.43	1.99	0	0	0	0
39-27-W4	SW¼ Sec 4	68.75	68.75	48.3	28.93	0	19.37	0	0	0	0	0	0	0	0	0.21	0	4.17	4.57	0	0.53	0	0	0	0
39-27-W4	SW¼ Sec 5	67.95	22.38	21.82	0	0	21.82	0	0	0	0	0	0	0	0	0	0	0.41	0	0	0	0	0	0	0
39-27-W4	SW¼ Sec 9	65.79	64.82	54.58	5.09	0	41.64	0	0	0	7.85	0	0	0	5.63	0	0	2.28	2.3	0	0	0.02	0	0	0

Figure 3: Preferred Land Use Concept

During the Stage 1 analysis, WCG also reviewed the effects of major growth or intensification within the portion of the study area located north of the current City limits. The results indicated that the study area road network would not be able to accommodate the level of traffic generated. To confirm that this is still valid with the Preferred Land Use Concept inside the City limits, a model run was completed with this portion of the study area having similar level of intensification as the portion of the study area within City limits. The results confirmed that multiple movements at multiple intersections within the study area will operate at poor levels of service with long delays and volumes that well exceed the theoretical capacity (or volume-to-capacity ratio much greater than 1.00).

As a result of the confirmation that the study area road network would not be able to support intensification of the study area north of the existing City limits, the detailed analysis concentrated on assessing the study area transportation requirements with the Preferred Land Use Concept inside the City limits and only the already approved land uses for the study area outside the City limits.

The long term road network concept for the study area was developed in consultation with City staff based on the results of the analysis carried out in Stage 1. As noted, it was confirmed that the Preferred Land Use Concept along with intensification of the study area north of the City limits will not be supportable with the transportation network. Therefore, the detailed analysis does not contemplate additional development (over what was already approved) in the portion of the study area north of the City limits. Therefore, the existing road network has been used for the area north of the City limits in the detailed analysis. The final analyzed concept of the road network plan is shown in **Figure 4**.

Figure 4: Preferred Road Network Concept

2.3 Methodology

In order to assess the impacts of the proposed land use on the study area road network, future background traffic volumes for the study area were developed based on modifications made by WCG to the City's VISUM traffic forecasting model for the 188,000 population horizon. A similar approach of developing forecast traffic volumes was taken during Stage 1, but with different land use and road network concepts.

WCG used the preferred land use and road network concepts as inputs to the forecasting model and it in turn generated both link volumes and turning movement volumes at key intersections in the study area during the p.m. peak hour. As the City model reflects only the p.m. peak hour, no a.m. peak analysis has been included in the work plan. Also, for the purpose of this study, as per the study scope, only volumes at full build-out of the study area were generated and analyzed.

Once the traffic volumes within the study area had been determined, WCG carried out intersection capacity analyses at the key intersections in the study area for the p.m. peak hour. The results of the analysis identified the projected operating conditions at the key intersections and assisted in the identification of the possible future operational/capacity issues. Results of this analysis lead to recommendations related to intersectional improvements required to accommodate forecasted traffic volumes.

2.4 Development of Study Area Forecast Traffic Volumes

The existing City VISUM model included only four large zones within the study area. For the purpose of this study, it was deemed necessary that the study area be modelled in greater detail by replacing the City modelled zones in this area with 32 new zones in total (30 zones inside City limits and 2 zones north of the City limits), as shown in **Figure 5**. As shown, the boundaries of modelled zones in the study area generally followed the quarter section lines, since the information available on future developments in the study area was available on a per quarter section basis. In creating the new zones, the access points to the network or connectors also needs to be created. In this case, stub links which branch off from the modelled roadways were created. The pattern of these stub links generally followed the edge of the zone or the transportation network. The connectors were created and located to ensure that the traffic from the zones are properly distributed and assigned to the modelled road network.

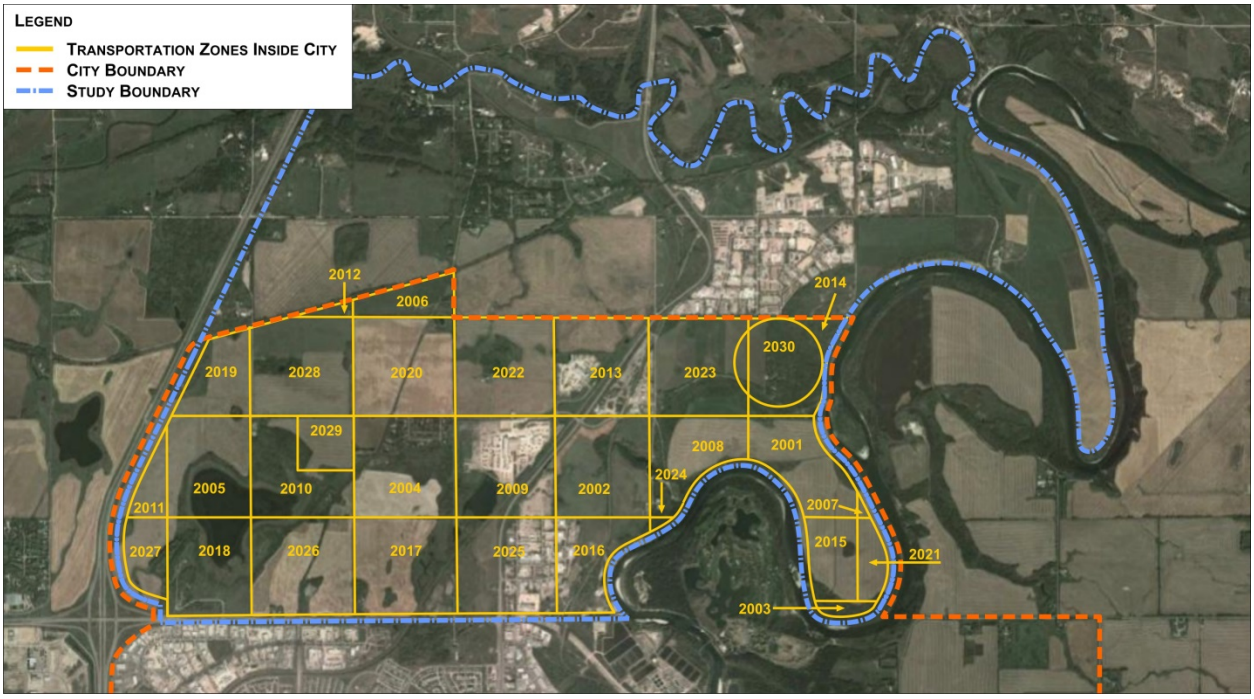


Figure 5: Zone Map

The City of Red Deer model has three main trip types: Home-Based Work (HBW), Home-Based Other (HBO) and Non-Home Based (NHB). The total trips are split into HBW, HBO, and NHB, which have different trip distribution characteristics. In addition, the model also splits the trips into external and internal components. We note that all input parameters from the City's 188,000 population have been retained for the purpose of this study.

2.5 Population and Employment

In accordance to discussions with the City of Red Deer staff, the following parameters were used in the analysis to estimate trips in the study area:

- 12 % Floor Area Ratio (FAR) for the industrial areas
- 30 % FAR for the commercial areas
- For residential areas, 17.7 dwelling units per hectare and 2.33 people per dwelling units

For each zone, the number of vehicle trips had been generated using trip rates outlined in the ITE Trip Generation Manual[1] or the City of Red Deer's trip generation rate table.

- For residential, a standard City trip generation rate of 0.31 trips per person was utilized.
- For commercial developments, an overall trip generation rate of 3.71 trips per 1000 ft^2 was used. This is the trip generation rate for the Shopping Centre land use from the ITE Trip Generation Manual.
- For industrial developments, a standard City of Red Deer trip generation rate of 0.7 trips per 1000 ft^2 was used.

For the **residential** land use in each quarter section within the study area, the City provided residential areas with each quarter section. Using the number of dwelling units per hectare and the number of people per dwelling unit, the population for each zone was obtained which in turn was used to calculate the trip generation using the trip rates noted above.

For the **commercia**l and **industrial** land uses, the City provided the developable land area within each quarter section, and the typical FAR for each land use as noted previously. With the developable area and FAR information, floor areas for the different commercial and industrial land uses were calculated. Trip generation for these uses were estimated by applying the trip generation rates outlined above.

Based on the above parameters, the total estimated trip generation in the study area will be 19,955 trips in the p.m. peak hour. For input into the VISUM model, the vehicular trip generation for each zone was converted to population and employment in order to replicate the calculated trip generation**.** A table summarizing the trip generation, and the converted population and employment numbers for each zone are included in **Table 1**.

[1] Institute of Transportation Engineers. Trip Generation Manual, 9th Edition. Washington, D.C. 2012.

TABLE 1: STUDY AREA TRAFFIC GENERATION, POPULATION AND EMPLOYMENT

Zone	Population	Retail Employment	Industrial Employment	PM Peak Trip Generation		
				Inbound	Outbound	Total
2001	1993	0	0	349	188	537
2002	0	0	851	47	347	394
2003	0	0	0	0	0	0
2004	1870	0	0	328	176	504
2005	1476	0	0	259	139	398
2006	908	0	0	159	86	245
2007	160	0	0	28	15	43
2008	1216	0	0	213	115	328
2009	0	0	639	40	296	336
2010	178	0	0	31	17	48
2011	640	0	0	112	60	173
2012	190	0	0	33	18	51
2013	0	0	744	49	358	407
2014	24	0	33	6	16	22
2015	956	0	0	168	90	258
2016	0	0	456	28	207	235
2017	1852	1480	52	1215	1158	2373
2018	1080	1120	0	862	830	1692
2019	1667	0	0	292	157	449
2020	2638	0	0	462	249	711
2021	810	0	0	142	76	218
2022	0	0	1151	64	467	531
2023	232	0	725	81	316	397
2024	0	0	0	0	0	0
2025	0	1194	417	754	1051	1805
2026	918	2773	0	1825	1889	3714
2027	1035	0	0	181	98	279
2028	1974	488	0	639	503	1142
2029	0	500	0	336	349	685
2030	0	15	0	8	10	19
2031(outside City limit)	562	0	0	99	53	152
2032(outside City limit)	0	0	3617	217	1591	1808
Total	**22,379**	**7,570**	**8,685**	**9,027**	**10,928**	**19,955**

3.0 Detailed Analysis Results

3.1 Intersections

3.1.1 Intersection Overview

A number of key intersections in the study area were evaluated. **Figure 6** shows the analyzed intersections. Since some of the roads in the study area outlined in the preferred road network concept do not currently exist and have no street names, the analyzed intersections were assigned identification numbers for the purpose of referencing them during our analysis and for documentation. The same intersection numbers are included in Figure 6 for reference in this report. As shown, we have reviewed the key study area intersections that are within the City limits, since the intensification of the study area north of the existing City limits was shown to be not supportable.

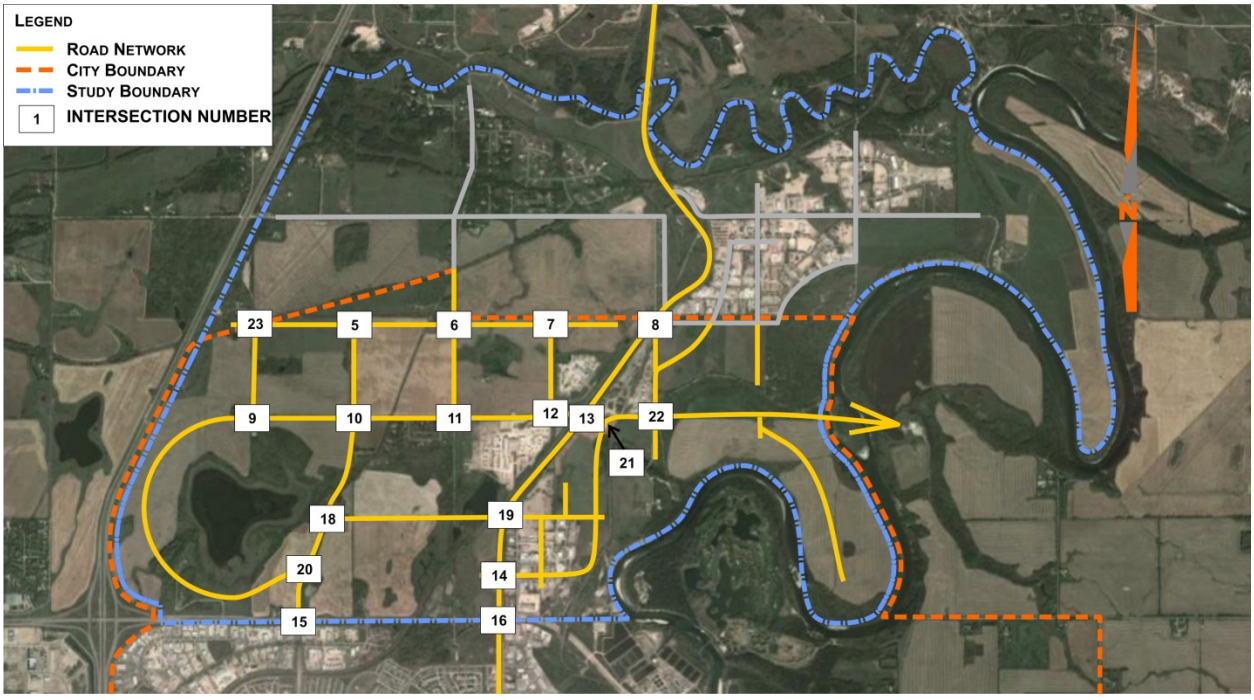


Figure 6: Study Area Intersections

3.1.2 Turning Movements

Based on parameters outlines in previous sections, the forecast turning movement volumes at the key intersections generated by the VISUM traffic forecasting model are summarized in **Figure 7**. These intersection volumes reflect the full buildout of the study area in accordance to the Preferred Land Use Concept presented.

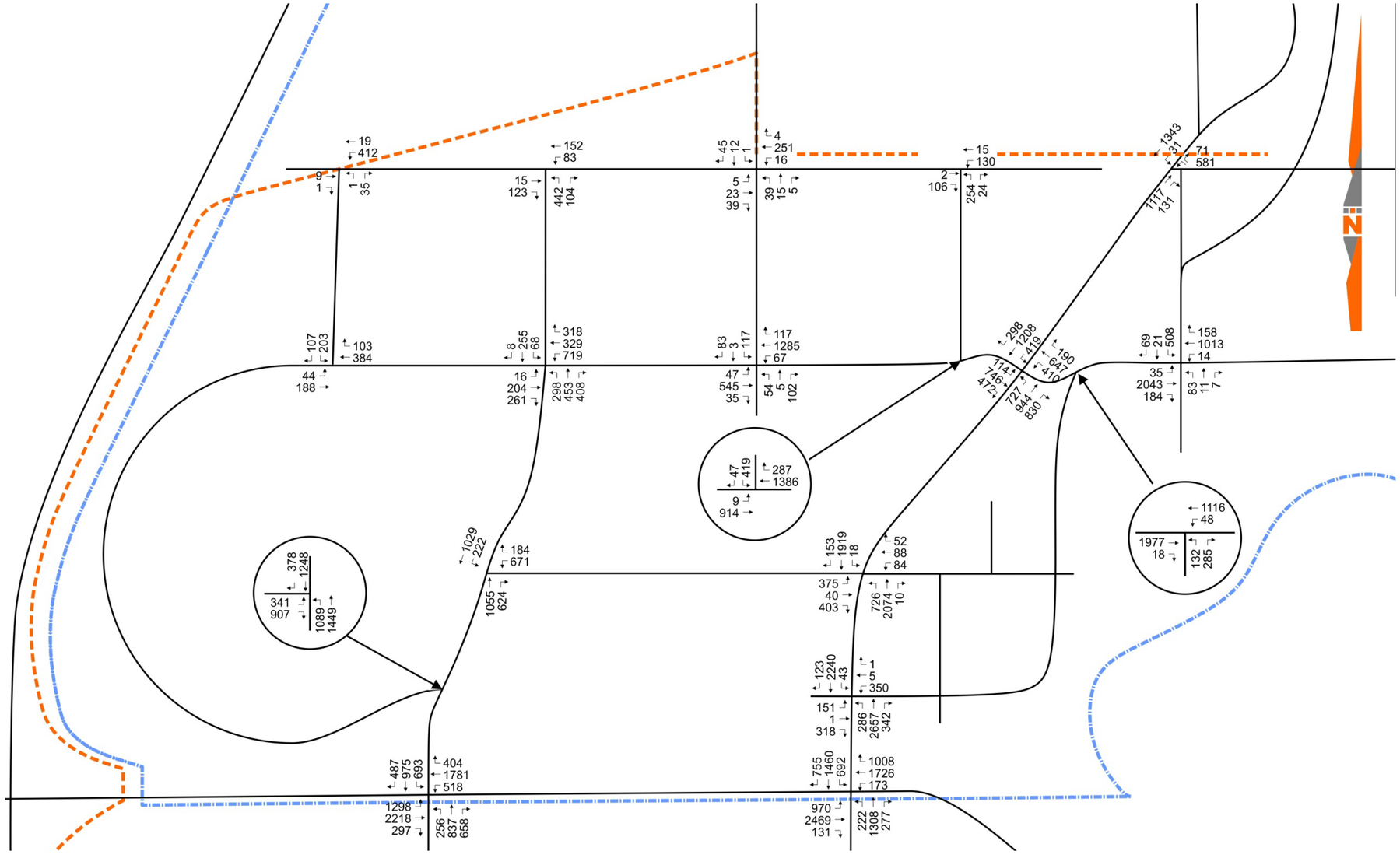


Figure 7: Intersection Turning Movement Volumes

3.1.3 Intersection Performance Evaluation

The operating conditions during the p.m. peak hour at the key study area intersections were evaluated using the Synchro/SimTraffic 7.0 software package (which is based on the methodology outlined in the U.S. Highway Capacity Manual[2]). For unsignalized (stop-controlled) intersections, the Level-of-Service (LOS) is based on the computed delays on each of the critical movements. LOS A represents minimal delays for minor street traffic movements, and LOS F represents a scenario with an insufficient number of gaps on the major street for minor street motorists to complete their movements without significant delays.

For signalized intersections, the methodology considers the intersection geometry, traffic volumes, the traffic signal phasing/timing plan, and also pedestrian volumes. The average delay for each lane group is calculated, as well as the delay for the overall intersection. The operating conditions can also be expressed in terms of volume-to-capacity (v/c) ratio. The City of Red Deer considers a v/c ratio of 0.85 and a Level of Service D to be the threshold, at which geometric or signal timing improvements may be considered. We have illustrated the LOS criteria for both unsignalized and signalized intersections, as summarized in the Highway Capacity Manual, in **Table 2**.

TABLE 2: LEVEL OF SERVICE CRITERIA

Level of Service (LOS)	Average Delay for UNSIGNALIZED Intersection Movements	Average Delay for SIGNALIZED Intersection Movements
A	0 – 10 seconds per vehicle	0 – 10 seconds per vehicle
B	> 10 – 15 seconds per vehicle	> 10 – 20 seconds per vehicle
C	> 15 – 25 seconds per vehicle	> 20 – 35 seconds per vehicle
D	> 25 – 35 seconds per vehicle	> 35 – 55 seconds per vehicle
E	> 35 – 50 seconds per vehicle	> 55 – 80 seconds per vehicle
F	> 50 seconds per vehicle	> 80 seconds per vehicle

All roundabouts reviewed in this study were evaluated using the SIDRA Intersection 5.1 software package. For roundabout approaches, the level-of-service is based on the computed delays on each of the approaches. LOS A represents minimal delays, and LOS F represents a scenario with an insufficient number of gaps on the circulating flow for motorists to enter to the roundabout without significant delays. The LOS criteria for roundabouts are shown in **Table 3**.

[2] Transportation Research Board, National Research Council. Highway Capacity Manual 2000. Washington, D.C. 2000.

TABLE 3: LEVEL OF SERVICE CRITERIA FOR ROUNDABOUTS

Level of Service (LOS)	Average Delay for Roundabout Movements
A	0 – 10 seconds per vehicle
B	> 10 – 15 seconds per vehicle
C	> 15 – 25 seconds per vehicle
D	> 25 – 35 seconds per vehicle
E	> 35 – 50 seconds per vehicle
F	> 50 seconds per vehicle

3.1.4 Future Intersection Operating Conditions

Once the forecast traffic volumes were developed, capacity analysis for the key intersections in the study area was performed. All key intersections in the study area, including the intersection of Highway 11A / Highway 2A intersection (which is expected to be a grade-separated single-point diamond interchange by this horizon as a result of the North Highway Connector Project), were evaluated at the outset as at-grade intersections. The intersections of Highway 11A / Highway 2A, Highway 11A / Taylor Drive, and Highway 2A / Township Road 391 (Intersection 13) were assessed as signalized intersections at the outset due to the traffic volumes (roundabouts were confirmed to not be sufficient for the anticipated traffic volumes). The remaining intersections were tested as stop-controlled intersections.

With the intersection of Highway 11A / Highway 2A, Highway 11A / Taylor Drive and Highway 2A / Township Road 391(Intersection 13) as at-grade signalized intersections, multiple movements at each intersections will operate at LOS E and F and v/c ratio greater than 1.0. Given that the intersections of Highway 11A / Highway 2A, Highway 11A / Taylor Drive and Highway 2A / Township Road 391(Intersection 13) will not operate satisfactorily as at-grade signalized intersections with the forecasted volumes, it was determined that these intersections will required grade separation to support the level of development outline in the Preferred Land Use Concept. Therefore, these intersections were all reassessed as grade-separated interchanges. It is beyond the scope of this study to determine when grade-separation for these locations is required. However, before grade separation is required, the above intersections will have to operate as at-grade signalized intersections as it provides more capacity than roundabouts. Therefore, the sequencing of development for these intersections is from at-grade intersections to grade-separated interchanges as development in area advances. It should also be noted that the specific interchange configuration will have to be confirmed by the City at a later time with additional studies, but we have assessed them as single-point diamond interchanges (with a set of signals controlling the cross-street and turning movements) for the

purpose of this study. Capacity analysis was carried out for the signalized intersection controlling the cross-street and turning movements on the interchange. As noted, the intersection of Highway 11A / Highway 2A was already contemplated to be a single-point diamond interchange by the North Highway Connector Study. The first intersection adjacent to the interchange must be located no less than 400 m from the nearest interchange terminal intersection or at least 150 m from the end of the nearest interchange ramp taper, whichever is greater. It is noted that the locations of Intersections 14 and 20 (intersections that are immediately north of the intersections of Highway 11A / Highway 2A, and Highway 11A / Taylor Drive, respectively) may be close to the acceptable minimum spacing from the future interchanges at these locations. Therefore, the noted intersection (and their cross-roads) may have to be shifted to the north from the locations shown pending the determination of the specific interchange configuration to be confirmed with additional studies.

Also from the results, Intersections 6 and 23 are expected to operate at acceptable levels of service as at-grade stop-controlled intersections. However, Intersections 5, 7, 8, 9, 10, 11, 12, 14, 18, 19, 20, 21, and 22 will not operate satisfactorily as at-grade stop-controlled intersections. Therefore, they were reassessed as roundabouts in keeping with the City's policy of evaluating intersections as roundabouts before signals. As roundabouts, the results indicate that all intersections will operate at acceptable levels of service with the exception of Intersections 14, 19, 20, 21, and 22. Therefore, Intersections 14, 19, 20, 21, and 22 will require signalization.

It is noted that roundabout was chosen as the appropriate traffic control type at Intersections 5, 7, 8, 9, 10, 11, 12 and 18 was based purely from a capacity perspective. These intersections were shown to operate satisfactorily as roundabouts. Although signalization is not required for these intersections, other factors might preclude these intersections from being roundabouts in the future and thereby requiring signalization. Such factor may include detailed design requirements for roundabouts, specific development types and intensities in the vicinity, the City's plan for Taylor Drive and other roads in the study area, and AT's plan for Highway 2A. Therefore, it is noted that the actual traffic controls at key intersections will be determined as development progresses in the study area.

As a result of the capacity analysis, we have illustrated the appropriate type of intersection control (stop-controlled, roundabout, or signalized) for each intersection in **Figure 8**. The lane configuration for each intersection is shown in **Figure 9**. The results of the intersection capacity analysis with the recommended traffic control and lane configuration illustrated are summarized in **Table 4**. The expected overall levels of service of the key intersections with the indicated traffic control types are summarized graphically in **Figure 10**. Capacity analysis results for the different traffic control types assessed (unsignalized intersections, roundabouts, and signalized intersections) for the studied intersections are included in **Appendix B**.

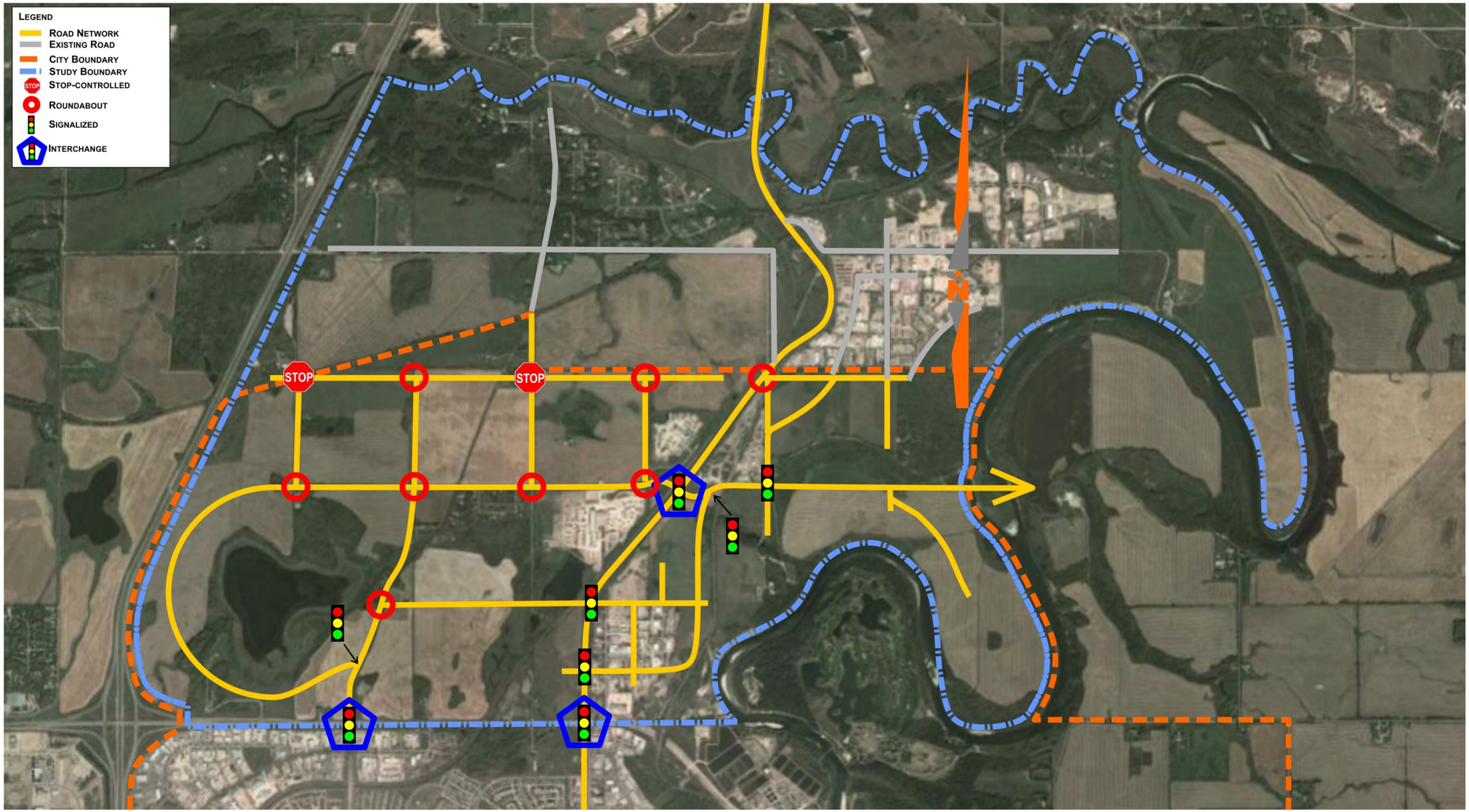


Figure 8: Traffic Control

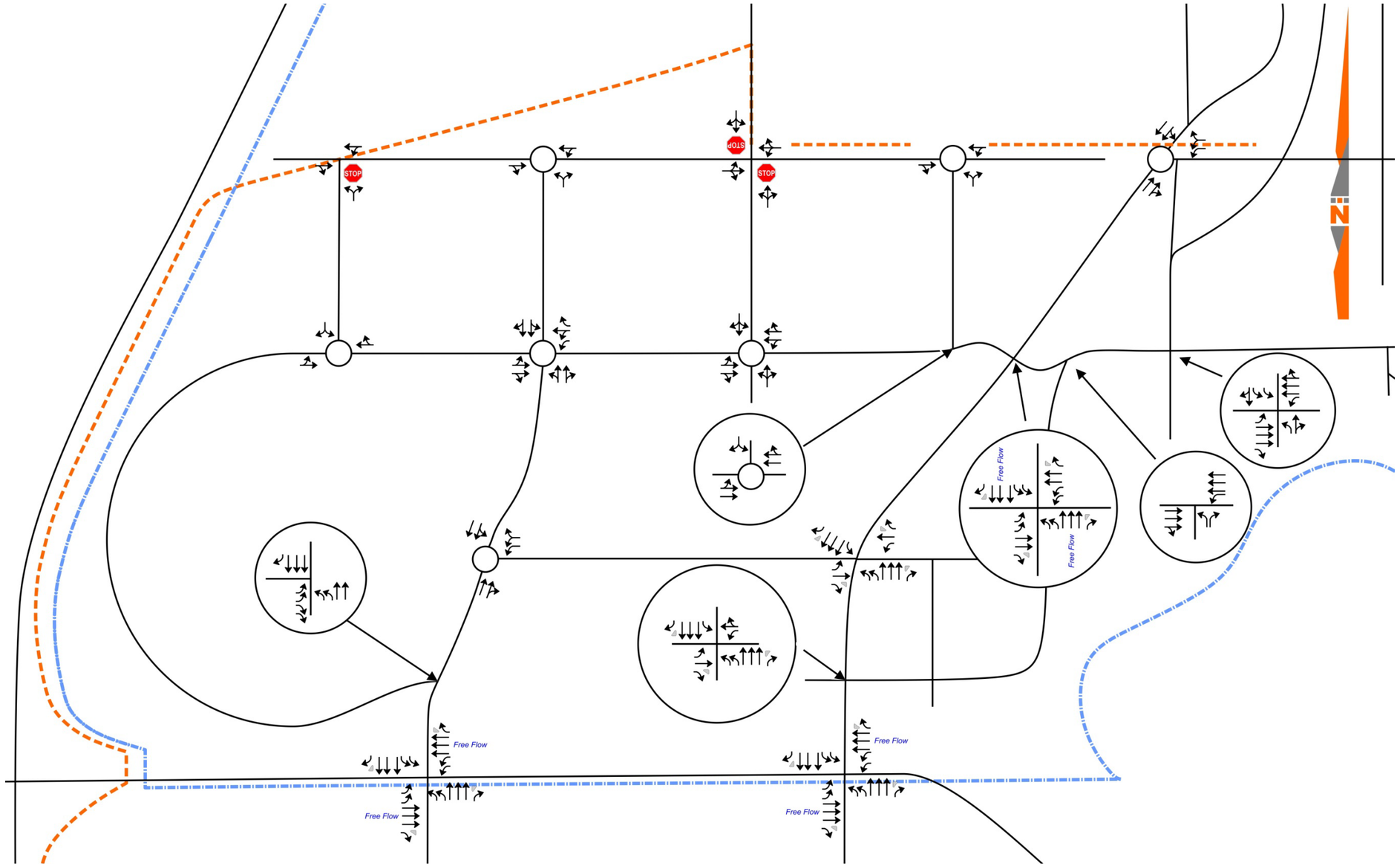


Figure 9: Intersection Lane Configuration

TABLE 4: FUTURE OPERATING CONDITIONS WITH RECOMMENDED INTERSECTION TRAFFIC CONTROL

INTERSECTION / MOVEMENT			PM PEAK HOUR v/c Ratio	LOS	Delay (s)	Queue (m)
Intersection #5 (Roundabout)	EB	Through/Right	0.11	A	0.4	4.7
	WB	Left/Through	0.26	A	3.8	11.1
	NB	Left/Right	0.36	A	2.4	17.9
	Intersection Summary			**A**	**2.5**	
Intersection # 6 (Unsignalized)	EB	Left/Through/Rigth	0.00	A	0.6	0.1
	WB	Left/Through/Rigth	0.01	A	0.5	0.3
	NB	Left/Through/Rigth	0.14	B	14.3	3.7
	SB	Left/Through/Rigth	0.10	B	11.5	2.6
Intersection #7 (Roundabout)	EB	Through/Right	0.09	A	0.6	3.6
	WB	Left/Through	0.14	A	4.0	5.2
	NB	Left/Right	0.17	A	2.7	7.2
	Intersection Summary			**A**	**2.6**	
Intersection #8 (Roundabout)	WB	Left	0.47	A	8.9	18.5
		Left/Right	0.47	A	7.2	19.4
	NB	Through	0.45	A	0.2	26.5
		Through/Right	0.45	A	0.2	27.0
	SB	Left/Through	0.84	A	9.1	73.1
		Through	0.84	A	8.1	75.0
	Intersection Summary			**A**	**5.2**	
Intersection #9 (Roundabout)	EB	Left/Through	0.23	A	3.8	10.3
	WB	Through/Right	0.36	A	1.5	18.7
	SB	Left/Right	0.42	B	13.9	20.6
	Intersection Summary			**A**	**5.9**	
Intertsection #10 (Roundabout)	EB	Left/Through	0.38	A	5.2	14.9
		Through/Right	0.38	A	4.1	15.7
	WB	Left	0.58	A	8.0	33.0
		Left/Through	0.58	A	5.1	35.8
		Right	0.27	A	1.2	10.6
	NB	Left/Through	0.57	A	4.0	33.5
		Through/Right	0.57	A	2.2	33.6
	SB	Left/Through	0.36	A	9.1	14.8
		Through/Right	0.36	A	6.3	16.0
	Intersection Summary			**A**	**4.6**	

INTERSECTION / MOVEMENT			PM PEAK HOUR v/c Ratio	LOS	Delay (s)	Queue (m)
Intersection #11 (Roundabout)	EB	Left/Through	0.36	A	2.1	15.4
		Through/Right	0.36	A	1.8	15.4
	WB	Left/Through	0.59	A	1.1	34.5
		Through/Right	0.59	A	0.7	34.8
	NB	Left/Through/Right	0.24	A	4.4	8.0
	SB	Left/Through/Right	0.45	A	9.9	17.4
	Intersection Summary			**A**	**1.9**	
Intersection #12 (Roundabout)	EB	Left/Through	0.54	A	3.7	31.9
		Through	0.54	A	3.3	32.4
	WB	Through	0.57	A	0.1	36.2
		Through/Right	0.57	A	0.1	37.3
	SB	Left/Right	0.78	C	21.7	72.7
	Intersection Summary			**A**	**4.4**	
Intersection # 13 Highway 2A / Township Road 391 Interchange Ramp Terminal Int. (Signalized)	EB	Left	0.33	C	31.2	15.1
		Through	0.73	C	25.4	67.7
		Right	0.63	A	5.8	19.3
	WB	Left	0.79	D	40.0	#49.5
		Through	0.54	B	18.6	51.5
		Right	0.30	A	3.7	11.4
	NB	Left	0.77	C	27.6	66.7
		Through	-	-	-	-
		Right	0.61	A	1.9	0.0
	SB	Left	0.44	C	20.8	36.0
		Through	-	-	-	-
		Right	0.22	A	0.3	0.0
	Intersection Summary			**B**	**17.5**	
Intersection # 14 (Signalized)	EB	Left	0.40	C	34.8	47.0
		Through	0.00	D	37.0	1.7
		Right	0.86	D	50.9	#104.7
	WB	Left	0.92	E	69.1	#144.3
		Through/Right	0.02	C	35.0	4.6
	NB	Left	1.14	F	131.0	m#56.5
		Through	1.18	F	110.0	m#327.8
		Right	0.25	A	0.2	m0.0
	SB	Left	0.42	E	68.1	m11.6
		Through	1.03	C	28.3	m34.7
		Right	0.09	A	0.0	m0.0
	Intersection Summary			**E**	**67.8**	

INTERSECTION / MOVEMENT			PM PEAK HOUR			
			v/c Ratio	LOS	Delay (s)	Queue (m)
Intersection # 15 Highway 11A/Taylor Drive Interchange Ramp Terminal Int. (Signalized)	EB	Left	0.98	D	54.0	#216.4
		Through	-	-	-	-
		Right	0.22	A	0.3	0.0
	WB	Left	0.39	C	24.0	59.5
		Through	-	-	-	-
		Right	0.30	A	0.5	0.0
	NB	Left	0.78	E	68.1	#52.3
		Through	0.84	D	53.1	92.0
		Right	0.89	C	21.8	#102.4
	SB	Left	0.98	E	75.0	#127.0
		Through	0.63	D	51.3	95.3
		Right	0.63	B	19.7	75.0
	Intersection Summary			**D**	**42.1**	
Intersection # 16 Highway 11A / Highway 2A Interchange Ramp Terminal Int. (Signalized)	EB	Left	0.96	E	59.4	#167.9
		Through	-	-	-	-
		Right	0.10	A	0.1	0.0
	WB	Left	0.17	C	28.8	24.7
		Through	-	-	-	-
		Right	0.74	A	3.4	0.0
	NB	Left	0.80	E	73.5	#48.6
		Through	0.95	D	54.7	#150.1
		Right	0.54	B	16.3	47.5
	SB	Left	0.95	D	54.1	m93.4
		Through	0.71	C	34.5	m101.7
		Right	0.76	B	10.6	m41.1
	Intersection Summary			**D**	**36.3**	
Intersection #18 (Roundabout)	WB	Left	0.80	C	17.8	57.2
		Left/Right	0.80	B	14.9	62.0
	NB	Through	0.78	A	4.0	79.7
		Through/Right	0.78	A	3.6	79.9
	SB	Left/Through	0.85	B	11.7	74.9
		Through	0.85	A	9.6	77.6
	Intersection Summary			**A**	**8.8**	

INTERSECTION / MOVEMENT			PM PEAK HOUR			
			v/c Ratio	LOS	Delay (s)	Queue (m)
Intersection # 19 (Signalized)	EB	Left	1.04	F	95.7	#163.9
		Through	0.11	D	39.2	18.1
		Right	0.71	B	14.6	48.5
	WB	Left	0.22	C	31.0	28.0
		Through	0.25	D	41.5	34.2
		Right	0.16	B	11.0	10.9
	NB	Left	1.20	F	141.3	m#92.8
		Through	0.92	C	28.6	m88.2
		Right	0.01	B	13.2	m0.4
	SB	Left	0.18	E	56.8	12.5
		Through	1.16	F	112.6	#241.6
		Right	0.25	A	6.5	16.9
	Intersection Summary			**E**	**72.4**	
Intersection # 20 (Signalized)	EB	Left	0.62	D	50.2	57.8
		Right	0.79	A	8.0	19.2
	NB	Left	0.94	D	42.0	#166.9
		Through	0.63	B	12.2	160.1
	SB	Through	0.88	D	46.8	129.9
		Right	0.59	A	9.1	36.9
	Intersection Summary			**C**	**27.7**	
Intersection # 21 (Signalized)	EB	Through/Right	0.86	C	23.3	128.4
	WB	Left	0.18	A	5.6	5.3
		Through	0.37	A	6.5	34.3
	NB	Left	0.40	C	32.8	36.7
		Right	0.69	B	19.9	42.9
	Intersection Summary			**B**	**17.9**	
Intersection # 22 (Signalized)	EB	Left	0.27	C	23.1	13.7
		Through	0.89	C	32.0	189.5
		Right	0.28	A	8.0	23.8
	WB	Left	0.25	C	29.9	8.2
		Through/Right	0.53	B	19.9	81.7
	NB	Left	0.49	E	60.3	37.2
		Through/Right	0.07	C	30.8	9.4
	SB	Left	0.84	E	58.9	#90.8
		Through/Right	0.22	B	12.8	17.3
	Intersection Summary			**C**	**30.9**	
Intersection # 23 (Unsignalized)	EB	Through/Right	0.01	A	0.0	0.0
	WB	Left/Through	0.29	A	8.1	9.4
	NB	Left/Right	0.05	A	9.4	1.1

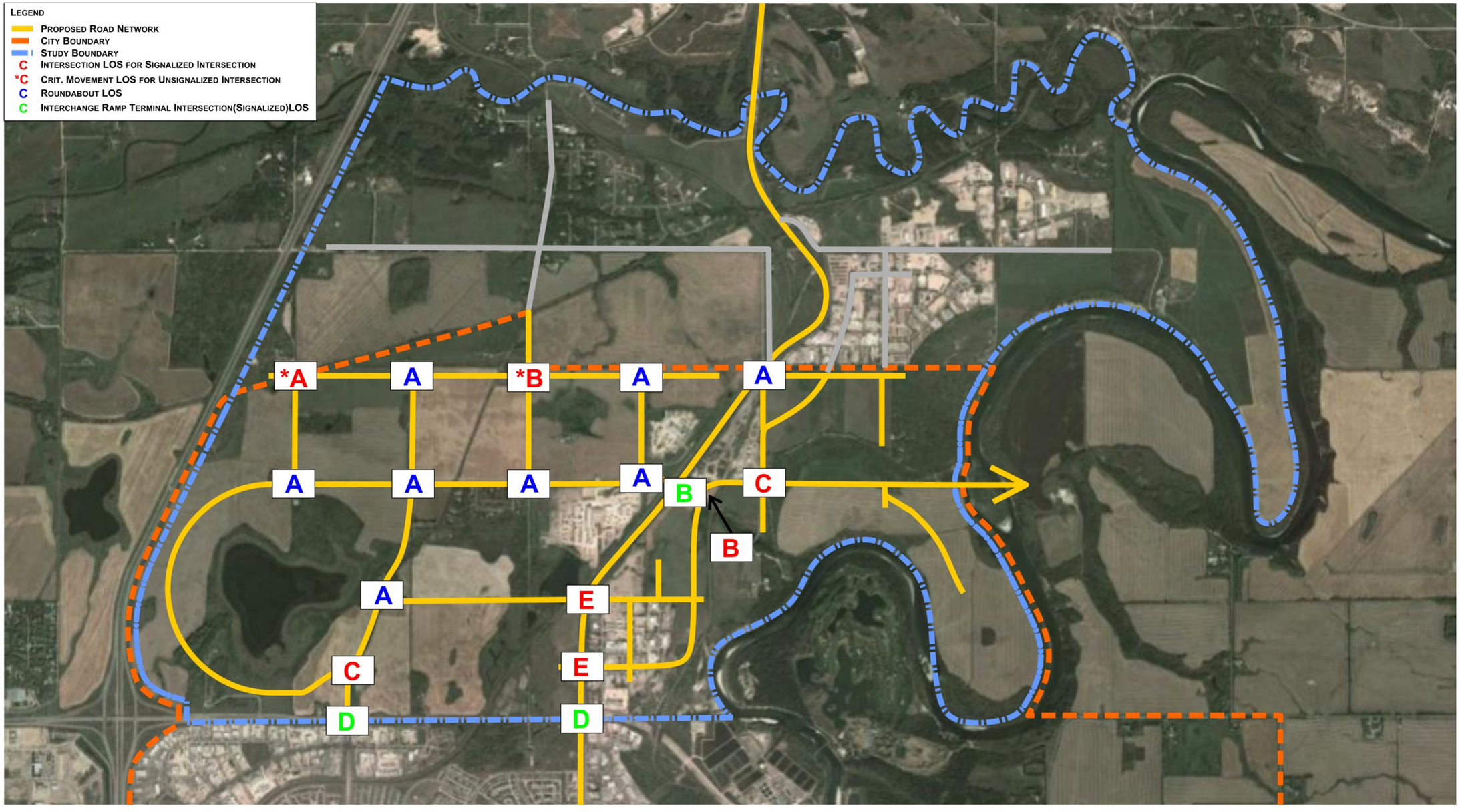


Figure 10: Intersection Level of Service

It is noted that the results outlined in Table 4 are based on planning level traffic volumes projected for a long term scenario. As shown by the results, it is anticipated that some movements at some of the studied intersections would not operate at v/c ratios and levels of service that are normally considered acceptable. WCG attempted to mitigate the operating conditions to the extent possible, given the current signal timing parameters that requires 120-second cycle lengths and pre-timed signal operation. Given the results, there is no flexibility for additional commercial land use above the level assessed in this study. However, it is expected that the operating conditions would improve if alternative cycle lengths and signal operation were used in assessing the signalized intersections in the study area. Operating conditions will change as time progresses and will also be contingent upon the type and intensities of development that actually proceeds. Therefore, it is recommended that operating conditions at the study area intersections be studied again as more detailed information pertaining to the existing and future land uses become available, such as when an application of a proposed development is in front of the City.

3.2 Internal Transportation Network

3.2.1 Daily Volumes

The daily volumes on the study area roadways were estimated by multiplying the two-way p.m. peak hour forecast volumes by a factor of 10, which is an accepted ratio between the daily and peak hour volumes. The daily volumes for the study area's internal road network are summarized in **Figure 11**.

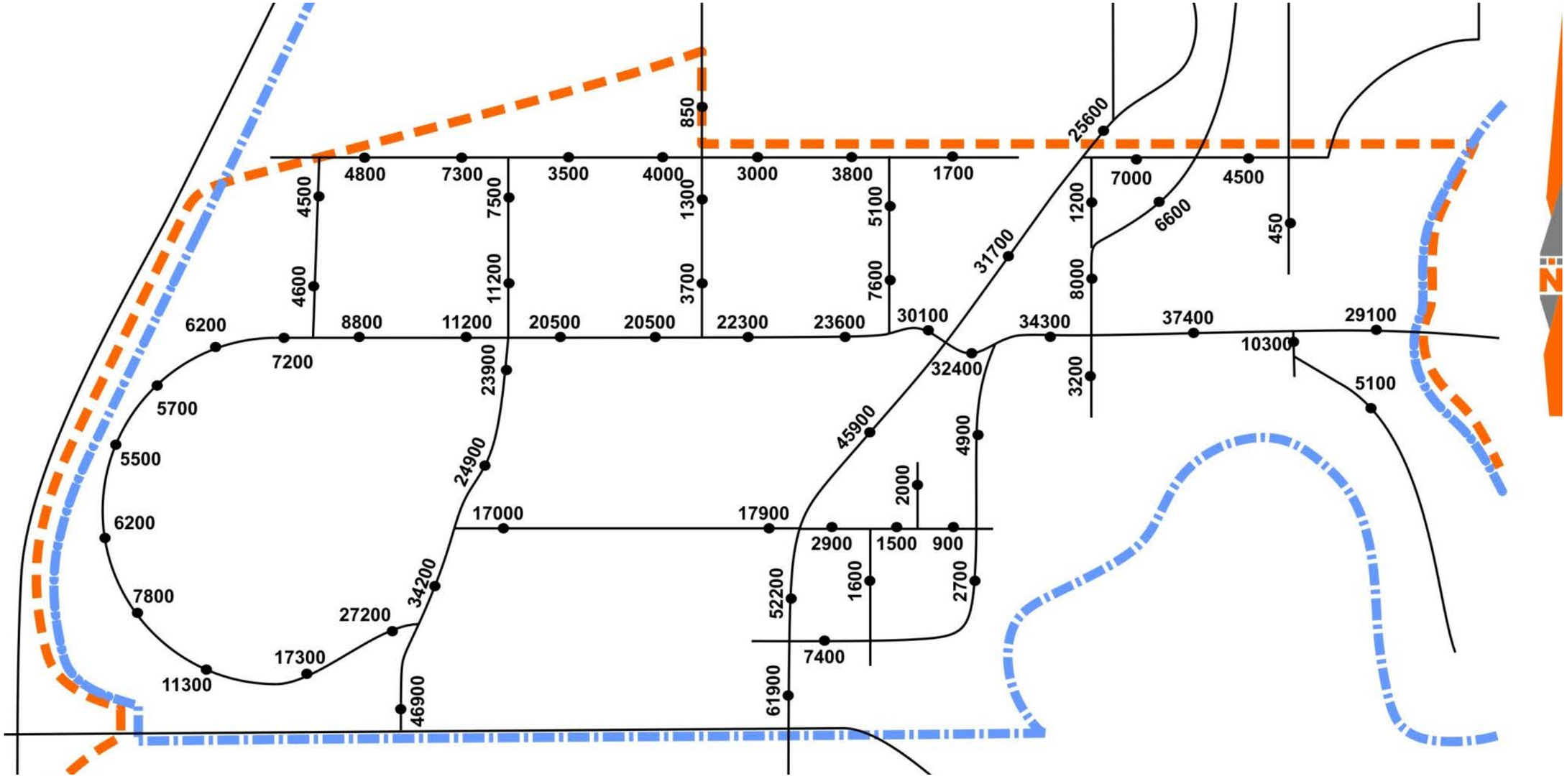


Figure 11: Daily Volumes

3.2.2 Road Classification System

A summary of the City of Red Deer Road Classification System and Road Design Standards is included in **Table 5**. Parameters included in Table 5 were used to develop the ultimate network concept discussed in subsequent section of this report. Standard cross-sections for each roadway type are included in **Appendix D**.

TABLE 5: CITY OF RED DEER ROADWAY DESIGN STANDARDS

Roadway Designation	Daily Service Volumes (vpd)	Right of Way Width
Divided Arterial	> 20,000	60 m
Undivided Arterial	<20,000	48 m
Undivided Residential Collector	<10,000	24 m (separate sidewalk)
Divided Residential Collector	<10,000	30 or 32 m (separate sidewalk)
Urban Industrial Collector	<10,000	30 m

3.2.3 Recommended Road Network

The recommended internal road network classification and the number of lanes in each road segment are shown in **Figures 12** and **13**. The internal roadways are classified based on the requirements of the projected daily traffic volumes and the daily service volumes for the different roadway designations under the City's functional road classification system. The numbers of lanes shown on the figure is based on number of through travel lanes associated with the corresponding roadway designation. It should be noted that the number of lanes indicated on Figure 12 may increase on the approaches to the intersections to accommodate left and right turn bays. A summary illustration of the final road network overlaid on top of the Preferred Land Use Concept is provided in **Figure 14**.

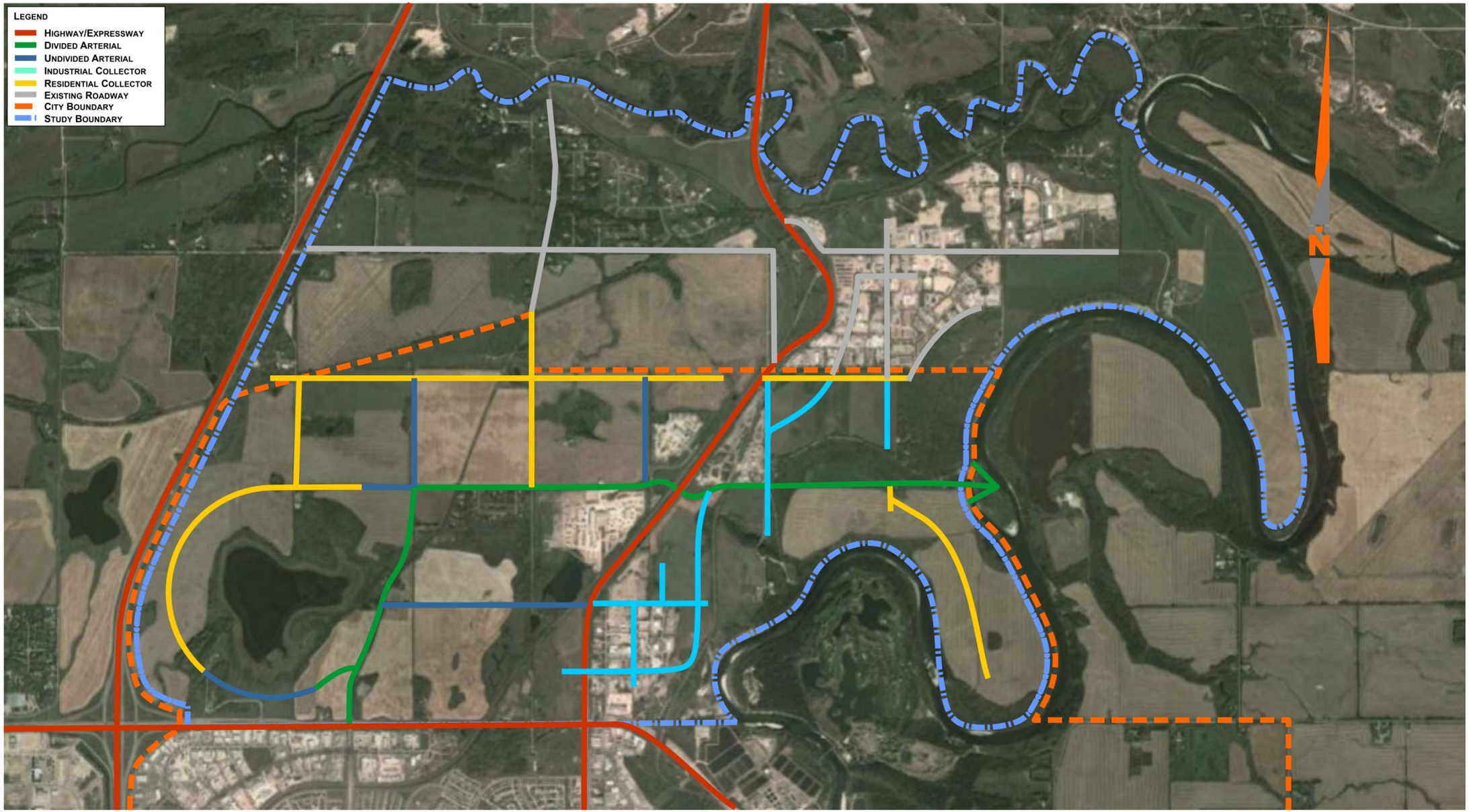


Figure 12: Internal Road Classification

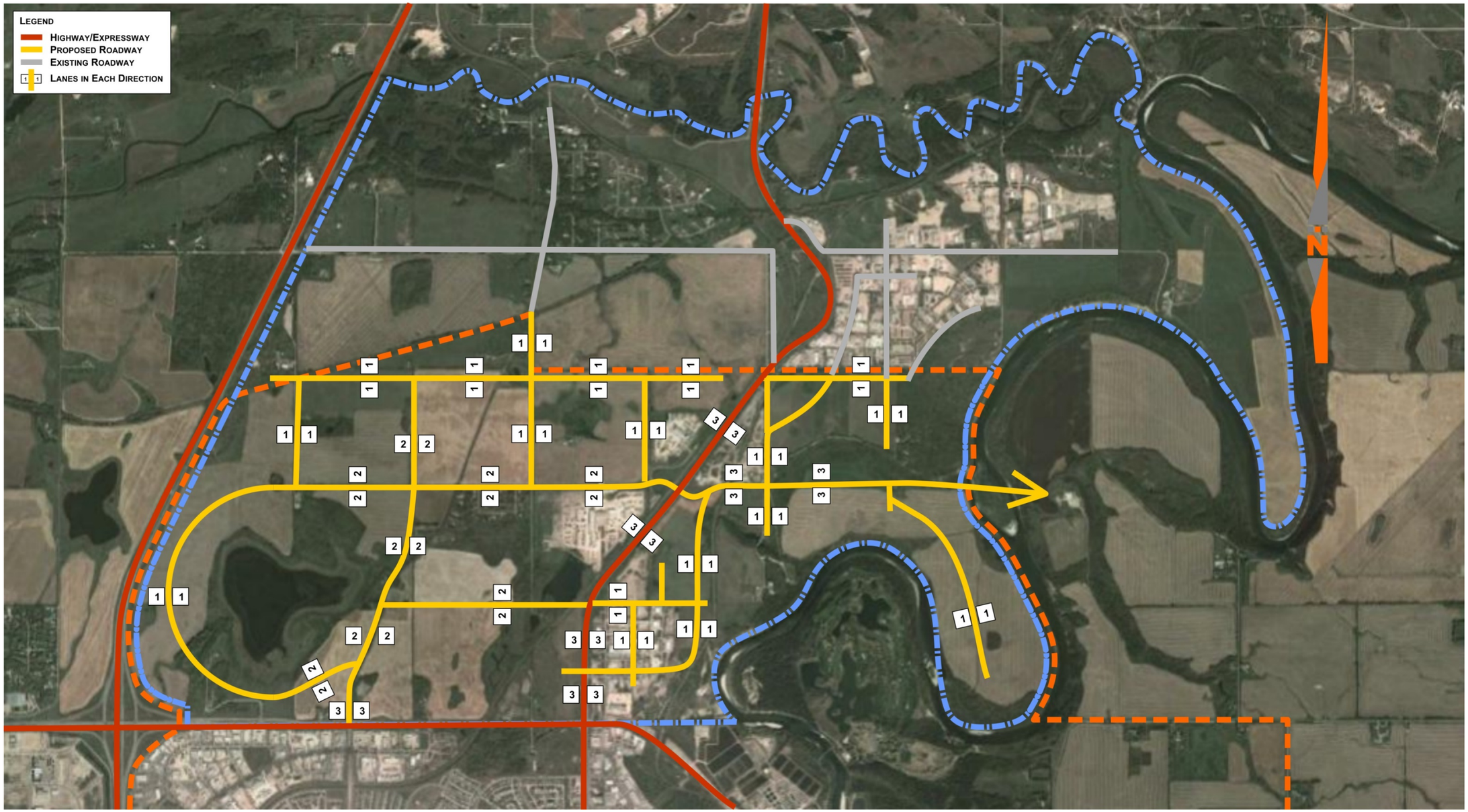


Figure 13: Number of Lanes

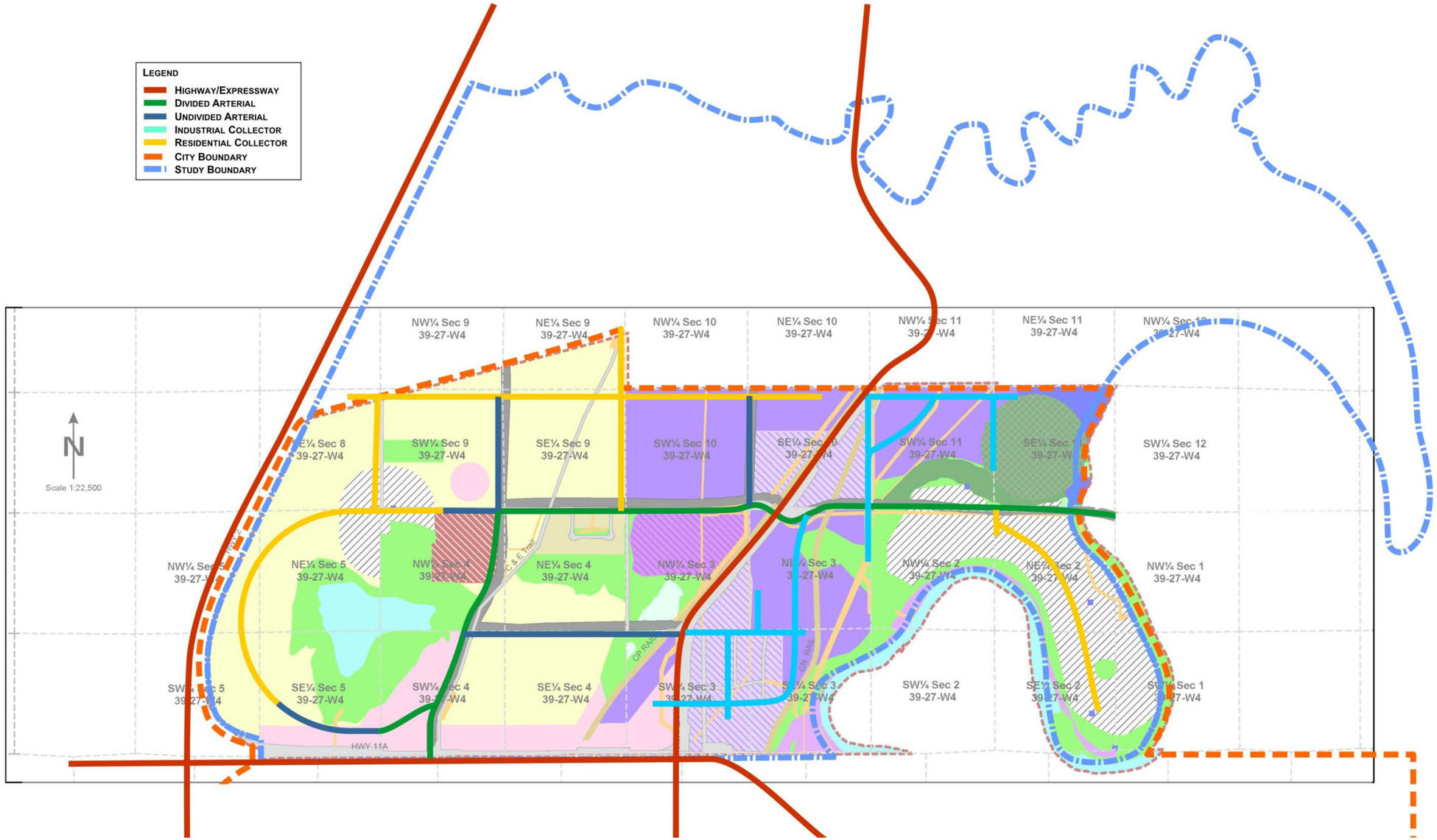


Figure 14: Road Network on Preferred Land Use Concept

3.3 Railway Crossings

The CP Rail main line crosses the study area between Highway 11A and Blindman River. Its alignment is located west of and runs parallel to Highway 2A for most of its segment within the study area. The presence of the CP Rail line will impose restrictions on the planned development and operation of the future network in the area. At the initial stage, all crossings of the CP line will be at-grade with the appropriate controls and warning system as per Transport Canada's Railway-Roadway Grade Crossings Policy to provide for safe operation. It should be noted that all existing and future identified crossings of the CP Rail line will ultimately have to be grade separated for traffic flow and safety reasons. This includes the existing crossing on Highway 11A, and crossings west of Intersections 13 and 19. The actual discussion/ negotiations of the considered crossings should be carried out at the subsequent stages of the development process with CP Rail.

3.4 Summary of Detailed Analysis Results

The results of the analysis lead to the following conclusions:

- **Interchanges along Highway 11A**: The results of the capacity analysis of the intersections of Highway 11A / Highway 2A and Highway 11A / Taylor Drive indicate that grade separated interchanges will be required at both of these locations in the long term. According to the North Highway Connector Study, grade separation is already contemplated by the City at the Highway 11A / Highway 2A intersection.

- **Highway 2A / Township Road 391 Intersection (Intersection 13)**: This intersection will operate at overall LOS F without the grade separation. This is a result of high forecast traffic volumes on both Highway 2A and the intersecting major east-west roadway which connects to the Red Deer River crossing to the east. It is recommended that traffic monitoring program be introduced in this area to ascertain if and when improvements are required. Traffic monitoring will be critical as the advancement of the development cannot be foreseen accurately at this point. The progression and pattern of area development will determine timing of the required improvements.

  The following approaches could be considered to improve operation of the network in this area:

  - Construction of an interchange – this solution may prove expensive as it will require construction of the over- or underpass crossing of both the CP Rail main line and Highway 2A given the proximity between the Highway 2A and the rail line.

- Curtailment of upgrades at the eastbound approach of the intersection to two-lane arterial standard to limit traffic volumes on this leg of the intersection. This approach will modify traffic patterns in the area and consequently level of the turning volumes at this intersection. It may also result in need of additional connections points along Highway 2A.

- **Highway 2 Connection**: It should be stressed that the additional connection to Highway 2 is not required to support the planned development within the City boundaries. However, the area is supported by four access points namely Taylor Drive, Highway 2A (Gaetz Avenue) from the south, East Bypass River Crossing from the east and Highway 2A from the north. As there is no direct access from the west, such connection should be considered and the right-of-way protected. A connection with Highway 2 will provide increased accessibility for the study area when development occurs and it could be located at a suitable location south of the Blindman River. Although determination of the precise location is not within the scope of this study, a possible location of such a connection could be at the approximate location of the existing Township Road 392 (Blindman Drive) alignment (approximately equidistant between the Highway 11A and Highway 597 interchanges), south of the Blindman River.

- At the initial stage, all CP Rail line crossings would be at-grade and should be equipped with the appropriate control and warning system to provide for safe operation. Ultimately, all existing and the future identified crossings of the CP Rail line will have to be grade separated.

4.0 ADDITIONAL ACCESS TO HIGHWAY 11A

One of the objectives of the study was the evaluation of a possible additional access on Highway 11A located equidistant between the Highway 2 interchange and the Taylor Drive intersection. Highway 11A within the City limits is classified as a future expressway in the North Highway Connector (NHC) Study. The Taylor Drive intersection is signalized and is expected to require improvements once development on the lands north of Highway 11A proceeds. The ultimate plans call for Highway 11A to be upgraded to a six lane divided facility. The existing Highway 2 interchange was constructed to a cloverleaf layout. Alberta Transportation's long term plans include modification of this interchange to a diamond standard. It should be stressed that Highway 11A is currently under the management jurisdiction and control of Alberta Transportation. It is classified as a multi-lane facility with a minimum spacing of 1.6 km between major intersections (according to Table I.5 on Page I-33 of the Highway Geometric Design Guidelines).

It should also be noted that the existing offset between the centerline of the Taylor Drive intersection and the gore of the Highway 2 interchange is approximately 1060 m, while it is expected that this offset will increase to approximately 1190 m following modification of the interchange. **Based on the AT Access Management Guidelines this intersection spacing is substandard and, therefore, no additional access should be considered in the area.** Similarly, the current intersection spacing between Taylor Drive and Highway 2A along Highway 11A is approximately 1.6 km, so no additional access should be considered between these two existing intersections.

However, **as per the request by the City of Red Deer, a feasibility assessment of the additional T-intersection access and its impact on the operation of Taylor Drive intersection and QE2 interchange was carried out.** This analysis included the review of intersection spacing, geometric review as well as capacity and operational reviews. The summary of the results of the analysis is included below.

4.1 Intersection Spacing Review

According to the City of Red Deer Street Classification System, Highway 11A is classified as an urban expressway which means that minimum 800 m spacing should be maintained between intersections along this link. This distance is dictated by the geometrical requirements for signage and intersection layouts (TAC Geometric Design Guide for Canadian Roads Section 3.2.3.2, and City of Red Deer Design Guidelines Drawing 5.01). Consequently, **no additional access should be permitted on Highway 11A west of Taylor Drive** as the spacing between the Taylor Drive and the considered access intersection would be approximately 530 m assuming current layout of the QE2 interchange and approximately 600 m if the QE2 interchange layout is modified.

4.2 Capacity and Operational Review

Capacity and operational review of the Taylor Drive intersection and possible interim access has been carried out for the scenarios without the access, with a right-in/right-out (RI/RO) access connection, and with an all-turns access connection. Results of the analysis are included in the **Appendix C**.

Results of the analysis show that the introduction of the additional access does not improve intersection level of service (LOS) at the Taylor Drive intersection. It also increases eastbound queues and introduces over 250 m queues at the considered access point in both eastbound and westbound directions.

4.3 Other Issues

The safety of operation was analyzed in terms of the weave manoeuvre in the area between the interchange ramp terminal and the considered access intersection. Results of the SimTraffic micro-simulation analysis using one hour loading time and one hour simulation indicate that if the considered access intersection is constructed, drivers entering Highway 11A from the interchange ramp and proceeding east with the intent to turn left to go northbound may experience difficulties executing this manoeuvre due to the high traffic volumes on the eastbound carriageway of approximately 3814 vehicles per hour (vph).

Although according to TAC Design Guidelines the first intersection on cross-roads should not be closer to the interchange gores than 400 m for a skeletal road (collector, arterial) a detailed analysis should be carried out to verify that this minimum spacing will permit proper operation of the road segment. In this case the length of the queues, more than 250 m, coupled with the expected posted speed limit of 80 km/h and the high expected traffic volumes of over 3814 vph eastbound suggests that increased intersection spacing should be considered as the minimum spacing of 400 m might be too short to prove sufficient to permit drivers to reach the intended lane prior to reaching the end of the queue.

4.4 Summary

Results of the analysis of the additional connection to Highway 11A lead to following conclusions:

- An additional access point on Highway 11A between Taylor Drive and Highway 2 should not be constructed, as it does not adhere to:
    a. AT Access Management Guidelines for intersection spacing for multilane roads,
    b. TAC and City Design Guidelines for intersection spacing for urban expressways.

- Construction of this additional access will not improve operation and LOS at the Taylor Drive intersection.
- Construction of this access may result in decreased safety of operation for the drivers entering Taylor Drive from the Highway 2 interchange via the northbound-to-eastbound ramp and intending to turn left at the considered access intersection.
- To improve operational conditions at the Highway 11A / Taylor Drive intersection, an interchange will ultimately be required at this location.

5.0 CONCLUSIONS AND RECOMMENDATIONS

5.1 Conclusions

Results of the analysis lead to the following conclusions:

Interchanges along Highway 11A: The intersections of Highway 11A / Highway 2A and Highway 11A / Taylor Drive, will have to be upgraded to grade separated interchanges in the long term. As a result, the locations of Intersections 14 and 20 (intersections that are immediately north of these interchanges) may have to be shifted north from the location shown to ensure proper spacing from the interchange gores.

- **Highway 2A / Township Road 391 Intersection (Intersection 13)**: This intersection will operate at overall LOS F without the grade separation. Traffic monitoring program should be implemented in this area to ascertain when improvements of the intersection are required. Traffic monitoring is critical as the advancement of future development in the study area cannot be foreseen accurately at this point, but its progression and pattern will determine timing of the required improvements.

  The following approaches could be considered to improve operation of the network in this area:

  - Construction of an interchange – this solution may prove expensive as it will require construction of the over or underpass crossing of both the CP Rail main line and Highway 2A.

  - Curtailment of upgrades at the EB approach of the intersection to two-lane arterial standard to limit traffic volumes on this leg of the intersection. This approach will modify traffic patterns in the area and consequently number of the turns at this intersection. It may also require additional connections points along Highway 2A.

- **Highway 2 Connection**: Although an additional connection to Highway 2 is not required to support the assumed development within the City boundaries evaluated in this study nor does the final road network shows such a connection, a direct connection from/to Highway 2 on the west side of the study area should be considered and the right-of-way protected. A connection with Highway 2 will provide increased accessibility for the study area when development occurs and it could be located at a suitable location south of the Blindman River. Should the area be developed in a denser manner than considered by the City, such a connection will be required in the future to improve operation of the network in the area. Consequently provision for such a connection should be included in the long term plans and the right-of-way protected to provide space for its construction.

Although determination of the precise location was not within the scope of this study, a possible location of such a connection could be at the approximate location of the existing Township Road 392 (Blindman Drive) alignment approximately half way along the QE2 between the Highway 11A and Highway 597 interchanges.

- At the initial stage, all CP Rail line crossings should be at-grade with the appropriate traffic controls and warning systems in place to provide for safe operation. Ultimately, all existing and the future identified crossings of the CP Rail line will have to be grade separated.

- **Additional Access Point on Highway 11A Between Taylor Drive and Highway 2**:
    - This additional access should not be constructed, as it does not adhere to:
        - AT Access Management Guidelines for intersection spacing for multilane roads,
        - TAC and City Design Guidelines for intersection spacing for and urban expressways.
    - Construction of this additional access will not improve operation and LOS at the Taylor Drive intersection.
    - Construction of this access may result in decreased safety of operation for the drivers entering Taylor Drive from the Highway 2 interchange via the northbound-to-eastbound ramp and intending to turn left at the considered access intersection.
    - To improve operational conditions at the Highway 11A / Taylor Drive intersection, an interchange will ultimately be required at this location.

5.2 Recommendations

Results of the analysis lead to the following recommendations:

- **Interchanges along Highway 11A**: The intersections of Highway 11A / Highway 2A and Highway 11A / Taylor Drive should ultimately be upgraded to grade-separated interchanges. As a result, the locations of Intersections 14 and 20 (intersections that are immediately north of these interchanges) may have to be shifted north from the location shown to ensure proper spacing from the interchange gores.

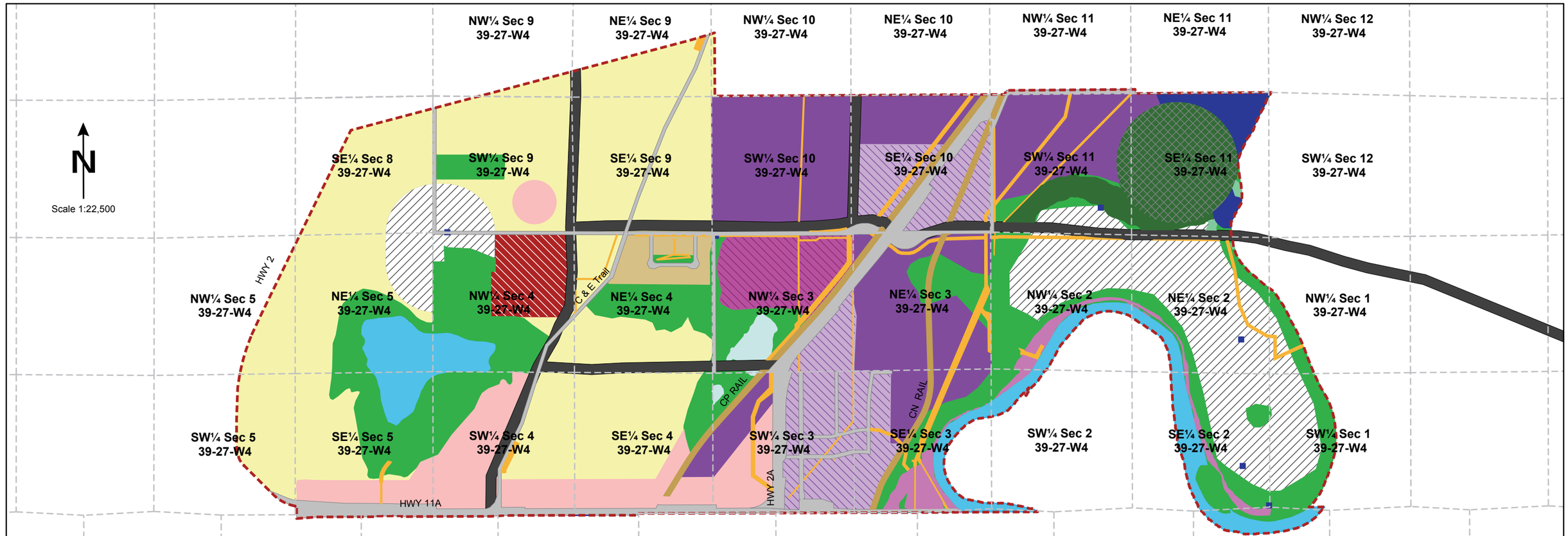
- **Highway 2A / Township Road 391 Intersection (Intersection 13)**: Traffic monitoring program should be implemented in this area to ascertain if and when improvements of the intersection are required.

- **Highway 2 Connection**: A provision should be made and right-of-way protected for direct connection to Highway 2 north of the Highway 11A interchange and south of Blindman River. Although determination of the precise location was not within the scope of this study, a possible location of such a connection could be considered at the extension of the existing Township Road 392 (Blindman Drive) alignment.

- At the initial stage all CP line crossings should be equipped in barriers and flashers to provide for safe operation. Ultimately all the existing and the future identified crossings of the CP line will have to be grade separated.

- An additional access point on Highway 11A between Taylor Drive and Highway 2 should not be constructed.

APPENDIX A: PREFERED LAND USE CONCEPT



North of Highway 11A MASP Developable Land

- Proposed Commercial
- Proposed Industrial
- Proposed Residential
- To Be Determined
- Major Park
- Regional Community Facility
- Business Service Industrial
- Heavy Industrial
- County Residential
- Oil Well/Facility Setback
- Utility Right of Way
- Road Right of Way
- Proposed Road Right of Way
- Rail Right of Way
- Environmental Reserve
- Open Space
- Escarpment (>15% slope + 10 m buffer)
- 100 Year Flood
- Waterbody
- Wetland
- North of 11A MASP Boundary

THE CITY OF Red Deer

June 16, 2014
Version: 8
File: North of 11A Developable Land by Quarter Section.gws

Developable and Undevelopable Area by Quarter Section (in hectares)
Note: Areas where ROW intersect are counted once only

Township	Quarter Section	Qsec Total	Qsec within MASP	Developable Land	Proposed Commercial	Proposed Industrial	Proposed Residential	Existing Commercial	Business Service Industrial	Heavy Industrial	To Be Determined	Major Park	Regional Communiity Facility	Existing County Residential	Existing Open Space	Existing Waterbody	Existing Wetland	Existing Road	Proposed Road	Existing Rail	Utility	Oil Well/Facility Setback	Environmental Reserve	100 Yr Flood	Escarpment
39-27-W4	NE¼ Sec 10	65.9	0.07	0.06	0	0.06	0	0	0	0	0	0	0	0	0	0	0	0	0.01	0	0	0	0	0	0
39-27-W4	NE¼ Sec 11	64.88	0.06	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.06	0	0	0	0	0	0	0
39-27-W4	NE¼ Sec 2	64.67	55.08	42.03	0	0	0	0	0	0	42.03	0	0	0	6.64	3.26	0	0	1.46	0	1.05	0.09	0.04	0.51	0
39-27-W4	NE¼ Sec 3	64.96	64.96	43.27	0	43.27	0	0	0.31	0.04	0	0	0	0	9.93	0	0	4.45	0.03	3.2	3.72	0	0	0	0
38-27-W4	NE¼ Sec 31	64.39	1.02	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1.02	0	0	0	0	0	0	0
38-27-W4	NE¼ Sec 32	64.19	0.01	0.01	0.01	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
38-27-W4	NE¼ Sec 33	64.52	0.8	0	0	0	0	0	0	0	0	0	0	0	0	0.64	0	0.15	0	0	0	0	0	0	0
38-27-W4	NE¼ Sec 34	65.07	7.91	0	0	0	0	0	0	0	0	0	0	0	1.85	5.47	0	0	0	0	0	0.01	0	0.57	0
39-27-W4	NE¼ Sec 4	66	66	27.06	0	0	27.06	0	0	0	0	0	0	12.36	17.4	0	0	3.15	5.18	0	0.85	0	0	0	0
39-27-W4	NE¼ Sec 5	65.72	65.65	42.29	0	0	31.12	0	0	0	11.17	0	0	0	0	11.98	0	0	0	0	0	0	0	0	0
39-27-W4	NE¼ Sec 9	65.99	21.05	19.15	0	0	19.15	0	0	0	0	0	0	0	0	0	0	0.8	0.81	0	0.3	0	0	0	0
39-27-W4	NW¼ Sec 1	66.31	7.64	3.38	0	0	0	0	0	0	3.38	0	0	0	3.7	0	0	0	0	0	0.53	0	0	0	0
39-27-W4	NW¼ Sec 10	66.56	0.88	0.78	0	0.05	0.73	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
39-27-W4	NW¼ Sec 11	66.69	1.8	0.01	0	0.01	0	0	0	0	0	0	0	0	0	0	0	1.8	0	0	0	0	0	0	0
39-27-W4	NW¼ Sec 2	66.38	53.2	25.65	0	0.01	0	0	0	0	25.64	0	0	0	16.82	5.15	0	0.02	0.81	0	1.54	0	0	3.21	0
39-27-W4	NW¼ Sec 3	66.99	66.99	0.01	0	0.01	0	0	9.2	28.81	0	0	0	0	9.27	0	5.15	7.21	2.02	2.21	3.1	0.02	0	0	0
38-27-W4	NW¼ Sec 31	66.1	0.57	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.57	0	0	0	0	0	0	0
38-27-W4	NW¼ Sec 32	66.85	1.61	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1.61	0	0	0	0	0	0	0
38-27-W4	NW¼ Sec 33	65.96	0.03	0	0	0	0	0	0.02	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
39-27-W4	NW¼ Sec 4	67.83	67.83	28.32	0	0	3.75	0	0	0	4.01	0	20.56	0	0	7.12	0	1.65	5.01	0	0	0.01	0	0	0
39-27-W4	NW¼ Sec 5	66.95	13.58	13.5	0	0	13.5	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
39-27-W4	NW¼ Sec 9	66.3	4.13	4.01	0	0	4.01	0	0	0	0	0	0	0	0	0	0	0	0.12	0	0	0	0	0	0
39-27-W4	SE¼ Sec 10	66.02	66.02	16.74	0	16.74	0	0	28.27	0	0	0	0	0	0	0	0	7.84	6.57	4.69	1.91	0	0	0	0
39-27-W4	SE¼ Sec 11	67.92	56.09	39.75	0	1.71	0	0	0	0	0.5	37.54	0	0	0.46	0	0	0	2.07	0	0	10.76	0.69	0	2.35
39-27-W4	SE¼ Sec 2	64.64	41.81	20.16	0	0	0	0	0	0	20.16	0	0	0	11.71	8.08	0	0	0	0	0	0.14	0	1.71	0
39-27-W4	SE¼ Sec 3	66.95	55.83	11.82	0	11.82	0	0	14.22	0	0	0	0	0	9.06	5.92	0	2.65	0	2.74	3.14	0	0	6.28	0
39-27-W4	SE¼ Sec 4	66.58	66.58	57.15	15.44	2.67	39.04	0	0	0	0	0	0	0	5	0	0.03	2.72	0.22	1.46	0	0	0	0	0
39-27-W4	SE¼ Sec 5	67.36	67.32	34.47	11.69	0	22.78	0	0	0	0	0	0	0	0	6.88	0	5.44	0	0	0.37	0	0	0	0
39-27-W4	SE¼ Sec 8	64.87	41.4	41.4	0	0	35.15	0	0	0	6.25	0	0	0	0	0	0	0	0	0	0	0	0	0	0
39-27-W4	SE¼ Sec 9	65.63	65.63	55.62	0	0	55.62	0	0	0	0	0	0	0	0	0	0	2.93	7.07	0	0	0	0	0	0
39-27-W4	SW¼ Sec 1	65.71	26.97	17.07	0	0	0	0	0	0	17.07	0	0	0	9.67	0.14	0	0	0	0	0	0.03	0	0	0
39-27-W4	SW¼ Sec 10	66.43	66.43	58.74	0	58.74	0	0	0	0	0	0	0	0	0	0	0	1.53	5.59	0	0.56	0	0	0	0
39-27-W4	SW¼ Sec 11	67.71	67.71	44.83	0	37.01	0	0	0	0	4.89	2.93	0	0	3.64	0	0	2.08	4.05	0.48	2.6	0.09	0	0	9.94
39-27-W4	SW¼ Sec 12	69.47	0.02	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.02	0	0	0
39-27-W4	SW¼ Sec 2	67.83	6.06	0	0	0	0	0	0	0	0	0	0	0	1.75	3.7	0	0	0	0	0	0	0	0.61	0
39-27-W4	SW¼ Sec 3	68.48	68.48	20.44	12.46	7.98	0	0	26.6	0	0	0	0	0	3.28	0	0.71	14.03	0	1.43	1.99	0	0	0	0
39-27-W4	SW¼ Sec 4	68.75	68.75	48.3	28.93	0	19.37	0	0	0	0	0	0	0	0	0.21	0	4.17	4.57	0	0.53	0	0	0	0
39-27-W4	SW¼ Sec 5	67.95	22.38	21.82	0	0	21.82	0	0	0	0	0	0	0	0	0	0	0.41	0	0	0	0	0	0	0
39-27-W4	SW¼ Sec 9	65.79	64.82	54.58	5.09	0	41.64	0	0	0	7.85	0	0	0	5.63	0	0	2.28	2.3	0	0	0.02	0	0	0

APPENDIX B: SYNCHRO AND SIDRA RESULTS

INTERSECTION / MOVEMENT			PM PEAK HOUR			
			v/c Ratio	LOS	Delay (s)	Queue (m)
Intersection # 5 (Signalized)	EB	Through/Right	0.28	A	5.5	10.6
	WB	Left/Through	0.58	C	21.1	37.3
	NB	Left	0.61	B	13.2	51.7
		Right	0.15	A	2.4	5.4
	Intersection Summary			**B**	**12.9**	
Intersection # 6 (Unsignalized)	EB	Left/Through/Rigth	0.00	A	0.6	0.1
	WB	Left/Through/Rigth	0.01	A	0.5	0.3
	NB	Left/Through/Rigth	0.14	B	14.3	3.7
	SB	Left/Through/Rigth	0.10	B	11.5	2.6
Intersection # 7 (Signalized)	EB	Left/Through/Rigth	0.23	A	4.5	7.3
	WB	Left/Through/Rigth	0.46	B	16.8	20.6
	NB	Left/Through/Rigth	0.42	A	9.3	24.9
	Intersection Summary			**B**	**10.4**	
Intersection # 8 (Signalized)	WB	Left	1.03	F	83.7	#229.2
		Right	0.14	B	12.2	14.5
	NB	Through/Right	0.75	C	23.8	149.3
	SB	Left/Through	1.00	D	51.2	#235.2
	Intersection Summary			**D**	**45.7**	
Intersection # 9 (Unsignalized)	EB	Left	0.09	A	9.5	-
		Through	0.37	B	11.9	-
	WB	Through	0.71	C	21.2	-
		Right	0.17	A	8.3	-
	NB	Left	0.55	C	15.8	-
		Right	0.55	C	15.8	-
Intersection # 10 (Signalized)	EB	Left	0.09	C	33.5	8.4
		Through	0.66	D	46.1	62.1
		Right	0.61	B	13.3	30.4
	WB	Left	0.84	D	41.5	#97.5
		Through	0.39	B	15.5	58.0
		Right	0.38	A	2.7	12.6
	NB	Left	0.77	D	36.4	#76.8
		Through	0.58	C	34.2	57.5
		Right	0.64	A	7.9	25.2
	SB	Left	0.25	C	21.5	17.4
		Through/Rigth	0.45	D	36.3	36.6
	Intersection Summary			**C**	**26.9**	

INTERSECTION / MOVEMENT			PM PEAK HOUR			
			v/c Ratio	LOS	Delay (s)	Queue (m)
Intersection # 11 (Signalized)	EB	Left/Through/Rigth	0.44	A	7.9	32.2
	WB	Left/Through/Rigth	0.86	B	17.3	118.6
	NB	Left/Through/Rigth	0.46	B	14.9	24.3
	SB	Left/Through/Rigth	0.74	D	38.6	#55.5
	Intersection Summary			**B**	**16.5**	
Intersection # 12 (Signalized)	EB	Left/Through	0.59	B	11.9	55.3
	WB	Through	0.83	B	17.6	100.7
		Right	0.35	A	2.3	9.4
	SB	Left	0.87	D	42.0	#98.9
		Right	0.11	B	11.9	9.2
	Intersection Summary			**B**	**17.7**	
Intersection # 13 Highway 2A / Township Road 391 (Signalized)	EB	Left	0.33	C	31.2	15.1
		Through	0.73	C	25.4	67.7
		Right	0.63	A	5.8	19.3
	WB	Left	0.79	D	40.0	#49.5
		Through	0.54	B	18.6	51.5
		Right	0.30	A	3.7	11.4
	NB	Left	0.77	C	27.6	66.7
		Through	-	-	-	-
		Right	0.61	A	1.9	0.0
	SB	Left	0.44	C	20.8	36.0
		Through	-	-	-	-
		Right	0.22	A	0.3	0.0
	Intersection Summary			**B**	**17.5**	
Intersection # 14 (Signalized)	EB	Left	0.40	C	34.8	47.0
		Through	0.00	D	37.0	1.7
		Right	0.86	D	50.9	#104.7
	WB	Left	0.92	E	69.1	#144.3
		Through/Right	0.02	C	35.0	4.6
	NB	Left	1.14	F	131.0	m#56.5
		Through	1.18	F	110.0	m#327.8
		Right	0.25	A	0.2	m0.0
	SB	Left	0.42	E	68.1	m11.6
		Through	1.03	C	28.3	m34.7
		Right	0.09	A	0.0	m0.0
	Intersection Summary			**E**	**67.8**	

INTERSECTION / MOVEMENT			PM PEAK HOUR			
			v/c Ratio	LOS	Delay (s)	Queue (m)
Intersection # 15 Highway 11A/Taylor Drive (Signalized)	EB	Left	0.98	D	54.0	#216.4
		Through	-	-	-	-
		Right	0.22	A	0.3	0.0
	WB	Left	0.39	C	24.0	59.5
		Through	-	-	-	-
		Right	0.30	A	0.5	0.0
	NB	Left	0.78	E	68.1	#52.3
		Through	0.84	D	53.1	92.0
		Right	0.89	C	21.8	#102.4
	SB	Left	0.98	E	75.0	#127.0
		Through	0.63	D	51.3	95.3
		Right	0.63	B	19.7	75.0
	Intersection Summary			**D**	**42.1**	
Intersection # 16 Highway 11A / Highway 2A (Signalized)	EB	Left	0.96	E	59.4	#167.9
		Through	-	-	-	-
		Right	0.10	A	0.1	0.0
	WB	Left	0.17	C	28.8	24.7
		Through	-	-	-	-
		Right	0.74	A	3.4	0.0
	NB	Left	0.80	E	73.5	#48.6
		Through	0.95	D	54.7	#150.1
		Right	0.54	B	16.3	47.5
	SB	Left	0.95	D	54.1	m93.4
		Through	0.71	C	34.5	m101.7
		Right	0.76	B	10.6	m41.1
	Intersection Summary			**D**	**36.3**	
Intersection # 18 (Signalized)	WB	Left	0.88	D	40.6	#80.0
		Right	0.38	A	6.2	14.5
	NB	Through	0.85	C	28.0	#104.4
		Right	0.67	A	6.3	22.4
	SB	Left	0.89	E	66.3	#72.2
		Through	0.54	A	9.6	57.3
	Intersection Summary			**C**	**22.6**	

INTERSECTION / MOVEMENT			PM PEAK HOUR			
			v/c Ratio	LOS	Delay (s)	Queue (m)
Intersection # 19 (Signalized)	EB	Left	1.04	F	95.7	#163.9
		Through	0.11	D	39.2	18.1
		Right	0.71	B	14.6	48.5
	WB	Left	0.22	C	31.0	28.0
		Through	0.25	D	41.5	34.2
		Right	0.16	B	11.0	10.9
	NB	Left	1.20	F	141.3	m#92.8
		Through	0.92	C	28.6	m88.2
		Right	0.01	B	13.2	m0.4
	SB	Left	0.18	E	56.8	12.5
		Through	1.16	F	112.6	#241.6
		Right	0.25	A	6.5	16.9
	Intersection Summary			**E**	**72.4**	
Intersection # 20 (Signalized)	EB	Left	0.62	D	50.2	57.8
		Right	0.79	A	8.0	19.2
	NB	Left	0.94	D	42.0	#166.9
		Through	0.63	B	12.2	160.1
	SB	Through	0.88	D	46.8	129.9
		Right	0.59	A	9.1	36.9
	Intersection Summary			**C**	**27.7**	
Intersection #21 (Signalized)	EB	Through/Right	0.86	C	23.3	128.4
	WB	Left	0.18	A	5.6	5.3
		Through	0.37	A	6.5	34.3
	NB	Left	0.40	C	32.8	36.7
		Right	0.69	B	19.9	42.9
	Intersection Summary			**B**	**17.9**	
Intersection # 22 (Signalized)	EB	Left	0.27	C	23.1	13.7
		Through	0.89	C	32.0	189.5
		Right	0.28	A	8.0	23.8
	WB	Left	0.25	C	29.9	8.2
		Through/Right	0.53	B	19.9	81.7
	NB	Left	0.49	E	60.3	37.2
		Through/Right	0.07	C	30.8	9.4
	SB	Left	0.84	E	58.9	#90.8
		Through/Right	0.22	B	12.8	17.3
	Intersection Summary			**C**	**30.9**	
Intersection # 23 (Unsignalized)	EB	Through/Right	0.01	A	0.0	0.0
	WB	Left/Through	0.29	A	8.1	9.4
	NB	Left/Right	0.05	A	9.4	1.1

INTERSECTION / MOVEMENT			PM PEAK HOUR			
			v/c Ratio	LOS	Delay (s)	Queue (m)
Intersection #5 (Roundabout)	EB	Through/Right	0.11	A	0.4	4.7
	WB	Left/Through	0.26	A	3.8	11.1
	NB	Left/Right	0.36	A	2.4	17.9
	Intersection Summary			**A**	**2.5**	
Intersection #7 (Roundabout)	EB	Through/Right	0.09	A	0.6	3.6
	WB	Left/Through	0.14	A	4.0	5.2
	NB	Left/Right	0.17	A	2.7	7.2
	Intersection Summary			**A**	**2.6**	
Intersection #8 (Roundabout)	WB	Left	0.47	A	8.9	18.5
		Left/Right	0.47	A	7.2	19.4
	NB	Through	0.45	A	0.2	26.5
		Through/Right	0.45	A	0.2	27.0
	SB	Left/Through	0.84	A	9.1	73.1
		Through	0.84	A	8.1	75.0
	Intersection Summary			**A**	**5.2**	
Intersection #9 (Roundabout)	EB	Left/Through	0.23	A	3.8	10.3
	WB	Through/Right	0.36	A	1.5	18.7
	SB	Left/Right	0.42	B	13.9	20.6
	Intersection Summary			**A**	**5.9**	
Intertsection #10 (Roundabout)	EB	Left/Through	0.38	A	5.2	14.9
		Through/Right	0.38	A	4.1	15.7
	WB	Left	0.58	A	8.0	33.0
		Left/Through	0.58	A	5.1	35.8
		Right	0.27	A	1.2	10.6
	NB	Left/Through	0.57	A	4.0	33.5
		Through/Right	0.57	A	2.2	33.6
	SB	Left/Through	0.36	A	9.1	14.8
		Through/Right	0.36	A	6.3	16.0
	Intersection Summary			**A**	**4.6**	
Intersection #11 (Roundabout)	EB	Left/Through	0.36	A	2.1	15.4
		Through/Right	0.36	A	1.8	15.4
	WB	Left/Through	0.59	A	1.1	34.5
		Through/Right	0.59	A	0.7	34.8
	NB	Left/Through/Right	0.24	A	4.4	8.0
	SB	Left/Through/Right	0.45	A	9.9	17.4
	Intersection Summary			**A**	**1.9**	

INTERSECTION / MOVEMENT			PM PEAK HOUR			
			v/c Ratio	LOS	Delay (s)	Queue (m)
Intersection #12 (Roundabout)	EB	Left/Through	0.54	A	3.7	31.9
		Through	0.54	A	3.3	32.4
	WB	Through	0.57	A	0.1	36.2
		Through/Right	0.57	A	0.1	37.3
	SB	Left/Right	0.78	C	21.7	72.7
	Intersection Summary			**A**	**4.4**	
Intertsection #14 (Roundabout)	EB	Left/Through	0.81	D	33.9	33.6
		Right	1.15	F	98.9	165.8
	WB	Left	1.17	F	147.6	138.9
		Left/Through	1.17	F	155.2	121.9
		Through/Right	0.06	C	17.0	1.4
	NB	Left/Through	0.94	A	8.3	157.8
		Through	0.94	A	6.6	161.0
		Through/Right	0.94	A	7.5	157.8
	SB	Left/Through	0.90	B	10.3	11.6
		Through	0.90	A	9.3	12.0
		Through/Right	0.90	B	10.1	11.6
	Intersection Summary			**C**	**21.2**	
Intersection #18 (Roundabout)	WB	Left	0.80	C	17.8	57.2
		Left/Right	0.80	B	14.9	62.0
	NB	Through	0.78	A	4.0	79.7
		Through/Right	0.78	A	3.6	79.9
	SB	Left/Through	0.85	B	11.7	74.9
		Through	0.85	A	9.6	77.6
	Intersection Summary			**A**	**8.8**	
Intertsection #19 (Roundabout)	EB	Left/Through	1.23	F	123.8	240.2
		Through/Right	1.23	F	119.8	262.3
	WB	Left/Through	1.00	F	123.2	67.3
		Through/Right	1.00	F	105.7	57.7
	NB	Left/Through	0.94	B	12.5	132.9
		Through	0.94	A	9.4	136.8
		Through/Right	0.94	B	10.2	133.0
	SB	Left/Through	1.24	F	125.1	433.2
		Through	1.24	F	124.0	485.5
		Through/Right	1.24	F	125.0	433.2
	Intersection Summary			**F**	**70.0**	

INTERSECTION / MOVEMENT			PM PEAK HOUR			
			v/c Ratio	LOS	Delay (s)	Queue (m)
Intertsection #20 (Roundabout)	EB	Left/Right	0.91	C	15.9	84.2
		Right	0.91	B	12.8	88.1
	NB	Left/Through	1.32	F	155.4	898.1
		Through	1.32	F	152.0	970.2
	SB	Through	1.69	F	325.1	896.7
		Through/Right	1.69	F	324.0	1001.7
	Intersection Summary			**F**	**172.9**	
Intertsection #21 (Roundabout)	EB	Left/Right	0.73	A	0.5	62.5
		Right	0.73	A	0.4	62.3
	WB	Left/Through	0.49	A	1.1	27.8
		Through	0.49	A	0.8	28.2
	NB	Through	0.39	C	15.2	14.6
		Through/Right	0.58	B	12.2	29.0
	Intersection Summary			**A**	**2.1**	
Intertsection #22 (Roundabout)	EB	Left/Through	1.40	F	190.9	903.8
		Through/Right	1.40	F	190.0	984.8
	WB	Left/Through	0.50	A	0.8	28.2
		Through/Right	0.50	A	0.7	28.6
	NB	Left/Through	0.32	C	17.3	15.0
		Through/Right	0.11	C	17.7	4.1
	SB	Left	0.73	B	12.0	46.7
		Through/Right	0.23	A	6.9	7.1
	Intersection Summary			**F**	**106.2**	

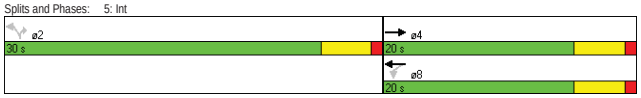
Lane Group	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Volume (vph)	15	123	83	152	442	104
Ideal Flow (vphpl)	1850	1850	1850	1850	1850	1850
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00
Ped Bike Factor	0.96			0.99	0.93	0.90
Frt	0.879					0.850
Flt Protected				0.983	0.950	
Satd. Flow (prot)	1504	0	0	1751	1692	1514
Flt Permitted				0.829	0.950	
Satd. Flow (perm)	1504	0	0	1466	1568	1364
Right Turn on Red		Yes				Yes
Satd. Flow (RTOR)	134					113
Link Speed (k/h)	50			50	50	
Link Distance (m)	423.6			786.2	330.1	
Travel Time (s)	30.5			56.6	23.8	
Confl. Peds. (#/hr)		25	25		25	25
Confl. Bikes (#/hr)		10				10
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	16	134	90	165	480	113
Shared Lane Traffic (%)						
Lane Group Flow (vph)	150	0	0	255	480	113
Enter Blocked Intersection	No	No	No	No	No	No
Lane Alignment	Left	Right	Left	Left	Left	Right
Median Width(m)	0.0			0.0	3.7	
Link Offset(m)	0.0			0.0	0.0	
Crosswalk Width(m)	1.6			1.6	1.6	
Two way Left Turn Lane						
Headway Factor	1.02	1.02	1.02	1.02	1.02	1.02
Turning Speed (k/h)		14	24		24	14
Turn Type			Perm			custom
Protected Phases	4			8		
Permitted Phases			8		2	2
Minimum Split (s)	19.5		19.5	19.5	20.0	20.0
Total Split (s)	20.0	0.0	20.0	20.0	30.0	30.0
Total Split (%)	40.0%	0.0%	40.0%	40.0%	60.0%	60.0%
Maximum Green (s)	15.0		15.0	15.0	25.0	25.0
Yellow Time (s)	4.0		4.0	4.0	4.0	4.0
All-Red Time (s)	1.0		1.0	1.0	1.0	1.0
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	0.0
Total Lost Time (s)	5.0	4.0	5.0	5.0	5.0	5.0
Lead/Lag						
Lead-Lag Optimize?						
Walk Time (s)	7.0		7.0	7.0	7.0	7.0
Flash Dont Walk (s)	7.5		7.5	7.5	1.5	1.5
Pedestrian Calls (#/hr)	0		0	0	0	0
Act Effct Green (s)	15.0			15.0	25.0	25.0
Actuated g/C Ratio	0.30			0.30	0.50	0.50
v/c Ratio	0.28			0.58	0.61	0.15
Control Delay	5.5			21.1	13.2	2.4

Lane Group	EBT	EBR	WBL	WBT	NBL	NBR
Queue Delay	0.0			0.0	0.0	0.0
Total Delay	5.5			21.1	13.2	2.4
LOS	A			C	B	A
Approach Delay	5.5			21.1	11.2	
Approach LOS	A			C	B	
Queue Length 50th (m)	1.0			18.9	27.8	0.0
Queue Length 95th (m)	10.6			37.3	51.7	5.4
Internal Link Dist (m)	399.6			762.2	306.1	
Turn Bay Length (m)						
Base Capacity (vph)	545			440	784	739
Starvation Cap Reductn	0			0	0	0
Spillback Cap Reductn	0			0	0	0
Storage Cap Reductn	0			0	0	0
Reduced v/c Ratio	0.28			0.58	0.61	0.15

Intersection Summary

Area Type: Other
Cycle Length: 50
Actuated Cycle Length: 50
Offset: 0 (0%), Referenced to phase 2:NBL and 6:, Start of Green
Natural Cycle: 50
Control Type: Pretimed
Maximum v/c Ratio: 0.61
Intersection Signal Delay: 12.9 Intersection LOS: B
Intersection Capacity Utilization 62.7% ICU Level of Service B
Analysis Period (min) 15

Splits and Phases: 5: Int



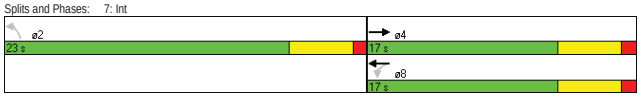
Lane Group	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Volume (vph)	2	106	130	15	254	24
Ideal Flow (vphpl)	1850	1850	1850	1850	1850	1850
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00
Ped Bike Factor	0.91			0.96	0.94	
Frt	0.867				0.988	
Flt Protected				0.957	0.956	
Satd. Flow (prot)	1409	0	0	1705	1670	0
Flt Permitted				0.666	0.956	
Satd. Flow (perm)	1409	0	0	1133	1580	0
Right Turn on Red		Yes				Yes
Satd. Flow (RTOR)	115				15	
Link Speed (k/h)	50			50	50	
Link Distance (m)	819.1			486.6	733.8	
Travel Time (s)	59.0			35.0	52.8	
Confl. Peds. (#/hr)		25	25		25	25
Confl. Bikes (#/hr)		10				10
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	2	115	141	16	276	26
Shared Lane Traffic (%)						
Lane Group Flow (vph)	117	0	0	157	302	0
Enter Blocked Intersection	No	No	No	No	No	No
Lane Alignment	Left	Right	Left	Left	Left	Right
Median Width(m)	0.0			0.0	3.7	
Link Offset(m)	0.0			0.0	0.0	
Crosswalk Width(m)	1.6			1.6	1.6	
Two way Left Turn Lane						
Headway Factor	1.02	1.02	1.02	1.02	1.02	1.02
Turning Speed (k/h)		14	24		24	14
Turn Type			Perm			
Protected Phases	4			8		
Permitted Phases			8		2	
Minimum Split (s)	15.0		15.0	15.0	20.0	
Total Split (s)	17.0	0.0	17.0	17.0	23.0	0.0
Total Split (%)	42.5%	0.0%	42.5%	42.5%	57.5%	0.0%
Maximum Green (s)	12.0		12.0	12.0	18.0	
Yellow Time (s)	4.0		4.0	4.0	4.0	
All-Red Time (s)	1.0		1.0	1.0	1.0	
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	0.0
Total Lost Time (s)	5.0	4.0	5.0	5.0	5.0	4.0
Lead/Lag						
Lead-Lag Optimize?						
Walk Time (s)	7.0		7.0	7.0	7.0	
Flash Dont Walk (s)	1.5		1.5	1.5	1.5	
Pedestrian Calls (#/hr)	0		0	0	0	
Act Effct Green (s)	12.0			12.0	18.0	
Actuated g/C Ratio	0.30			0.30	0.45	
v/c Ratio	0.23			0.46	0.42	
Control Delay	4.5			16.8	9.3	

Lane Group	EBT	EBR	WBL	WBT	NBL	NBR
Queue Delay	0.0			0.0	0.0	
Total Delay	4.5			16.8	9.3	
LOS	A			B	A	
Approach Delay	4.5			16.8	9.3	
Approach LOS	A			B	A	
Queue Length 50th (m)	0.1			8.5	11.8	
Queue Length 95th (m)	7.3			20.6	24.9	
Internal Link Dist (m)	795.1			462.6	709.8	
Turn Bay Length (m)						
Base Capacity (vph)	503			340	719	
Starvation Cap Reductn	0			0	0	
Spillback Cap Reductn	0			0	0	
Storage Cap Reductn	0			0	0	
Reduced v/c Ratio	0.23			0.46	0.42	

Intersection Summary

Area Type: Other
Cycle Length: 40
Actuated Cycle Length: 40
Offset: 0 (0%), Referenced to phase 2:NBL and 6:, Start of Green
Natural Cycle: 40
Control Type: Pretimed
Maximum v/c Ratio: 0.46
Intersection Signal Delay: 10.4 Intersection LOS: B
Intersection Capacity Utilization 39.4% ICU Level of Service A
Analysis Period (min) 15

Splits and Phases: 7: Int



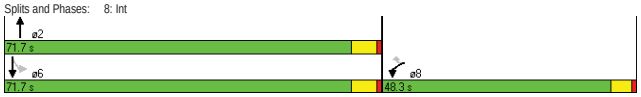
Lane Group	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Volume (vph)	581	71	1117	131	31	1343
Ideal Flow (vphpl)	1850	1850	1850	1850	1850	1850
Lane Util. Factor	1.00	1.00	0.95	0.95	0.95	0.95
Ped Bike Factor	0.94	0.92	0.99			
Frt		0.850	0.984			
Flt Protected	0.950					0.999
Satd. Flow (prot)	1692	1514	3304	0	0	3381
Flt Permitted	0.950					0.805
Satd. Flow (perm)	1587	1396	3304	0	0	2725
Right Turn on Red		Yes		Yes		
Satd. Flow (RTOR)		49	16			
Link Speed (k/h)	50		100			100
Link Distance (m)	449.1		462.4			1323.6
Travel Time (s)	32.3		16.6			47.6
Confl. Peds. (#/hr)	25	25		25	25	
Confl. Bikes (#/hr)		10		10		
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	632	77	1214	142	34	1460
Shared Lane Traffic (%)						
Lane Group Flow (vph)	632	77	1356	0	0	1494
Enter Blocked Intersection	No	No	No	No	No	No
Lane Alignment	Left	Right	Left	Right	Left	Left
Median Width(m)	3.7		0.0			0.0
Link Offset(m)	0.0		0.0			0.0
Crosswalk Width(m)	1.6		1.6			1.6
Two way Left Turn Lane						
Headway Factor	1.02	1.02	1.02	1.02	1.02	1.02
Turning Speed (k/h)	24	14		14	24	
Turn Type		Perm			Perm	
Protected Phases	8		2			6
Permitted Phases		8			6	
Minimum Split (s)	19.5	19.5	21.0		21.0	21.0
Total Split (s)	48.3	48.3	71.7	0.0	71.7	71.7
Total Split (%)	40.3%	40.3%	59.8%	0.0%	59.8%	59.8%
Maximum Green (s)	43.3	43.3	65.7		65.7	65.7
Yellow Time (s)	4.0	4.0	5.0		5.0	5.0
All-Red Time (s)	1.0	1.0	1.0		1.0	1.0
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	0.0
Total Lost Time (s)	5.0	5.0	6.0	4.0	6.0	6.0
Lead/Lag						
Lead-Lag Optimize?						
Walk Time (s)	7.0	7.0	7.0		7.0	7.0
Flash Dont Walk (s)	7.5	7.5	7.5		7.5	7.5
Pedestrian Calls (#/hr)	0	0	0		0	0
Act Effct Green (s)	43.3	43.3	65.7			65.7
Actuated g/C Ratio	0.36	0.36	0.55			0.55
v/c Ratio	1.03	0.14	0.75			1.00
Control Delay	83.7	12.2	23.8			51.2

Lane Group	WBL	WBR	NBT	NBR	SBL	SBT
Queue Delay	0.0	0.0	0.0			0.0
Total Delay	83.7	12.2	23.8			51.2
LOS	F	B	C			D
Approach Delay	76.0		23.8			51.2
Approach LOS	E		C			D
Queue Length 50th (m)	~160.1	4.3	121.8			~178.1
Queue Length 95th (m)	#229.2	14.5	149.3			#235.2
Internal Link Dist (m)	425.1		438.4			1299.6
Turn Bay Length (m)						
Base Capacity (vph)	611	535	1816			1492
Starvation Cap Reductn	0	0	0			0
Spillback Cap Reductn	0	0	0			0
Storage Cap Reductn	0	0	0			0
Reduced v/c Ratio	1.03	0.14	0.75			1.00

Intersection Summary

Area Type: Other
Cycle Length: 120
Actuated Cycle Length: 120
Offset: 0 (0%), Referenced to phase 2:NBT and 6:SBTL, Start of Green
Natural Cycle: 100
Control Type: Pretimed
Maximum v/c Ratio: 1.03
Intersection Signal Delay: 45.7 Intersection LOS: D
Intersection Capacity Utilization 103.1% ICU Level of Service G
Analysis Period (min) 15
~ Volume exceeds capacity, queue is theoretically infinite.
Queue shown is maximum after two cycles.
95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.

Splits and Phases: 8: Int



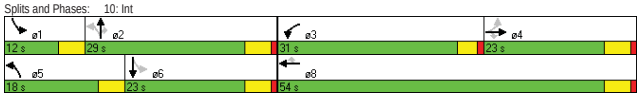
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	16	204	261	719	329	318	298	453	408	68	255	8
Ideal Flow (vphpl)	1850	1850	1850	1850	1850	1850	1850	1850	1850	1850	1850	1850
Storage Length (m)	100.0		100.0	100.0		100.0	100.0		100.0	100.0		100.0
Storage Lanes	1		1	1		1	1		1	1		0
Taper Length (m)	2.5		2.5	2.5		2.5	2.5		2.5	2.5		2.5
Lane Util. Factor	1.00	1.00	1.00	0.97	1.00	1.00	1.00	0.95	1.00	1.00	0.95	0.95
Ped Bike Factor	0.98		0.94	0.95		0.94	0.95		0.93	0.98	1.00	
Frt			0.850			0.850			0.850		0.995	
Flt Protected	0.950			0.950			0.950			0.950		
Satd. Flow (prot)	1692	1781	1514	3283	1781	1514	1692	3385	1514	1692	3353	0
Flt Permitted	0.547			0.950			0.419			0.448		
Satd. Flow (perm)	950	1781	1419	3120	1781	1430	708	3385	1411	779	3353	0
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)			245			346			443		3	
Link Speed (k/h)		50			50			50			50	
Link Distance (m)		819.8			192.5			444.9			432.3	
Travel Time (s)		59.0			13.9			32.0			31.1	
Confl. Peds. (#/hr)	25		25	25		25	25		25	25		25
Confl. Bikes (#/hr)			10			10			10			10
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
Adj. Flow (vph)	17	222	284	782	358	346	324	492	443	74	277	9
Shared Lane Traffic (%)												
Lane Group Flow (vph)	17	222	284	782	358	346	324	492	443	74	286	0
Enter Blocked Intersection	No	No	No	No	No	No	No	No	No	No	No	No
Lane Alignment	Left	Left	Right	Left	Left	Right	Left	Left	Right	Left	Left	Right
Median Width(m)		7.4			7.4			3.7			3.7	
Link Offset(m)		0.0			0.0			0.0			0.0	
Crosswalk Width(m)		1.6			1.6			1.6			1.6	
Two way Left Turn Lane												
Headway Factor	1.02	1.02	1.02	1.02	1.02	1.02	1.02	1.02	1.02	1.02	1.02	1.02
Turning Speed (k/h)	24		14	24		14	24		14	24		14
Turn Type	Perm		Perm	Prot		Perm	pm+pt		Perm	pm+pt		
Protected Phases		4		3	8		5	2		1	6	
Permitted Phases	4		4			8	2		2	6		
Minimum Split (s)	22.5	22.5	22.5	12.0	22.5	22.5	12.0	20.0	20.0	12.0	20.0	
Total Split (s)	23.0	23.0	23.0	31.0	54.0	54.0	18.0	29.0	29.0	12.0	23.0	0.0
Total Split (%)	24.2%	24.2%	24.2%	32.6%	56.8%	56.8%	18.9%	30.5%	30.5%	12.6%	24.2%	0.0%
Maximum Green (s)	18.0	18.0	18.0	27.0	49.0	49.0	14.0	24.0	24.0	8.0	18.0	
Yellow Time (s)	4.0	4.0	4.0	3.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	
All-Red Time (s)	1.0	1.0	1.0	1.0	1.0	1.0	0.0	1.0	1.0	0.0	1.0	
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Lost Time (s)	5.0	5.0	5.0	4.0	5.0	5.0	4.0	5.0	5.0	4.0	5.0	4.0
Lead/Lag	Lag	Lag	Lag	Lead			Lead	Lag	Lag	Lead	Lag	
Lead-Lag Optimize?	Yes	Yes	Yes	Yes			Yes	Yes	Yes	Yes	Yes	
Walk Time (s)	7.0	7.0	7.0		7.0	7.0		7.0	7.0		7.0	
Flash Dont Walk (s)	10.5	10.5	10.5		10.5	10.5		7.5	7.5		4.5	
Pedestrian Calls (#/hr)	0	0	0		0	0		0	0		0	
Act Effct Green (s)	18.0	18.0	18.0	27.0	49.0	49.0	37.0	24.0	24.0	27.0	18.0	

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Actuated g/C Ratio	0.19	0.19	0.19	0.28	0.52	0.52	0.39	0.25	0.25	0.28	0.19	
v/c Ratio	0.09	0.66	0.61	0.84	0.39	0.38	0.77	0.58	0.64	0.25	0.45	
Control Delay	33.5	46.1	13.3	41.5	15.5	2.7	36.4	34.2	7.9	21.5	36.3	
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	
Total Delay	33.5	46.1	13.3	41.5	15.5	2.7	36.4	34.2	7.9	21.5	36.3	
LOS	C	D	B	D	B	A	D	C	A	C	D	
Approach Delay		27.9			26.2			25.5			33.3	
Approach LOS		C			C			C			C	
Queue Length 50th (m)	2.6	38.0	6.0	69.2	37.8	0.0	44.0	41.5	0.0	8.5	24.3	
Queue Length 95th (m)	8.4	62.1	30.4	#97.5	58.0	12.6	#76.8	57.5	25.2	17.4	36.6	
Internal Link Dist (m)		795.8			168.5			420.9			408.3	
Turn Bay Length (m)	100.0		100.0	100.0		100.0	100.0		100.0	100.0		
Base Capacity (vph)	180	337	467	933	919	905	421	855	688	298	638	
Starvation Cap Reductn	0	0	0	0	0	0	0	0	0	0	0	
Spillback Cap Reductn	0	0	0	0	0	0	0	0	0	0	0	
Storage Cap Reductn	0	0	0	0	0	0	0	0	0	0	0	
Reduced v/c Ratio	0.09	0.66	0.61	0.84	0.39	0.38	0.77	0.58	0.64	0.25	0.45	

Intersection Summary

Area Type: Other
Cycle Length: 95
Actuated Cycle Length: 95
Offset: 0 (0%), Referenced to phase 2:NBTL and 6:SBTL, Start of Green
Natural Cycle: 80
Control Type: Pretimed
Maximum v/c Ratio: 0.84
Intersection Signal Delay: 26.9 Intersection LOS: C
Intersection Capacity Utilization 80.1% ICU Level of Service D
Analysis Period (min) 15
95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.

Splits and Phases: 10: Int



Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	47	545	35	67	1285	117	54	5	102	117	3	83
Ideal Flow (vphpl)	1850	1850	1850	1850	1850	1850	1850	1850	1850	1850	1850	1850
Lane Util. Factor	0.95	0.95	0.95	0.95	0.95	0.95	1.00	1.00	1.00	1.00	1.00	1.00
Ped Bike Factor		0.99			0.99			0.96			0.96	
Frt		0.992			0.988			0.914			0.945	
Flt Protected		0.996			0.998			0.983			0.972	
Satd. Flow (prot)	0	3319	0	0	3305	0	0	1541	0	0	1597	0
Flt Permitted		0.725			0.880			0.831			0.706	
Satd. Flow (perm)	0	2416	0	0	2909	0	0	1293	0	0	1143	0
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)		16			23			108			43	
Link Speed (k/h)		50			50			50			50	
Link Distance (m)		617.6			807.4			241.5			742.5	
Travel Time (s)		44.5			58.1			17.4			53.5	
Confl. Peds. (#/hr)	25		25	25		25	25		25	25		25
Confl. Bikes (#/hr)			10			10			10			10
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
Adj. Flow (vph)	51	592	38	73	1397	127	59	5	111	127	3	90
Shared Lane Traffic (%)												
Lane Group Flow (vph)	0	681	0	0	1597	0	0	175	0	0	220	0
Enter Blocked Intersection	No	No	No	No	No	No	No	No	No	No	No	No
Lane Alignment	Left	Left	Right	Left	Left	Right	Left	Left	Right	Left	Left	Right
Median Width(m)		0.0			0.0			0.0			0.0	
Link Offset(m)		0.0			0.0			0.0			0.0	
Crosswalk Width(m)		1.6			1.6			1.6			1.6	
Two way Left Turn Lane												
Headway Factor	1.02	1.02	1.02	1.02	1.02	1.02	1.02	1.02	1.02	1.02	1.02	1.02
Turning Speed (k/h)	24		14	24		14	24		14	24		14
Turn Type	Perm			Perm			Perm			Perm		
Protected Phases		2			6			8			4	
Permitted Phases	2			6			8			4		
Minimum Split (s)	20.0	20.0		20.0	20.0		19.5	19.5		19.5	19.5	
Total Split (s)	52.6	52.6	0.0	52.6	52.6	0.0	22.4	22.4	0.0	22.4	22.4	0.0
Total Split (%)	70.1%	70.1%	0.0%	70.1%	70.1%	0.0%	29.9%	29.9%	0.0%	29.9%	29.9%	0.0%
Maximum Green (s)	47.6	47.6		47.6	47.6		17.4	17.4		17.4	17.4	
Yellow Time (s)	4.0	4.0		4.0	4.0		4.0	4.0		4.0	4.0	
All-Red Time (s)	1.0	1.0		1.0	1.0		1.0	1.0		1.0	1.0	
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Lost Time (s)	5.0	5.0	4.0	5.0	5.0	4.0	5.0	5.0	4.0	5.0	5.0	4.0
Lead/Lag												
Lead-Lag Optimize?												
Walk Time (s)	7.0	7.0		7.0	7.0		7.0	7.0		7.0	7.0	
Flash Dont Walk (s)	1.5	1.5		2.5	2.5		7.5	7.5		7.5	7.5	
Pedestrian Calls (#/hr)	0	0		0	0		0	0		0	0	
Act Effct Green (s)		47.6			47.6			17.4			17.4	
Actuated g/C Ratio		0.63			0.63			0.23			0.23	
v/c Ratio		0.44			0.86			0.46			0.74	
Control Delay		7.9			17.3			14.9			38.6	

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Queue Delay		0.0			0.0			0.0			0.0	
Total Delay		7.9			17.3			14.9			38.6	
LOS		A			B			B			D	
Approach Delay		7.9			17.3			14.9			38.6	
Approach LOS		A			B			B			D	
Queue Length 50th (m)		21.9			82.7			7.7			23.2	
Queue Length 95th (m)		32.2			118.6			24.3			#55.5	
Internal Link Dist (m)		593.6			783.4			217.5			718.5	
Turn Bay Length (m)												
Base Capacity (vph)		1539			1855			383			298	
Starvation Cap Reductn		0			0			0			0	
Spillback Cap Reductn		0			0			0			0	
Storage Cap Reductn		0			0			0			0	
Reduced v/c Ratio		0.44			0.86			0.46			0.74	

Intersection Summary

Area Type:	Other		
Cycle Length: 75			
Actuated Cycle Length: 75			
Offset: 0 (0%), Referenced to phase 2:EBTL and 6:WBTL, Start of Green			
Natural Cycle: 60			
Control Type: Pretimed			
Maximum v/c Ratio: 0.86			
Intersection Signal Delay: 16.5		Intersection LOS: B	
Intersection Capacity Utilization 92.8%		ICU Level of Service F	
Analysis Period (min) 15			

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

Splits and Phases: 11: Int

Lane Group	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Volume (vph)	9	914	1386	287	419	47
Ideal Flow (vphpl)	1850	1850	1850	1850	1850	1850
Storage Length (m)	0.0			0.0	0.0	30.0
Storage Lanes	0			1	1	1
Taper Length (m)	2.5			2.5	2.5	2.5
Lane Util. Factor	0.95	0.95	0.95	1.00	1.00	1.00
Ped Bike Factor				0.90	0.97	0.95
Frt				0.850		0.850
Flt Protected					0.950	
Satd. Flow (prot)	0	3385	3385	1514	1692	1514
Flt Permitted		0.935			0.950	
Satd. Flow (perm)	0	3165	3385	1369	1645	1444
Right Turn on Red				Yes		Yes
Satd. Flow (RTOR)				312		21
Link Speed (k/h)		50	50		50	
Link Distance (m)		807.4	72.2		733.8	
Travel Time (s)		58.1	5.2		52.8	
Confl. Peds. (#/hr)	25			25	25	25
Confl. Bikes (#/hr)				10		10
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	10	993	1507	312	455	51
Shared Lane Traffic (%)						
Lane Group Flow (vph)	0	1003	1507	312	455	51
Enter Blocked Intersection	No	No	No	No	No	No
Lane Alignment	Left	Left	Left	Right	Left	Right
Median Width(m)		0.0	0.0		3.7	
Link Offset(m)		0.0	0.0		0.0	
Crosswalk Width(m)		1.6	1.6		1.6	
Two way Left Turn Lane						
Headway Factor	1.02	1.02	1.02	1.02	1.02	1.02
Turning Speed (k/h)	24			14	24	14
Turn Type	Perm			Perm		Perm
Protected Phases		2	6		4	
Permitted Phases	2			6		4
Minimum Split (s)	16.5	16.5	16.5	16.5	22.5	22.5
Total Split (s)	40.0	40.0	40.0	40.0	25.0	25.0
Total Split (%)	61.5%	61.5%	61.5%	61.5%	38.5%	38.5%
Maximum Green (s)	35.0	35.0	35.0	35.0	20.0	20.0
Yellow Time (s)	4.0	4.0	4.0	4.0	4.0	4.0
All-Red Time (s)	1.0	1.0	1.0	1.0	1.0	1.0
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	0.0
Total Lost Time (s)	5.0	5.0	5.0	5.0	5.0	5.0
Lead/Lag						
Lead-Lag Optimize?						
Walk Time (s)	7.0	7.0	7.0	7.0	7.0	7.0
Flash Dont Walk (s)	4.5	4.5	4.5	4.5	10.5	10.5
Pedestrian Calls (#/hr)	0	0	0	0	0	0
Act Effct Green (s)		35.0	35.0	35.0	20.0	20.0

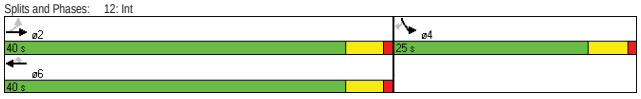
Lane Group	EBL	EBT	WBT	WBR	SBL	SBR
Actuated g/C Ratio		0.54	0.54	0.54	0.31	0.31
v/c Ratio		0.59	0.83	0.35	0.87	0.11
Control Delay		11.9	17.6	2.3	42.0	11.9
Queue Delay		0.0	0.0	0.0	0.0	0.0
Total Delay		11.9	17.6	2.3	42.0	11.9
LOS		B	B	A	D	B
Approach Delay		11.9	15.0		39.0	
Approach LOS		B	B		D	
Queue Length 50th (m)		39.3	72.4	0.0	51.3	2.5
Queue Length 95th (m)		55.3	100.7	9.4	#98.9	9.2
Internal Link Dist (m)		783.4	48.2		709.8	
Turn Bay Length (m)						30.0
Base Capacity (vph)		1704	1823	881	521	459
Starvation Cap Reductn		0	0	0	0	0
Spillback Cap Reductn		0	0	0	0	0
Storage Cap Reductn		0	0	0	0	0
Reduced v/c Ratio		0.59	0.83	0.35	0.87	0.11

Intersection Summary

Area Type:	Other		
Cycle Length: 65			
Actuated Cycle Length: 65			
Offset: 0 (0%), Referenced to phase 2:EBTL and 6:WBT, Start of Green			
Natural Cycle: 65			
Control Type: Pretimed			
Maximum v/c Ratio: 0.87			
Intersection Signal Delay: 17.7		Intersection LOS: B	
Intersection Capacity Utilization 71.5%		ICU Level of Service C	
Analysis Period (min) 15			

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

Splits and Phases: 12: Int



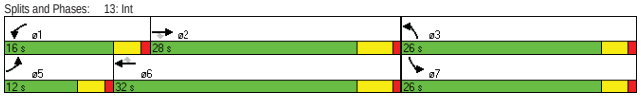
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	114	746	472	410	647	190	727	0	830	419	0	298
Ideal Flow (vphpl)	1850	1850	1850	1850	1850	1850	1850	1850	1850	1850	1850	1850
Storage Length (m)	100.0		100.0	100.0		100.0	0.0		0.0	0.0		0.0
Storage Lanes	2		1	2		1	2		1	2		1
Taper Length (m)	2.5		2.5	2.5		2.5	2.5		2.5	2.5		2.5
Lane Util. Factor	0.97	0.95	1.00	0.97	0.95	1.00	0.97	1.00	1.00	0.97	1.00	1.00
Ped Bike Factor	0.99		0.95	0.99		0.95	0.97		0.98	0.97		0.98
Frt			0.850			0.850			0.850			0.850
Flt Protected	0.950			0.950			0.950			0.950		
Satd. Flow (prot)	3283	3385	1514	3283	3385	1514	3283	0	1514	3283	0	1514
Flt Permitted	0.950			0.950			0.950			0.950		
Satd. Flow (perm)	3246	3385	1442	3251	3385	1443	3199	0	1482	3199	0	1482
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)			513			207			233			212
Link Speed (k/h)		50			50			100			100	
Link Distance (m)		139.3			172.2			126.7			513.4	
Travel Time (s)		10.0			12.4			4.6			18.5	
Confl. Peds. (#/hr)	25		25	25		25	25		25	25		25
Confl. Bikes (#/hr)			10			10			10			10
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
Adj. Flow (vph)	124	811	513	446	703	207	790	0	902	455	0	324
Shared Lane Traffic (%)												
Lane Group Flow (vph)	124	811	513	446	703	207	790	0	902	455	0	324
Enter Blocked Intersection	No	No	No	No	No	No	No	No	No	No	No	No
Lane Alignment	Left	Left	Right	Left	Left	Right	Left	Left	Right	Left	Left	Right
Median Width(m)		7.4			7.4			7.4			7.4	
Link Offset(m)		0.0			0.0			0.0			0.0	
Crosswalk Width(m)		1.6			1.6			1.6			1.6	
Two way Left Turn Lane												
Headway Factor	1.02	1.02	1.02	1.02	1.02	1.02	1.02	1.02	1.02	1.02	1.02	1.02
Turning Speed (k/h)	24		14	24		14	24		14	24		14
Turn Type	Prot		Perm	Prot		Perm	Prot		Free	Prot		Free
Protected Phases	5	2		1	6		3			7		
Permitted Phases			2			6			Free			Free
Minimum Split (s)	12.0	22.5	22.5	12.0	22.5	22.5	24.5			24.5		
Total Split (s)	12.0	28.0	28.0	16.0	32.0	32.0	26.0	0.0	0.0	26.0	0.0	0.0
Total Split (%)	17.1%	40.0%	40.0%	22.9%	45.7%	45.7%	37.1%	0.0%	0.0%	37.1%	0.0%	0.0%
Maximum Green (s)	8.0	23.0	23.0	12.0	27.0	27.0	22.0			22.0		
Yellow Time (s)	3.0	4.0	4.0	3.0	4.0	4.0	3.0			3.0		
All-Red Time (s)	1.0	1.0	1.0	1.0	1.0	1.0	1.0			1.0		
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Lost Time (s)	4.0	5.0	5.0	4.0	5.0	5.0	4.0	4.0	4.0	4.0	4.0	4.0
Lead/Lag	Lead	Lag	Lag	Lead	Lag	Lag						
Lead-Lag Optimize?	Yes	Yes	Yes	Yes	Yes	Yes						
Walk Time (s)		7.0	7.0		7.0	7.0	7.0			7.0		
Flash Dont Walk (s)		10.5	10.5		10.5	10.5	13.5			13.5		
Pedestrian Calls (#/hr)		0	0		0	0	0			0		
Act Effct Green (s)	8.0	23.0	23.0	12.0	27.0	27.0	22.0		70.0	22.0		70.0

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Actuated g/C Ratio	0.11	0.33	0.33	0.17	0.39	0.39	0.31		1.00	0.31		1.00
v/c Ratio	0.33	0.73	0.63	0.79	0.54	0.30	0.77		0.61	0.44		0.22
Control Delay	31.2	25.4	5.8	40.0	18.6	3.7	27.6		1.9	20.8		0.3
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0		0.0	0.0		0.0
Total Delay	31.2	25.4	5.8	40.0	18.6	3.7	27.6		1.9	20.8		0.3
LOS	C	C	A	D	B	A	C		A	C		A
Approach Delay		19.0			23.3							
Approach LOS		B			C							
Queue Length 50th (m)	7.8	48.6	0.0	29.2	36.5	0.0	47.5		0.0	24.1		0.0
Queue Length 95th (m)	15.1	67.7	19.3	#49.5	51.5	11.4	66.7		0.0	36.0		0.0
Internal Link Dist (m)		115.3			148.2			102.7			489.4	
Turn Bay Length (m)	100.0		100.0	100.0		100.0						
Base Capacity (vph)	375	1112	818	563	1306	684	1032		1482	1032		1482
Starvation Cap Reductn	0	0	0	0	0	0	0		0	0		0
Spillback Cap Reductn	0	0	0	0	0	0	0		0	0		0
Storage Cap Reductn	0	0	0	0	0	0	0		0	0		0
Reduced v/c Ratio	0.33	0.73	0.63	0.79	0.54	0.30	0.77		0.61	0.44		0.22

Intersection Summary

Area Type: Other
Cycle Length: 70
Actuated Cycle Length: 70
Offset: 0 (0%), Referenced to phase 2:EBT and 6:WBT, Start of Green
Natural Cycle: 60
Control Type: Pretimed
Maximum v/c Ratio: 0.79
Intersection Signal Delay: 17.5 Intersection LOS: B
Intersection Capacity Utilization 65.3% ICU Level of Service C
Analysis Period (min) 15
95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.

Splits and Phases: 13: Int



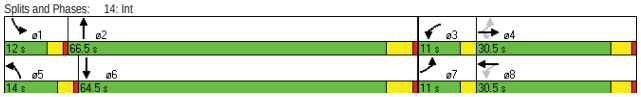
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	151	1	318	350	5	1	286	2657	342	43	2240	123
Ideal Flow (vphpl)	1850	1850	1850	1850	1850	1850	1850	1850	1850	1850	1850	1850
Storage Length (m)	100.0		100.0	100.0		0.0	100.0		100.0	100.0		100.0
Storage Lanes	1		1	1		0	2		1	1		1
Taper Length (m)	2.5		2.5	2.5		2.5	2.5		2.5	2.5		2.5
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	0.97	0.91	1.00	1.00	0.91	1.00
Ped Bike Factor	0.96		0.94	0.96	0.99		1.00		0.98	1.00		0.98
Frt			0.850		0.975				0.850			0.850
Flt Protected	0.950			0.950			0.950			0.950		
Satd. Flow (prot)	1692	1781	1514	1692	1721	0	3283	4863	1514	1692	4863	1514
Flt Permitted	0.754			0.757			0.950			0.950		
Satd. Flow (perm)	1296	1781	1429	1301	1721	0	3269	4863	1482	1690	4863	1482
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)			123		1				149			64
Link Speed (k/h)		50			50			100			100	
Link Distance (m)		151.5			142.4			266.6			387.4	
Travel Time (s)		10.9			10.3			9.6			13.9	
Confl. Peds. (#/hr)	25		25	25		25	25		25	25		25
Confl. Bikes (#/hr)			10			10			10			10
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
Adj. Flow (vph)	164	1	346	380	5	1	311	2888	372	47	2435	134
Shared Lane Traffic (%)												
Lane Group Flow (vph)	164	1	346	380	6	0	311	2888	372	47	2435	134
Enter Blocked Intersection	No	No	No	No	No	No	No	No	No	No	No	No
Lane Alignment	Left	Left	Right	Left	Left	Right	Left	Left	Right	Left	Left	Right
Median Width(m)		3.7			3.7			7.4			7.4	
Link Offset(m)		0.0			0.0			0.0			0.0	
Crosswalk Width(m)		1.6			1.6			1.6			1.6	
Two way Left Turn Lane												
Headway Factor	1.02	1.02	1.02	1.02	1.02	1.02	1.02	1.02	1.02	1.02	1.02	1.02
Turning Speed (k/h)	24		14	24		14	24		14	24		14
Turn Type	pm+pt		Perm	pm+pt			Prot		Free	Prot		Free
Protected Phases	7	4		3	8		5	2		1	6	
Permitted Phases	4		4	8					Free			Free
Minimum Split (s)	11.0	30.5	30.5	11.0	30.5		12.0	21.0		12.0	21.0	
Total Split (s)	11.0	30.5	30.5	11.0	30.5	0.0	14.0	66.5	0.0	12.0	64.5	0.0
Total Split (%)	9.2%	25.4%	25.4%	9.2%	25.4%	0.0%	11.7%	55.4%	0.0%	10.0%	53.8%	0.0%
Maximum Green (s)	8.0	25.5	25.5	8.0	25.5		10.0	60.5		8.0	58.5	
Yellow Time (s)	3.0	4.0	4.0	3.0	4.0		3.0	5.0		3.0	5.0	
All-Red Time (s)	0.0	1.0	1.0	0.0	1.0		1.0	1.0		1.0	1.0	
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Lost Time (s)	3.0	5.0	5.0	3.0	5.0	4.0	4.0	6.0	4.0	4.0	6.0	4.0
Lead/Lag	Lead	Lag	Lag	Lead	Lag		Lead	Lag		Lead	Lag	
Lead-Lag Optimize?	Yes	Yes	Yes	Yes	Yes		Yes	Yes		Yes	Yes	
Walk Time (s)		7.0	7.0		7.0			7.0			7.0	
Flash Dont Walk (s)		18.5	18.5		18.5			4.5			4.5	
Pedestrian Calls (#/hr)		0	0		0			0			0	
Act Effct Green (s)	35.5	25.5	25.5	35.5	25.5		10.0	60.5	120.0	8.0	58.5	120.0

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Actuated g/C Ratio	0.30	0.21	0.21	0.30	0.21		0.08	0.50	1.00	0.07	0.49	1.00
v/c Ratio	0.40	0.00	0.86	0.92	0.02		1.14	1.18	0.25	0.42	1.03	0.09
Control Delay	34.8	37.0	50.9	69.1	35.0		131.0	110.0	0.2	68.1	28.3	0.0
Queue Delay	0.0	0.0	0.0	0.0	0.0		0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	34.8	37.0	50.9	69.1	35.0		131.0	110.0	0.2	68.1	28.3	0.0
LOS	C	D	D	E	C		F	F	A	E	C	A
Approach Delay		45.7			68.5			100.4			27.6	
Approach LOS		D			E			F			C	
Queue Length 50th (m)	29.0	0.2	52.9	78.2	1.0		~44.9	~303.1	0.0	11.8	~63.1	0.0
Queue Length 95th (m)	47.0	1.7	#104.7	#144.3	4.6		m#56.5	m#327.8	m0.0	m11.6	m34.7	m0.0
Internal Link Dist (m)		127.5			118.4			242.6			363.4	
Turn Bay Length (m)	100.0		100.0	100.0			100.0		100.0	100.0		100.0
Base Capacity (vph)	410	378	401	411	367		274	2452	1482	113	2371	1482
Starvation Cap Reductn	0	0	0	0	0		0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0		0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0		0	0	0	0	0	0
Reduced v/c Ratio	0.40	0.00	0.86	0.92	0.02		1.14	1.18	0.25	0.42	1.03	0.09

Intersection Summary

Area Type: Other
Cycle Length: 120
Actuated Cycle Length: 120
Offset: 0 (0%), Referenced to phase 2:NBT and 6:SBT, Start of Green
Natural Cycle: 150
Control Type: Pretimed
Maximum v/c Ratio: 1.18
Intersection Signal Delay: 67.8 Intersection LOS: E
Intersection Capacity Utilization 99.4% ICU Level of Service F
Analysis Period (min) 15
~ Volume exceeds capacity, queue is theoretically infinite.
Queue shown is maximum after two cycles.
95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.
m Volume for 95th percentile queue is metered by upstream signal.

Splits and Phases: 14: Int



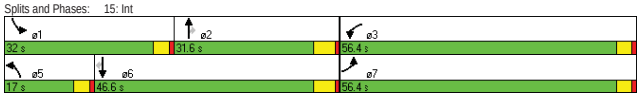
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	1298	0	297	518	0	404	256	837	658	693	975	487
Ideal Flow (vphpl)	1850	1850	1850	1850	1850	1850	1850	1850	1850	1850	1850	1850
Storage Length (m)	0.0		0.0	0.0		0.0	100.0		50.0	100.0		100.0
Storage Lanes	2		1	2		1	2		1	2		1
Taper Length (m)	2.5		2.5	2.5		2.5	2.5		2.5	2.5		2.5
Lane Util. Factor	0.97	1.00	1.00	0.97	1.00	1.00	0.97	0.91	1.00	0.97	0.91	1.00
Ped Bike Factor	0.96		0.98	0.96		0.98	0.99		0.93	0.99		0.93
Frt			0.850			0.850			0.850			0.850
Flt Protected	0.950			0.950			0.950			0.950		
Satd. Flow (prot)	3283	0	1514	3283	0	1514	3283	4863	1514	3283	4863	1514
Flt Permitted	0.950			0.950			0.950			0.950		
Satd. Flow (perm)	3167	0	1482	3167	0	1482	3245	4863	1406	3236	4863	1411
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)			147			260			627			529
Link Speed (k/h)		100			100			50			50	
Link Distance (m)		808.3			175.9			136.7			165.7	
Travel Time (s)		29.1			6.3			9.8			11.9	
Confl. Peds. (#/hr)	25		25	25		25	25		25	25		25
Confl. Bikes (#/hr)			10			10			10			10
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
Adj. Flow (vph)	1411	0	323	563	0	439	278	910	715	753	1060	529
Shared Lane Traffic (%)												
Lane Group Flow (vph)	1411	0	323	563	0	439	278	910	715	753	1060	529
Enter Blocked Intersection	No	No	No	No	No	No	No	No	No	No	No	No
Lane Alignment	Left	Left	Right	Left	Left	Right	Left	Left	Right	Left	Left	Right
Median Width(m)		7.4			7.4			7.4			7.4	
Link Offset(m)		0.0			0.0			0.0			0.0	
Crosswalk Width(m)		1.6			1.6			1.6			1.6	
Two way Left Turn Lane												
Headway Factor	1.02	1.02	1.02	1.02	1.02	1.02	1.02	1.02	1.02	1.02	1.02	1.02
Turning Speed (k/h)	24		14	24		14	24		14	24		14
Turn Type	Prot		Free	Prot		Free	Prot		Perm	Prot		Perm
Protected Phases	7			3			5	2		1	6	
Permitted Phases			Free			Free			2			6
Minimum Split (s)	29.5			29.5			12.0	22.5	22.5	12.0	22.5	22.5
Total Split (s)	56.4	0.0	0.0	56.4	0.0	0.0	17.0	31.6	31.6	32.0	46.6	46.6
Total Split (%)	47.0%	0.0%	0.0%	47.0%	0.0%	0.0%	14.2%	26.3%	26.3%	26.7%	38.8%	38.8%
Maximum Green (s)	52.4			52.4			13.0	26.6	26.6	28.0	41.6	41.6
Yellow Time (s)	3.0			3.0			3.0	4.0	4.0	3.0	4.0	4.0
All-Red Time (s)	1.0			1.0			1.0	1.0	1.0	1.0	1.0	1.0
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Lost Time (s)	4.0	4.0	4.0	4.0	4.0	4.0	4.0	5.0	5.0	4.0	5.0	5.0
Lead/Lag							Lead	Lag	Lag	Lead	Lag	Lag
Lead-Lag Optimize?							Yes	Yes	Yes	Yes	Yes	Yes
Walk Time (s)	7.0			7.0				7.0	7.0		7.0	7.0
Flash Dont Walk (s)	18.5			18.5				10.5	10.5		10.5	10.5
Pedestrian Calls (#/hr)	0			0				0	0		0	0
Act Effct Green (s)	52.4		120.0	52.4		120.0	13.0	26.6	26.6	28.0	41.6	41.6

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Actuated g/C Ratio	0.44		1.00	0.44		1.00	0.11	0.22	0.22	0.23	0.35	0.35
v/c Ratio	0.98		0.22	0.39		0.30	0.78	0.84	0.89	0.98	0.63	0.63
Control Delay	54.0		0.3	24.0		0.5	68.1	53.1	21.8	75.0	51.3	19.7
Queue Delay	0.0		0.0	0.0		0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	54.0		0.3	24.0		0.5	68.1	53.1	21.8	75.0	51.3	19.7
LOS	D		A	C		A	E	D	C	E	D	B
Approach Delay								43.5			51.8	
Approach LOS								D			D	
Queue Length 50th (m)	165.9		0.0	45.5		0.0	33.4	75.6	17.3	95.8	79.5	48.4
Queue Length 95th (m)	#216.4		0.0	59.5		0.0	#52.3	92.0	#102.4	m#127.0	m95.3	m75.0
Internal Link Dist (m)		784.3			151.9			112.7			141.7	
Turn Bay Length (m)							100.0		50.0	100.0		100.0
Base Capacity (vph)	1434		1482	1434		1482	356	1078	800	766	1686	835
Starvation Cap Reductn	0		0	0		0	0	0	0	0	0	0
Spillback Cap Reductn	0		0	0		0	0	0	0	0	0	0
Storage Cap Reductn	0		0	0		0	0	0	0	0	0	0
Reduced v/c Ratio	0.98		0.22	0.39		0.30	0.78	0.84	0.89	0.98	0.63	0.63

Intersection Summary

Area Type: Other
Cycle Length: 120
Actuated Cycle Length: 120
Offset: 0 (0%), Referenced to phase 2:NBT and 6:SBT, Start of Green
Natural Cycle: 90
Control Type: Pretimed
Maximum v/c Ratio: 0.98
Intersection Signal Delay: 42.1 Intersection LOS: D
Intersection Capacity Utilization 85.8% ICU Level of Service E
Analysis Period (min) 15
95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.
m Volume for 95th percentile queue is metered by upstream signal.

Splits and Phases: 15: Int



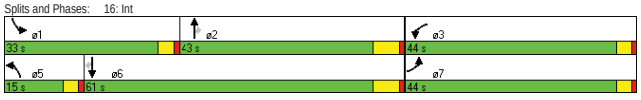
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	970	0	131	173	0	1008	222	1308	277	692	1460	755
Ideal Flow (vphpl)	1850	1850	1850	1850	1850	1850	1850	1850	1850	1850	1850	1850
Storage Length (m)	0.0		0.0	0.0		0.0	100.0		50.0	100.0		100.0
Storage Lanes	2		1	2		1	2		1	2		1
Taper Length (m)	2.5		2.5	2.5		2.5	2.5		2.5	2.5		2.5
Lane Util. Factor	0.97	1.00	1.00	0.97	1.00	1.00	0.97	0.91	1.00	0.97	0.91	1.00
Ped Bike Factor	0.96		0.98	0.96		0.98	0.99		0.92	0.99		0.92
Frt			0.850			0.850			0.850			0.850
Flt Protected	0.950			0.950			0.950			0.950		
Satd. Flow (prot)	3283	0	1514	3283	0	1514	3283	4863	1514	3283	4863	1514
Flt Permitted	0.950			0.950			0.950			0.950		
Satd. Flow (perm)	3167	0	1482	3167	0	1482	3261	4863	1394	3236	4863	1397
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)			86			272			190			821
Link Speed (k/h)		100			100			50			100	
Link Distance (m)		725.9			914.3			185.9			129.1	
Travel Time (s)		26.1			32.9			13.4			4.6	
Confl. Peds. (#/hr)	25		25	25		25	25		25	25		25
Confl. Bikes (#/hr)			10			10			10			10
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
Adj. Flow (vph)	1054	0	142	188	0	1096	241	1422	301	752	1587	821
Shared Lane Traffic (%)												
Lane Group Flow (vph)	1054	0	142	188	0	1096	241	1422	301	752	1587	821
Enter Blocked Intersection	No	No	No	No	No	No	No	No	No	No	No	No
Lane Alignment	Left	Left	Right	Left	Left	Right	Left	Left	Right	Left	Left	Right
Median Width(m)		7.4			7.4			7.4			7.4	
Link Offset(m)		0.0			0.0			0.0			0.0	
Crosswalk Width(m)		1.6			1.6			1.6			1.6	
Two way Left Turn Lane												
Headway Factor	1.02	1.02	1.02	1.02	1.02	1.02	1.02	1.02	1.02	1.02	1.02	1.02
Turning Speed (k/h)	24		14	24		14	24		14	24		14
Turn Type	Prot		Free	Prot		Free	Prot		Perm	Prot		Perm
Protected Phases	7			3			5	2		1	6	
Permitted Phases			Free			Free			2			6
Minimum Split (s)	29.5			29.5			12.0	20.5	20.5	12.0	20.5	20.5
Total Split (s)	44.0	0.0	0.0	44.0	0.0	0.0	15.0	43.0	43.0	33.0	61.0	61.0
Total Split (%)	36.7%	0.0%	0.0%	36.7%	0.0%	0.0%	12.5%	35.8%	35.8%	27.5%	50.8%	50.8%
Maximum Green (s)	40.0			40.0			11.0	37.0	37.0	29.0	55.0	55.0
Yellow Time (s)	3.0			3.0			3.0	5.0	5.0	3.0	5.0	5.0
All-Red Time (s)	1.0			1.0			1.0	1.0	1.0	1.0	1.0	1.0
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Lost Time (s)	4.0	4.0	4.0	4.0	4.0	4.0	4.0	6.0	6.0	4.0	6.0	6.0
Lead/Lag							Lead	Lag	Lag	Lead	Lag	Lag
Lead-Lag Optimize?							Yes	Yes	Yes	Yes	Yes	Yes
Walk Time (s)	7.0			7.0				7.0	7.0		7.0	7.0
Flash Dont Walk (s)	18.5			18.5				7.5	7.5		7.5	7.5
Pedestrian Calls (#/hr)	0			0				0	0		0	0
Act Effct Green (s)	40.0		120.0	40.0		120.0	11.0	37.0	37.0	29.0	55.0	55.0

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Actuated g/C Ratio	0.33		1.00	0.33		1.00	0.09	0.31	0.31	0.24	0.46	0.46
v/c Ratio	0.96		0.10	0.17		0.74	0.80	0.95	0.54	0.95	0.71	0.76
Control Delay	59.4		0.1	28.8		3.4	73.5	54.7	16.3	54.1	34.5	10.6
Queue Delay	0.0		0.0	0.0		0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	59.4		0.1	28.8		3.4	73.5	54.7	16.3	54.1	34.5	10.6
LOS	E		A	C		A	E	D	B	D	C	B
Approach Delay								51.1			32.9	
Approach LOS								D			C	
Queue Length 50th (m)	125.1		0.0	16.0		0.0	29.1	119.5	20.0	94.8	101.4	40.3
Queue Length 95th (m)	#167.9		0.0	24.7		0.0	#48.6	#150.1	47.5	m93.4	m101.7	m41.1
Internal Link Dist (m)		701.9			890.3			161.9			105.1	
Turn Bay Length (m)							100.0		50.0	100.0		100.0
Base Capacity (vph)	1094		1482	1094		1482	301	1499	561	793	2229	1085
Starvation Cap Reductn	0		0	0		0	0	0	0	0	0	0
Spillback Cap Reductn	0		0	0		0	0	0	0	0	0	0
Storage Cap Reductn	0		0	0		0	0	0	0	0	0	0
Reduced v/c Ratio	0.96		0.10	0.17		0.74	0.80	0.95	0.54	0.95	0.71	0.76

Intersection Summary

Area Type: Other
Cycle Length: 120
Actuated Cycle Length: 120
Offset: 0 (0%), Referenced to phase 2:NBT and 6:SBT, Start of Green
Natural Cycle: 90
Control Type: Pretimed
Maximum v/c Ratio: 0.96
Intersection Signal Delay: 36.3 Intersection LOS: D
Intersection Capacity Utilization 86.3% ICU Level of Service E
Analysis Period (min) 15
95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.
m Volume for 95th percentile queue is metered by upstream signal.

Splits and Phases: 16: Int



Lane Group	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Volume (vph)	671	184	1055	624	222	1029
Ideal Flow (vphpl)	1850	1850	1850	1850	1850	1850
Storage Length (m)	150.0	100.0		100.0	100.0	
Storage Lanes	1	1		1	1	
Taper Length (m)	2.5	2.5		2.5	2.5	
Lane Util. Factor	0.97	1.00	0.95	1.00	1.00	0.95
Ped Bike Factor	0.97	0.96		0.90	0.98	
Frt		0.850		0.850		
Flt Protected	0.950				0.950	
Satd. Flow (prot)	3283	1514	3385	1514	1692	3385
Flt Permitted	0.950				0.950	
Satd. Flow (perm)	3178	1448	3385	1363	1664	3385
Right Turn on Red		Yes		Yes		
Satd. Flow (RTOR)		200		678		
Link Speed (k/h)	50		50			50
Link Distance (m)	1351.7		573.2			377.3
Travel Time (s)	97.3		41.3			27.2
Confl. Peds. (#/hr)	25	25		25	25	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	729	200	1147	678	241	1118
Shared Lane Traffic (%)						
Lane Group Flow (vph)	729	200	1147	678	241	1118
Enter Blocked Intersection	No	No	No	No	No	No
Lane Alignment	Left	Right	Left	Right	Left	Left
Median Width(m)	7.4		3.7			3.7
Link Offset(m)	0.0		0.0			0.0
Crosswalk Width(m)	1.6		1.6			1.6
Two way Left Turn Lane						
Headway Factor	1.02	1.02	1.02	1.02	1.02	1.02
Turning Speed (k/h)	24	14		14	24	
Turn Type		Perm		Perm	Prot	
Protected Phases	8		2		1	6
Permitted Phases		8		2		
Minimum Split (s)	22.5	22.5	20.0	20.0	12.0	20.0
Total Split (s)	24.0	24.0	35.0	35.0	16.0	51.0
Total Split (%)	32.0%	32.0%	46.7%	46.7%	21.3%	68.0%
Maximum Green (s)	19.0	19.0	30.0	30.0	12.0	46.0
Yellow Time (s)	4.0	4.0	4.0	4.0	3.0	4.0
All-Red Time (s)	1.0	1.0	1.0	1.0	1.0	1.0
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	0.0
Total Lost Time (s)	5.0	5.0	5.0	5.0	4.0	5.0
Lead/Lag			Lag	Lag	Lead	
Lead-Lag Optimize?			Yes	Yes	Yes	
Walk Time (s)	7.0	7.0	7.0	7.0		7.0
Flash Dont Walk (s)	10.5	10.5	4.5	4.5		4.5
Pedestrian Calls (#/hr)	0	0	0	0		0
Act Effct Green (s)	19.0	19.0	30.0	30.0	12.0	46.0
Actuated g/C Ratio	0.25	0.25	0.40	0.40	0.16	0.61

Lane Group	WBL	WBR	NBT	NBR	SBL	SBT
v/c Ratio	0.88	0.39	0.85	0.71	0.89	0.54
Control Delay	40.6	6.2	28.0	6.3	66.3	9.6
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	40.6	6.2	28.0	6.3	66.3	9.6
LOS	D	A	C	A	E	A
Approach Delay	33.2		19.9			19.6
Approach LOS	C		B			B
Queue Length 50th (m)	50.9	0.0	75.2	0.0	33.8	42.6
Queue Length 95th (m)	#80.0	14.5	#104.4	22.4	#72.2	57.3
Internal Link Dist (m)	1327.7		549.2			353.3
Turn Bay Length (m)	150.0	100.0		100.0	100.0	
Base Capacity (vph)	832	516	1354	952	271	2076
Starvation Cap Reductn	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0
Reduced v/c Ratio	0.88	0.39	0.85	0.71	0.89	0.54

Intersection Summary

Area Type: Other
Cycle Length: 75
Actuated Cycle Length: 75
Offset: 0 (0%), Referenced to phase 2:NBT and 6:SBT, Start of Green
Natural Cycle: 75
Control Type: Pretimed
Maximum v/c Ratio: 0.89
Intersection Signal Delay: 22.8 Intersection LOS: C
Intersection Capacity Utilization 73.9% ICU Level of Service D
Analysis Period (min) 15
95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.

Splits and Phases: 18: Int

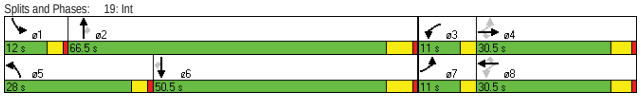
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	375	40	403	84	88	52	726	2074	10	18	1919	153
Ideal Flow (vphpl)	1850	1850	1850	1850	1850	1850	1850	1850	1850	1850	1850	1850
Storage Length (m)	100.0		50.0	100.0		80.0	100.0		100.0	100.0		100.0
Storage Lanes	1		1	1		1	2		1	1		1
Taper Length (m)	2.5		2.5	2.5		2.5	2.5		2.5	2.5		2.5
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	0.97	0.91	1.00	1.00	0.91	1.00
Frt			0.850			0.850			0.850			0.850
Flt Protected	0.950			0.950			0.950			0.950		
Satd. Flow (prot)	1692	1781	1514	1692	1781	1514	3283	4863	1514	1692	4863	1514
Flt Permitted	0.686			0.729			0.950			0.950		
Satd. Flow (perm)	1222	1781	1514	1299	1781	1514	3283	4863	1514	1692	4863	1514
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)			376			57			11			147
Link Speed (k/h)		50			50			100			100	
Link Distance (m)		1351.7			342.5			387.4			638.0	
Travel Time (s)		97.3			24.7			13.9			23.0	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	408	43	438	91	96	57	789	2254	11	20	2086	166
Shared Lane Traffic (%)												
Lane Group Flow (vph)	408	43	438	91	96	57	789	2254	11	20	2086	166
Enter Blocked Intersection	No	No	No	No	No	No	No	No	No	No	No	No
Lane Alignment	Left	Left	Right	Left	Left	Right	Left	Left	Right	Left	Left	Right
Median Width(m)		3.7			3.7			7.4			7.4	
Link Offset(m)		0.0			0.0			0.0			0.0	
Crosswalk Width(m)		1.6			1.6			1.6			1.6	
Two way Left Turn Lane												
Headway Factor	1.02	1.02	1.02	1.02	1.02	1.02	1.02	1.02	1.02	1.02	1.02	1.02
Turning Speed (k/h)	24		14	24		14	24		14	24		14
Turn Type	pm+pt		Perm	pm+pt		Perm	Prot		Perm	Prot		Perm
Protected Phases	7	4		3	8		5	2		1	6	
Permitted Phases	4		4	8		8			2			6
Minimum Split (s)	11.0	30.5	30.5	11.0	30.5	30.5	12.0	21.0	21.0	12.0	21.0	21.0
Total Split (s)	11.0	30.5	30.5	11.0	30.5	30.5	28.0	66.5	66.5	12.0	50.5	50.5
Total Split (%)	9.2%	25.4%	25.4%	9.2%	25.4%	25.4%	23.3%	55.4%	55.4%	10.0%	42.1%	42.1%
Maximum Green (s)	8.0	25.5	25.5	8.0	25.5	25.5	24.0	60.5	60.5	8.0	44.5	44.5
Yellow Time (s)	3.0	4.0	4.0	3.0	4.0	4.0	3.0	5.0	5.0	3.0	5.0	5.0
All-Red Time (s)	0.0	1.0	1.0	0.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Lost Time (s)	3.0	5.0	5.0	3.0	5.0	5.0	4.0	6.0	6.0	4.0	6.0	6.0
Lead/Lag	Lead	Lag	Lag	Lead	Lag	Lag	Lead	Lag	Lag	Lead	Lag	Lag
Lead-Lag Optimize?	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Walk Time (s)		7.0	7.0		7.0	7.0		7.0	7.0		7.0	7.0
Flash Dont Walk (s)		18.5	18.5		18.5	18.5		4.5	4.5		4.5	4.5
Pedestrian Calls (#/hr)		0	0		0	0		0	0		0	0
Act Effct Green (s)	35.5	25.5	25.5	35.5	25.5	25.5	24.0	60.5	60.5	8.0	44.5	44.5
Actuated g/C Ratio	0.30	0.21	0.21	0.30	0.21	0.21	0.20	0.50	0.50	0.07	0.37	0.37
v/c Ratio	1.04	0.11	0.71	0.22	0.25	0.16	1.20	0.92	0.01	0.18	1.16	0.25
Control Delay	95.7	39.2	14.6	31.0	41.5	11.0	141.3	28.6	13.2	56.8	112.6	6.5

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	95.7	39.2	14.6	31.0	41.5	11.0	141.3	28.6	13.2	56.8	112.6	6.5
LOS	F	D	B	C	D	B	F	C	B	E	F	A
Approach Delay		53.0			30.5			57.7			104.3	
Approach LOS		D			C			E			F	
Queue Length 50th (m)	~90.4	8.2	12.1	15.4	19.0	0.0	~120.0	102.4	0.5	4.5	~212.5	2.8
Queue Length 95th (m)	#163.9	18.1	48.5	28.0	34.2	10.9	m#92.8	m88.2	m0.4	12.5	#241.6	16.9
Internal Link Dist (m)		1327.7			318.5			363.4			614.0	
Turn Bay Length (m)	100.0		50.0	100.0		80.0	100.0		100.0	100.0		100.0
Base Capacity (vph)	393	378	618	410	378	367	657	2452	769	113	1803	654
Starvation Cap Reductn	0	0	0	0	0	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0	0	0	0	0	0
Reduced v/c Ratio	1.04	0.11	0.71	0.22	0.25	0.16	1.20	0.92	0.01	0.18	1.16	0.25

Intersection Summary

Area Type: Other
Cycle Length: 120
Actuated Cycle Length: 120
Offset: 0 (0%), Referenced to phase 2:NBT and 6:SBT, Start of Green
Natural Cycle: 140
Control Type: Pretimed
Maximum v/c Ratio: 1.20
Intersection Signal Delay: 72.4 Intersection LOS: E
Intersection Capacity Utilization 99.9% ICU Level of Service F
Analysis Period (min) 15
~ Volume exceeds capacity, queue is theoretically infinite.
Queue shown is maximum after two cycles.
95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.
m Volume for 95th percentile queue is metered by upstream signal.

Splits and Phases: 19: Int



Lane Group	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Volume (vph)	341	907	1089	1449	1248	378
Ideal Flow (vphpl)	1850	1850	1850	1850	1850	1850
Storage Length (m)	150.0	0.0	200.0			100.0
Storage Lanes	2	2	2			1
Taper Length (m)	2.5	2.5	2.5			2.5
Lane Util. Factor	0.97	0.88	0.97	0.95	0.91	1.00
Ped Bike Factor	0.93	0.91	0.98			0.93
Frt		0.850				0.850
Flt Protected	0.950		0.950			
Satd. Flow (prot)	3283	2665	3283	3385	4863	1514
Flt Permitted	0.950		0.950			
Satd. Flow (perm)	3043	2421	3232	3385	4863	1404
Right Turn on Red		Yes				Yes
Satd. Flow (RTOR)		986				364
Link Speed (k/h)	50			50	50	
Link Distance (m)	448.4			124.6	573.2	
Travel Time (s)	32.3			9.0	41.3	
Confl. Peds. (#/hr)	25	25	25			25
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	371	986	1184	1575	1357	411
Shared Lane Traffic (%)						
Lane Group Flow (vph)	371	986	1184	1575	1357	411
Enter Blocked Intersection	No	No	No	No	No	No
Lane Alignment	Left	Right	Left	Left	Left	Right
Median Width(m)	7.4			7.4	7.4	
Link Offset(m)	0.0			0.0	0.0	
Crosswalk Width(m)	1.6			1.6	1.6	
Two way Left Turn Lane						
Headway Factor	1.02	1.02	1.02	1.02	1.02	1.02
Turning Speed (k/h)	24	14	24			14
Turn Type		Perm	Prot			Perm
Protected Phases	4		5	2	6	
Permitted Phases		4				6
Minimum Split (s)	25.5	25.5	12.0	20.0	20.0	20.0
Total Split (s)	27.0	27.0	50.0	93.0	43.0	43.0
Total Split (%)	22.5%	22.5%	41.7%	77.5%	35.8%	35.8%
Maximum Green (s)	22.0	22.0	46.0	88.0	38.0	38.0
Yellow Time (s)	4.0	4.0	3.0	4.0	4.0	4.0
All-Red Time (s)	1.0	1.0	1.0	1.0	1.0	1.0
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	0.0
Total Lost Time (s)	5.0	5.0	4.0	5.0	5.0	5.0
Lead/Lag			Lead		Lag	Lag
Lead-Lag Optimize?			Yes		Yes	Yes
Walk Time (s)	7.0	7.0		7.0	7.0	7.0
Flash Dont Walk (s)	13.5	13.5		7.5	7.5	7.5
Pedestrian Calls (#/hr)	0	0		0	0	0
Act Effct Green (s)	22.0	22.0	46.0	88.0	38.0	38.0
Actuated g/C Ratio	0.18	0.18	0.38	0.73	0.32	0.32

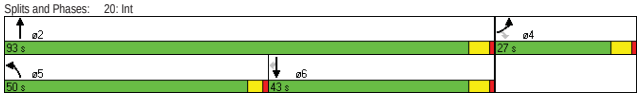
Lane Group	EBL	EBR	NBL	NBT	SBT	SBR
v/c Ratio	0.62	0.79	0.94	0.63	0.88	0.59
Control Delay	50.2	8.0	42.0	12.2	46.8	9.1
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	50.2	8.0	42.0	12.2	46.8	9.1
LOS	D	A	D	B	D	A
Approach Delay	19.5			25.0	38.0	
Approach LOS	B			C	D	
Queue Length 50th (m)	41.8	0.0	152.6	128.4	110.6	7.8
Queue Length 95th (m)	57.8	19.2	m#166.9	m160.1	129.9	36.9
Internal Link Dist (m)	424.4			100.6	549.2	
Turn Bay Length (m)	150.0		200.0			100.0
Base Capacity (vph)	602	1249	1258	2482	1540	693
Starvation Cap Reductn	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0
Reduced v/c Ratio	0.62	0.79	0.94	0.63	0.88	0.59

Intersection Summary

Area Type: Other
Cycle Length: 120
Actuated Cycle Length: 120
Offset: 0 (0%), Referenced to phase 2:NBT and 6:SBT, Start of Green
Natural Cycle: 90
Control Type: Pretimed
Maximum v/c Ratio: 0.94
Intersection Signal Delay: 27.7 — Intersection LOS: C
Intersection Capacity Utilization 85.4% — ICU Level of Service E
Analysis Period (min) 15

95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.
m Volume for 95th percentile queue is metered by upstream signal.

Splits and Phases: 20: Int



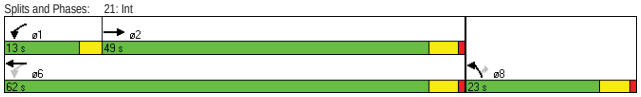
Lane Group	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Volume (vph)	1977	18	48	1116	132	285
Ideal Flow (vphpl)	1850	1850	1850	1850	1850	1850
Storage Length (m)		60.0	60.0		60.0	0.0
Storage Lanes		0	1		1	1
Taper Length (m)		2.5	2.5		2.5	2.5
Lane Util. Factor	0.91	0.91	1.00	0.91	1.00	1.00
Ped Bike Factor	1.00				0.93	0.91
Frt	0.999					0.850
Flt Protected			0.950		0.950	
Satd. Flow (prot)	4854	0	1692	4863	1692	1514
Flt Permitted			0.085		0.950	
Satd. Flow (perm)	4854	0	151	4863	1565	1371
Right Turn on Red		Yes				Yes
Satd. Flow (RTOR)	2					204
Link Speed (k/h)	50			50	50	
Link Distance (m)	163.5			189.1	543.0	
Travel Time (s)	11.8			13.6	39.1	
Confl. Peds. (#/hr)		25	25		25	25
Confl. Bikes (#/hr)		10				10
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	2149	20	52	1213	143	310
Shared Lane Traffic (%)						
Lane Group Flow (vph)	2169	0	52	1213	143	310
Enter Blocked Intersection	No	No	No	No	No	No
Lane Alignment	Left	Right	Left	Left	Left	Right
Median Width(m)	7.4			7.4	3.7	
Link Offset(m)	0.0			0.0	0.0	
Crosswalk Width(m)	1.6			1.6	1.6	
Two way Left Turn Lane						
Headway Factor	1.02	1.02	1.02	1.02	1.02	1.02
Turning Speed (k/h)		14	24		24	14
Turn Type			pm+pt			Perm
Protected Phases	2		1	6	8	
Permitted Phases			6			8
Minimum Split (s)	20.0		13.0	20.0	15.0	15.0
Total Split (s)	49.0	0.0	13.0	62.0	23.0	23.0
Total Split (%)	57.6%	0.0%	15.3%	72.9%	27.1%	27.1%
Maximum Green (s)	44.0		10.0	57.0	18.0	18.0
Yellow Time (s)	4.0		3.0	4.0	4.0	4.0
All-Red Time (s)	1.0		0.0	1.0	1.0	1.0
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	0.0
Total Lost Time (s)	5.0	4.0	3.0	5.0	5.0	5.0
Lead/Lag	Lag		Lead			
Lead-Lag Optimize?	Yes		Yes			
Walk Time (s)	7.0			7.0	7.0	7.0
Flash Dont Walk (s)	7.5			7.5	1.5	1.5
Pedestrian Calls (#/hr)	0			0	0	0
Act Effct Green (s)	44.0		59.0	57.0	18.0	18.0

Lane Group	EBT	EBR	WBL	WBT	NBL	NBR
Actuated g/C Ratio	0.52		0.69	0.67	0.21	0.21
v/c Ratio	0.86		0.18	0.37	0.40	0.69
Control Delay	22.5		5.6	6.5	32.8	19.9
Queue Delay	0.8		0.0	0.0	0.0	0.0
Total Delay	23.3		5.6	6.5	32.8	19.9
LOS	C		A	A	C	B
Approach Delay	23.3			6.5	24.0	
Approach LOS	C			A	C	
Queue Length 50th (m)	106.0		2.3	27.5	20.1	14.8
Queue Length 95th (m)	128.4		5.3	34.3	36.7	42.9
Internal Link Dist (m)	139.5			165.1	519.0	
Turn Bay Length (m)			60.0		60.0	
Base Capacity (vph)	2514		286	3261	358	451
Starvation Cap Reductn	120		0	0	0	0
Spillback Cap Reductn	0		0	0	0	0
Storage Cap Reductn	0		0	0	0	0
Reduced v/c Ratio	0.91		0.18	0.37	0.40	0.69

Intersection Summary

Area Type: Other
Cycle Length: 85
Actuated Cycle Length: 85
Offset: 0 (0%), Referenced to phase 2:EBT and 6:WBTL, Start of Green
Natural Cycle: 60
Control Type: Pretimed
Maximum v/c Ratio: 0.86
Intersection Signal Delay: 17.9 — Intersection LOS: B
Intersection Capacity Utilization 68.5% — ICU Level of Service C
Analysis Period (min) 15

Splits and Phases: 21: Int

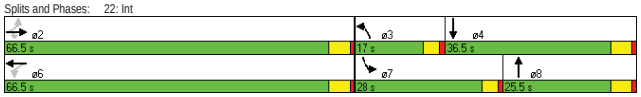


Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	35	2043	184	14	1013	158	83	11	7	508	21	69
Ideal Flow (vphpl)	1850	1850	1850	1850	1850	1850	1850	1850	1850	1850	1850	1850
Storage Length (m)	50.0		50.0	50.0		0.0	0.0		0.0	0.0		0.0
Storage Lanes	1		1	1		0	1		0	2		0
Taper Length (m)	2.5		2.5	2.5		2.5	2.5		2.5	2.5		2.5
Lane Util. Factor	1.00	0.91	1.00	1.00	0.91	0.91	1.00	1.00	1.00	0.97	1.00	1.00
Ped Bike Factor			0.86		0.98		0.96	0.97		0.96	0.95	
Frt			0.850		0.980			0.940			0.885	
Flt Protected	0.950			0.950			0.950			0.950		
Satd. Flow (prot)	1692	4863	1514	1692	4679	0	1692	1630	0	3283	1501	0
Flt Permitted	0.154			0.065			0.950			0.950		
Satd. Flow (perm)	274	4863	1309	116	4679	0	1628	1630	0	3143	1501	0
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)			115		36			8			75	
Link Speed (k/h)		50			50			50			50	
Link Distance (m)		248.8			561.8			261.2			606.0	
Travel Time (s)		17.9			40.4			18.8			43.6	
Confl. Peds. (#/hr)	25		25	25		25	25		25	25		25
Confl. Bikes (#/hr)			10			10			10			10
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
Adj. Flow (vph)	38	2221	200	15	1101	172	90	12	8	552	23	75
Shared Lane Traffic (%)												
Lane Group Flow (vph)	38	2221	200	15	1273	0	90	20	0	552	98	0
Enter Blocked Intersection	No	No	No	No	No	No	No	No	No	No	No	No
Lane Alignment	Left	Left	Right	Left	Left	Right	Left	Left	Right	Left	Left	Right
Median Width(m)		3.7			3.7			7.4			7.4	
Link Offset(m)		0.0			0.0			0.0			0.0	
Crosswalk Width(m)		1.6			1.6			1.6			1.6	
Two way Left Turn Lane												
Headway Factor	1.02	1.02	1.02	1.02	1.02	1.02	1.02	1.02	1.02	1.02	1.02	1.02
Turning Speed (k/h)	24		14	24		14	24		14	24		14
Turn Type	Perm		Perm	Perm			Prot			Prot		
Protected Phases		2			6		3	8		7	4	
Permitted Phases	2		2	6								
Minimum Split (s)	20.0	20.0	20.0	20.0	20.0		12.0	25.5		12.0	25.5	
Total Split (s)	66.5	66.5	66.5	66.5	66.5	0.0	17.0	25.5	0.0	28.0	36.5	0.0
Total Split (%)	55.4%	55.4%	55.4%	55.4%	55.4%	0.0%	14.2%	21.3%	0.0%	23.3%	30.4%	0.0%
Maximum Green (s)	61.5	61.5	61.5	61.5	61.5		13.0	20.5		24.0	31.5	
Yellow Time (s)	4.0	4.0	4.0	4.0	4.0		3.0	4.0		3.0	4.0	
All-Red Time (s)	1.0	1.0	1.0	1.0	1.0		1.0	1.0		1.0	1.0	
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Lost Time (s)	5.0	5.0	5.0	5.0	5.0	4.0	4.0	5.0	4.0	4.0	5.0	4.0
Lead/Lag							Lead	Lag		Lead	Lag	
Lead-Lag Optimize?							Yes	Yes		Yes	Yes	
Walk Time (s)	7.0	7.0	7.0	7.0	7.0			7.0			7.0	
Flash Dont Walk (s)	6.5	6.5	6.5	6.5	6.5			13.5			13.5	
Pedestrian Calls (#/hr)	0	0	0	0	0			0			0	
Act Effct Green (s)	61.5	61.5	61.5	61.5	61.5		13.0	20.5		24.0	31.5	

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Actuated g/C Ratio	0.51	0.51	0.51	0.51	0.51		0.11	0.17		0.20	0.26	
v/c Ratio	0.27	0.89	0.28	0.25	0.53		0.49	0.07		0.84	0.22	
Control Delay	23.1	32.0	8.0	29.9	19.9		60.3	30.8		58.9	12.8	
Queue Delay	0.0	0.0	0.0	0.0	0.0		0.0	0.0		0.0	0.0	
Total Delay	23.1	32.0	8.0	29.9	19.9		60.3	30.8		58.9	12.8	
LOS	C	C	A	C	B		E	C		E	B	
Approach Delay		29.9			20.0			54.9			51.9	
Approach LOS		C			C			D			D	
Queue Length 50th (m)	4.9	166.0	10.1	1.9	68.7		20.3	2.4		65.0	4.1	
Queue Length 95th (m)	13.7	189.5	23.8	8.2	81.7		37.2	9.4		#90.8	17.3	
Internal Link Dist (m)		224.8			537.8			237.2			582.0	
Turn Bay Length (m)	50.0		50.0	50.0								
Base Capacity (vph)	140	2492	727	59	2416		183	285		657	449	
Starvation Cap Reductn	0	0	0	0	0		0	0		0	0	
Spillback Cap Reductn	0	0	0	0	0		0	0		0	0	
Storage Cap Reductn	0	0	0	0	0		0	0		0	0	
Reduced v/c Ratio	0.27	0.89	0.28	0.25	0.53		0.49	0.07		0.84	0.22	

Intersection Summary			
Area Type:	Other		
Cycle Length: 120			
Actuated Cycle Length: 120			
Offset: 0 (0%), Referenced to phase 2:EBTL and 6:WBTL, Start of Green			
Natural Cycle: 90			
Control Type: Pretimed			
Maximum v/c Ratio: 0.89			
Intersection Signal Delay: 30.9		Intersection LOS: C	
Intersection Capacity Utilization 70.4%		ICU Level of Service C	
Analysis Period (min) 15			
# 95th percentile volume exceeds capacity, queue may be longer.			
Queue shown is maximum after two cycles.			

Splits and Phases: 22: Int



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (veh/h)	5	23	39	16	251	4	39	15	5	1	12	45
Sign Control		Free			Free			Stop			Stop	
Grade		0%			0%			0%			0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	5	25	42	17	273	4	42	16	5	1	13	49
Pedestrians		25			25			25			25	
Lane Width (m)		3.7			3.7			3.7			3.7	
Walking Speed (m/s)		1.2			1.2			1.2			1.2	
Percent Blockage		2			2			2			2	
Right turn flare (veh)												
Median type		None			None							
Median storage veh)												
Upstream signal (m)												
pX, platoon unblocked												
vC, conflicting volume	302			92			472	419	96	430	438	325
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	302			92			472	419	96	430	438	325
tC, single (s)	4.1			4.1			7.1	6.5	6.2	7.1	6.5	6.2
tC, 2 stage (s)												
tF (s)	2.2			2.2			3.5	4.0	3.3	3.5	4.0	3.3
p0 queue free %	100			99			90	97	99	100	97	93
cM capacity (veh/h)	1215			1452			413	490	912	470	478	679

Direction, Lane #	EB 1	WB 1	NB 1	SB 1
Volume Total	73	295	64	63
Volume Left	5	17	42	1
Volume Right	42	4	5	49
cSH	1215	1452	452	621
Volume to Capacity	0.00	0.01	0.14	0.10
Queue Length 95th (m)	0.1	0.3	3.7	2.6
Control Delay (s)	0.6	0.5	14.3	11.5
Lane LOS	A	A	B	B
Approach Delay (s)	0.6	0.5	14.3	11.5
Approach LOS			B	B

Intersection Summary				
Average Delay		3.7		
Intersection Capacity Utilization		36.8%	ICU Level of Service	A
Analysis Period (min)		15		

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Sign Control		Stop	Stop		Stop	
Volume (vph)	44	188	384	103	203	107
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	48	204	417	112	221	116

Direction, Lane #	EB 1	EB 2	WB 1	WB 2	SB 1
Volume Total (vph)	48	204	417	112	337
Volume Left (vph)	48	0	0	0	221
Volume Right (vph)	0	0	0	112	116
Hadj (s)	0.58	0.08	0.09	-0.61	0.01
Departure Headway (s)	7.0	6.5	6.1	5.4	5.9
Degree Utilization, x	0.09	0.37	0.71	0.17	0.55
Capacity (veh/h)	485	528	577	645	577
Control Delay (s)	9.5	11.9	21.2	8.3	15.8
Approach Delay (s)	11.5		18.5		15.8
Approach LOS	B		C		C

Intersection Summary				
Delay		16.1		
HCM Level of Service		C		
Intersection Capacity Utilization		53.2%	ICU Level of Service	A
Analysis Period (min)		15		

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Volume (veh/h)	9	1	412	19	1	35
Sign Control	Free			Free	Stop	
Grade	0%			0%	0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	10	1	448	21	1	38
Pedestrians	25			25	25	
Lane Width (m)	3.7			3.7	3.7	
Walking Speed (m/s)	1.2			1.2	1.2	
Percent Blockage	2			2	2	
Right turn flare (veh)						
Median type	None			None		
Median storage veh)						
Upstream signal (m)						
pX, platoon unblocked						
vC, conflicting volume			36		977	60
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol			36		977	60
tC, single (s)			4.1		6.4	6.2
tC, 2 stage (s)						
tF (s)			2.2		3.5	3.3
p0 queue free %			71		99	96
cM capacity (veh/h)			1523		186	954

Direction, Lane #	EB 1	WB 1	NB 1
Volume Total	11	468	39
Volume Left	0	448	1
Volume Right	1	0	38
cSH	1700	1523	856
Volume to Capacity	0.01	0.29	0.05
Queue Length 95th (m)	0.0	9.4	1.1
Control Delay (s)	0.0	8.1	9.4
Lane LOS		A	A
Approach Delay (s)	0.0	8.1	9.4
Approach LOS			A

Intersection Summary				
Average Delay		8.0		
Intersection Capacity Utilization		47.3%	ICU Level of Service	A
Analysis Period (min)		15		

LANE SUMMARY

Site: #5

Roundabout

Lane Use and Performance

	Demand Flows L veh/h	T veh/h	R veh/h	Total veh/h	HV %	Cap. veh/h	Deg. Satn v/c	Lane Util. %	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	Distance m	Lane Length m	SL Type	Cap. Adj. %	Prob. Block. %
South: RoadName																
Lane 1	442	0	104	546	5.0	1539	P	100	2.4	LOS A	2.3	17.9	500	–	0.0	0.0
Approach	442	0	104	546	5.0		0.355		2.4	LOS A	2.3	17.9				
East: RoadName																
Lane 1	83	152	0	235	5.0	908	P	100	3.8	LOS A	1.4	11.1	500	–	0.0	0.0
Approach	83	152	0	235	5.0		0.259		3.8	LOS A	1.4	11.1				
West: RoadName																
Lane 1	0	15	123	138	5.0	1211	P	100	0.4	LOS A	0.6	4.7	500	–	0.0	0.0
Approach	0	15	123	138	5.0		0.114		0.4	LOS A	0.6	4.7				
Intersection				919	5.0		0.355		2.5	LOS A	2.3	17.9				

P: You need to Process this Site (F9) for this variable to be computed.

Level of Service (LOS) Method: Delay (HCM 2000).
Roundabout LOS Method: Same as Sign Control.
Lane LOS values are based on average delay per lane.
Intersection and Approach LOS values are based on average delay for all lanes.
Roundabout Capacity Model: SIDRA Standard.
SIDRA Standard Delay Model used.

LANE SUMMARY

Site: #7

Roundabout

Lane Use and Performance

	Demand Flows L veh/h	T veh/h	R veh/h	Total veh/h	HV %	Cap. veh/h	Deg. Satn v/c	Lane Util. %	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	Distance m	Lane Length m	SL Type	Cap. Adj. %	Prob. Block. %
South: RoadName																
Lane 1	254	0	24	278	5.0	1623	P	100	2.7	LOS A	0.9	7.2	500	–	0.0	0.0
Approach	254	0	24	278	5.0		0.171		2.7	LOS A	0.9	7.2				
East: RoadName																
Lane 1	130	15	0	145	5.0	1051	P	100	4.0	LOS A	0.7	5.2	500	–	0.0	0.0
Approach	130	15	0	145	5.0		0.138		4.0	LOS A	0.7	5.2				
West: RoadName																
Lane 1	0	2	106	108	5.0	1145	P	100	0.6	LOS A	0.5	3.6	500	–	0.0	0.0
Approach	0	2	106	108	5.0		0.094		0.6	LOS A	0.5	3.6				
Intersection				531	5.0		0.171		2.6	LOS A	0.9	7.2				

P: You need to Process this Site (F9) for this variable to be computed.

Level of Service (LOS) Method: Delay (HCM 2000).
Roundabout LOS Method: Same as Sign Control.
Lane LOS values are based on average delay per lane.
Intersection and Approach LOS values are based on average delay for all lanes.
Roundabout Capacity Model: SIDRA Standard.
SIDRA Standard Delay Model used.

LANE SUMMARY

Site: #8

Roundabout

Lane Use and Performance

	Demand Flows L veh/h	T veh/h	R veh/h	Total veh/h	HV %	Cap. veh/h	Deg. Satn v/c	Lane Util. %	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	Distance m	Lane Length m	SL Type	Cap. Adj. %	Prob. Block. %
South East: RoadName																
Lane 1	297	0	0	297	5.0	637	P	100	8.9	LOS A	2.3	18.5	500	–	0.0	0.0
Lane 2	284	0	71	355	5.0	763	P	100	7.2	LOS A	2.4	19.4	500	–	0.0	0.0
Approach	581	0	71	652	5.0		0.466		8.0	LOS A	2.4	19.4				
North East: RoadName																
Lane 1	31	627	0	658	5.0	782	P	100	9.1	LOS A	9.2	73.1	500	–	0.0	0.0
Lane 2	0	716	0	716	5.0	852	P	100	8.1	LOS A	9.5	75.0	500	–	0.0	0.0
Approach	31	1343	0	1374	5.0		0.840		8.6	LOS A	9.5	75.0				
South West: RoadName																
Lane 1	0	593	0	593	5.0	1311	P	100	0.2	LOS A	3.3	26.5	500	–	0.0	0.0
Lane 2	0	524	131	655	5.0	1446	P	100	0.2	LOS A	3.4	27.0	500	–	0.0	0.0
Approach	0	1117	131	1248	5.0		0.453		0.2	LOS A	3.4	27.0				
Intersection				3274	5.0		0.840		5.2	LOS A	9.5	75.0				

P: You need to Process this Site (F9) for this variable to be computed.

Level of Service (LOS) Method: Delay (HCM 2000).
Roundabout LOS Method: Same as Sign Control.
Lane LOS values are based on average delay per lane.
Intersection and Approach LOS values are based on average delay for all lanes.
Roundabout Capacity Model: SIDRA Standard.
SIDRA Standard Delay Model used.

LANE SUMMARY

Site: #9

Roundabout

Lane Use and Performance

	Demand Flows L veh/h	T veh/h	R veh/h	Total veh/h	HV %	Cap. veh/h	Deg. Satn v/c	Lane Util. %	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	Distance m	Lane Length m	SL Type	Cap. Adj. %	Prob. Block. %
East: RoadName																
Lane 1	0	384	112	496	5.0	1395	0.355	100	1.5	LOS A	2.4	18.7	500	–	0.0	0.0
Approach	0	384	112	496	5.0		0.355		1.5	LOS A	2.4	18.7				
North: RoadName																
Lane 1	221	0	116	337	5.0	811	0.416	100	13.9	LOS B	2.6	20.6	500	–	0.0	0.0
Approach	221	0	116	337	5.0		0.416		13.9	LOS B	2.6	20.6				
West: RoadName																
Lane 1	48	188	0	236	5.0	1041	0.226	100	3.8	LOS A	1.3	10.3	500	–	0.0	0.0
Approach	48	188	0	236	5.0		0.226		3.8	LOS A	1.3	10.3				
Intersection				1069	5.0		0.416		5.9	LOS A	2.6	20.6				

Level of Service (LOS) Method: Delay (HCM 2000).
Roundabout LOS Method: Same as Sign Control.
Lane LOS values are based on average delay per lane.
Intersection and Approach LOS values are based on average delay for all lanes.
Roundabout Capacity Model: SIDRA Standard.
SIDRA Standard Delay Model used.

LANE SUMMARY

Site: #10

Roundabout

Lane Use and Performance

	Demand Flows L veh/h	T veh/h	R veh/h	Total veh/h	HV %	Cap. veh/h	Deg. Satn v/c	Lane Util. %	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	Distance m	Lane Length m	SL Type	Cap. Adj. %	Prob. Block. %
South: RoadName																
Lane 1	298	265	0	563	5.0	985	P	100	4.0	LOS A	4.2	33.5	500	–	0.0	0.0
Lane 2	0	188	408	596	5.0	1041	P	100	2.2	LOS A	4.2	33.6	500	–	0.0	0.0
Approach	298	453	408	1159	5.0		0.572		3.1	LOS A	4.2	33.6				
East: RoadName																
Lane 1	456	0	0	456	5.0	785	P	100	8.0	LOS A	4.2	33.0	500	–	0.0	0.0
Lane 2	263	329	0	592	5.0	1020	P	100	5.1	LOS A	4.5	35.8	500	–	0.0	0.0
Lane 3	0	0	318	318	5.0	1186	P	100	1.2	LOS A	1.3	10.6	500	Turn Bay	0.0	0.0
Approach	719	329	318	1366	5.0		0.581		5.2	LOS A	4.5	35.8				
North: RoadName																
Lane 1	68	80	0	148	5.0	412	P	100	9.1	LOS A	1.9	14.8	500	–	0.0	0.0
Lane 2	0	175	8	183	5.0	511	P	100	6.3	LOS A	2.0	16.0	500	–	0.0	0.0
Approach	68	255	8	331	5.0		0.359		7.6	LOS A	2.0	16.0				
West: RoadName																
Lane 1	16	204	0	220	5.0	580	P	99[5]	5.2	LOS A	1.9	14.9	500	–	0.0	0.0
Lane 2	0	0	261	261	5.0	685	P	100	4.1	LOS A	2.0	15.7	500	–	0.0	0.0
Approach	16	204	261	481	5.0		0.381		4.6	LOS A	2.0	15.7				
Intersection				3337	5.0		0.581		4.6	LOS A	4.5	35.8				

P: You need to Process this Site (F9) for this variable to be computed.

Level of Service (LOS) Method: Delay (HCM 2000).
Roundabout LOS Method: Same as Sign Control.
Lane LOS values are based on average delay per lane.
Intersection and Approach LOS values are based on average delay for all lanes.
Roundabout Capacity Model: SIDRA Standard.
SIDRA Standard Delay Model used.

5 Lane underutilisation determined by program

LANE SUMMARY

Site: #11

Roundabout

Lane Use and Performance

	Demand Flows L veh/h	T veh/h	R veh/h	Total veh/h	HV %	Cap. veh/h	Deg. Satn v/c	Lane Util. %	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	Distance m	Lane Length m	SL Type	Cap. Adj. %	Prob. Block. %
South: RoadName																
Lane 1	54	5	102	161	5.0	661	P	100	4.4	LOS A	1.0	8.0	500	–	0.0	0.0
Approach	54	5	102	161	5.0		0.243		4.4	LOS A	1.0	8.0				
East: RoadName																
Lane 1	67	640	0	707	5.0	1201	P	100	1.1	LOS A	4.4	34.5	500	–	0.0	0.0
Lane 2	0	645	117	762	5.0	1294	P	100	0.7	LOS A	4.4	34.8	500	–	0.0	0.0
Approach	67	1285	117	1469	5.0		0.589		0.9	LOS A	4.4	34.8				
North: RoadName																
Lane 1	117	3	83	203	5.0	455	P	100	9.9	LOS A	2.2	17.4	500	–	0.0	0.0
Approach	117	3	83	203	5.0		0.446		9.9	LOS A	2.2	17.4				
West: RoadName																
Lane 1	47	261	0	308	5.0	1077	P	100	1.4	LOS A	1.5	11.7	500	–	0.0	0.0
Lane 2	0	284	35	319	5.0	1118	P	100	0.9	LOS A	1.5	11.8	500	–	0.0	0.0
Approach	47	545	35	627	5.0		0.286		1.2	LOS A	1.5	11.8				
Intersection				2460	5.0		0.589		1.9	LOS A	4.4	34.8				

P: You need to Process this Site (F9) for this variable to be computed.

Level of Service (LOS) Method: Delay (HCM 2000).
Roundabout LOS Method: Same as Sign Control.
Lane LOS values are based on average delay per lane.
Intersection and Approach LOS values are based on average delay for all lanes.
Roundabout Capacity Model: SIDRA Standard.
SIDRA Standard Delay Model used.

LANE SUMMARY

Site: #12

Roundabout

Lane Use and Performance

	Demand Flows L veh/h	T veh/h	R veh/h	Total veh/h	HV %	Cap. veh/h	Deg. Satn v/c	Lane Util. %	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	Distance m	Lane Length m	SL Type	Cap. Adj. %	Prob. Block. %
East: RoadName																
Lane 1	0	784	0	784	5.0	1381	P	100	0.1	LOS A	4.6	36.2	500	–	0.0	0.0
Lane 2	0	602	287	889	5.0	1567	P	100	0.1	LOS A	4.7	37.3	500	–	0.0	0.0
Approach	0	1386	287	1673	5.0		0.568		0.1	LOS A	4.7	37.3				
North: RoadName																
Lane 1	419	0	47	466	5.0	598	P	100	21.7	LOS C	9.2	72.7	500	–	0.0	0.0
Approach	419	0	47	466	5.0		0.779		21.7	LOS C	9.2	72.7				
West: RoadName																
Lane 1	9	440	0	449	5.0	825	P	100	3.7	LOS A	4.0	31.9	500	–	0.0	0.0
Lane 2	0	474	0	474	5.0	872	P	100	3.3	LOS A	4.1	32.4	500	–	0.0	0.0
Approach	9	914	0	923	5.0		0.544		3.5	LOS A	4.1	32.4				
Intersection				3062	5.0		0.779		4.4	LOS A	9.2	72.7				

P: You need to Process this Site (F9) for this variable to be computed.

Level of Service (LOS) Method: Delay (HCM 2000).
Roundabout LOS Method: Same as Sign Control.
Lane LOS values are based on average delay per lane.
Intersection and Approach LOS values are based on average delay for all lanes.
Roundabout Capacity Model: SIDRA Standard.
SIDRA Standard Delay Model used.

LANE SUMMARY

Site: #13

Roundabout

Lane Use and Performance

	Demand Flows L veh/h	T veh/h	R veh/h	Total veh/h	HV %	Cap. veh/h	Deg. Satn v/c	Lane Util. %	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	Distance m	Lane Length m	SL Type	Cap. Adj. %	Prob. Block. %
South: RoadName																
Lane 1	727	439	0	1166	5.0	577	2.022	100	471.1	LOS F	200.5	1588.3	500	–	0.0	100.0
Lane 2	0	505	830	1335	5.0	660	2.022	100	468.1	LOS F	228.0	1806.1	500	–	0.0	100.0
Approach	727	944	830	2501	5.0		2.022		469.5	LOS F	228.0	1806.1				
East: RoadName																
Lane 1	410	170	0	580	5.0	547	1.060	100	55.1	LOS F	25.8	204.3	500	–	0.0	0.0
Lane 2	0	477	190	667	5.0	629	1.060	100	50.9	LOS F	28.6	226.6	500	–	0.0	0.0
Approach	410	647	190	1247	5.0		1.060		52.9	LOS F	28.6	226.6				
North: RoadName																
Lane 1	419	440	0	859	5.0	374	2.295	100	598.4	LOS F	166.5	1318.5	500	–	0.0	58.2
Lane 2	0	768	298	1066	5.0	465	2.295	100	594.8	LOS F	204.6	1620.4	500	–	0.0	100.0
Approach	419	1208	298	1925	5.0		2.295		596.4	LOS F	204.6	1620.4				
West: RoadName																
Lane 1	114	496	0	610	5.0	489	1.246	100	130.1	LOS F	49.9	395.3	500	–	0.0	0.0
Lane 2	0	250	472	722	5.0	580	1.246	100	127.4	LOS F	58.0	459.5	500	–	0.0	2.6
Approach	114	746	472	1332	5.0		1.246		128.6	LOS F	58.0	459.5				
Intersection				7005	5.0		2.295		365.4	LOS F	228.0	1806.1				

Level of Service (LOS) Method: Delay (HCM 2000).
Roundabout LOS Method: Same as Sign Control.
Lane LOS values are based on average delay per lane.
Intersection and Approach LOS values are based on average delay for all lanes.
Roundabout Capacity Model: SIDRA Standard.
SIDRA Standard Delay Model used.

LANE SUMMARY

Site: #14

Roundabout

Lane Use and Performance

	Demand Flows L veh/h	T veh/h	R veh/h	Total veh/h	HV %	Cap. veh/h	Deg. Satn v/c	Lane Util. %	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	Distance m	Lane Length m	SL Type	Cap. Adj. %	Prob. Block. %
South: RoadName																
Lane 1	286	779	0	1065	5.0	1130	P	100	8.3	LOS A	19.9	157.8	500	–	0.0	0.0
Lane 2	0	1155	0	1155	5.0	1226	P	100	6.6	LOS A	20.3	161.0	500	–	0.0	0.0
Lane 3	0	723	342	1065	5.0	1130	P	100	7.5	LOS A	19.9	157.8	500	–	0.0	0.0
Approach	286	2657	342	3285	5.0		0.942		7.5	LOS A	20.3	161.0				
East: RoadName																
Lane 1	175	0	0	175	5.0	150[2]	P	100	147.6	LOS F	17.5	138.9	500	–	0.0	0.0
Lane 2	175	0	0	175	5.0	150[2]	P	100	155.2	LOS F	15.4	121.9	500	–	0.0	0.0
Lane 3	0	5	1	6	5.0	95	P	5[5]	17.0	LOS C	0.2	1.4	500	–	0.0	0.0
Approach	350	5	1	356	5.0		1.167		149.2	LOS F	17.5	138.9				
North: RoadName																
Lane 1	43	735	0	778	5.0	864	P	100	10.3	LOS B	11.6	92.0	500	–	0.0	0.0
Lane 2	0	851	0	851	5.0	945	P	100	9.3	LOS A	12.0	95.2	500	–	0.0	0.0
Lane 3	0	655	123	778	5.0	864	P	100	10.1	LOS B	11.6	92.0	500	–	0.0	0.0
Approach	43	2240	123	2406	5.0		0.900		9.9	LOS A	12.0	95.2				
West: RoadName																
Lane 1	151	1	0	152	5.0	188	P	100	33.9	LOS D	4.2	33.6	500	–	0.0	0.0
Lane 2	0	0	318	318	5.0	277	P	100	98.9	LOS F	20.9	165.8	500	–	0.0	0.0
Approach	151	1	318	470	5.0		1.150		77.9	LOS F	20.9	165.8				
Intersection				6517	5.0		1.167		21.2	LOS C	20.9	165.8				

P: You need to Process this Site (F9) for this variable to be computed.

Level of Service (LOS) Method: Delay (HCM 2000).
Roundabout LOS Method: Same as Sign Control.
Lane LOS values are based on average delay per lane.
Intersection and Approach LOS values are based on average delay for all lanes.
Roundabout Capacity Model: SIDRA Standard.
SIDRA Standard Delay Model used.

2 Minimum Capacity
5 Lane underutilisation determined by program

LANE SUMMARY

Site: #15

Roundabout

Lane Use and Performance

	Demand Flows L veh/h	T veh/h	R veh/h	Total veh/h	HV %	Cap. veh/h	Deg. Satn v/c	Lane Util. %	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	Distance m	Lane Length m	SL Type	Cap. Adj. %	Prob. Block. %
South: RoadName																
Lane 1	256	523	0	779	5.0	378	2.062	100	492.2	LOS F	138.8	1098.9	500	–	0.0	38.6
Lane 2	0	314	658	972	5.0	471	2.062	100	489.1	LOS F	171.1	1355.3	500	–	0.0	63.4
Approach	256	837	658	1751	5.0		2.062		490.4	LOS F	171.1	1355.3				
East: RoadName																
Lane 1	518	738	0	1256	5.0	562	2.235	100	568.2	LOS F	235.0	1861.0	500	–	0.0	100.0
Lane 2	0	1043	404	1447	5.0	647	2.235	100	565.6	LOS F	268.9	2130.1	500	–	0.0	100.0
Approach	518	1781	404	2703	5.0		2.235		566.8	LOS F	268.9	2130.1				
North: RoadName																
Lane 1	693	286	0	979	5.0	450	2.174	100	540.1	LOS F	179.5	1421.7	500	–	0.0	77.5
Lane 2	0	689	487	1176	5.0	541	2.174	100	536.5	LOS F	214.0	1694.6	500	–	0.0	100.0
Approach	693	975	487	2155	5.0		2.174		538.2	LOS F	214.0	1694.6				
West: RoadName																
Lane 1	1298	452	0	1750	5.0	524	3.339	100	1062.6	LOS F	404.9	3206.7	500	–	0.0	100.0
Lane 2	0	1766	297	2063	5.0	618	3.339	100	1058.7	LOS F	474.3	3756.5	500	–	0.0	100.0
Approach	1298	2218	297	3813	5.0		3.339		1060.5	LOS F	474.3	3756.5				
Intersection				10422	5.0		3.339		728.7	LOS F	474.3	3756.5				

Level of Service (LOS) Method: Delay (HCM 2000).
Roundabout LOS Method: Same as Sign Control.
Lane LOS values are based on average delay per lane.
Intersection and Approach LOS values are based on average delay for all lanes.
Roundabout Capacity Model: SIDRA Standard.
SIDRA Standard Delay Model used.

LANE SUMMARY

Site: #16

Roundabout

Lane Use and Performance

	Demand Flows L veh/h	T veh/h	R veh/h	Total veh/h	HV %	Cap. veh/h	Deg. Satn v/c	Lane Util. %	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	Distance m	Lane Length m	SL Type	Cap. Adj. %	Prob. Block. %
South: RoadName																
Lane 1	222	582	0	804	5.0	373	2.156	100	534.1	LOS F	148.5	1176.4	500	–	0.0	44.2
Lane 2	0	726	277	1003	5.0	465	2.156	100	531.2	LOS F	183.3	1452.1	500	–	0.0	89.0
Approach	222	1308	277	1807	5.0		2.156		532.5	LOS F	183.3	1452.1				
East: RoadName																
Lane 1	173	1166	0	1339	5.0	528	2.539	100	701.9	LOS F	271.3	2149.0	500	–	0.0	100.0
Lane 2	0	560	1008	1568	5.0	618	2.539	100	700.1	LOS F	315.5	2499.1	500	–	0.0	100.0
Approach	173	1726	1008	2907	5.0		2.539		701.0	LOS F	315.5	2499.1				
North: RoadName																
Lane 1	692	661	0	1353	5.0	586	2.310	100	599.5	LOS F	257.7	2040.8	500	–	0.0	100.0
Lane 2	0	799	755	1554	5.0	673	2.310	100	596.8	LOS F	294.0	2328.7	500	–	0.0	100.0
Approach	692	1460	755	2907	5.0		2.310		598.0	LOS F	294.0	2328.7				
West: RoadName																
Lane 1	970	667	0	1637	5.0	510	3.210	100	1003.9	LOS F	373.3	2956.1	500	–	0.0	100.0
Lane 2	0	1802	131	1933	5.0	602	3.210	100	1000.3	LOS F	437.3	3463.6	500	–	0.0	100.0
Approach	970	2469	131	3570	5.0		3.210		1002.0	LOS F	437.3	3463.6				
Intersection				11191	5.0		3.210		743.0	LOS F	437.3	3463.6				

Level of Service (LOS) Method: Delay (HCM 2000).
Roundabout LOS Method: Same as Sign Control.
Lane LOS values are based on average delay per lane.
Intersection and Approach LOS values are based on average delay for all lanes.
Roundabout Capacity Model: SIDRA Standard.
SIDRA Standard Delay Model used.

LANE SUMMARY

Site: #18

Roundabout

Lane Use and Performance

	Demand Flows L veh/h	T veh/h	R veh/h	Total veh/h	HV %	Cap. veh/h	Deg. Satn v/c	Lane Util. %	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	Distance m	Lane Length m	SL Type	Cap. Adj. %	Prob. Block. %
South East: RoadName																
Lane 1	393	0	0	393	5.0	494	P	100	17.8	LOS C	7.2	57.2	500	–	0.0	0.0
Lane 2	278	0	184	462	5.0	582	P	100	14.9	LOS B	7.8	62.0	500	–	0.0	0.0
Approach	671	0	184	855	5.0		0.795		16.2	LOS C	7.8	62.0				
North East: RoadName																
Lane 1	222	373	0	595	5.0	696	P	100	11.7	LOS B	9.5	74.9	500	–	0.0	0.0
Lane 2	0	656	0	656	5.0	769	P	100	9.6	LOS A	9.8	77.6	500	–	0.0	0.0
Approach	222	1029	0	1251	5.0		0.854		10.6	LOS B	9.8	77.6				
South West: RoadName																
Lane 1	0	811	0	811	5.0	1037	P	100	4.0	LOS A	10.1	79.7	500	–	0.0	0.0
Lane 2	0	244	624	868	5.0	1109	P	100	3.6	LOS A	10.1	79.9	500	–	0.0	0.0
Approach	0	1055	624	1679	5.0		0.782		3.8	LOS A	10.1	79.9				
Intersection				3785	5.0		0.854		8.8	LOS A	10.1	79.9				

P: You need to Process this Site (F9) for this variable to be computed.

Level of Service (LOS) Method: Delay (HCM 2000).
Roundabout LOS Method: Same as Sign Control.
Lane LOS values are based on average delay per lane.
Intersection and Approach LOS values are based on average delay for all lanes.
Roundabout Capacity Model: SIDRA Standard.
SIDRA Standard Delay Model used.

LANE SUMMARY

Site: #19

Roundabout

Lane Use and Performance

	Demand Flows L veh/h	T veh/h	R veh/h	Total veh/h	HV %	Cap. veh/h	Deg. Satn v/c	Lane Util. %	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	Distance m	Lane Length m	SL Type	Cap. Adj. %	Prob. Block. %
South: RoadName																
Lane 1	726	186	0	912	5.0	971	P	100	12.5	LOS B	16.8	132.9	500	–	0.0	0.0
Lane 2	0	986	0	986	5.0	1050	P	100	9.4	LOS A	17.3	136.8	500	–	0.0	0.0
Lane 3	0	903	10	913	5.0	972	P	100	10.2	LOS B	16.8	133.0	500	–	0.0	0.0
Approach	726	2074	10	2810	5.0		0.939		10.7	LOS B	17.3	136.8				
East: RoadName																
Lane 1	84	28	0	112	5.0	112[2]	P	100	123.2	LOS F	8.5	67.3	500	–	0.0	0.0
Lane 2	0	60	52	112	5.0	112[2]	P	100	105.7	LOS F	7.3	57.7	500	–	0.0	0.0
Approach	84	88	52	224	5.0		1.000		114.4	LOS F	8.5	67.3				
North: RoadName																
Lane 1	18	649	0	667	5.0	539	P	100	125.1	LOS F	54.7	433.2	500	–	0.0	0.9
Lane 2	0	756	0	756	5.0	611	P	100	124.0	LOS F	61.3	485.5	500	–	0.0	4.1
Lane 3	0	514	153	667	5.0	539	P	100	125.0	LOS F	54.7	433.2	500	–	0.0	0.9
Approach	18	1919	153	2090	5.0		1.237		124.7	LOS F	61.3	485.5				
West: RoadName																
Lane 1	375	13	0	388	5.0	315	P	100	123.8	LOS F	30.3	240.2	500	–	0.0	0.0
Lane 2	0	27	403	430	5.0	349	P	100	119.8	LOS F	33.1	262.3	500	–	0.0	0.0
Approach	375	40	403	818	5.0		1.231		121.7	LOS F	33.1	262.3				
Intersection				5942	5.0		1.237		70.0	LOS F	61.3	485.5				

P: You need to Process this Site (F9) for this variable to be computed.

Level of Service (LOS) Method: Delay (HCM 2000).
Roundabout LOS Method: Same as Sign Control.
Lane LOS values are based on average delay per lane.
Intersection and Approach LOS values are based on average delay for all lanes.
Roundabout Capacity Model: SIDRA Standard.
SIDRA Standard Delay Model used.

2 Minimum Capacity

LANE SUMMARY

Site: #20

Roundabout

Lane Use and Performance

	Demand Flows L veh/h	T veh/h	R veh/h	Total veh/h	HV %	Cap. veh/h	Deg. Satn v/c	Lane Util. %	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	Distance m	Lane Length m	SL Type	Cap. Adj. %	Prob. Block. %
South: RoadName																
Lane 1	1089	126	0	1215	5.0	920	P	100	155.4	LOS F	113.4	898.1	500	–	0.0	26.5
Lane 2	0	1323	0	1323	5.0	1002	P	100	152.0	LOS F	122.5	970.2	500	–	0.0	30.6
Approach	1089	1449	0	2538	5.0		1.320		153.6	LOS F	122.5	970.2				
North: RoadName																
Lane 1	0	765	0	765	5.0	453	P	100	325.1	LOS F	113.2	896.7	500	–	0.0	26.5
Lane 2	0	483	378	861	5.0	510	P	100	324.0	LOS F	126.5	1001.7	500	–	0.0	32.4
Approach	0	1248	378	1626	5.0		1.688		324.6	LOS F	126.5	1001.7				
West: RoadName																
Lane 1	341	0	249	590	5.0	650	P	100	15.9	LOS C	10.6	84.2	500	–	0.0	0.0
Lane 2	0	0	658	658	5.0	725	P	100	12.8	LOS B	11.1	88.1	500	–	0.0	0.0
Approach	341	0	907	1248	5.0		0.908		14.3	LOS B	11.1	88.1				
Intersection				5412	5.0		1.688		172.9	LOS F	126.5	1001.7				

P: You need to Process this Site (F9) for this variable to be computed.

Level of Service (LOS) Method: Delay (HCM 2000).
Roundabout LOS Method: Same as Sign Control.
Lane LOS values are based on average delay per lane.
Intersection and Approach LOS values are based on average delay for all lanes.
Roundabout Capacity Model: SIDRA Standard.
SIDRA Standard Delay Model used.

LANE SUMMARY

Site: #21

Roundabout

Lane Use and Performance

	Demand Flows L veh/h	T veh/h	R veh/h	Total veh/h	HV %	Cap. veh/h	Deg. Satn v/c	Lane Util. %	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	Distance m	Lane Length m	SL Type	Cap. Adj. %	Prob. Block. %
South: RoadName																
Lane 1	132	0	0	132	5.0	337	0.392	100	15.2	LOS C	1.8	14.6	500	–	0.0	0.0
Lane 2	0	0	285	285	5.0	493	0.578	100	12.2	LOS B	3.7	29.0	500	–	0.0	0.0
Approach	132	0	285	417	5.0		0.578		13.1	LOS B	3.7	29.0				
East: RoadName																
Lane 1	48	516	0	564	5.0	1142	0.494	100	1.1	LOS A	3.5	27.8	500	–	0.0	0.0
Lane 2	0	600	0	600	5.0	1216	0.494	100	0.8	LOS A	3.6	28.2	500	–	0.0	0.0
Approach	48	1116	0	1164	5.0		0.494		0.9	LOS A	3.6	28.2				
West: RoadName																
Lane 1	0	947	0	947	5.0	1296	0.730	100	0.5	LOS A	7.9	62.5	500	–	0.0	0.0
Lane 2	0	1030	18	1048	5.0	1435	0.730	100	0.4	LOS A	7.9	62.3	500	–	0.0	0.0
Approach	0	1977	18	1995	5.0		0.730		0.5	LOS A	7.9	62.5				
Intersection				3576	5.0		0.730		2.1	LOS A	7.9	62.5				

Level of Service (LOS) Method: Delay (HCM 2000).
Roundabout LOS Method: Same as Sign Control.
Lane LOS values are based on average delay per lane.
Intersection and Approach LOS values are based on average delay for all lanes.
Roundabout Capacity Model: SIDRA Standard.
SIDRA Standard Delay Model used.

LANE SUMMARY

Site: #22

Roundabout

Lane Use and Performance

	Demand Flows L veh/h	T veh/h	R veh/h	Total veh/h	HV %	Cap. veh/h	Deg. Satn v/c	Lane Util. %	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	Distance m	Lane Length m	SL Type	Cap. Adj. %	Prob. Block. %
South: RoadName																
Lane 1	83	0	0	83	5.0	261	0.318	100	17.3	LOS C	1.9	15.0	500	–	0.0	0.0
Lane 2	0	11	7	18	5.0	166	0.108	34[5]	17.7	LOS C	0.5	4.1	500	–	0.0	0.0
Approach	83	11	7	101	5.0		0.318		17.4	LOS C	1.9	15.0				
East: RoadName																
Lane 1	14	559	0	573	5.0	1157	0.495	100	0.8	LOS A	3.6	28.2	500	–	0.0	0.0
Lane 2	0	454	158	612	5.0	1235	0.495	100	0.7	LOS A	3.6	28.6	500	–	0.0	0.0
Approach	14	1013	158	1185	5.0		0.495		0.8	LOS A	3.6	28.6				
North: RoadName																
Lane 1	508	0	0	508	5.0	696	0.730	100	12.0	LOS B	5.9	46.7	500	–	0.0	0.0
Lane 2	0	21	69	90	5.0	390	0.231	100	6.9	LOS A	0.9	7.1	500	–	0.0	0.0
Approach	508	21	69	598	5.0		0.730		11.2	LOS B	5.9	46.7				
West: RoadName																
Lane 1	35	1043	0	1078	5.0	769	1.401	100	190.9	LOS F	114.1	903.8	500	–	0.0	26.9
Lane 2	0	1000	184	1184	5.0	845	1.401	100	190.0	LOS F	124.3	984.8	500	–	0.0	31.4
Approach	35	2043	184	2262	5.0		1.401		190.4	LOS F	124.3	984.8				
Intersection				4146	5.0		1.401		106.2	LOS F	124.3	984.8				

Level of Service (LOS) Method: Delay (HCM 2000).
Roundabout LOS Method: Same as Sign Control.
Lane LOS values are based on average delay per lane.
Intersection and Approach LOS values are based on average delay for all lanes.
Roundabout Capacity Model: SIDRA Standard.
SIDRA Standard Delay Model used.

5 Lane underutilisation determined by program

APPENDIX C: CAPACITY ANALYSIS FOR ADDITIONAL ACCESS REVIEW

INTERSECTION / MOVEMENT			Without RI/RO				With RI/RO				With All Turn			
			v/c Ratio	LOS	Delay (s)	Queue (m)	v/c Ratio	LOS	Delay (s)	Queue (m)	v/c Ratio	LOS	Delay (s)	Queue (m)
Intersection # 15 Highway 11A/Taylor Drive (Signalized)	EB	Left	1.92	F	445.4	#305.9	2.36	F	638.6	#336.2	1.60	F	299.3	m#146.3
		Through	1.24	F	147.5	#288.1	1.18	F	118.2	118.2	1.37	F	199.7	m#260.7
		Right	0.22	A	0.3	0.0	0.22	A	0.3	0.0	0.29	A	0.0	m0.00
	WB	Left	1.59	F	314.0	#132.1	1.80	F	403.5	#132.7	1.50	F	277.5	#124.0
		Through	1.41	F	223.5	#254.6	1.58	F	293.5	#314.1	1.32	F	185.3	#253.9
		Right	0.30	A	0.5	0.0	0.25	A	0.4	0.0	0.45	A	1.0	0.0
	NB	Left	1.28	F	199.3	#70.0	1.93	F	459.0	#154.0	0.98	F	97.3	#73.0
		Through	0.88	E	57.4	#98.8	0.65	D	46.7	67.4	0.87	E	55.8	#93.8
		Right	0.48	A	1.1	0.0	0.46	A	1.0	0.0	0.46	A	1.0	0.0
	SB	Left	1.84	F	418.3	#176.4	2.13	F	541.6	#219.0	1.50	F	271.3	#146.0
		Through	0.81	D	46.8	103.0	0.89	D	54.4	#112.7	0.84	D	51.3	96.8
		Right	0.36	A	0.7	0.0	0.08	A	0.1	0.0	0.24	A	0.4	0.0
	Intersection Summary			**F**	**182.5**			**F**	**262.3**			**F**	**147.6**	
Intersection #17 RI/RO (Unsignalized)	EB	Through	-	-	-	-	0.81	A	0.0	0.0	-	-	-	-
	WB	Through	-	-	-	-	0.45	A	0.0	0.0	-	-	-	-
		Right	-	-	-	-	0.48	A	0.0	0.0	-	-	-	-
	SB	Right	-	-	-	-	1.43	F	240.4	195.5	-	-	-	-
Intersection #17 All Turn (Signalized)	EB	Left	-	-	-	-	-	-	-	-	1.18	F	140.8	#128.9
		Through	-	-	-	-	-	-	-	-	1.09	E	67.3	#365.7
	WB	Through	-	-	-	-	-	-	-	-	1.11	E	71.3	m48.1
		Right	-	-	-	-	-	-	-	-	0.25	A	0.9	m0.9
	SB	Left	-	-	-	-	-	-	-	-	1.08	F	111.9	#179.1
		Right	-	-	-	-	-	-	-	-	0.44	A	7.3	19.8
	Intersection Summary		-	**-**	**-**	-	-	**-**	**-**	-		**E**	**73.8**	

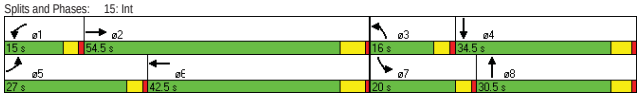
INTERSECTION / MOVEMENT			PM PEAK HOUR			
			v/c Ratio	LOS	Delay (s)	Queue (m)
Intersection # 13 Highway 2A / Township Road 391 (Signalized)	EB	Left	0.57	E	64.9	24.8
		Through	1.00	E	77.1	#143.0
		Right	0.79	B	19.5	70.1
	WB	Left	1.09	F	119.0	#92.6
		Through	0.70	D	41.6	98.3
		Right	0.36	A	6.1	17.0
	NB	Left	1.07	F	97.6	#143.8
		Through	0.76	D	44.2	97.8
		Right	0.61	A	1.9	0.0
	SB	Left	0.69	D	50.9	69.2
		Through	1.07	F	90.5	#154.9
		Right	0.22	A	0.3	0.0
	Intersection Summary			**E**	**56.5**	
Intersection # 16 Highway 11A / Highway 2A (Signalized)	EB	Left	1.83	F	411.2	#233.5
		Through	1.41	F	218.0	#338.0
		Right	0.10	A	0.1	0.0
	WB	Left	0.86	F	88.7	#43.3
		Through	1.36	F	202.3	#242.3
		Right	0.74	A	3.4	0.0
	NB	Left	1.10	F	141.6	#59.0
		Through	1.17	F	125.7	#175.5
		Right	0.65	C	28.6	65.3
	SB	Left	1.72	F	364.4	#171.8
		Through	1.03	E	71.6	#176.0
		Right	1.23	F	138.6	#259.8
	Intersection Summary			**F**	**176.0**	
Intersection # 15 Highway 11A/Taylor Drive (Signalized)	EB	Left	1.92	F	445.4	#305.9
		Through	1.24	F	147.5	#288.1
		Right	0.22	A	0.3	0.0
	WB	Left	1.59	F	314.0	#132.1
		Through	1.41	F	223.5	#254.6
		Right	0.30	A	0.5	0.0
	NB	Left	1.28	F	199.3	#70.0
		Through	0.88	E	57.4	#98.8
		Right	0.48	A	1.1	0.0
	SB	Left	1.84	F	418.3	#176.4
		Through	0.81	D	46.8	103.0
		Right	0.36	A	0.7	0.0
	Intersection Summary			**F**	**182.5**	

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	1363	2125	298	498	2145	344	582	622	623	857	983	111
Ideal Flow (vphpl)	1850	1850	1850	1850	1850	1850	1850	1850	1850	1850	1850	1850
Storage Length (m)	100.0		100.0	100.0		100.0	100.0		100.0	100.0		100.0
Storage Lanes	2		1	2		1	2		1	2		1
Taper Length (m)	2.5		2.5	2.5		2.5	2.5		2.5	2.5		2.5
Lane Util. Factor	0.97	0.91	1.00	0.97	0.91	1.00	0.97	0.91	1.00	0.97	0.91	1.00
Ped Bike Factor	1.00		0.98	1.00		0.98	0.99		0.98	0.99		0.98
Frt			0.850			0.850			0.850			0.850
Flt Protected	0.950			0.950			0.950			0.950		
Satd. Flow (prot)	3283	4863	1514	3283	4863	1514	3283	4863	1514	3283	4863	1514
Flt Permitted	0.950			0.950			0.950			0.950		
Satd. Flow (perm)	3279	4863	1482	3279	4863	1482	3257	4863	1482	3238	4863	1482
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)			163			186			428			121
Link Speed (k/h)		100			100			50			50	
Link Distance (m)		133.8			129.8			136.7			165.7	
Travel Time (s)		4.8			4.7			9.8			11.9	
Confl. Peds. (#/hr)	25		25	25		25	25		25	25		25
Confl. Bikes (#/hr)			10			10			10			10
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
Adj. Flow (vph)	1482	2310	324	541	2332	374	633	676	677	932	1068	121
Shared Lane Traffic (%)												
Lane Group Flow (vph)	1482	2310	324	541	2332	374	633	676	677	932	1068	121
Enter Blocked Intersection	No	No	No	No	No	No	No	No	No	No	No	No
Lane Alignment	Left	Left	Right	Left	Left	Right	Left	Left	Right	Left	Left	Right
Median Width(m)		7.4			7.4			7.4			7.4	
Link Offset(m)		0.0			0.0			0.0			0.0	
Crosswalk Width(m)		1.6			1.6			1.6			1.6	
Two way Left Turn Lane												
Headway Factor	1.02	1.02	1.02	1.02	1.02	1.02	1.02	1.02	1.02	1.02	1.02	1.02
Turning Speed (k/h)	24		14	24		14	24		14	24		14
Turn Type	Prot		Free	Prot		Free	Prot		Free	Prot		Free
Protected Phases	5	2		1	6		3	8		7	4	
Permitted Phases			Free			Free			Free			Free
Minimum Split (s)	12.0	31.5		12.0	31.5		12.0	30.5		12.0	30.5	
Total Split (s)	27.0	54.5	0.0	15.0	42.5	0.0	16.0	30.5	0.0	20.0	34.5	0.0
Total Split (%)	22.5%	45.4%	0.0%	12.5%	35.4%	0.0%	13.3%	25.4%	0.0%	16.7%	28.8%	0.0%
Maximum Green (s)	23.0	48.5		11.0	36.5		12.0	25.5		16.0	29.5	
Yellow Time (s)	3.0	5.0		3.0	5.0		3.0	4.0		3.0	4.0	
All-Red Time (s)	1.0	1.0		1.0	1.0		1.0	1.0		1.0	1.0	
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Lost Time (s)	4.0	6.0	4.0	4.0	6.0	4.0	4.0	5.0	4.0	4.0	5.0	4.0
Lead/Lag	Lead	Lag		Lead	Lag		Lead	Lag		Lead	Lag	
Lead-Lag Optimize?	Yes	Yes		Yes	Yes		Yes	Yes		Yes	Yes	
Walk Time (s)		7.0			7.0			7.0			7.0	
Flash Dont Walk (s)		18.5			18.5			18.5			18.5	
Pedestrian Calls (#/hr)		0			0			0			0	
Act Effct Green (s)	23.0	48.5	120.0	11.0	36.5	120.0	12.0	25.5	120.0	16.0	29.5	120.0

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Actuated g/C Ratio	0.19	0.40	1.00	0.09	0.30	1.00	0.10	0.21	1.00	0.13	0.25	1.00
v/c Ratio	2.36	1.18	0.22	1.80	1.58	0.25	1.93	0.65	0.46	2.13	0.89	0.08
Control Delay	638.6	118.2	0.3	403.5	293.5	0.4	459.0	46.7	1.0	541.6	54.4	0.1
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	638.6	118.2	0.3	403.5	293.5	0.4	459.0	46.7	1.0	541.6	54.4	0.1
LOS	F	F	A	F	F	A	F	D	A	F	D	A
Approach Delay		296.3			278.1			162.5			265.4	
Approach LOS		F			F			F			F	
Queue Length 50th (m)	~294.8	~238.2	0.0	~98.6	~285.8	0.0	~118.4	53.7	0.0	~180.1	89.4	0.0
Queue Length 95th (m)	#336.2	#266.7	0.0	#132.7	#314.1	0.0	#154.0	67.4	0.0	#219.0	#112.7	0.0
Internal Link Dist (m)		109.8			105.8			112.7			141.7	
Turn Bay Length (m)	100.0		100.0	100.0		100.0	100.0		100.0	100.0		100.0
Base Capacity (vph)	629	1965	1482	301	1479	1482	328	1033	1482	438	1195	1482
Starvation Cap Reductn	0	0	0	0	0	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0	0	0	0	0	0
Reduced v/c Ratio	2.36	1.18	0.22	1.80	1.58	0.25	1.93	0.65	0.46	2.13	0.89	0.08

Intersection Summary			
Area Type:	Other		
Cycle Length: 120			
Actuated Cycle Length: 120			
Offset: 0 (0%), Referenced to phase 2:EBT and 6:WBT, Start of Green			
Natural Cycle: 150			
Control Type: Pretimed			
Maximum v/c Ratio: 2.36			
Intersection Signal Delay: 262.3		Intersection LOS: F	
Intersection Capacity Utilization 144.7%		ICU Level of Service H	
Analysis Period (min) 15			
~	Volume exceeds capacity, queue is theoretically infinite.		
	Queue shown is maximum after two cycles.		
#	95th percentile volume exceeds capacity, queue may be longer.		
	Queue shown is maximum after two cycles.		

Splits and Phases: 15: Int



Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Volume (veh/h)	0	3786	2093	746	0	452
Sign Control		Free	Free		Yield	
Grade		0%	0%		0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	0	4115	2275	811	0	491
Pedestrians						
Lane Width (m)						
Walking Speed (m/s)						
Percent Blockage						
Right turn flare (veh)						
Median type		None	None			
Median storage veh)						
Upstream signal (m)						
pX, platoon unblocked						
vC, conflicting volume	2275				3647	758
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	2275				3647	758
tC, single (s)	4.2				6.9	7.0
tC, 2 stage (s)						
tF (s)	2.2				3.5	3.3
p0 queue free %	100				100	0
cM capacity (veh/h)	211				3	343

Direction, Lane #	EB 1	EB 2	EB 3	WB 1	WB 2	WB 3	WB 4	SB 1
Volume Total	1372	1372	1372	758	758	758	811	491
Volume Left	0	0	0	0	0	0	0	0
Volume Right	0	0	0	0	0	0	811	491
cSH	1700	1700	1700	1700	1700	1700	1700	343
Volume to Capacity	0.81	0.81	0.81	0.45	0.45	0.45	0.48	1.43
Queue Length 95th (m)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	195.5
Control Delay (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	240.4
Lane LOS								F
Approach Delay (s)	0.0			0.0				240.4
Approach LOS								F

Intersection Summary					
Average Delay		15.4			
Intersection Capacity Utilization		78.5%	ICU Level of Service		D
Analysis Period (min)		15			

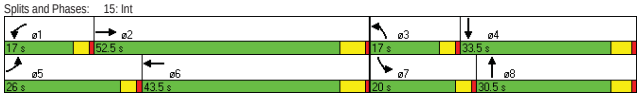
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	884	2377	396	492	1852	614	322	826	629	603	892	321
Ideal Flow (vphpl)	1850	1850	1850	1850	1850	1850	1850	1850	1850	1850	1850	1850
Storage Length (m)	100.0		100.0	100.0		100.0	100.0		100.0	100.0		100.0
Storage Lanes	2		1	2		1	2		1	2		1
Taper Length (m)	2.5		2.5	2.5		2.5	2.5		2.5	2.5		2.5
Lane Util. Factor	0.97	0.91	1.00	0.97	0.91	1.00	0.97	0.91	1.00	0.97	0.91	1.00
Ped Bike Factor	1.00		0.98	1.00		0.98	0.99		0.98	0.99		0.98
Frt			0.850			0.850			0.850			0.850
Flt Protected	0.950			0.950			0.950			0.950		
Satd. Flow (prot)	3283	4863	1514	3283	4863	1514	3283	4863	1514	3283	4863	1514
Flt Permitted	0.950			0.950			0.950			0.950		
Satd. Flow (perm)	3276	4863	1482	3280	4863	1482	3253	4863	1482	3250	4863	1482
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)			193			384			447			349
Link Speed (k/h)		100			100			50			50	
Link Distance (m)		133.8			129.8			136.7			165.7	
Travel Time (s)		4.8			4.7			9.8			11.9	
Confl. Peds. (#/hr)	25		25	25		25	25		25	25		25
Confl. Bikes (#/hr)			10			10			10			10
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
Adj. Flow (vph)	961	2584	430	535	2013	667	350	898	684	655	970	349
Shared Lane Traffic (%)												
Lane Group Flow (vph)	961	2584	430	535	2013	667	350	898	684	655	970	349
Enter Blocked Intersection	No	No	No	No	No	No	No	No	No	No	No	No
Lane Alignment	Left	Left	Right	Left	Left	Right	Left	Left	Right	Left	Left	Right
Median Width(m)		7.4			7.4			7.4			7.4	
Link Offset(m)		0.0			0.0			0.0			0.0	
Crosswalk Width(m)		1.6			1.6			1.6			1.6	
Two way Left Turn Lane												
Headway Factor	1.02	1.02	1.02	1.02	1.02	1.02	1.02	1.02	1.02	1.02	1.02	1.02
Turning Speed (k/h)	24		14	24		14	24		14	24		14
Turn Type	Prot		Free	Prot		Free	Prot		Free	Prot		Free
Protected Phases	5	2		1	6		3	8		7	4	
Permitted Phases			Free			Free			Free			Free
Minimum Split (s)	12.0	31.5		12.0	31.5		12.0	30.5		12.0	30.5	
Total Split (s)	26.0	52.5	0.0	17.0	43.5	0.0	17.0	30.5	0.0	20.0	33.5	0.0
Total Split (%)	21.7%	43.8%	0.0%	14.2%	36.3%	0.0%	14.2%	25.4%	0.0%	16.7%	27.9%	0.0%
Maximum Green (s)	22.0	46.5		13.0	37.5		13.0	25.5		16.0	28.5	
Yellow Time (s)	3.0	5.0		3.0	5.0		3.0	4.0		3.0	4.0	
All-Red Time (s)	1.0	1.0		1.0	1.0		1.0	1.0		1.0	1.0	
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Lost Time (s)	4.0	6.0	4.0	4.0	6.0	4.0	4.0	5.0	4.0	4.0	5.0	4.0
Lead/Lag	Lead	Lag		Lead	Lag		Lead	Lag		Lead	Lag	
Lead-Lag Optimize?	Yes	Yes		Yes	Yes		Yes	Yes		Yes	Yes	
Walk Time (s)		7.0			7.0			7.0			7.0	
Flash Dont Walk (s)		18.5			18.5			18.5			18.5	
Pedestrian Calls (#/hr)		0			0			0			0	
Act Effct Green (s)	22.0	46.5	120.0	13.0	37.5	120.0	13.0	25.5	120.0	16.0	28.5	120.0

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Actuated g/C Ratio	0.18	0.39	1.00	0.11	0.31	1.00	0.11	0.21	1.00	0.13	0.24	1.00
v/c Ratio	1.60	1.37	0.29	1.50	1.32	0.45	0.98	0.87	0.46	1.50	0.84	0.24
Control Delay	307.4	198.2	0.0	277.5	185.3	1.0	97.3	55.8	1.0	271.3	51.3	0.4
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	307.4	198.2	0.0	277.5	185.3	1.0	97.3	55.8	1.0	271.3	51.3	0.4
LOS	F	F	A	F	F	A	F	E	A	F	D	A
Approach Delay		203.2			162.4			43.9			115.3	
Approach LOS		F			F			D			F	
Queue Length 50th (m)	~169.4	~294.1	0.0	~90.2	~224.9	0.0	43.0	75.3	0.0	~110.1	80.0	0.0
Queue Length 95th (m)	m#149.6	m#256.2	m0.0	#124.0	#253.9	0.0	#73.0	#93.8	0.0	#146.0	96.8	0.0
Internal Link Dist (m)		109.8			105.8			112.7			141.7	
Turn Bay Length (m)	100.0		100.0	100.0		100.0	100.0		100.0	100.0		100.0
Base Capacity (vph)	602	1884	1482	356	1520	1482	356	1033	1482	438	1155	1482
Starvation Cap Reductn	0	0	0	0	0	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0	0	0	0	0	0
Reduced v/c Ratio	1.60	1.37	0.29	1.50	1.32	0.45	0.98	0.87	0.46	1.50	0.84	0.24

Intersection Summary

Area Type: Other
Cycle Length: 120
Actuated Cycle Length: 120
Offset: 0 (0%), Referenced to phase 2:EBT and 6:WBT, Start of Green
Natural Cycle: 150
Control Type: Pretimed
Maximum v/c Ratio: 1.60
Intersection Signal Delay: 148.0 Intersection LOS: F
Intersection Capacity Utilization 117.4% ICU Level of Service H
Analysis Period (min) 15
~ Volume exceeds capacity, queue is theoretically infinite.
Queue shown is maximum after two cycles.
95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.
m Volume for 95th percentile queue is metered by upstream signal.

Splits and Phases: 15: Int



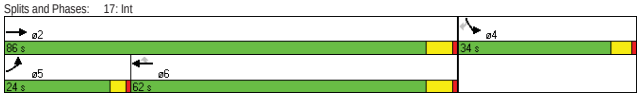
Lane Group	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Volume (vph)	592	3248	2314	180	408	222
Ideal Flow (vphpl)	1850	1850	1850	1850	1850	1850
Storage Length (m)	150.0			100.0	0.0	100.0
Storage Lanes	2			1	1	1
Taper Length (m)	2.5			2.5	2.5	2.5
Lane Util. Factor	0.97	0.91	0.91	1.00	1.00	1.00
Frt				0.850		0.850
Flt Protected	0.950				0.950	
Satd. Flow (prot)	3283	4863	4863	1514	1692	1514
Flt Permitted	0.950				0.950	
Satd. Flow (perm)	3283	4863	4863	1514	1692	1514
Right Turn on Red				Yes		Yes
Satd. Flow (RTOR)				169		241
Link Speed (k/h)		100	100		50	
Link Distance (m)		182.8	366.5		290.3	
Travel Time (s)		6.6	13.2		20.9	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	643	3530	2515	196	443	241
Shared Lane Traffic (%)						
Lane Group Flow (vph)	643	3530	2515	196	443	241
Enter Blocked Intersection	No	No	No	No	No	No
Lane Alignment	Left	Left	Left	Right	Left	Right
Median Width(m)		7.4	7.4		3.7	
Link Offset(m)		0.0	0.0		0.0	
Crosswalk Width(m)		1.6	1.6		1.6	
Two way Left Turn Lane						
Headway Factor	1.02	1.02	1.02	1.02	1.02	1.02
Turning Speed (k/h)	24			14	24	14
Turn Type	Prot			Perm		Perm
Protected Phases	5	2	6		4	
Permitted Phases				6		4
Minimum Split (s)	12.0	21.0	21.0	21.0	30.5	30.5
Total Split (s)	24.0	86.0	62.0	62.0	34.0	34.0
Total Split (%)	20.0%	71.7%	51.7%	51.7%	28.3%	28.3%
Maximum Green (s)	20.0	80.0	56.0	56.0	29.0	29.0
Yellow Time (s)	3.0	5.0	5.0	5.0	4.0	4.0
All-Red Time (s)	1.0	1.0	1.0	1.0	1.0	1.0
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	0.0
Total Lost Time (s)	4.0	6.0	6.0	6.0	5.0	5.0
Lead/Lag	Lead		Lag	Lag		
Lead-Lag Optimize?	Yes		Yes	Yes		
Walk Time (s)		7.0	7.0	7.0	7.0	7.0
Flash Dont Walk (s)		1.5	1.5	1.5	18.5	18.5
Pedestrian Calls (#/hr)		0	0	0	0	0
Act Effct Green (s)	20.0	80.0	56.0	56.0	29.0	29.0
Actuated g/C Ratio	0.17	0.67	0.47	0.47	0.24	0.24
v/c Ratio	1.18	1.09	1.11	0.25	1.08	0.44
Control Delay	140.8	67.3	71.3	0.9	111.9	7.3

Lane Group	EBL	EBT	WBT	WBR	SBL	SBR
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	140.8	67.3	71.3	0.9	111.9	7.3
LOS	F	E	E	A	F	A
Approach Delay		78.6	66.2		75.1	
Approach LOS		E	E		E	
Queue Length 50th (m)	~93.2	~342.6	~239.3	1.4	~116.9	0.0
Queue Length 95th (m)	#128.9	#365.7	m48.1	m0.9	#179.1	19.8
Internal Link Dist (m)		158.8	342.5		266.3	
Turn Bay Length (m)	150.0			100.0		100.0
Base Capacity (vph)	547	3242	2269	797	409	549
Starvation Cap Reductn	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0
Reduced v/c Ratio	1.18	1.09	1.11	0.25	1.08	0.44

Intersection Summary

Area Type: Other
Cycle Length: 120
Actuated Cycle Length: 120
Offset: 0 (0%), Referenced to phase 2:EBT and 6:WBT, Start of Green
Natural Cycle: 150
Control Type: Pretimed
Maximum v/c Ratio: 1.18
Intersection Signal Delay: 73.8 Intersection LOS: E
Intersection Capacity Utilization 99.0% ICU Level of Service F
Analysis Period (min) 15
~ Volume exceeds capacity, queue is theoretically infinite.
Queue shown is maximum after two cycles.
95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.
m Volume for 95th percentile queue is metered by upstream signal.

Splits and Phases: 17: Int



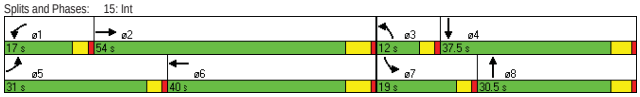
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	1298	2218	297	518	1781	404	256	837	658	693	975	487
Ideal Flow (vphpl)	1850	1850	1850	1850	1850	1850	1850	1850	1850	1850	1850	1850
Storage Length (m)	100.0		100.0	100.0		100.0	100.0		100.0	100.0		100.0
Storage Lanes	2		1	2		1	2		1	2		1
Taper Length (m)	2.5		2.5	2.5		2.5	2.5		2.5	2.5		2.5
Lane Util. Factor	0.97	0.91	1.00	0.97	0.91	1.00	0.97	0.91	1.00	0.97	0.91	1.00
Ped Bike Factor	1.00		0.98	1.00		0.98	0.99		0.98	0.99		0.98
Frt			0.850			0.850			0.850			0.850
Flt Protected	0.950			0.950			0.950			0.950		
Satd. Flow (prot)	3283	4863	1514	3283	4863	1514	3283	4863	1514	3283	4863	1514
Flt Permitted	0.950			0.950			0.950			0.950		
Satd. Flow (perm)	3275	4863	1482	3279	4863	1482	3257	4863	1482	3250	4863	1482
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)			155			262			449			529
Link Speed (k/h)		100			100			50			50	
Link Distance (m)		133.4			129.8			136.7			165.7	
Travel Time (s)		4.8			4.7			9.8			11.9	
Confl. Peds. (#/hr)	25		25	25		25	25		25	25		25
Confl. Bikes (#/hr)			10			10			10			10
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
Adj. Flow (vph)	1411	2411	323	563	1936	439	278	910	715	753	1060	529
Shared Lane Traffic (%)												
Lane Group Flow (vph)	1411	2411	323	563	1936	439	278	910	715	753	1060	529
Enter Blocked Intersection	No	No	No	No	No	No	No	No	No	No	No	No
Lane Alignment	Left	Left	Right	Left	Left	Right	Left	Left	Right	Left	Left	Right
Median Width(m)		7.4			7.4			7.4			7.4	
Link Offset(m)		0.0			0.0			0.0			0.0	
Crosswalk Width(m)		1.6			1.6			1.6			1.6	
Two way Left Turn Lane												
Headway Factor	1.02	1.02	1.02	1.02	1.02	1.02	1.02	1.02	1.02	1.02	1.02	1.02
Turning Speed (k/h)	24		14	24		14	24		14	24		14
Turn Type	Prot		Free	Prot		Free	Prot		Free	Prot		Free
Protected Phases	5	2		1	6		3	8		7	4	
Permitted Phases			Free			Free			Free			Free
Minimum Split (s)	12.0	31.5		12.0	31.5		12.0	30.5		12.0	30.5	
Total Split (s)	31.0	54.0	0.0	17.0	40.0	0.0	12.0	30.5	0.0	19.0	37.5	0.0
Total Split (%)	25.7%	44.8%	0.0%	14.1%	33.2%	0.0%	10.0%	25.3%	0.0%	15.8%	31.1%	0.0%
Maximum Green (s)	27.0	48.0		13.0	34.0		8.0	25.5		15.0	32.5	
Yellow Time (s)	3.0	5.0		3.0	5.0		3.0	4.0		3.0	4.0	
All-Red Time (s)	1.0	1.0		1.0	1.0		1.0	1.0		1.0	1.0	
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Lost Time (s)	4.0	6.0	4.0	4.0	6.0	4.0	4.0	5.0	4.0	4.0	5.0	4.0
Lead/Lag	Lead	Lag		Lead	Lag		Lead	Lag		Lead	Lag	
Lead-Lag Optimize?	Yes	Yes		Yes	Yes		Yes	Yes		Yes	Yes	
Walk Time (s)		7.0			7.0			7.0			7.0	
Flash Dont Walk (s)		18.5			18.5			18.5			18.5	
Pedestrian Calls (#/hr)		0			0			0			0	
Act Effct Green (s)	27.0	48.0	120.5	13.0	34.0	120.5	8.0	25.5	120.5	15.0	32.5	120.5

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Actuated g/C Ratio	0.22	0.40	1.00	0.11	0.28	1.00	0.07	0.21	1.00	0.12	0.27	1.00
v/c Ratio	1.92	1.24	0.22	1.59	1.41	0.30	1.28	0.88	0.48	1.84	0.81	0.36
Control Delay	445.4	147.5	0.3	314.0	223.5	0.5	199.3	57.4	1.1	418.3	46.8	0.7
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	445.4	147.5	0.3	314.0	223.5	0.5	199.3	57.4	1.1	418.3	46.8	0.7
LOS	F	F	A	F	F	A	F	E	A	F	D	A
Approach Delay		237.5			207.5			57.0			155.8	
Approach LOS		F			F			E			F	
Queue Length 50th (m)	~264.6	~260.0	0.0	~97.8	~225.3	0.0	~42.8	77.0	0.0	~139.1	85.9	0.0
Queue Length 95th (m)	#305.9	#288.1	0.0	#132.1	#254.6	0.0	#70.0	#98.8	0.0	#176.4	103.0	0.0
Internal Link Dist (m)		109.4			105.8			112.7			141.7	
Turn Bay Length (m)	100.0		100.0	100.0		100.0	100.0		100.0	100.0		100.0
Base Capacity (vph)	736	1937	1482	354	1372	1482	218	1029	1482	409	1312	1482
Starvation Cap Reductn	0	0	0	0	0	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0	0	0	0	0	0
Reduced v/c Ratio	1.92	1.24	0.22	1.59	1.41	0.30	1.28	0.88	0.48	1.84	0.81	0.36

Intersection Summary

Area Type: Other
Cycle Length: 120.5
Actuated Cycle Length: 120.5
Offset: 0 (0%), Referenced to phase 2:EBT and 6:WBT, Start of Green
Natural Cycle: 150
Control Type: Pretimed
Maximum v/c Ratio: 1.92
Intersection Signal Delay: 182.5 Intersection LOS: F
Intersection Capacity Utilization 130.8% ICU Level of Service H
Analysis Period (min) 15
~ Volume exceeds capacity, queue is theoretically infinite.
Queue shown is maximum after two cycles.
95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.

Splits and Phases: 15: Int



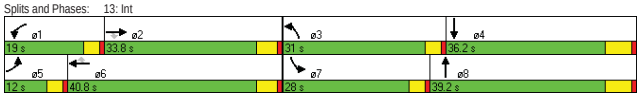
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	114	746	472	410	647	190	727	944	830	419	1208	298
Ideal Flow (vphpl)	1850	1850	1850	1850	1850	1850	1850	1850	1850	1850	1850	1850
Storage Length (m)	100.0		100.0	100.0		100.0	0.0		0.0	0.0		0.0
Storage Lanes	2		1	2		1	2		1	2		1
Taper Length (m)	2.5		2.5	2.5		2.5	2.5		2.5	2.5		2.5
Lane Util. Factor	0.97	0.95	1.00	0.97	0.95	1.00	0.97	0.91	1.00	0.97	0.91	1.00
Ped Bike Factor	0.99		0.94	0.99		0.95	0.99		0.98	0.99		0.98
Frt			0.850			0.850			0.850			0.850
Flt Protected	0.950			0.950			0.950			0.950		
Satd. Flow (prot)	3283	3385	1514	3283	3385	1514	3283	4863	1514	3283	4863	1514
Flt Permitted	0.950			0.950			0.950			0.950		
Satd. Flow (perm)	3240	3385	1431	3246	3385	1433	3260	4863	1482	3249	4863	1482
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)			403			207			490			222
Link Speed (k/h)		50			50			100			100	
Link Distance (m)		139.3			172.2			126.7			513.4	
Travel Time (s)		10.0			12.4			4.6			18.5	
Confl. Peds. (#/hr)	25		25	25		25	25		25	25		25
Confl. Bikes (#/hr)			10			10			10			10
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
Adj. Flow (vph)	124	811	513	446	703	207	790	1026	902	455	1313	324
Shared Lane Traffic (%)												
Lane Group Flow (vph)	124	811	513	446	703	207	790	1026	902	455	1313	324
Enter Blocked Intersection	No	No	No	No	No	No	No	No	No	No	No	No
Lane Alignment	Left	Left	Right	Left	Left	Right	Left	Left	Right	Left	Left	Right
Median Width(m)		7.4			7.4			7.4			7.4	
Link Offset(m)		0.0			0.0			0.0			0.0	
Crosswalk Width(m)		1.6			1.6			1.6			1.6	
Two way Left Turn Lane												
Headway Factor	1.02	1.02	1.02	1.02	1.02	1.02	1.02	1.02	1.02	1.02	1.02	1.02
Turning Speed (k/h)	24		14	24		14	24		14	24		14
Turn Type	Prot		Perm	Prot		Perm	Prot		Free	Prot		Free
Protected Phases	5	2		1	6		3	8		7	4	
Permitted Phases			2			6			Free			Free
Minimum Split (s)	12.0	30.5	30.5	12.0	30.5	30.5	12.0	26.5		12.0	26.5	
Total Split (s)	12.0	33.8	33.8	19.0	40.8	40.8	31.0	39.2	0.0	28.0	36.2	0.0
Total Split (%)	10.0%	28.2%	28.2%	15.8%	34.0%	34.0%	25.8%	32.7%	0.0%	23.3%	30.2%	0.0%
Maximum Green (s)	8.0	28.8	28.8	15.0	35.8	35.8	27.0	33.2		24.0	30.2	
Yellow Time (s)	3.0	4.0	4.0	3.0	4.0	4.0	3.0	5.0		3.0	5.0	
All-Red Time (s)	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0		1.0	1.0	
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Lost Time (s)	4.0	5.0	5.0	4.0	5.0	5.0	4.0	6.0	4.0	4.0	6.0	4.0
Lead/Lag	Lead	Lag	Lag	Lead	Lag	Lag	Lead	Lag		Lead	Lag	
Lead-Lag Optimize?	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes		Yes	Yes	
Walk Time (s)		7.0	7.0		7.0	7.0		7.0			7.0	
Flash Dont Walk (s)		18.5	18.5		18.5	18.5		13.5			13.5	
Pedestrian Calls (#/hr)		0	0		0	0		0			0	
Act Effct Green (s)	8.0	28.8	28.8	15.0	35.8	35.8	27.0	33.2	120.0	24.0	30.2	120.0

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Actuated g/C Ratio	0.07	0.24	0.24	0.12	0.30	0.30	0.22	0.28	1.00	0.20	0.25	1.00
v/c Ratio	0.57	1.00	0.79	1.09	0.70	0.36	1.07	0.76	0.61	0.69	1.07	0.22
Control Delay	64.9	77.1	19.5	119.0	41.6	6.1	97.6	44.2	1.9	50.9	90.5	0.3
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	64.9	77.1	19.5	119.0	41.6	6.1	97.6	44.2	1.9	50.9	90.5	0.3
LOS	E	E	B	F	D	A	F	D	A	D	F	A
Approach Delay		55.6			61.7			45.7			67.9	
Approach LOS		E			E			D			E	
Queue Length 50th (m)	14.8	101.0	23.0	~60.8	77.1	0.0	~106.2	81.2	0.0	51.7	~125.8	0.0
Queue Length 95th (m)	24.8	#143.0	70.1	#92.6	98.3	17.0	#143.8	97.8	0.0	69.2	#154.9	0.0
Internal Link Dist (m)		115.3			148.2			102.7			489.4	
Turn Bay Length (m)	100.0		100.0	100.0		100.0						
Base Capacity (vph)	219	812	650	410	1010	573	739	1345	1482	657	1224	1482
Starvation Cap Reductn	0	0	0	0	0	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0	0	0	0	0	0
Reduced v/c Ratio	0.57	1.00	0.79	1.09	0.70	0.36	1.07	0.76	0.61	0.69	1.07	0.22

Intersection Summary

Area Type: Other
Cycle Length: 120
Actuated Cycle Length: 120
Offset: 0 (0%), Referenced to phase 2:EBT and 6:WBT, Start of Green
Natural Cycle: 125
Control Type: Pretimed
Maximum v/c Ratio: 1.09
Intersection Signal Delay: 56.5 Intersection LOS: E
Intersection Capacity Utilization 94.4% ICU Level of Service F
Analysis Period (min) 15
~ Volume exceeds capacity, queue is theoretically infinite.
Queue shown is maximum after two cycles.
95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.

Splits and Phases: 13: Int



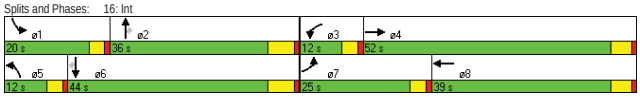
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	970	2469	131	173	1726	1008	222	1308	277	692	1460	755
Ideal Flow (vphpl)	1850	1850	1850	1850	1850	1850	1850	1850	1850	1850	1850	1850
Storage Length (m)	0.0		0.0	0.0		0.0	100.0		50.0	100.0		100.0
Storage Lanes	2		1	2		1	2		1	2		1
Taper Length (m)	2.5		2.5	2.5		2.5	2.5		2.5	2.5		2.5
Lane Util. Factor	0.97	0.91	1.00	0.97	0.91	1.00	0.97	0.91	1.00	0.97	0.91	1.00
Ped Bike Factor	1.00		0.98	1.00		0.98	1.00		0.95	1.00		0.95
Frt			0.850			0.850			0.850			0.850
Flt Protected	0.950			0.950			0.950			0.950		
Satd. Flow (prot)	3283	4863	1514	3283	4863	1514	3283	4863	1514	3283	4863	1514
Flt Permitted	0.950			0.950			0.950			0.950		
Satd. Flow (perm)	3275	4863	1482	3280	4863	1482	3270	4863	1431	3267	4863	1434
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)			48			526			139			315
Link Speed (k/h)		100			100			50			100	
Link Distance (m)		725.9			914.3			185.9			129.1	
Travel Time (s)		26.1			32.9			13.4			4.6	
Confl. Peds. (#/hr)	25		25	25		25	25		25	25		25
Confl. Bikes (#/hr)			10			10			10			10
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
Adj. Flow (vph)	1054	2684	142	188	1876	1096	241	1422	301	752	1587	821
Shared Lane Traffic (%)												
Lane Group Flow (vph)	1054	2684	142	188	1876	1096	241	1422	301	752	1587	821
Enter Blocked Intersection	No	No	No	No	No	No	No	No	No	No	No	No
Lane Alignment	Left	Left	Right	Left	Left	Right	Left	Left	Right	Left	Left	Right
Median Width(m)		7.4			7.4			7.4			7.4	
Link Offset(m)		0.0			0.0			0.0			0.0	
Crosswalk Width(m)		1.6			1.6			1.6			1.6	
Two way Left Turn Lane												
Headway Factor	1.02	1.02	1.02	1.02	1.02	1.02	1.02	1.02	1.02	1.02	1.02	1.02
Turning Speed (k/h)	24		14	24		14	24		14	24		14
Turn Type	Prot		Free	Prot		Free	Prot		Perm	Prot		Perm
Protected Phases	7	4		3	8		5	2		1	6	
Permitted Phases			Free			Free			2			6
Minimum Split (s)	12.0	30.5		12.0	30.5		12.0	31.5	31.5	12.0	31.5	31.5
Total Split (s)	25.0	52.0	0.0	12.0	39.0	0.0	12.0	36.0	36.0	20.0	44.0	44.0
Total Split (%)	20.8%	43.3%	0.0%	10.0%	32.5%	0.0%	10.0%	30.0%	30.0%	16.7%	36.7%	36.7%
Maximum Green (s)	21.0	47.0		8.0	34.0		8.0	30.0	30.0	16.0	38.0	38.0
Yellow Time (s)	3.0	4.0		3.0	4.0		3.0	5.0	5.0	3.0	5.0	5.0
All-Red Time (s)	1.0	1.0		1.0	1.0		1.0	1.0	1.0	1.0	1.0	1.0
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Lost Time (s)	4.0	5.0	4.0	4.0	5.0	4.0	4.0	6.0	6.0	4.0	6.0	6.0
Lead/Lag	Lead	Lag		Lead	Lag		Lead	Lag	Lag	Lead	Lag	Lag
Lead-Lag Optimize?	Yes	Yes		Yes	Yes		Yes	Yes	Yes	Yes	Yes	Yes
Walk Time (s)		7.0			7.0			7.0	7.0		7.0	7.0
Flash Dont Walk (s)		18.5			18.5			18.5	18.5		18.5	18.5
Pedestrian Calls (#/hr)		0			0			0	0		0	0
Act Effct Green (s)	21.0	47.0	120.0	8.0	34.0	120.0	8.0	30.0	30.0	16.0	38.0	38.0

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Actuated g/C Ratio	0.18	0.39	1.00	0.07	0.28	1.00	0.07	0.25	0.25	0.13	0.32	0.32
v/c Ratio	1.83	1.41	0.10	0.86	1.36	0.74	1.10	1.17	0.65	1.72	1.03	1.23
Control Delay	411.2	218.0	0.1	88.7	202.3	3.4	141.6	125.7	28.6	364.4	71.6	138.6
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	411.2	218.0	0.1	88.7	202.3	3.4	141.6	125.7	28.6	364.4	71.6	138.6
LOS	F	F	A	F	F	A	F	F	C	F	E	F
Approach Delay		262.5			126.5			112.8			158.7	
Approach LOS		F			F			F			F	
Queue Length 50th (m)	~193.6	~310.8	0.0	22.9	~213.0	0.0	~33.2	~146.1	34.2	~134.6	~146.6	~185.0
Queue Length 95th (m)	#233.5	#338.0	0.0	#43.3	#242.3	0.0	#59.0	#175.5	65.3	#171.8	#176.0	#259.8
Internal Link Dist (m)		701.9			890.3			161.9			105.1	
Turn Bay Length (m)							100.0		50.0	100.0		100.0
Base Capacity (vph)	575	1905	1482	219	1378	1482	219	1216	462	438	1540	669
Starvation Cap Reductn	0	0	0	0	0	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0	0	0	0	0	0
Reduced v/c Ratio	1.83	1.41	0.10	0.86	1.36	0.74	1.10	1.17	0.65	1.72	1.03	1.23

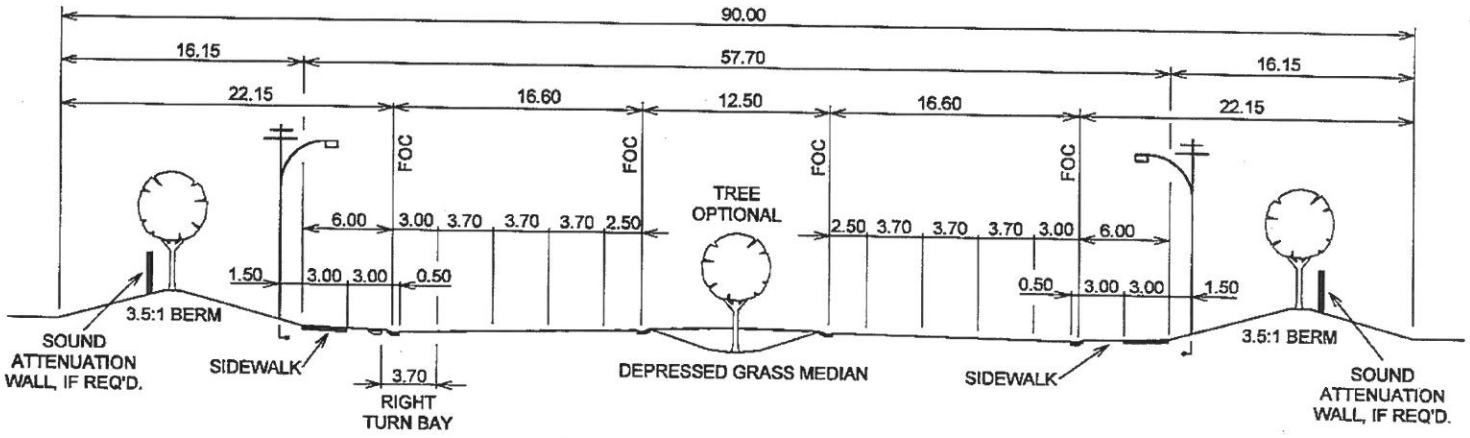
Intersection Summary

Area Type: Other
Cycle Length: 120
Actuated Cycle Length: 120
Offset: 0 (0%), Referenced to phase 2:NBT and 6:SBT, Start of Green
Natural Cycle: 150
Control Type: Pretimed
Maximum v/c Ratio: 1.83
Intersection Signal Delay: 176.0 Intersection LOS: F
Intersection Capacity Utilization 124.7% ICU Level of Service H
Analysis Period (min) 15
~ Volume exceeds capacity, queue is theoretically infinite.
Queue shown is maximum after two cycles.
95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.

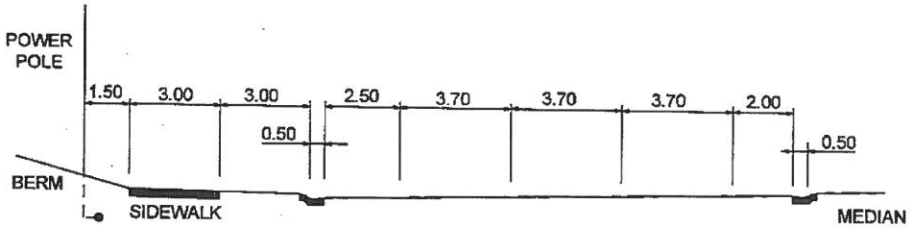
Splits and Phases: 16: Int



APPENDIX D: TYPICAL CROSS-SECTION

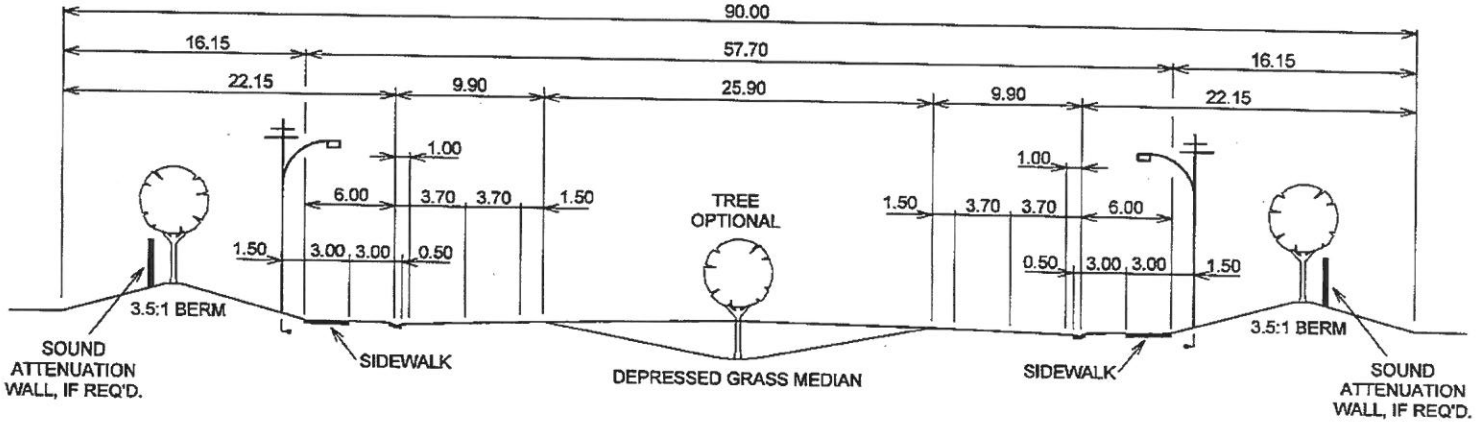


SIX LANE CROSS-SECTION



DETAIL

NOTE :
- RAISED MEDIAN AT INTERSECTIONS SEE DWG. 5.26
- DEPRESSED GRASS MEDIANS BETWEEN INTERSECTIONS



FOUR LANE INTERIM CROSS-SECTION

NO.	DATE	REVISION
1	Mar 15, 2005	Median dimension revised
2	Feb 13, 2008	Revised

THE CITY OF RED DEER ENGINEERING DEPARTMENT

DESIGN GUIDELINE DRAWINGS

Roadway Design

EXPRESSWAYS

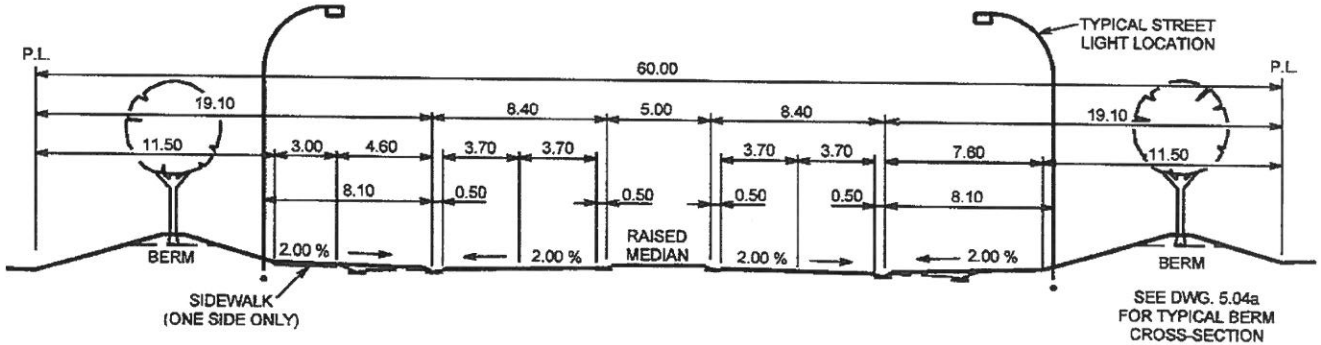
DRAWN BY: D.W.K.

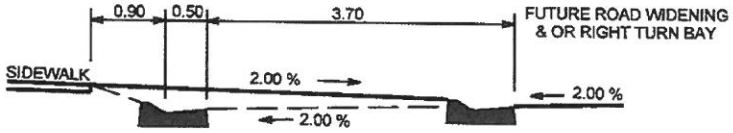
DATE: MAR 16, 2004

SCALE: N.T.S.

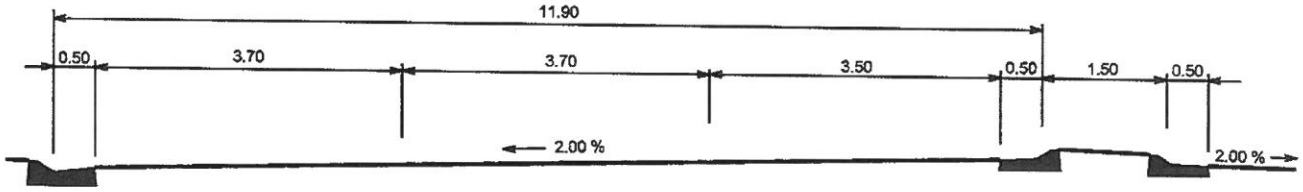
APPROVED BY: STREETS-UTILITIES ENGINEER

DRAWING NO. 5.02





RIGHT TURN BAY / FUTURE ROAD WIDENING OPTION



LEFT TURN BAY OPTION

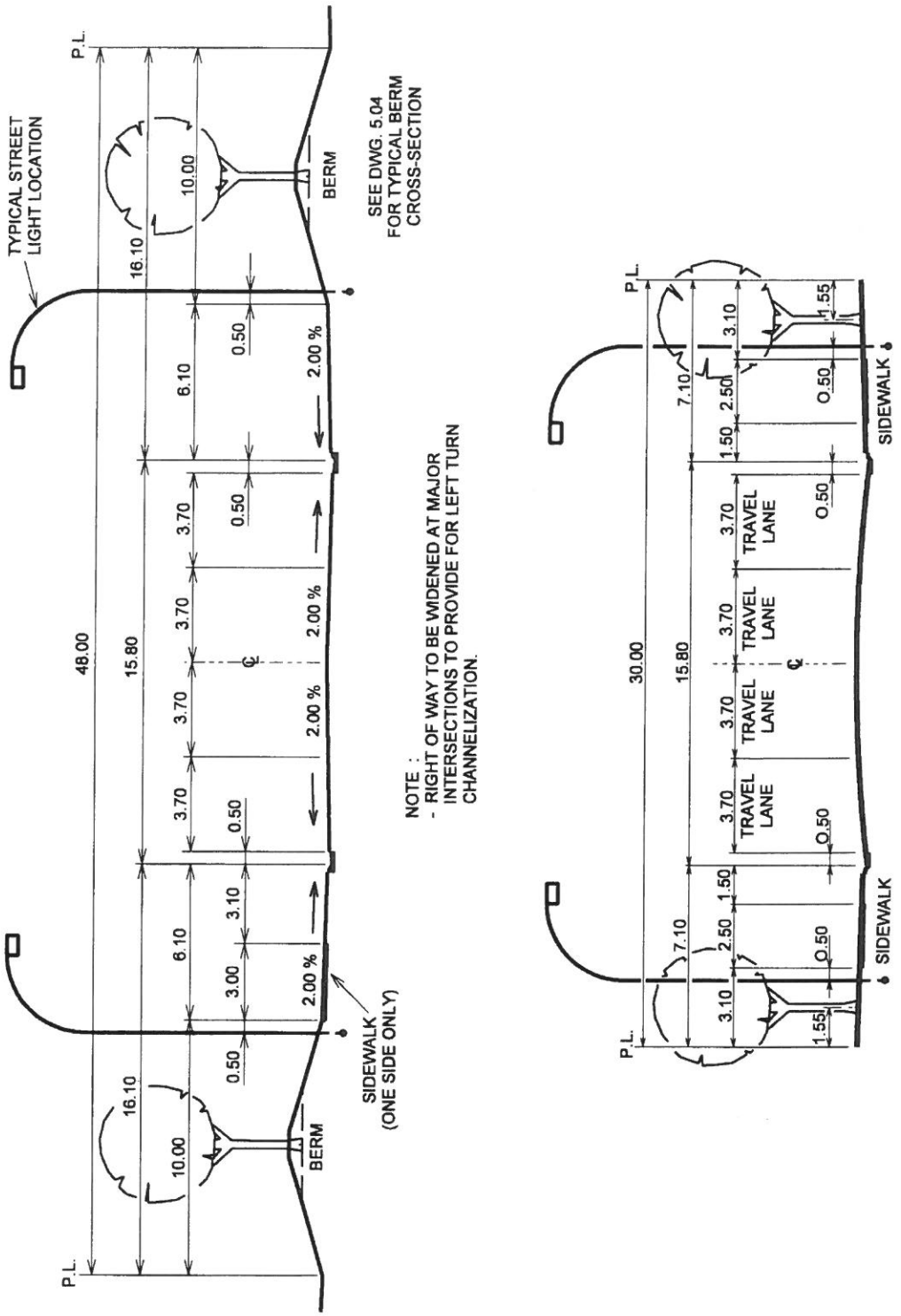
NO.	DATE	REVISION
1	Feb 9, 2004	Revised number
2	Feb 1, 2008	Revised radius curb
3	Nov 26/09	Updated DWG reference

THE CITY OF RED DEER ENGINEERING DEPARTMENT

DESIGN GUIDELINE DRAWINGS
Roadway Design

DIVIDED ARTERIAL ROADWAY

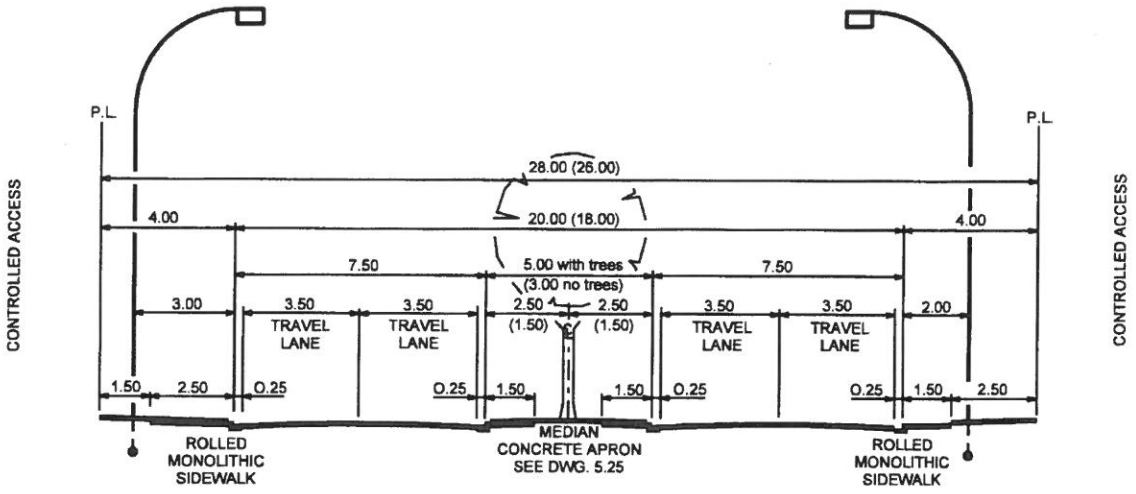
DRAWN BY: D.W.K.
DATE: OCT 10, 2000
SCALE: N.T.S.
APPROVED BY: M.L.
STREETS-UTILITIES ENGINEER
DRAWING NO. 5.03



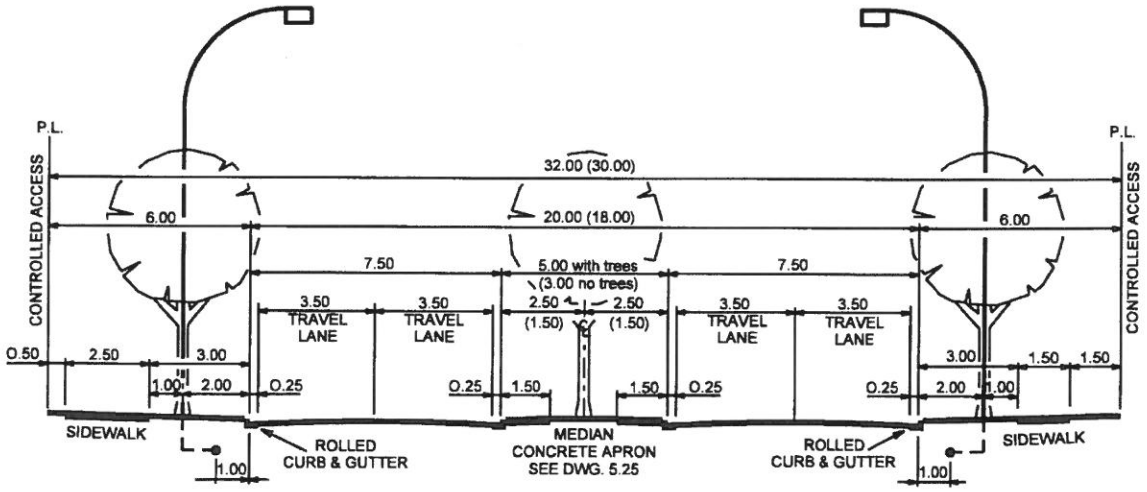
			THE CITY OF RED DEER	ENGINEERING DEPARTMENT
			DRAWN BY: D.W.K.	DESIGN GUIDELINE DRAWINGS Roadway Design
			DATE: JAN 10, 2001	UNDIVIDED ARTERIAL ROADWAY
1	FEB 11. 2004	Revised	SCALE: N.T.S.	
NO.	DATE	REVISION		

APPROVED BY:
STREETS-UTILITIES ENGINEER

DRAWING NO. 5.05



DIVIDED COLLECTOR ROADWAY
WITH TREES IN MEDIAN



DIVIDED COLLECTOR ROADWAY
WITH SEPARATE SIDEWALK

NO.	DATE	REVISION
2	Mar 18, 2004	Revised
1	Mar 5, 2003	Revised

THE CITY OF RED DEER — ENGINEERING DEPARTMENT

DRAWN BY: D.W.K.

DESIGN GUIDELINE DRAWINGS
Roadway Design

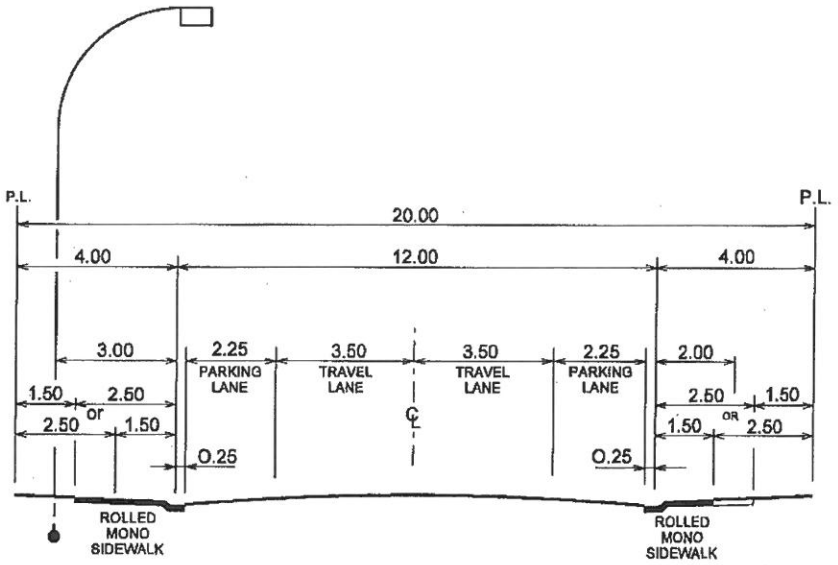
APPROVED BY:
STREETS-UTILITIES ENGINEER

DATE: DEC 11, 2000

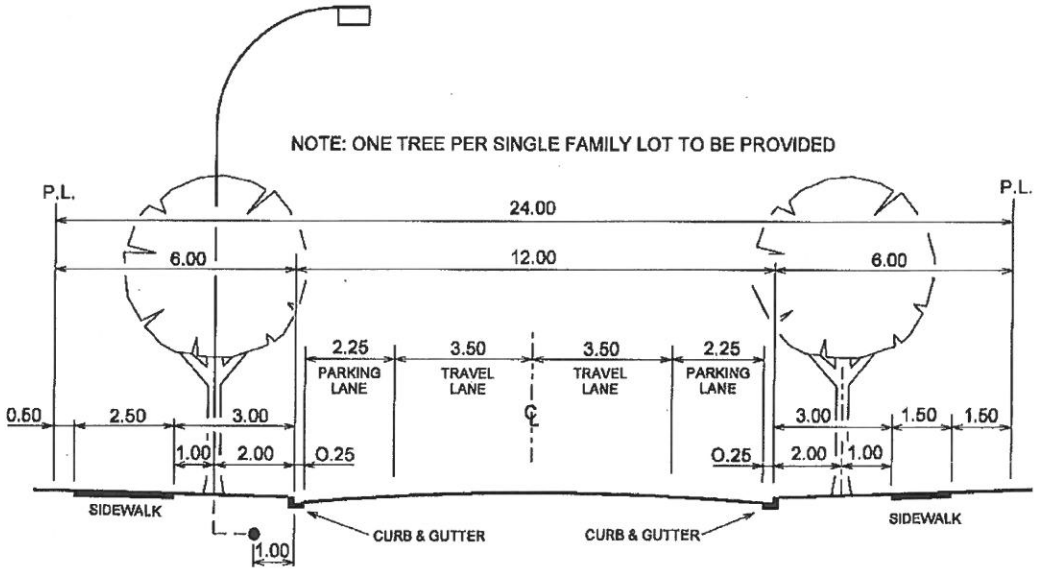
SCALE: N.T.S.

DIVIDED COLLECTOR ROADWAY

DRAWING NO. 5.06



STANDARD COLLECTOR ROADWAY
(PREVIOUS STANDARD)



COLLECTOR ROADWAY
WITH SEPARATE SIDEWALK
(CURRENT STANDARD)

NOTE: ROLLED CURB AND GUTTER TO BE INSTALLED ON ROADWAYS WITH FRONT DRIVEWAYS, OTHERWISE STANDARD CURB AND GUTTER IS REQUIRED.

NO.	DATE	REVISION
4	Feb 1, 2008	Revised
3	July 10, 2007	Revised
2	Feb 24, 2005	Revised Sidewalk dimensions
1	Mar 22, 2004	Revised

THE CITY OF RED DEER ENGINEERING DEPARTMENT

DRAWN BY: D.W.K.

DESIGN GUIDELINE DRAWINGS
Roadway Design

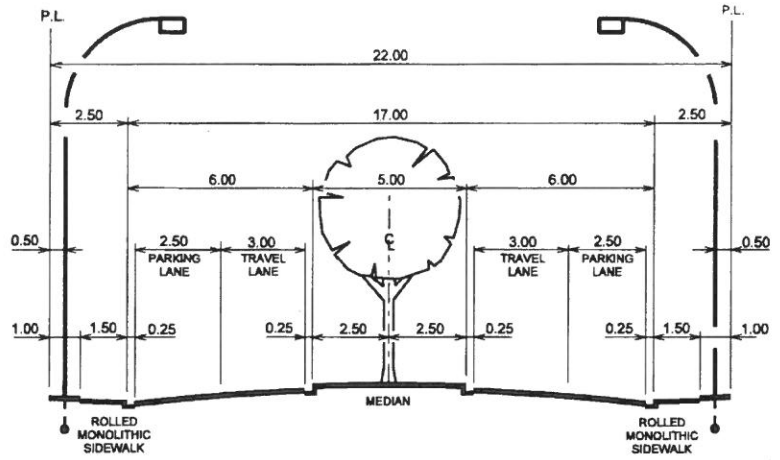
APPROVED BY: STREETS-UTILITIES ENGINEER

DATE: JAN 10, 2001

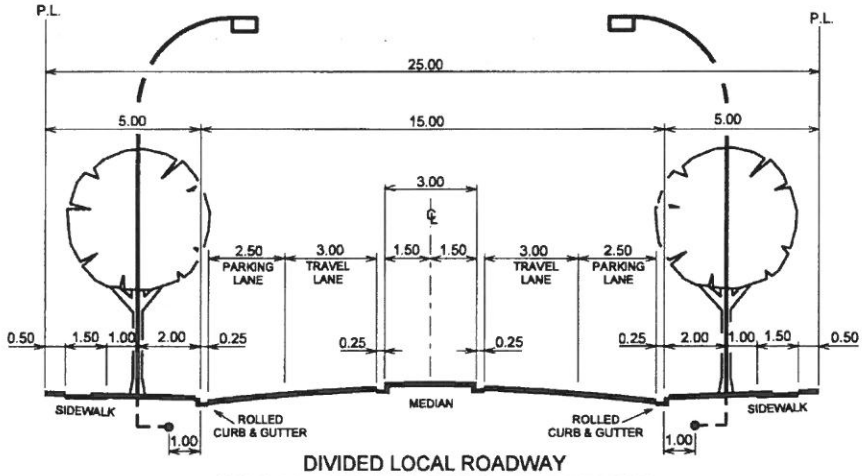
RESIDENTIAL UNDIVIDED COLLECTOR ROADWAY

SCALE: N.T.S.

DRAWING NO. 5.07



DIVIDED LOCAL ROADWAY
WITH TREES IN 5.0m MEDIAN & NO TREES IN BOULEVARD



DIVIDED LOCAL ROADWAY
WITH 3.0m MEDIAN & TREES IN BOULEVARD

NO.	DATE	REVISION
1	Mar 19, 2004	Revised

THE CITY OF RED DEER ENGINEERING DEPARTMENT

DRAWN BY: D.W.K.

DESIGN GUIDELINE DRAWINGS
Roadway Design

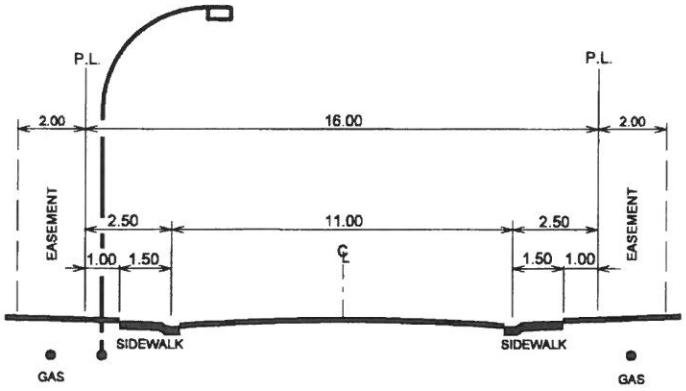
APPROVED BY: STREETS-UTILITIES ENGINEER

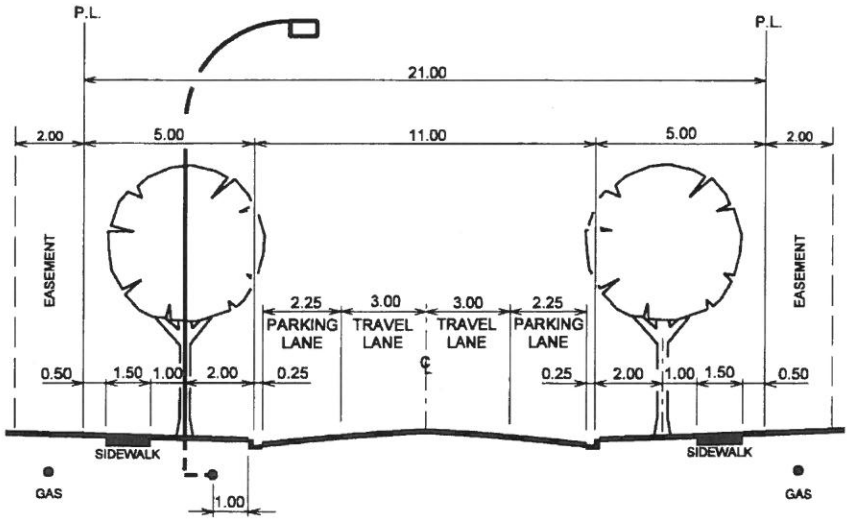
DATE: MAR 5, 2003

DIVIDED RESIDENTIAL LOCAL ROADWAY

SCALE: N.T.S.

DRAWING NO. 5.08





NO.	DATE	REVISION
1	Mar 22, 2004	Revised

THE CITY OF RED DEER ENGINEERING DEPARTMENT

DRAWN BY: D.W.K.

DESIGN GUIDELINE DRAWINGS
Roadway Design

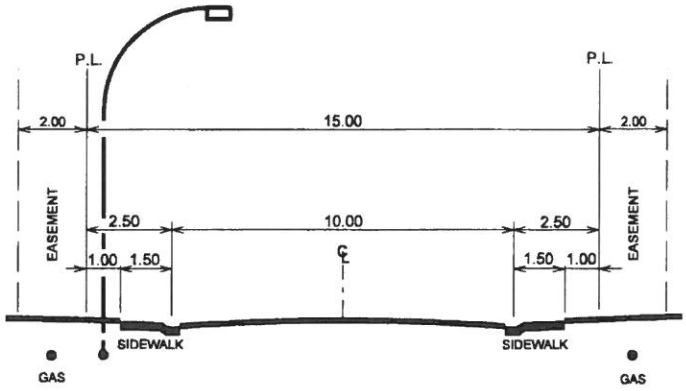
APPROVED BY: STREETS-UTILITIES ENGINEER

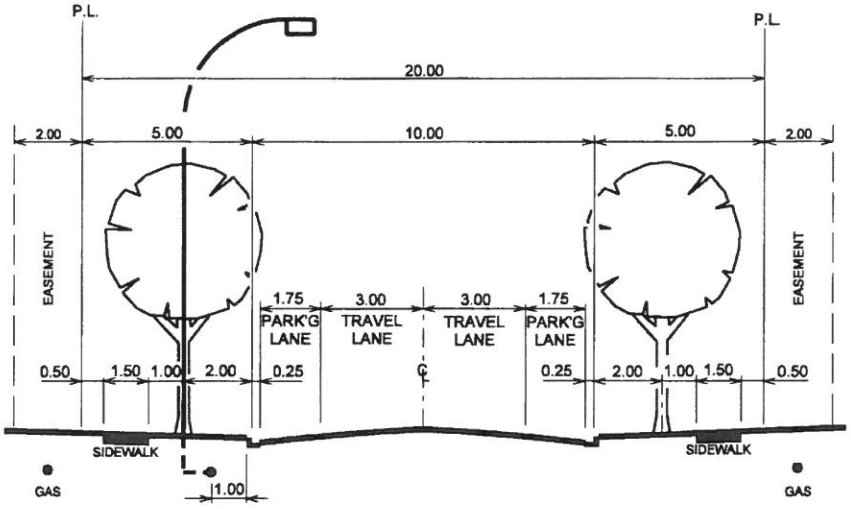
DATE: MAR 10, 2003

11m UNDIVIDED LOCAL ROADWAY

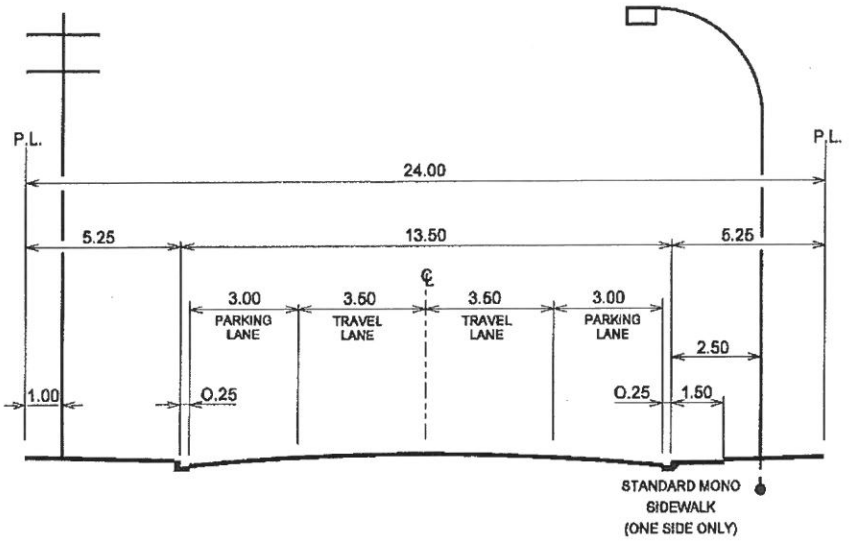
SCALE: N.T.S.

DRAWING NO. 5.09

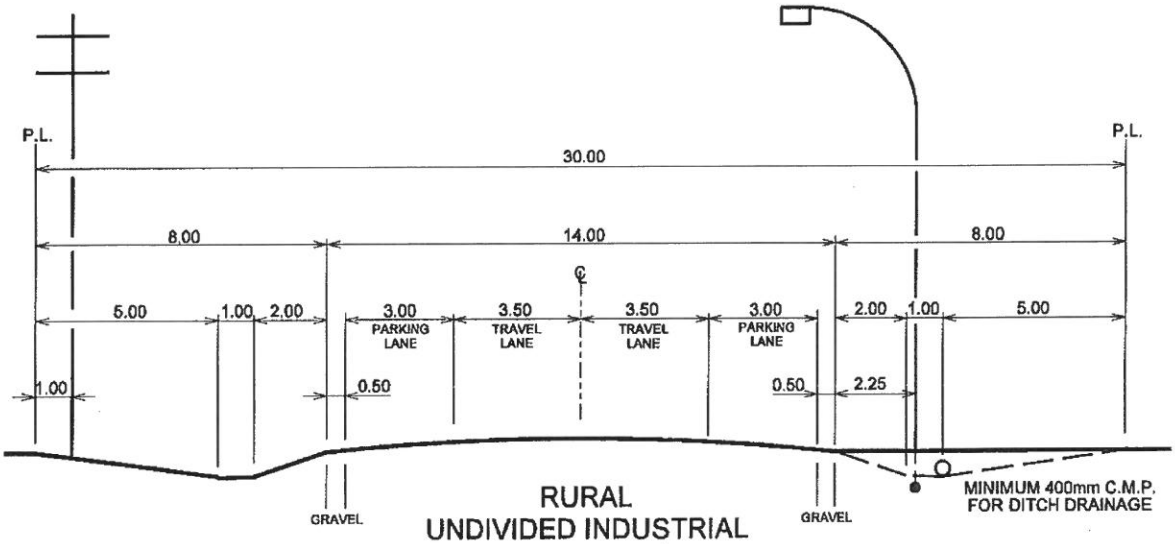




			THE CITY OF RED DEER ENGINEERING DEPARTMENT		
			DRAWN BY: D.W.K.	DESIGN GUIDELINE DRAWINGS Roadway Design	APPROVED BY: STREETS-UTILITIES ENGINEER
			DATE: MAR 10, 2003	10m UNDIVIDED LOCAL ROADWAY	
1	Mar 22, 2004	Revised	SCALE: N.T.S.		DRAWING NO. 5.10
NO.	DATE	REVISION			



URBAN
UNDIVIDED INDUSTRIAL
COLLECTOR ROADWAY



RURAL
UNDIVIDED INDUSTRIAL
COLLECTOR ROADWAY

NO.	DATE	REVISION
2	Mar 4, 2009	Revised
1	Feb 1, 2008	Revised

THE CITY OF RED DEER ENGINEERING DEPARTMENT

DRAWN BY: D.W.K.

DESIGN GUIDELINE DRAWINGS
Roadway Design

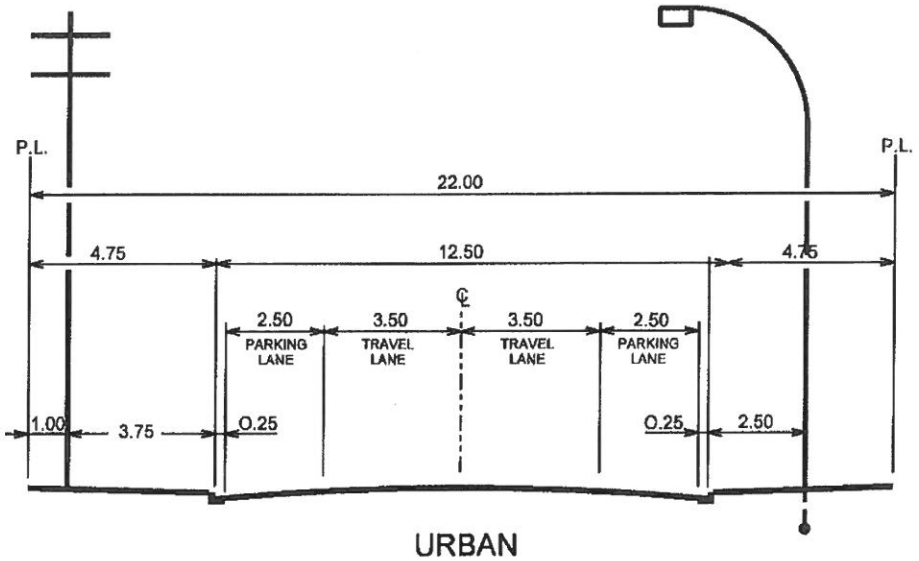
APPROVED BY: M.W.
STREETS-UTILITIES ENGINEER

DATE: JAN 10, 2001

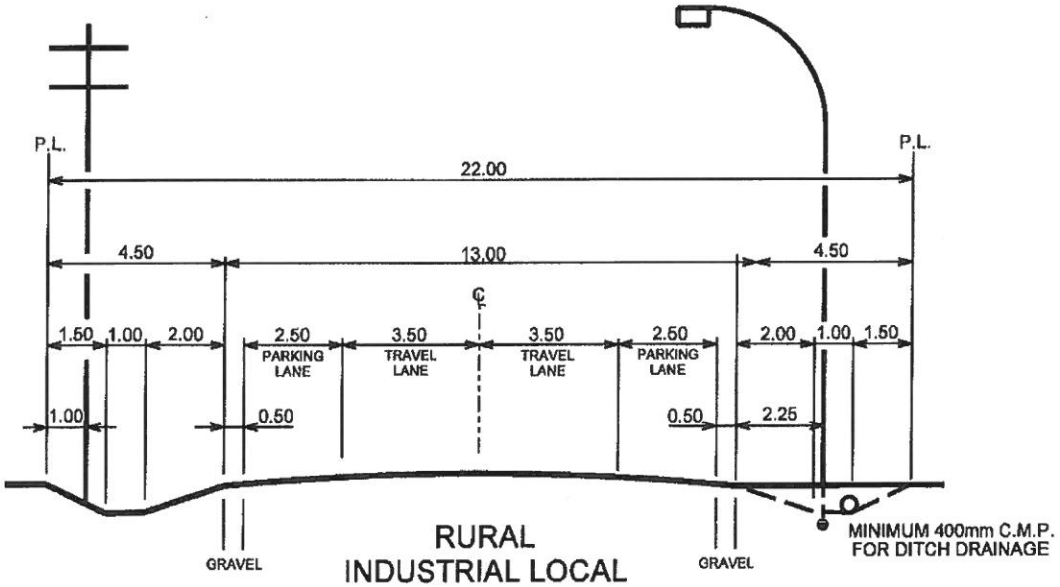
RURAL & URBAN
UNDIVIDED INDUSTRIAL
COLLECTOR ROADWAY

SCALE: N.T.S.

DRAWING NO. 5.11



URBAN
INDUSTRIAL LOCAL
ROADWAY



RURAL
INDUSTRIAL LOCAL
ROADWAY

NO.	DATE	REVISION
1	Mar 26/09	Revised measurements

THE CITY OF RED DEER ENGINEERING DEPARTMENT

DRAWN BY: D.W.K.

DESIGN GUIDELINE DRAWINGS
Roadway Design

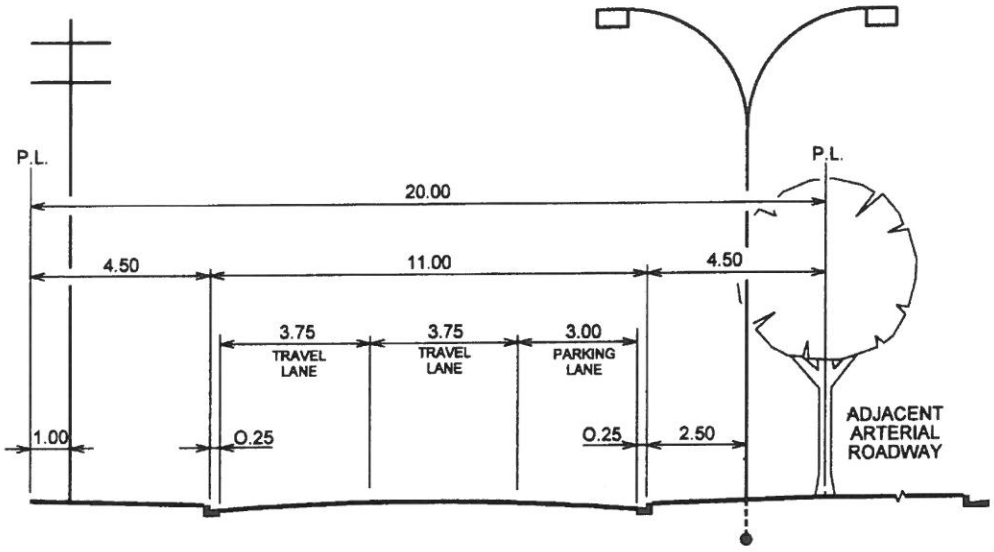
APPROVED BY: M.W.
STREETS-UTILITIES ENGINEER

DATE: JAN 10, 2001

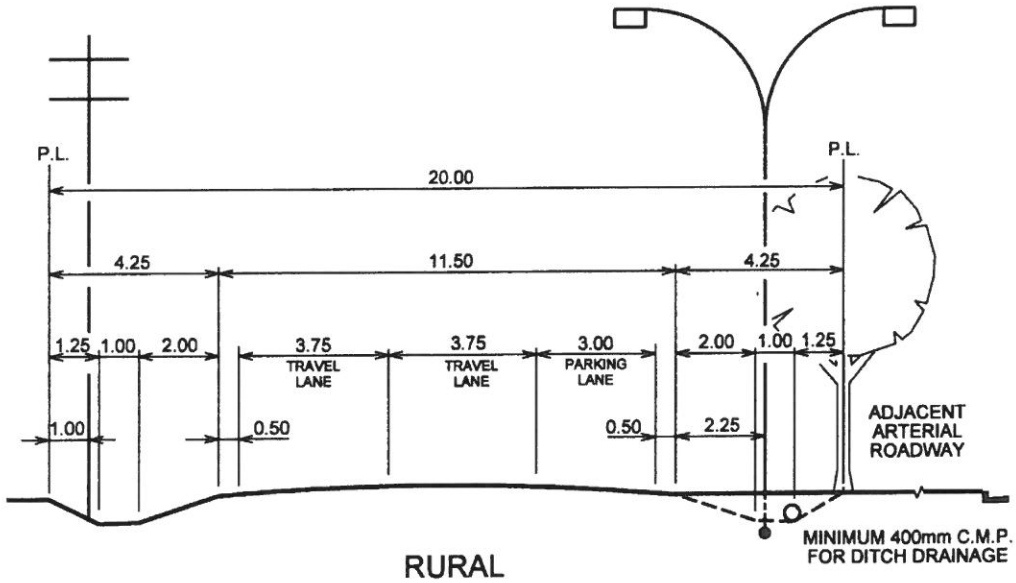
RURAL & URBAN
INDUSTRIAL LOCAL
ROADWAY

SCALE: N.T.S.

DRAWING NO. 5.12



URBAN
SERVICE ROAD



RURAL
SERVICE ROAD

NO.	DATE	REVISION

THE CITY OF RED DEER ENGINEERING DEPARTMENT

DRAWN BY: D.W.K.

DESIGN GUIDELINE DRAWINGS
Roadway Design

APPROVED BY:

STREETS-UTILITIES ENGINEER

DATE: JAN 10, 2001

SCALE: N.T.S.

RURAL & URBAN SERVICE ROAD ADJACENT TO ARTERIAL ROADWAY

DRAWING NO. 5.13