TES Industrial Development
Traffic Impact Assessment Addendum
(South Aspelund Industrial Park)

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Sign-off Sheet

Stantec

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Date MAR 25/2013
PERMIT NUMBER: P 0258
The Association of Professional Engineers Geologists and Geophysicists of Alberta

CORPORATE AUTHORIZATION

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1.0 Introduction

1.1 BACKGROUND

1598768 Alberta Ltd (Developer) is currently seeking approval of the proposed South Aspelund Industrial Park Outline Plan. The proposed development (NW1/4 Sec 21-39-27-W4M) is south of the proposed TES Industrial Development, as shown on South Aspelund Concept Plan (Appendix A), and will likely attract similar land uses.

Stantec Consulting Ltd. (Stantec) completed a Traffic Impact Assessment (TIA) for the TES Industrial Development in May of 2012. This Addendum has been completed to address those items that have changed since completion of the original TIA.

1.2 MODIFICATIONS TO TIA

The items that have changed from the 2012 submission of the TES Industrial Development TIA include:

- Area for McLevin's Development / South Aspelund Industrial Park, total area of 135 acres has increased to 229 acres;
- The full build out of the McLevin's Development / South Aspelund Industrial Park has changed from 2022 to 2017; and
- The McLevin's Development / South Aspelund Industrial Park has been removed from the background growth and added to the site generated traffic.

The items that have not changed from the 2012 submission of the TIA include:

- 2012 horizon analysis;
- Background growth rates;
- Trip generation rates; and
- The timing of the TES and Aspelund Industrial developments.

1.3 OBJECTIVES

The objective of this TIA is to:

- Update the analysis completed in the TES Industrial TIA to include the additional land area within the South Aspelund Industrial Park, as well as those lands originally considered as part of the McLevin's Industrial Site;

- Revise analysis, as required, at the fllowing horizon years – 2017 (McLevin's / South Aspelund fully developed), 2022 (TES fully developed), and 2032 20-year horizon); and

- Recommend appropriate improvements, if necessary, to the intersection of Aspelund Road / Site Access Road and Aspelund Road / Range Road 274 (RR274) in order to mitigate any impact due to the construction of the proposed development.

2.0 Site Context

2.1 STUDY AREA

The South Aspelund Industrial Park is bound by Aspelund Road to the north, McLevin's Industrial Development to the east, and RR 274 to the west. The Town of Blackfalds is located east of the development as is the Queen Elizabeth II (QE2) Highway, providing convenient access to the province's major transportation network. Aspelund Road (running east-west) and RR 274 (running north-south) have direct access to the development.

The report "TES Industrial Development Traffic Impact Assessment" (Stantec Consulting Ltd., May 2012) was completed and included 135 ac for the McLevin's Industrial development. For this TIA addendum, the total area of the combined Mclevins and South Aspelund Industrial developments has been increased to 229 ac. It should be noted that there was some overlap between the original area for the Mclevin's Industrual Development (as illustrated in the "Traffic Impact Assessment NE 21-39-27-w4m Blackfalds, Alberta" completed by A.D. Williams Engineering Inc. in June 2007) and the current plan for the South Aspelund Industrial Park, as shown on Figure 2.1.

The TES Industrial Park, located north of Aspelund Road, encompasses 145.48 ac. The Aspelund Industrial Park, located directly east of the TES Industrial Park, encompasses 128 ac.

2.2 EXISTING ROAD NETWORK & INTERSECTIONS

Aspelund Road, in the vicinity of the proposed development is a two-lane, undivided roadway running in an east-west orientation. The posted speed limit in the westbound direction increases from 80 km/h to 100 km/h between the Site Access Road and RR 274. The posted speed limit in the eastbound direction decreases from 100 km/h to 80 km/h east of the Site Access Road, on the QE2 interchange. RR 274 is a 2-lane, undivided gravel road running north-south, with a speed limit of 80 km/h.

Illumination currently exists at the intersection of Aspelund Road / Site Access Road and the intersection is a stop-controlled T-intersection with the free movements on Aspelund Road. The existing intersection appears to be a modified Type IV configuration, based on Alberta Transportation (AT) guidelines, with dedicated eastbound left and westbound right turn lanes on Aspelund Road. Though the intersection is a T-intersection, provisions for future access to the south (into the McLevin's Industrial Development) is provided.

The intersection of Aspelund Road / RR 274 is a two-way stop controlled (TWSC) intersection with stop signs on RR 274 and the free movements on Aspelund Road. The intersection of Aspelund Road / RR 274 appears to be Type I with no illumination.

2.3 GROWTH TRENDS

Historical traffic volume data (provided in the May 2012 TIA) was supplied by AT for the intersection of QE2 and Highway 597 (Hwy 597), east of the proposed development, and annual average growth rates were calculated for the period of 2002 to 2010. The results are summarized below:

- Aspelund Road, west of QE2 – 5-year growth rate of 8.5% annually, 8-year growth rate of 6.0% annually; and
- Hwy 597, East of QE2 – 5-year growth rate of 12.0% annually, 8-year growth rate of 9.4% annually.

For the purposes of this study, a 6% annual, uncompounded background growth rate up to the 10 year horizon and AT's typical growth rate of 2.5% annually up to the 20-year horizon has been used.

2.4 BACKGROUND TRAFFIC

Traffic counts for the intersections of Aspelund Road / Site Access Road, Aspelund Road / RR 274 and Aspelund Road / South Service Road were conducted on November 24, 2011, for both the AM and PM peak hours. These counts can be found in the May 2012 TIA.

Figure 2.1

Site Plan

South Aspelund Industrial Park

LEGEND

South Aspelund Industrial Park

McLevin's Industrial Park

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PROJECT #: 112849380

February, 2013

3.0 Proposed Development and Trip Characteristics

3.1 PROPOSED DEVELOPMENT

The development concept for the South Aspelund Industrial Park has been prepared in response to current and anticipated industrial/commercial market trends in the region. The proposed Concept Plan for the development can be found in Appendix A. South Aspelund Industrial Park primarily consists of business industrial districts. The purpose of the business industrial district land use is to provide for a range of commercial and industrial uses, some of which may have outdoor storage or work activities. The South Aspelund Industrial Park consists of 90.1 ac of industrial lots. When combined with the McLevin's Industrial development, there is 229 ac of industrial development south of Aspelund Road.

3.1.1 Development Staging

The following staging assumptions have been used for the purpose of this report:

- 2017 – McLevin's / South Aspelund Industrial Park and Aspelund Industrial Park fully built-out and TES Industrial Development 75% built out;
- 2022 – McLevin's / South Aspelund Industrial Park, TES Industrial Development and Aspelund Industrial Park fully built-out; and
- 2032 – 20 Year Horizon.

3.2 TRIP GENERATION

Local trip generation rates were measured for the existing Aspelund Industrial Park, as part of the TES TIA. These same trip generation rates have been used for this Addendum and are as follows:

- AM peak – 3.7 trips / acre (84% in, 16% out); and
- PM peak – 3.0 trips / acre (16% in, 84% out).

Given the rural nature of the proposed development and the lower lot density, the average daily traffic generation rates can be expected to be significantly less than the rates reported in Institute of Transportation Engineers (ITE) Trip Generation Manual, 8th Edition (for General Light Industrial AM peak – 7.96 trips / acre, PM peak – 8.77 trips / acre) and are expected to be better estimated by the observed rates for the Aspelund Industrial Park.

Tables 3.1a, 3.1b and 3.1c, below, show the results of the trip generation calculations for 2017 (full build-out of all developments except TES Industrial Development – 75 %), 2022 (full build-out of all developments), and 2032 (20-year horizon), respectively.

Table 3.1a - 2017 Trip Generation							
Development / Phase	Local Trip Generation Rate		Size (acres)	Weekday AM Peak		Weekday PM Peak	
	AM Peak	PM Peak		In	Out	In	Out
TES Industrial Development - 75%	3.7	3.0	80	249	48	39	202
Aspelund Industrial Park - Full Build Out	3.7	3.0	128	398	76	61	323
McLevin's / South Aspelund Industrial Park - 100%	3.7	3.0	200	622	118	96	504
			Total Trips	***1269***	***242***	***196***	***1029***
				1511		***1225***	

Table 3.1b - 2022 Trip Generation							
Development / Phase	Local Trip Generation Rate		Size (acres)	Weekday AM Peak		Weekday PM Peak	
	AM Peak	PM Peak		In	Out	In	Out
TES Industrial Development - Full Build Out	3.7	3.0	107	333	63	51	270
Aspelund Industrial Park - Full Build Out	3.7	3.0	128	398	76	61	323
McLevin's / South Aspelund Industrial Park - 100%	3.7	3.0	200	622	118	96	504
			Total Trips	***1353***	***257***	***208***	***1097***
				1610		***1305***	

Table 3.1c - 2032 Trip Generation							
Development / Phase	Local Trip Generation Rate		Size (acres)	Weekday AM Peak		Weekday PM Peak	
	AM Peak	PM Peak		In	Out	In	Out
TES Industrial Development - Full Build Out	3.7	3.0	107	333	63	51	270
Aspelund Industrial Park - Full Build Out	3.7	3.0	128	398	76	61	323
McLevin's / South Aspelund Industrial Park - 100%	3.7	3.0	200	622	118	96	504
			Total Trips	***1353***	***257***	***208***	***1097***
				1610		***1305***	

3.3 TRIP DISTRIBUTION AND ASSIGNMENT

Taking into consideration the current trip distribution pattern for Aspelund Industrial Park, the development's proximity to the Town of Blackfalds and the QE2 Highway, as well as the existing road network, the following trip distribution assumptions have been used for this TIA Addendum:

- 85% of trips to/from the east of the proposed development; and
- 15% of trips to/from the west of the proposed development.

Based on the trip generation calculations outlined in Tables 3.1a, 3.1b and 3.1c, the trip distribution patterns described here, the site generated traffic was manually assigned to the studied intersections. Figures 3.1a and 3.1b, for the AM and PM peak hours respectively, illustrates the trip assignment for 2017. Figures 3.2a and 3.2b, for the AM and PM peak hours

respectively, illustrate the trip assignment for 2022 (full build-out of all developments within the study area).

3.4 DESIGN VOLUMES

The horizons that have been analyzed in this TIA Addendum include the following:

- 2017 – total traffic;
- 2022 – total traffic; and
- 2032 – total traffic.

3.5 2017

It is assumed at 2017 that the Aspelund, McLevin's and South Aspelund Industrial Parks will be fully developed and the TES Industrial park will be 75% developed. The total traffic volumes for 2017 are shown on Figures 3.3a and 3.3b for the AM and PM peak hours, respectively.

3.5.1 2022

It is assumed at 2022 that the Mclevin's, South Aspelund, Aspelund and TES Industrial parks will be fully built-out. The total traffic volumes for 2022 are shown on Figures 3.4a and 3.4b for the AM and PM peak hours, respectively.

3.5.2 2032 – 20-Year Horizon

The total traffic volumes for 2032 (20-year horizon) are shown on Figures 3.5a and 3.5b for the AM and PM peak hours, respectively.

Figure 3.1a
2017 Site Generated Traffic - AM Peak

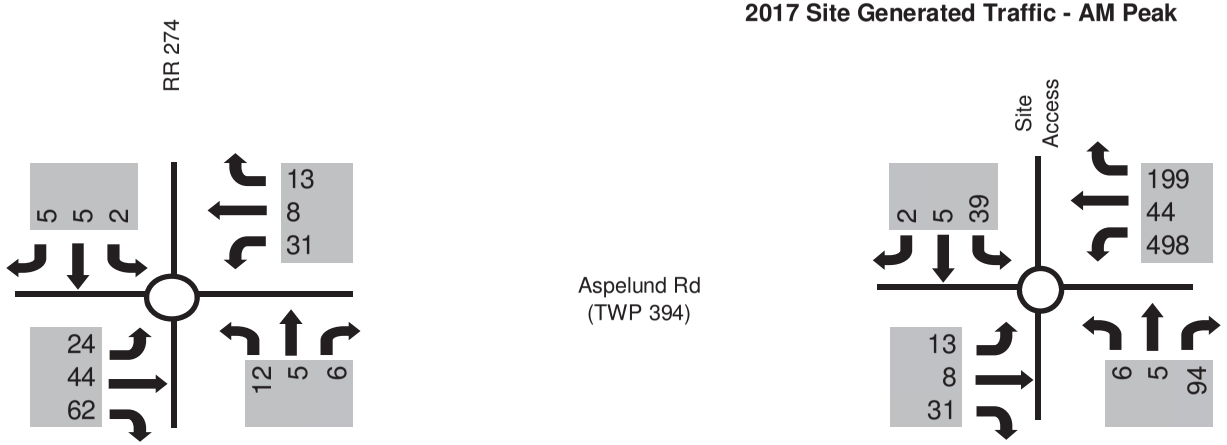


Figure 3.1b
2022 Site Generated Traffic - PM Peak

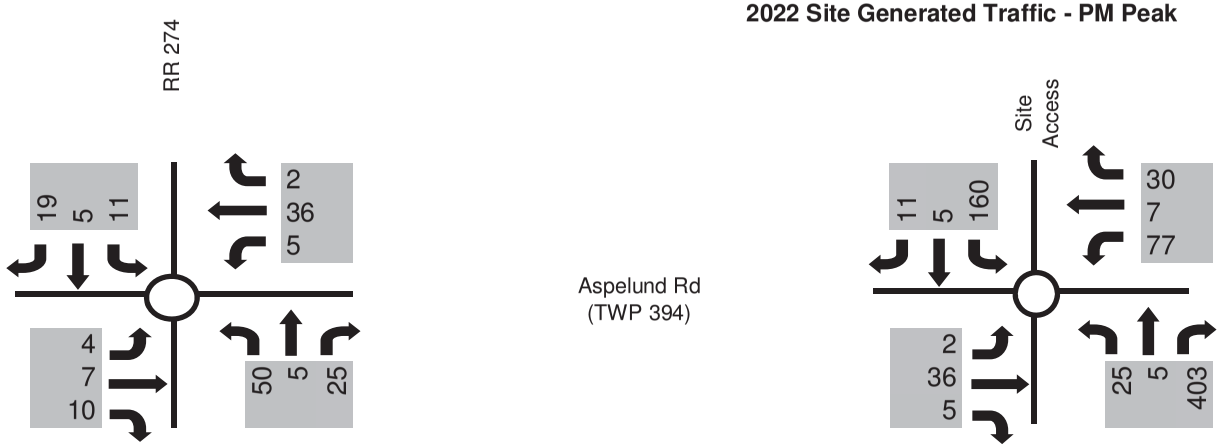


Figure 3.2a
2022 Site Generated Traffic - AM Peak

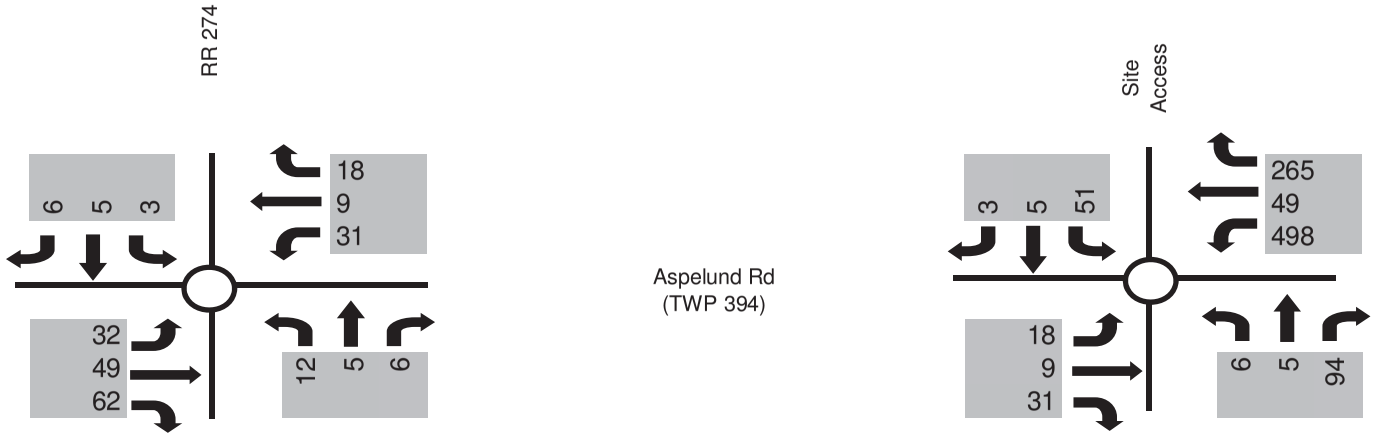


Figure 3.2b
2022 Site Generated Traffic - PM Peak

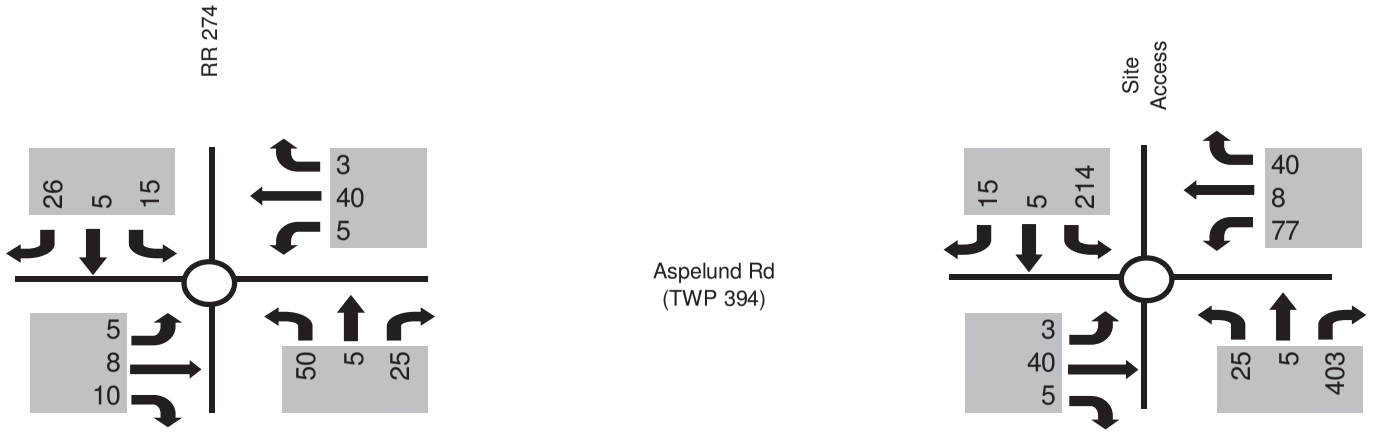


Figure 3.3a
2017 Total Traffic - AM Peak

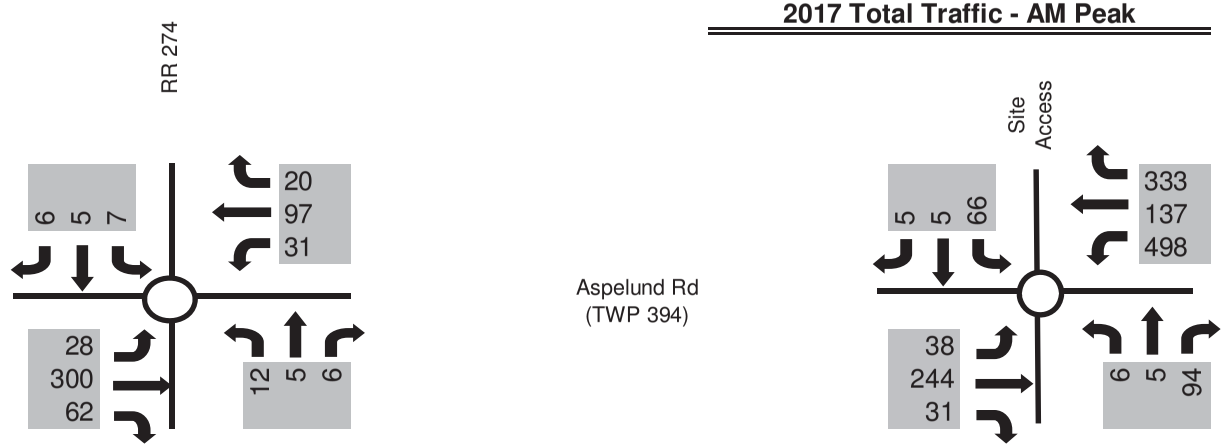


Figure 3.3b
2017 Total Traffic - PM Peak

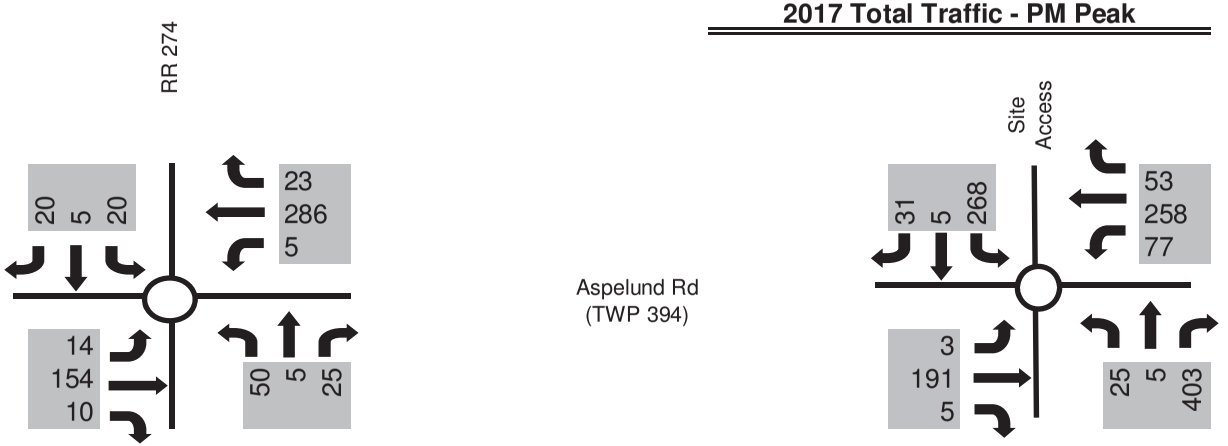


Figure 3.4a
2022 Total Traffic - AM Peak

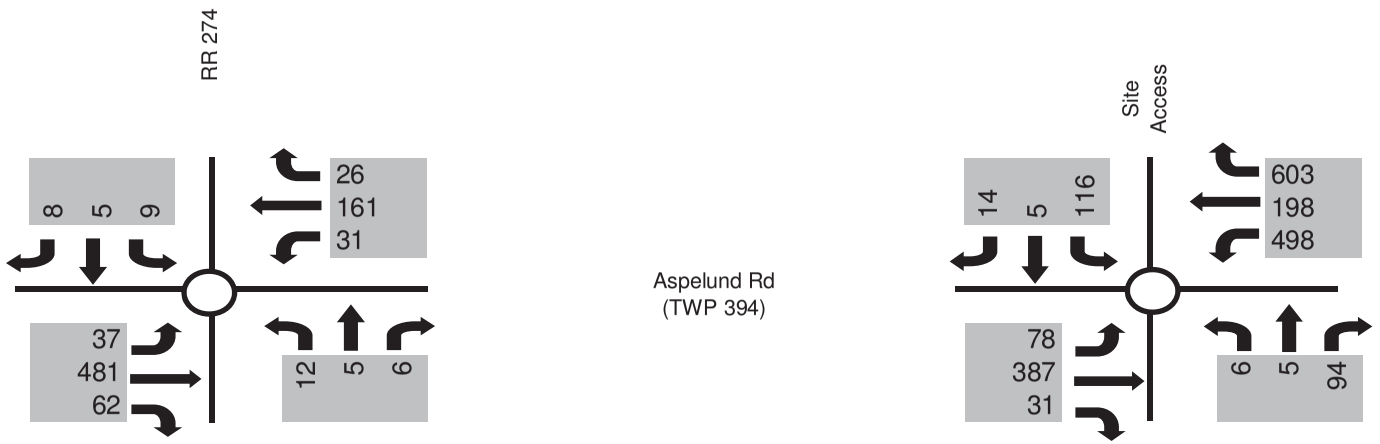


Figure 3.4b
2022 Total Traffic - PM Peak

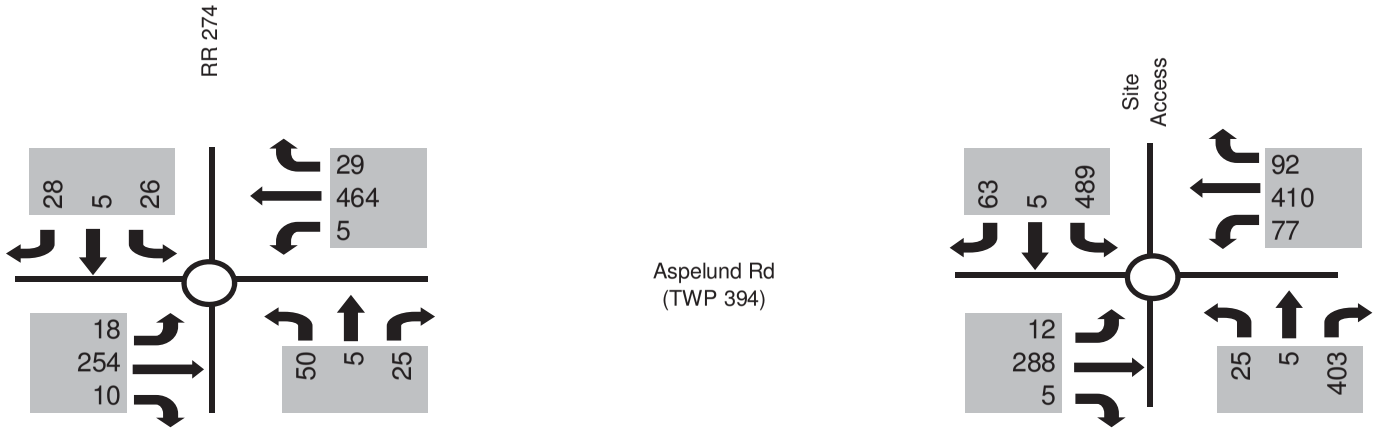


Figure 3.5a
2032 Total Traffic - AM Peak

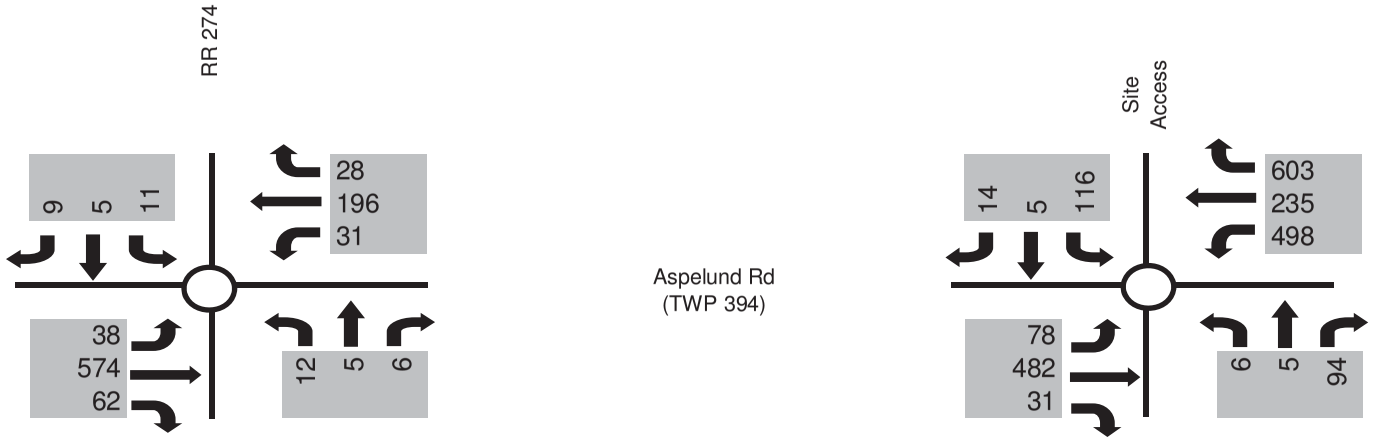
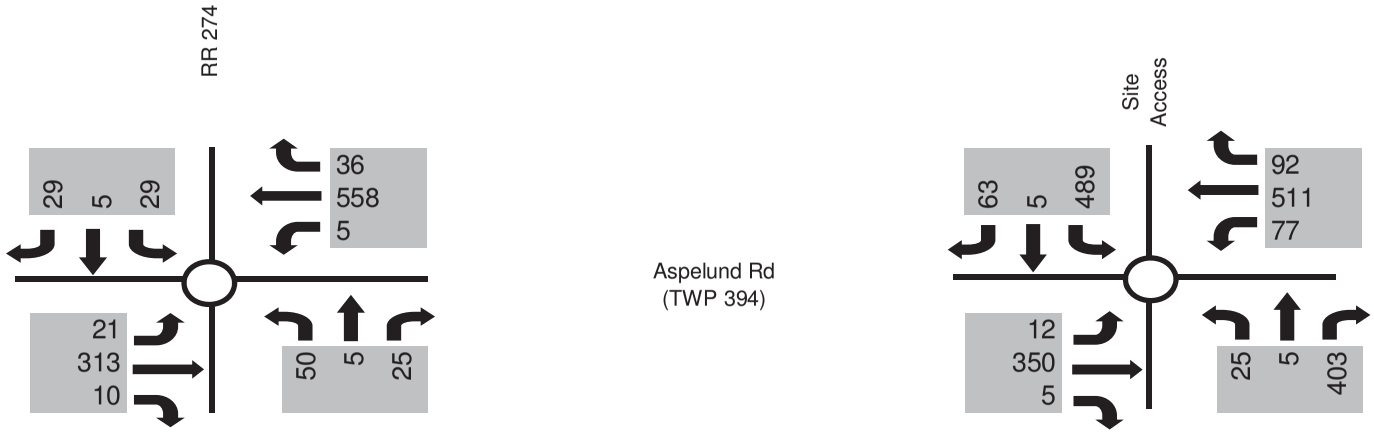


Figure 3.5b
2032 Total Traffic - PM Peak



4.0 Transportation Assessment

The assessment of the intersections within the study area for the TIA Addendum (South Aspelund Industrial Park) consists of five parts:

- Intersection Treatment Analysis (ITA);
- Signal Warrant Analysis (SWA);
- Intersection Capacity Analysis (ICA);
- Intersection Sight Distance Analysis (ISDA); and
- Illumination Warrant Analysis (IWA).

The ITA will determine what intersectional upgrades are required for each design volume scenario. The ICA will confirm that the intersection, when upgraded, can be expected to perform satisfactorily when subjected to the design volumes and will also determine what additional upgrades are required, if any. The SWA and IWA determine whether traffic signals, advanced warning flashers (AWF) and/or intersection illumination is warranted and the ISDA will determine if sufficient sight distances exist at each intersection.

In addition, a discussion relating to the possible twinning of Aspelund Road is presented in this section.

4.1 INTERSECTION TREATMENT ANALYSIS

The calculations for the ITA are based on daily volumes as well as peak hour volumes. Thus, it is necessary to convert the peak hour volumes into daily volumes. As per AT's *Highway Geometric Design Guide* (HGDG):

- DHV = k (AADT), where DHV is the design hourly volume, AADT is the average annual daily traffic and k is a factor equivalent to 0.12.

As the highest volumes are expected during AM peak hour (as the local data shown a higher trip generation rate during the AM), they are used as the design hour volumes and then converted into daily traffic volumes.

Intersections involving provincial highways must meet minimum requirements as defined by AT's HGDG. Although Aspelund Road is not a provincial highway, it is an extension of Highway 597 (east of the QE2 Highway) and as such the ITA has been completed to AT standards. The ITA for this report was completed utilizing section D.7.4 and, where required, warrant analyses for dedicated left and right turn lanes were completed as per section D.7.6 and D.7.7 of the HGDG for the intersections of Aspelund Road / Site Access Road and Aspelund Road / RR 274.

Table 4.1, below, outlines the results of the ITA based on the design traffic volumes.

Table 4.1 – ITA Results

Horizon Year	Aspelund Road / Site Access Rd	Aspelund Road / RR 274
2017 – Total Traffic	EB: Type IV, s=15, RT not Req WB: Type V, s=75, RT Req.	EB: Type V, s=0, RT Req WB: Type IV, s=o RT not Req.
2022 – Total Traffic	EB: Type IV, s=15, RT not Req WB: Type V, s>75, RT Req.	EB: Type V, s=0, RT Req WB: Type IV, s=5 RT not Req.
2032 – Total Traffic	EB: Type IV, s>40, RT not Req WB: Type V, s>75, RT Req.	EB: Type V, s=10, RT Req WB: Type IV, s=10 RT not Req.

A Type V intersection, based on AT's HGDG, is needed when both the dedicated left and right turn lanes are warranted in the same direction – as is the case for the east leg of the Aspelund Road / Site Access intersection. Current geometric constraints may not allow for the construction of a Type V intersection at Aspelund Road / Site Access Road due to the proximity of the local access road to Aspelund Road. As the intersection will require signalization, discussed below, a Type IV intersection is expected to function adequately from a capacity perspective.

A Type V intersection is also warranted for the west leg of the Aspelund Road / RR 274 intersection at the 2017 horizon. It should be noted that these warrants are based on AT's HGDG, and Type IV intersections would provide the same level of intersection operations.

4.2 SIGNAL WARRANT ANALYSIS

The SWA was completed using Transportation Association of Canada's (TAC) *Traffic Signal Warrant Analysis Spreadsheet, v.3H* (2007). When the spreadsheet yields a W-value equal to or greater than 100 points, signalization is warranted. No pedestrian movements have been included in the SWA as there are no existing or planned sidewalks in the vicinity of either intersection. Tables 4.2 and 4.3 below outline the results of the SWA for the intersections of Aspelund Road / Site Access Road and Aspelund Road / RR 274 for all analyzed horizons. Details of the SWA analysis can be found in Appendix C.

Table 4.2 – SWA Results: Aspelund Road / Site Access Road

Horizon Year	Total Points (W-value)	Result
2017 – Total Traffic	148	Signals warranted
2022 – Total Traffic	305	Signals warranted
2032 – Total Traffic	353	Signals warranted

Table 4.3 – SWA Results: Aspelund Road / RR 274

Horizon Year	Total Points (W-value)	Result
2017 – Total Traffic	<39	Signals not warranted
2022 – Total Traffic	<39	Signals not warranted
2032 – Total Traffic	39	Signals not warranted

4.3 INTERSECTION CAPACITY ANALYSIS

The ICA was completed in order to determine whether the Level of Service (LOS) and the delay of the studied intersections remains at an acceptable level once they are subjected to the design volumes. The traffic modeling software package of Synchro Studio 8 has been used to complete intersection capacity analysis for different scenarios. The LOS for the intersection is based on the computed delays on each of the critical movements. LOS 'A' represents minimal delays and LOS 'F' represents a scenario with significant vehicular delays. Table 4.4 shows LOS criteria for both signalized and unsignalized intersections as summarized in the Highway Capacity Manual.

Table 4.4: Level of Service Criteria

Level of Service (LOS)	Control Delay Per Vehicle (s)	
	Unsignalized	Signalized
A	≤10	≤10
B	>10 and ≤15	>10 and ≤20
C	>15 and ≤25	>20 and ≤35
D	>25 and ≤35	>35 and ≤55
E	>35 and ≤50	>55 and ≤80
F	>50	>80

Generally, a LOS-D is the lowest acceptable LOS for a given turning movement within an intersection when analyzing short-term planning horizons (10-years or less) while LOS-E is the lowest acceptable for long-term planning horizons. Movements experiencing LOS-E or LOS-F in short-term or long-term planning, respectively, typically require upgrading in order to increase performance of the failing traffic movements. An exception to this guideline is in situations where the affected traffic movement has a relatively small volume compared to other movements within the same intersection.

The volume to capacity (V/C) ratio indicates the level of congestion for a lane. A V/C ratio equal to or greater than 1.00 indicates that the lane is operating at or above capacity. It is generally accepted that lanes operating with V/C ratios equal to or less than 0.85 have acceptable levels of congestion.

Tables 4.1, 4.2 and 4.3 summarize the results of the ICA for the 2017, 2022 and 2032 horizons, which will be discussed in the following sections, and can be found in Appendix D along with the detailed results from Synchro Studio.

Figures 4.1, 4.2 and 4.3 illustrate the recommended intersection configurations for the 2017, 2022 and 2032 horizons, respectively.

4.3.1 2017

Aspelund Road / Site Access Road

Total traffic volumes result in the need for eastbound and dual westbound left turn lanes, in conjunction with a westbound right turn lane. The dual westbound left turn lanes will require two southbound lanes south of the intersection on the Site Access Road. Intersection signalization is warranted at this time. The lowest LOS experienced is LOS-D and all V/C ratios are less than 0.85, with the proposed lane configuration (Figure 4.1) in both the AM and PM peak hours.

Aspelund Road / RR 274

Total traffic volumes result in the need for eastbound and westbound left turn lanes, in conjunction with an eastbound right turn lane. Signalization is not warranted, the intersection was analyzed as a TWSC intersection with free movements on Aspelund Road. The lowest LOS experienced is LOS-B and all V/C ratios are less than 0.85, with the proposed lane configuration (Figure 4.1) in both the AM and PM peak hours.

4.3.2 2022

Aspelund Road / Site Access Road

Total traffic volumes result in the need for eastbound, dual westbound and dual southbound left turn lanes, in conjunction with eastbound and westbound right turn lanes. The dual southbound left turn lanes will require dual eastbound through lanes east of the intersection along Aspelund

Road. The lowest LOS experienced is LOS-D and all V/C ratios are less than 0.85, with the proposed lane configuration (Figure.4.2) in both the AM and PM peak hours.

Aspelund Road / RR 274

Total traffic volumes result in the need for east and westbound left turn lanes, in conjunction with an eastbound right turn lane. Signalization is not warranted, and thus the intersection was analyzed as a TWSC with free movements on Aspelund Road. The lowest LOS experienced is LOS-C and all V/C ratios are less than 0.85, with the proposed lane configuration (Figure 4.2) in both the AM and PM peak hours.

4.3.3 2032 – 20-Year Horizon

Aspelund Road / Site Access Road

Total traffic volumes result in the need for eastbound, dual westbound and dual southbound left turn lanes, in conjunction with eastbound and westbound right turn lanes. The lowest LOS experienced is LOS E in the westbound and southbound left turn movements. All other LOS are D or better and all V/C ratios are less than 0.90, with the proposed lane configuration (Figure 4.3) in both the AM and PM peak hours.

Aspelund Road / RR 274

Total traffic volumes result in the need for eastbound and westbound left turn lanes, in conjunction with an eastbound right turn lane. Signalization is not warranted, and thus the intersection was analyzed as a TWSC with free movements on Aspelund Road. The lowest LOS experienced is LOS-D and all V/C ratios are less than 0.85, with the proposed lane configuration (Figure 4.3) in both the AM and PM Peak hours.

4.4 INTERSECTION SIGHT DISTANCE ANALYSIS

As stated in Section D.4.1 of AT's HGDG, "generally, the crucial maneuver for sight distance purposes is the left turn onto the highway." Accordingly, AT's HGDG Figure D-4.2.2.2 (Appendix B) was used to determine the sight distance for a WB-36 design vehicle, that being 600 m with design speed of 110 km/h. The WB-36 design vehicle was chosen for this analysis due to the industrial nature of the development and the potential for oilfield related occupants.

Based on field observations, the existing sight distance west of the intersection of Aspelund Road / Site Access Road exceeds 1 km while the sight distance east of the intersection is approximately 750 m, as it is limited by the existing curve at the QE2 interchange. The existing sight distances at the intersection of Aspelund Road / RR 274 are in excess of 1 km in both directions. Therefore, sight distances are considered adequate at both intersections.

4.5 INTERSECTION ILLUMINATION WARRANT

Intersection illumination warrants for this TIA were completed utilizing TAC's *Illumination of Isolated Rural Intersections*, specifically Table 1. The results of the intersection illumination warrants are as follows:

- Aspelund Road / Site Access – intersection signalization is warranted at the 2017 total traffic horizon and thus full illumination is also warranted (no detailed analysis has been carried out);

- Aspelund Road / RR 274 – warrants total 166 at the 2017 total traffic scenario and illumination is not warranted at this horizon. Warrant totals 176 points at the 2022 and 2032 total traffic scenarios (as shown in Appendix B) and partial intersection illumination (delineation lighting) is warranted.

4.6 ASPELUND ROAD TWINNING CONSIDERATION

Aspelund Road currently experiences a significant volume of daily traffic. Daily traffic volumes estimates (based on k = 0.12) are shown on Table 4.5, below.

Table 4.5 – Aspelund Road Projected Daily Traffic Volumes

Horizon Year	East of Site Access Road	West of Site Access Road	West of RR 274
2017 – Total Traffic	11,433	3,842	4,208
2022 – Total Traffic	15,800	5,950	6,342
2032 – Total Traffic	16,900	7,050	7,225

As Aspelund Road would likely be classified as a Type 1B roadway (minor arterial) Figure A-9, shown in Appendix A, from AT's HGDG shows that daily traffic ranging from 8,500 to 9,750 vehicles per day may indicate the need for the roadway to be twinned.

The 2017 total traffic, east of Site Access Road, surpasses the range where twinning may be considered for Aspelund Road. West of the Site Access Road, the expected total traffic volumes are not expected to be high enough to consider twinning until beyond 2032 (20-year horizon).

It is understood that Lacombe County is currently collecting levies for the future twinning of Aspelund Road. The timing of the future twinning, especially between the Access Road and the QE2 Highway interchange, should be taken into consideration when planning upgrades to the intersections analyzed in this TIA Addendum. A high level review of the traffic model, including Aspelund Road being twinned from the QE2 Highway to RR 274, suggest that either the dual southbound left-turn lanes or the dual westbound left-turn (but not both sets) would be reduced

to a single left turn lane. The twiinning of Aspelund Road also delays the need for dual left-turn lanes from 2017 (full buildout of the South Aspelund Industrial Park) to 2022 (full buildout of all development within the study area).

Figure 4.1
2017 Recommended Lane Configuration

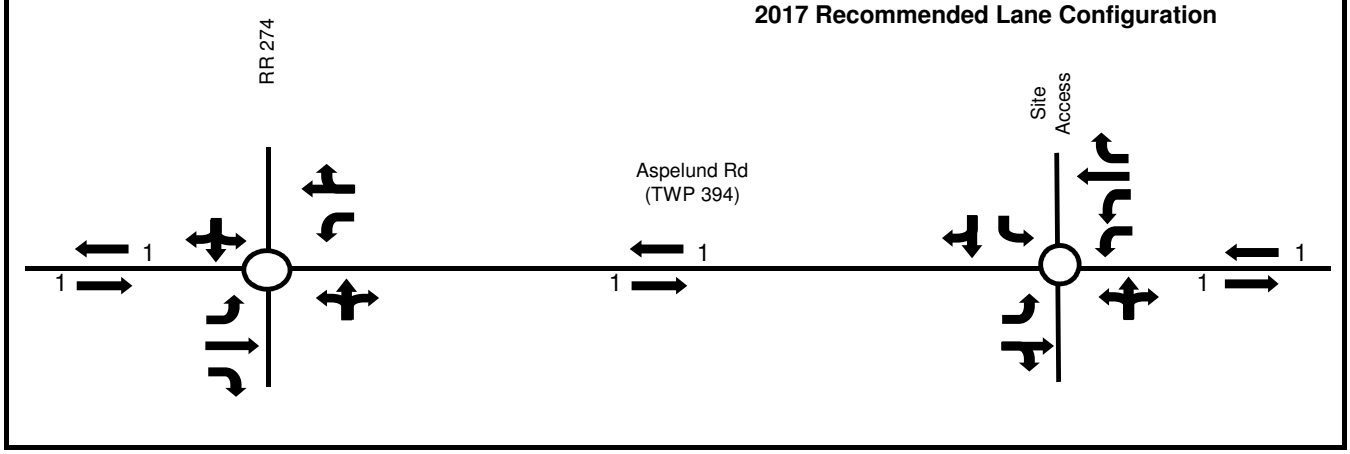


Figure 4.2
2022 Recommended Lane Configuration

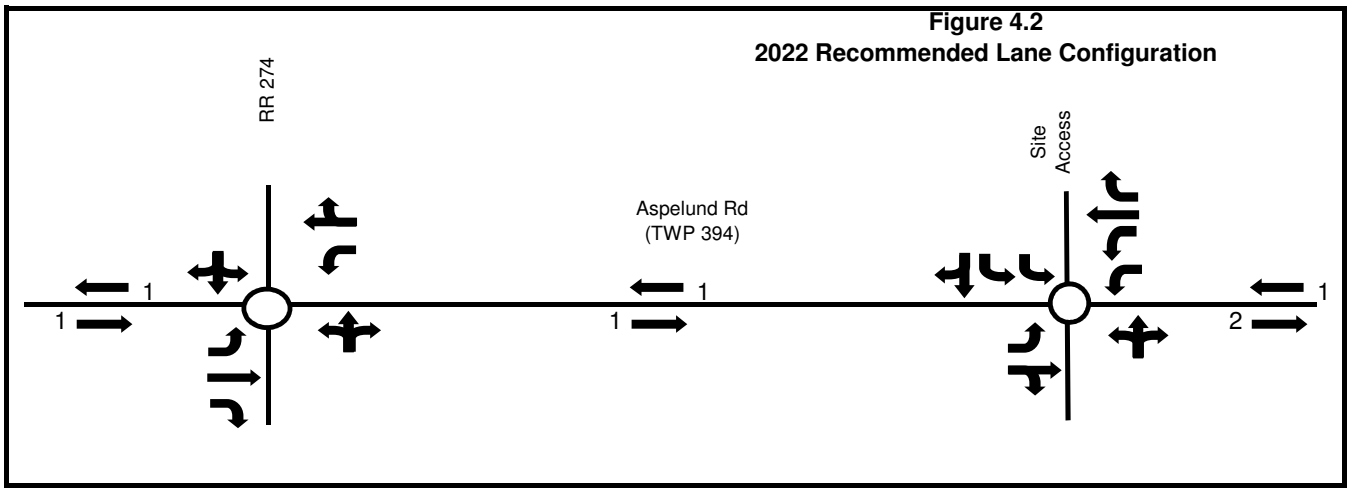
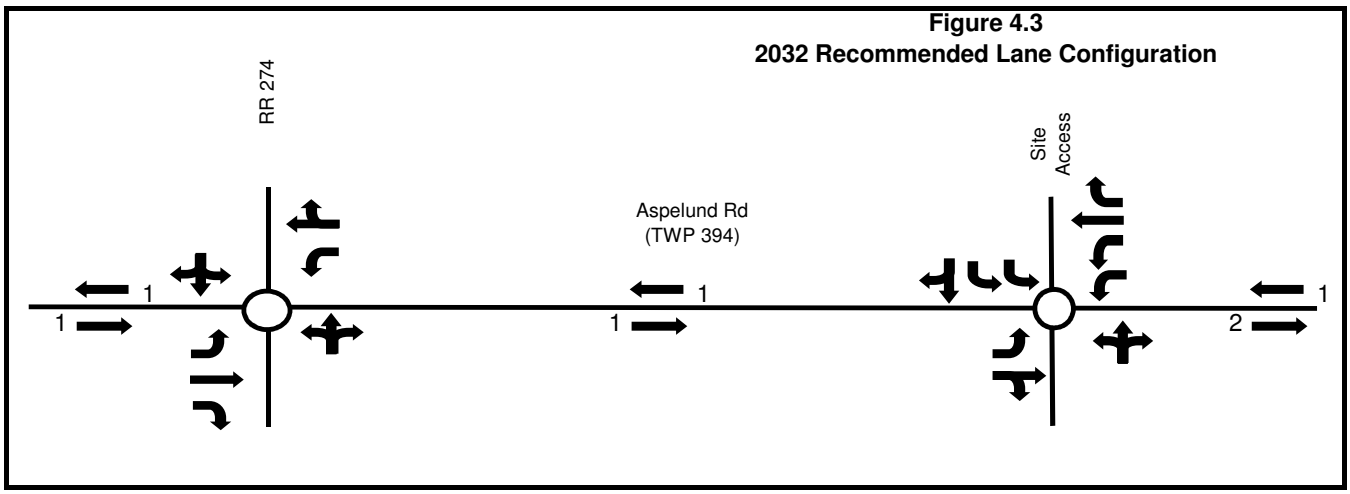


Figure 4.3
2032 Recommended Lane Configuration



5.0 Conclusions

Based on the analysis contained within this document, the following conclusions can be made:

1. At the 2017 analysis horizon, the intersection of Aspelund Road and Site Access requires an eastbound and dual westbound left turn lanes in conjunction with a westbound right turn lane. Intersection signalization is warranted at this horizon.

2. At the 2017 analysis horizon, the intersection of Aspelund Road and Range Road 274 requires eastbound and westbound left turn lanes in conjunction with an eastbound right turn lane. Illumination and intersection signalization are not warranted at this horizon.

3. At the 2022 analysis horizon, the intersection of Aspelund Road and Site Access requires an eastbound, dual westbound and dual southbound left turn lanes, in conjunction with a westbound right turn lane.

4. At the 2022 analysis horizon, the intersection of Aspelund Road and Range Road 274 warrants an eastbound, and westbound left turn lanes, in conjunction with an eastbound right turn lane. Partial illumination (delineation lighting) is warranted, but signalization is not.

5. No additional upgrades, beyond those listed for the 2022 analysis horizon, are required for the 2032 (20 year) horizon at either of the analyzed intersections.

6. Based on the intersection treatment analysis (from Alberta Transportation's Highway Geometric Design Guide) and Sim Traffic queuing analysis, the storage requirements for the various turn bays at the 2032 (20-year) horizon are as follows:

    a. Aspelund Road / Site Access Road

        i. Eastbound left-turn – 40m

        ii. Dual Westbound left-turn – 90m

        iii. Westbound right turn – 50m (based on Type IV intersection)

        iv. Dual southbound left-turn – 80m

    b. Aspelund Road / Range Road

        i. Eastbound left-turn – 15m (based on Type IV intersection)

        ii. Eastbound right-turn – 50m (based on Type IV intersection)

iii. Westbound left-turn – 15m (based on Type IV intersection)

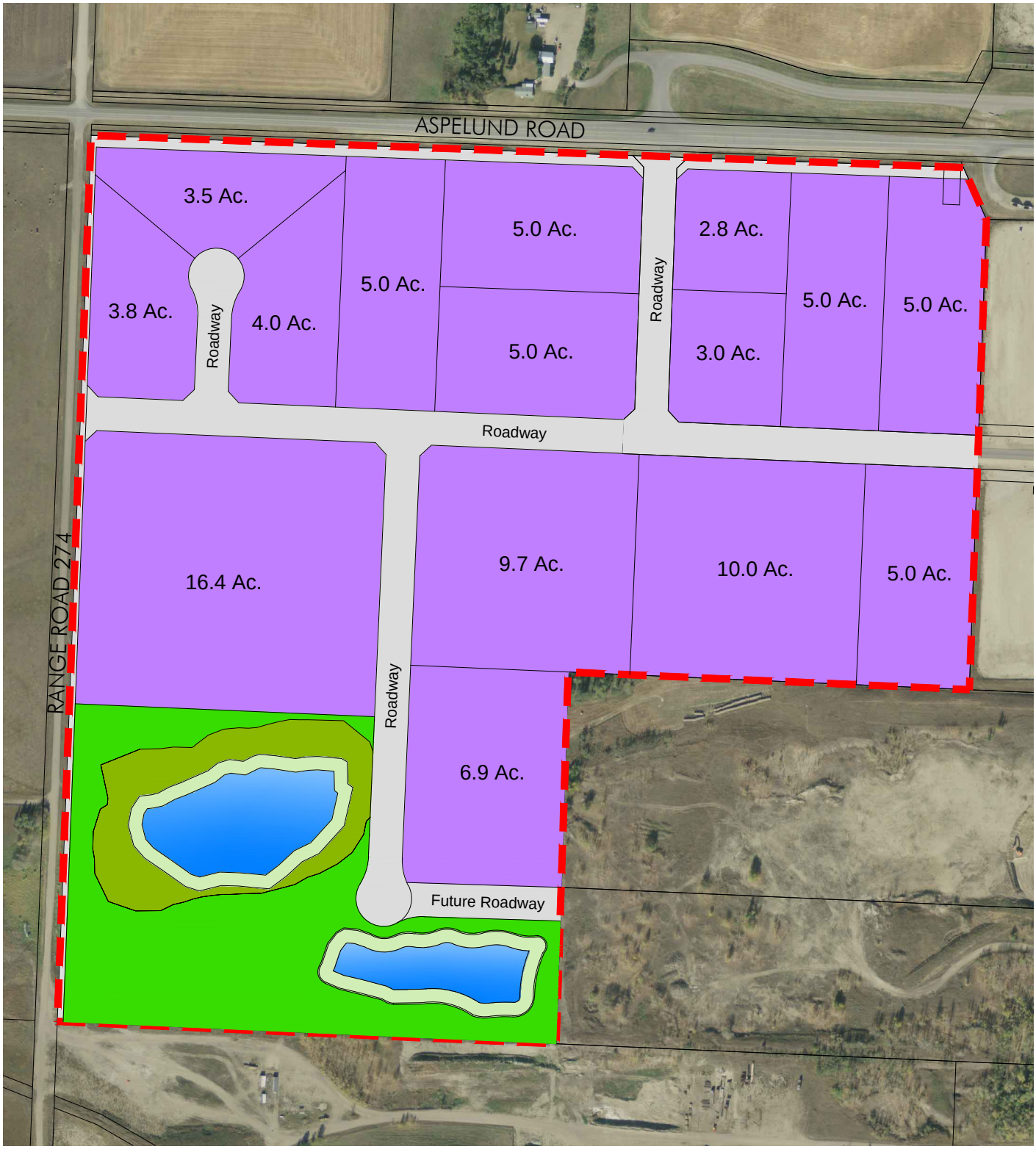
Storage bay requirements should be confirmed at the detailed design stage, and do not include deceleration lengths

7. Twinning of Aspelund Road, east of the Site Access Road, may be required by 2017 based on total traffic volumes.

8. At the detailed design stage, the configuration of the Site Access Road north of Aspelund Road will need to be examined in order to provide the necessary southbound left-turn storage while ensuring safety and truck turning moving requirements are maintained.

9. It should be noted that the major upgrades required to the intersection of Aspelund Road / Site Access Road and along Aspelund Road, east of the Site Access Road, are a combined result of the Aspelund Industrial Park, TES Industrial Park, McLevin's Industrial Development and South Aspelund Industrial Park..

6.0 Appendix A – Figures & Tables



LEGEND

- Business Industrial District (I-BI)
- Municipal Reserve (MR)
- Public Utility Lot (PUL)
- Environmental Reserve (ER)
- Roadway
- Plan Boundary

NORTH

FIGURE 4.0
Concept Plan
South Aspelund Industrial Park

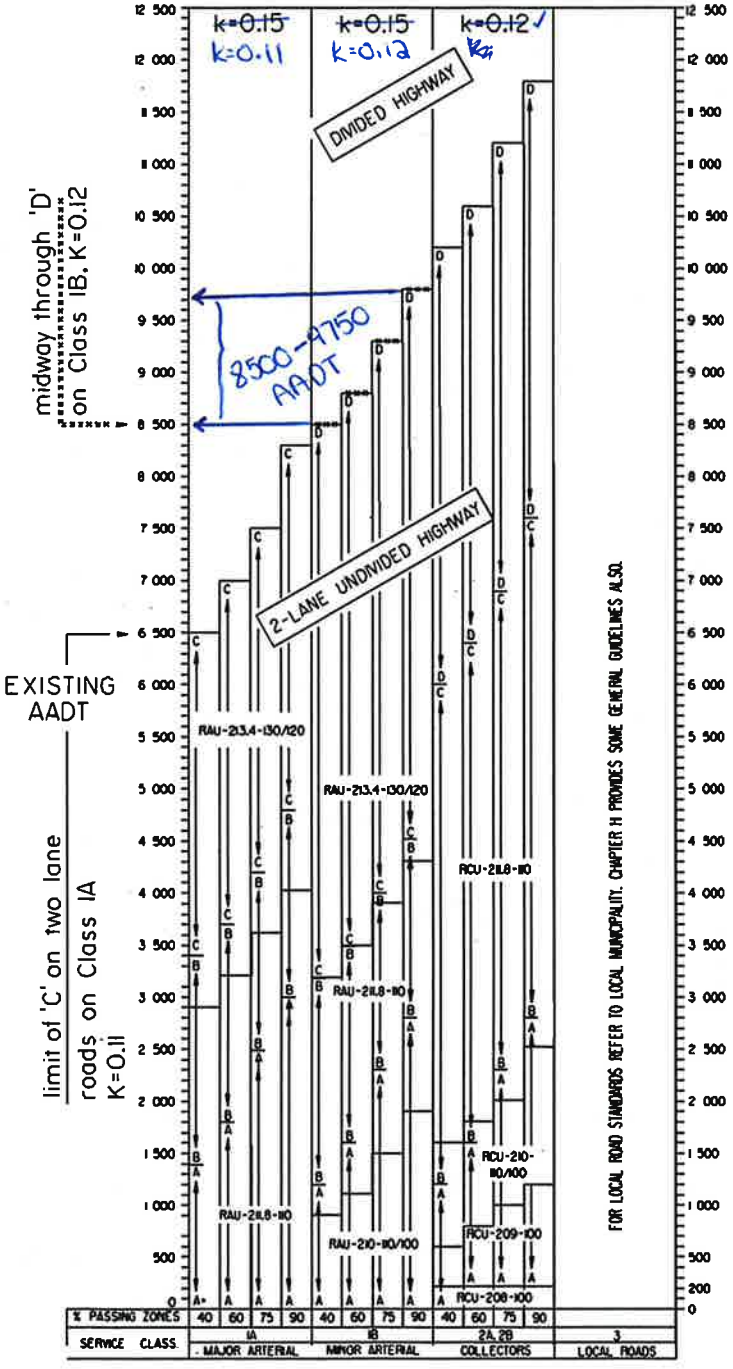
Prepared for:
Pidherney's
Red Deer, Alberta

Stantec
#1100, 4900-50th Street, Red Deer, AB T4N1X7
Ph:(403) 341-3320 Fx:(403) 342-0969

DRAWN BY: SAS
CHECKED BY: GCL
SCALE: 1:5000
PROJECT #: 112849380

February, 2013

FIGURE A-9 GUIDELINES FOR TWINNING BASED ON LEVEL OF SERVICE FOR RURAL HIGHWAYS IN ALBERTA (shown in terms of existing AADT)



limit of 'D' on two lane roads on service class 2A & 2B, K=0.12

NOTES

1. The decision to twin a particular section of highway may be made based on system requirements (for continuity, etc.) or due to an unacceptably low level of service on the two-lane roadway. This chart is based on level-of-service requirements.

2. The twinning volume ranges shown here are based on a minimum tolerable level of service in the design hour for two-lane highways on each service classification. The higher classes have a higher minimum tolerable level-of-service. These are C for service classification IA and midway through D for Class IB and D for Classes 2A and 2B.

3. The ranges are calculated here for level terrain with assumed percentages of passing zones variable from 40 to 90.

4. To convert from design hour volume to AADT, a K value was used.
K=0.11 was used for Class IA and K=0.12 for all other roads except on Classes 2A and 2B where K=0.10 is used for AADT > 8000.

5. The level of service at which a two-lane roadway is operating in the design hour is more relevant than AADT when considered twinning. This chart shows AADT values because these figures are generally more easily available to designers and planners. Where there is a difference between the AADT value showing in the chart and the actual AADT that can be carried on a particular roadway at the designated level of service, the actual AADT should be used. Such differences may occur due to unusual traffic, geometry, or terrain. Designers should always use the actual recorded K value for the highway segment when assessing the need for twinning.

6. A four-lane divided facility is normally used for the divided highway ranges shown on this chart. Additional lanes could be provided when the level-of-service on a divided facility reaches C. The AADT at which this would occur is dependent on many factors including terrain, speed, and traffic type; however the following ranges are suggested:
Less than 31,000 : 4 lane
31,000 - 50,000 : 6 lane
Over 50,000 : 8 or more lanes.

7. For planning and design purposes, projected AADT values should be used to ensure that the designation selected is appropriate for the design life of the facility.

8 The levels of service shown in this chart are based on Level Terrain because it has been found that this assumption yields the most accurate results in Alberta conditions, even on roadways which are in rolling terrain. This is because the factors listed in the Highway Capacity Manual for reduction in service volume at the various levels of service appear to overestimate the effect of rolling terrain on traffic as compared to actual field observations in Canada.

Volume Capacity Ratio in Level Terrain				
Level of Service	% Passing Zones			
	40	60	75	90
A	0.07	0.09	0.12	0.15
B	0.19	0.21	0.24	0.27
C	0.34	0.36	0.39	0.43
D	0.59	0.60	0.62	0.64
E	1.00	1.00	1.00	1.00
F	–	–	–	–

Levels of Service Assumptions

The following assumptions were in the Level of Service calculations.

1. Terrain: Level
2. % Trucks: 15
3. % Bus: 0
4. % R.V.: 4
5. Design Speed: 70 mph (112.6km/h)
6. Peak Hour Factor: 1.0
7. Directional Distribution: 60/40
8. Lane Width: 12 feet (3.66m)
9. Shoulder Width: Variable
10. % No Passing Zones: Variable
11. DHV=0.11 AADT on Service Class IA, DHV=0.12 AADT on all other roads

* This letter indicates the level of service expected in the hour with the 100th highest traffic volume in the year being considered.

7.0 Appendix B – Traffic Data & Calculations

INTERSECTION TREATMENT ANALYSIS WORKSHEET

Project: TES TIA Addendum (112849380)
Date: Febuary 12, 2013
Sheet: 1 of 2

Design Volume:	Eastbound 2017 Total Traffic					Main Road:	Aspelund Road	Design Speed:	110
						Side Road:	Access Road	Existing Treatment:	IV
AM	V_L= 38	V_A= 313	L%= 12%	V_O= 968				Treatment Required:	Type IV, s=15
	ADT_{main}= 3842	ADT_{side}= 5325	ADT_{right}= 258					Treatment Required:	Right Turn Not Req
PM	V_L= 3	V_A= 199	L%= 2%	V_O= 388				Treatment Required:	Type III
	ADT_{main}= 4275	ADT_{side}= 4333	ADT_{right}= 42					Treatment Required:	Right Turn Not Req
Design Volume:	Westbound 2017 Total Traffic					Main Road:	Aspelund Road	Design Speed:	110
						Side Road:	Access Road	Existing Treatment:	IV
AM	V_L= 498	V_A= 968	L%= 51%	V_O= 313				Treatment Required:	Type IV, s=75
	ADT_{main}= 11433	ADT_{side}= 3767	ADT_{right}= 2775					Treatment Required:	Right Turn Req Therefore Type V Req
PM	V_L= 77	V_A= 388	L%= 20%	V_O= 199				Treatment Required:	Type IV, s=10
	ADT_{main}= 10417	ADT_{side}= 3042	ADT_{right}= 442					Treatment Required:	Right Turn Req Therefore Type V Req
Design Volume:	Eastbound 2022 Total Traffic					Main Road:	Aspelund Road	Design Speed:	110
						Side Road:	Access Road	Existing Treatment:	IV
AM	V_L= 78	V_A= 496	L%= 16%	V_O= 1299				Treatment Required:	Type IV, s=15
	ADT_{main}= 5950	ADT_{side}= 5325	ADT_{right}= 258					Treatment Required:	Right Turn Not Req
PM	V_L= 12	V_A= 305	L%= 4%	V_O= 579				Treatment Required:	Type IV, s=0
	ADT_{main}= 6692	ADT_{side}= 4333	ADT_{right}= 42					Treatment Required:	Right Turn Not Req
Design Volume:	Westbound 2022 Total Traffic					Main Road:	Aspelund Road	Design Speed:	110
						Side Road:	Access Road	Existing Treatment:	IV
AM	V_L= 498	V_A= 1299	L%= 38%	V_O= 496				Treatment Required:	Type IV, s>75
	ADT_{main}= 15800	ADT_{side}= 6842	ADT_{right}= 5025					Treatment Required:	Right Turn Req Therefore Type V Req
PM	V_L= 77	V_A= 579	L%= 13%	V_O= 305				Treatment Required:	Type IV, s=15
	ADT_{main}= 14658	ADT_{side}= 5550	ADT_{right}= 767					Treatment Required:	Right Turn Req Therefore Type V Req
Design Volume:	Eastbound 2032 Total Traffic					Main Road:	Aspelund Road	Design Speed:	110
						Side Road:	Access Road	Existing Treatment:	IV
AM	V_L= 78	V_A= 591	L%= 13%	V_O= 1336				Treatment Required:	Type IV, s>40
	ADT_{main}= 7050	ADT_{side}= 5325	ADT_{right}= 258					Treatment Required:	Right Turn Not Req
PM	V_L= 12	V_A= 367	L%= 3%	V_O= 680				Treatment Required:	Type IV, s=0
	ADT_{main}= 8050	ADT_{side}= 4333	ADT_{right}= 42					Treatment Required:	Right Turn Not Req

Stantec

INTERSECTION TREATMENT ANALYSIS WORKSHEET

Project: TES TIA Addendum (112849380)

Date: Febuary 12, 2013

Sheet: 2 of 2

Design Volume:	Westbound 2032 Total Traffic	Main Road:	Aspelund Road	Design Speed:	110
		Side Road:	Access Road	Existing Treatment:	IV

AM	V_L=	498	V_A=	1336	L%=	37%	V_O=	591	Treatment Required:	Type IV, s>75
	ADT_{main}=	16900	ADT_{side}=	6842	ADT_{right}=	5025			Treatment Required:	Right Turn Req Therefore Type V Req
PM	V_L=	77	V_A=	680	L%=	11%	V_O=	367	Treatment Required:	Type IV, s=15
	ADT_{main}=	16017	ADT_{side}=	5550	ADT_{right}=	767			Treatment Required:	Right Turn Req Therefore Type V Req

Design Volume:		Main Road:		Design Speed:	
		Side Road:		Existing Treatment:	

AM	V_L=		V_A=		L%=		V_O=		Treatment Required:	
	ADT_{main}=		ADT_{side}=		ADT_{right}=				Treatment Required:	
PM	V_L=		V_A=		L%=		V_O=		Treatment Required:	
	ADT_{main}=		ADT_{side}=		ADT_{right}=				Treatment Required:	

Design Volume:		Main Road:		Design Speed:	
		Side Road:		Existing Treatment:	

AM	V_L=		V_A=		L%=		V_O=		Treatment Required:	
	ADT_{main}=		ADT_{side}=		ADT_{right}=				Treatment Required:	
PM	V_L=		V_A=		L%=		V_O=		Treatment Required:	
	ADT_{main}=		ADT_{side}=		ADT_{right}=				Treatment Required:	

Design Volume:		Main Road:		Design Speed:	
		Side Road:		Existing Treatment:	

AM	V_L=		V_A=		L%=		V_O=		Treatment Required:	
	ADT_{main}=		ADT_{side}=		ADT_{right}=				Treatment Required:	
PM	V_L=		V_A=		L%=		V_O=		Treatment Required:	
	ADT_{main}=		ADT_{side}=		ADT_{right}=				Treatment Required:	

Design Volume:		Main Road:		Design Speed:	
		Side Road:		Existing Treatment:	

AM	V_L=		V_A=		L%=		V_O=		Treatment Required:	
	ADT_{main}=		ADT_{side}=		ADT_{right}=				Treatment Required:	
PM	V_L=		V_A=		L%=		V_O=		Treatment Required:	
	ADT_{main}=		ADT_{side}=		ADT_{right}=				Treatment Required:	

Aspelund Road / Access Road

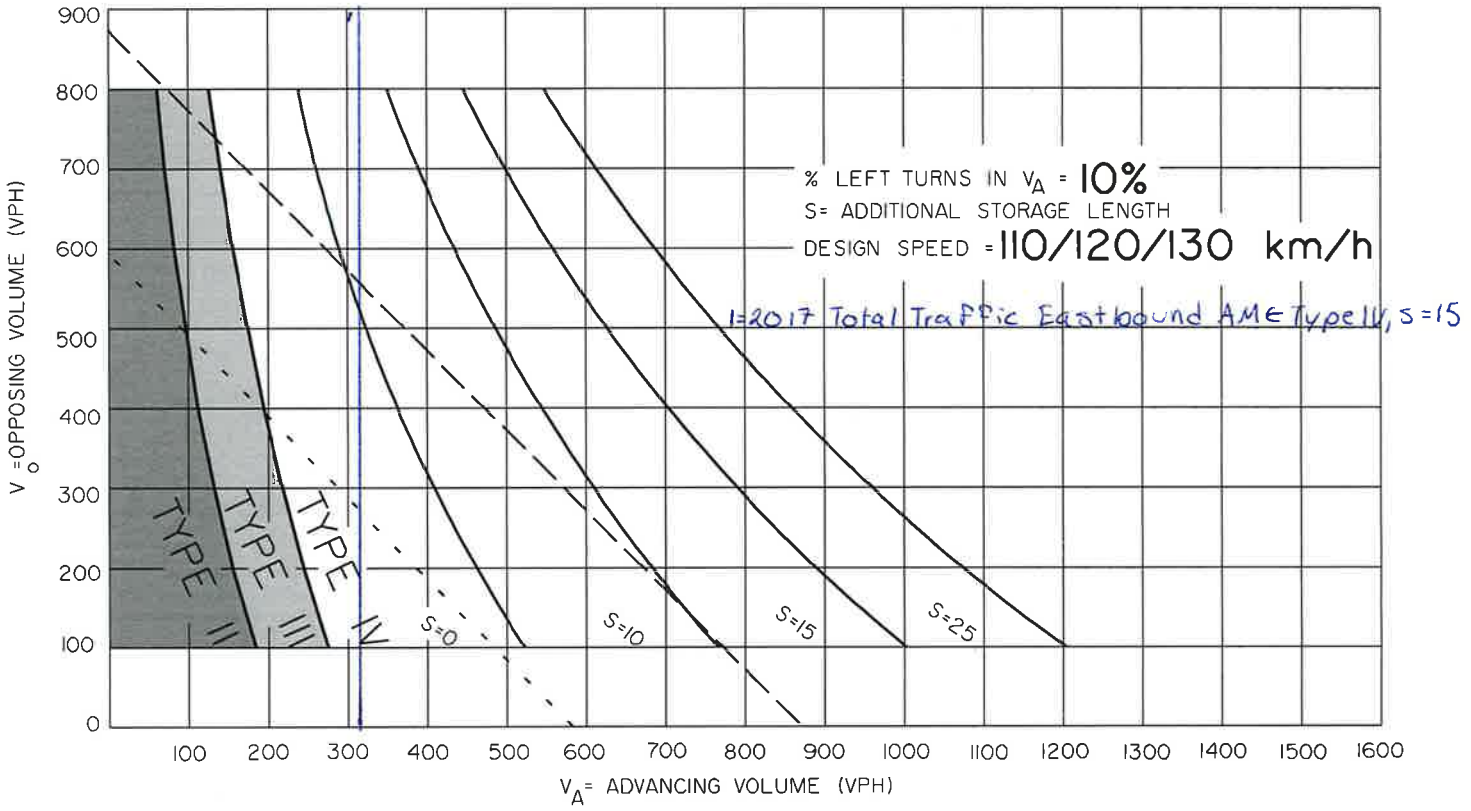
S = Additional storage length required, that is, in addition to what is shown on the appropriate Type IV standard drawing. Designers should check additional storage requirements for trucks, also see Table D.7.6a.

- - - - Traffic signals may be warranted in rural areas, or urban areas, with restricted flow.

—— —— —— Traffic signals may be warranted in "free flow" urban areas.

Notes:

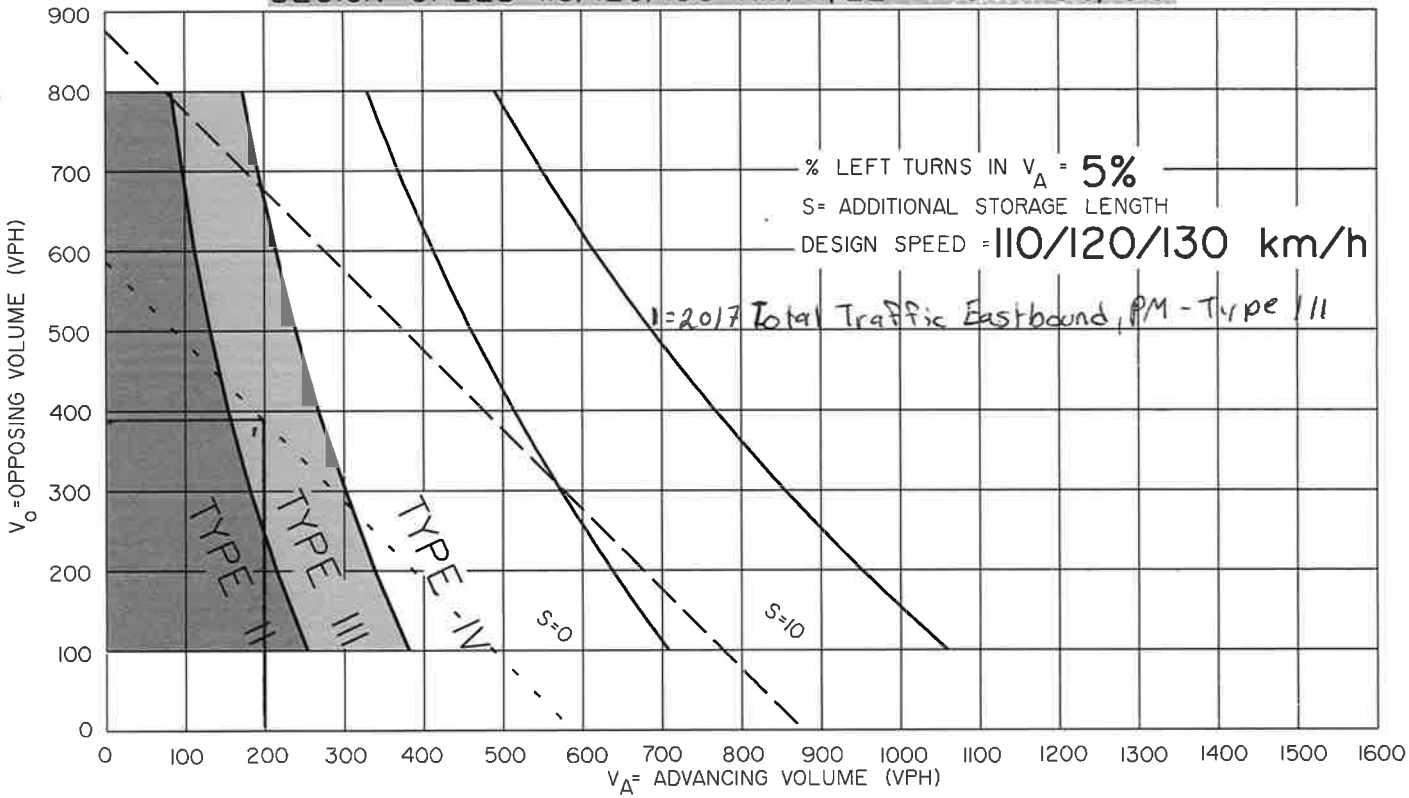
1. The traffic signal warrant lines are provided for reference only. For detailed analysis of the requirements for signals, contact Roadway Engineering Branch.
2. Warrant for Type I treatment is shown in Figure D-7.4.



GRAPHICS FILE: debd767a.man

Aspelund Road / Access Road.

FIGURE D-7.6-7a WARRANTS FOR LEFT TURN LANES AND STORAGE REQUIREMENTS FOR TWO-LANE HIGHWAYS DESIGN SPEED 110/120/130 KM/H, LEFT TURN 5%, 10%



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Aspelund Road / Access Road.

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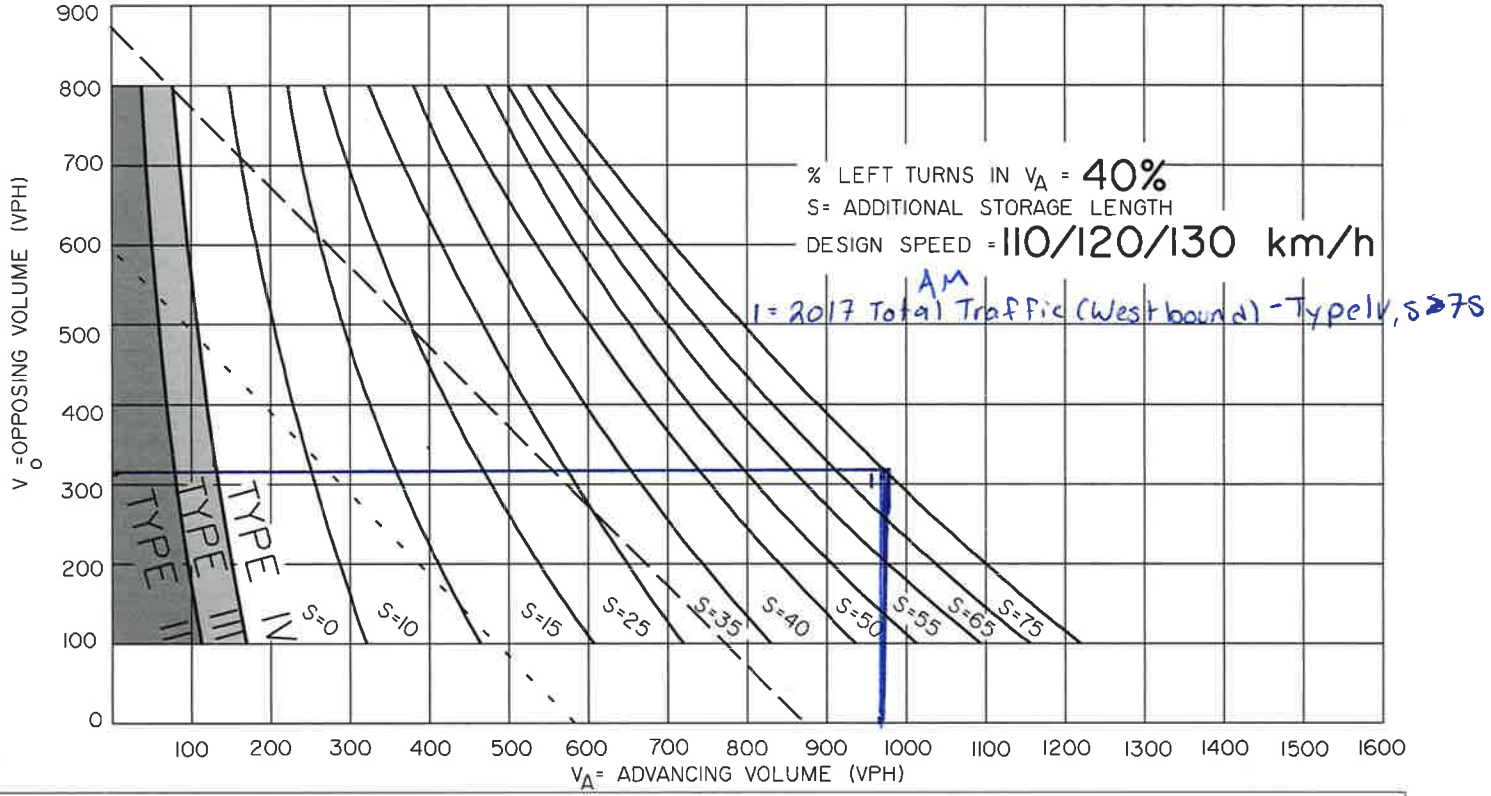

GRAPHICS FILE: debd767a.mgn

Aspelund Road / Access Road

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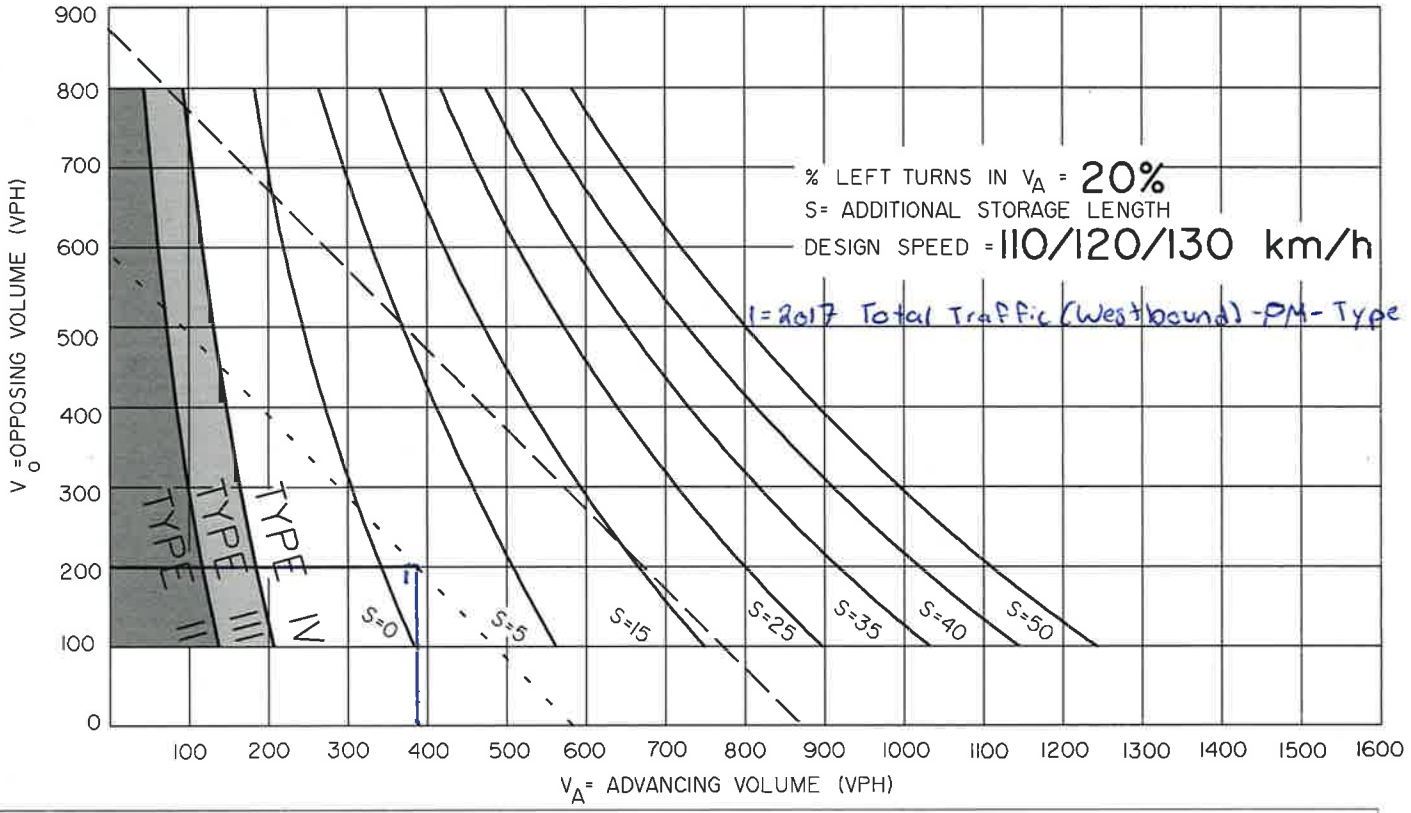
2. Warrant for Type I treatment is shown in Figure D-7.4.

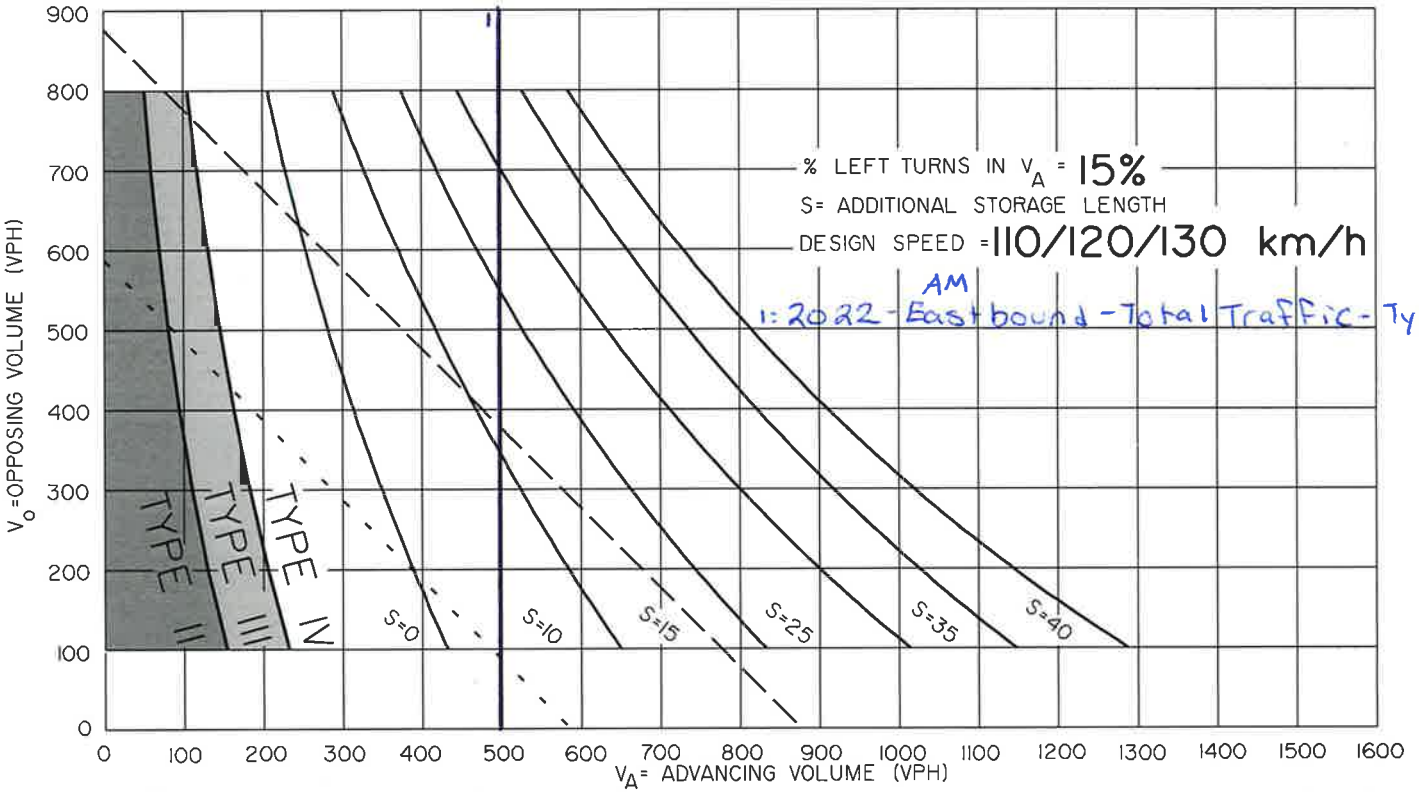


I = 2017 Total Traffic (Westbound) - PM - Type IV, S = S

GRAPHICS FILE: debd767a.man

Aspelund Road / Access Road

FIGURE D-7.6-7b WARRANTS FOR LEFT TURN LANES AND STORAGE REQUIREMENTS FOR TWO-LANE HIGHWAYS DESIGN SPEED 110/120/130 KM/H, LEFT TURN 15%, 20%



S = Additional storage length required, that is, in addition to what is shown on the appropriate Type IV standard drawing. Designers should check additional storage requirements for trucks, also see Table D.7.6a.

- - - - Traffic signals may be warranted in rural areas, or urban areas, with restricted flow.

—— —— —— Traffic signals may be warranted in "free flow" urban areas.

Notes:

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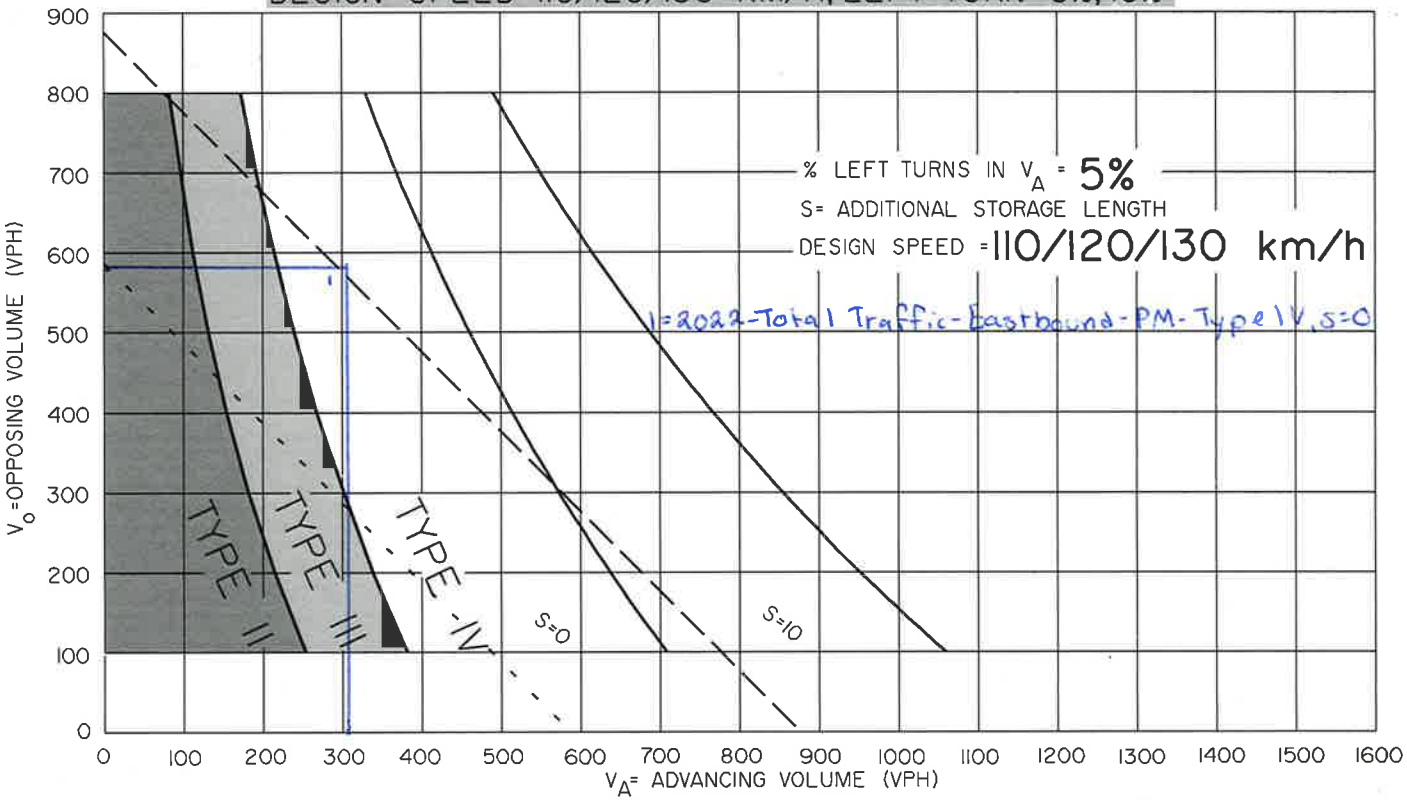
2. Warrant for Type I treatment is shown in Figure D-7.4.

Aspelund Road/Access Road

FIGURE D-7.6-7a WARRANTS FOR LEFT TURN LANES AND STORAGE REQUIREMENTS FOR TWO-LANE HIGHWAYS DESIGN SPEED 110/120/130 KM/H, LEFT TURN 5%, 10%



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Aspelund Road / Access Road

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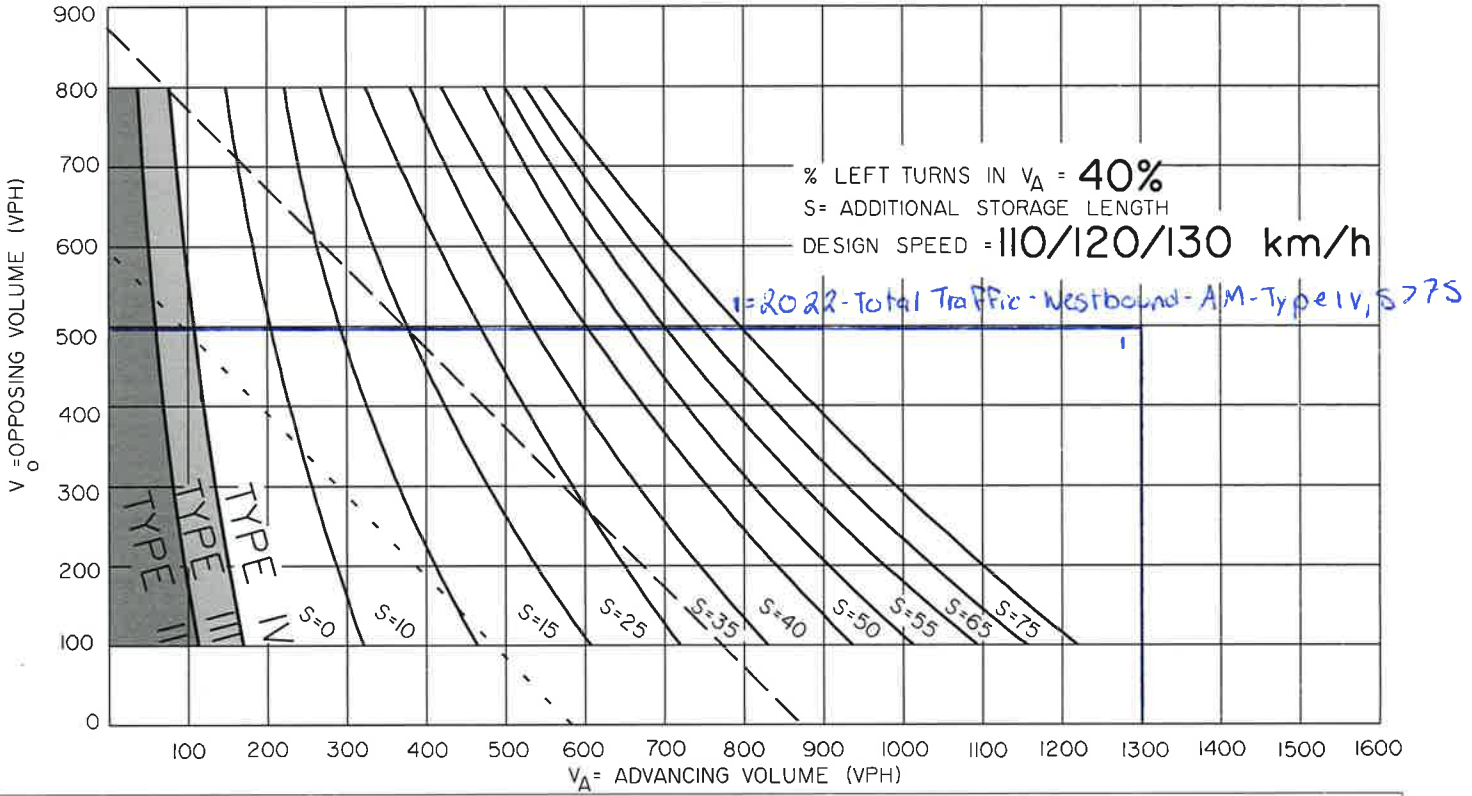
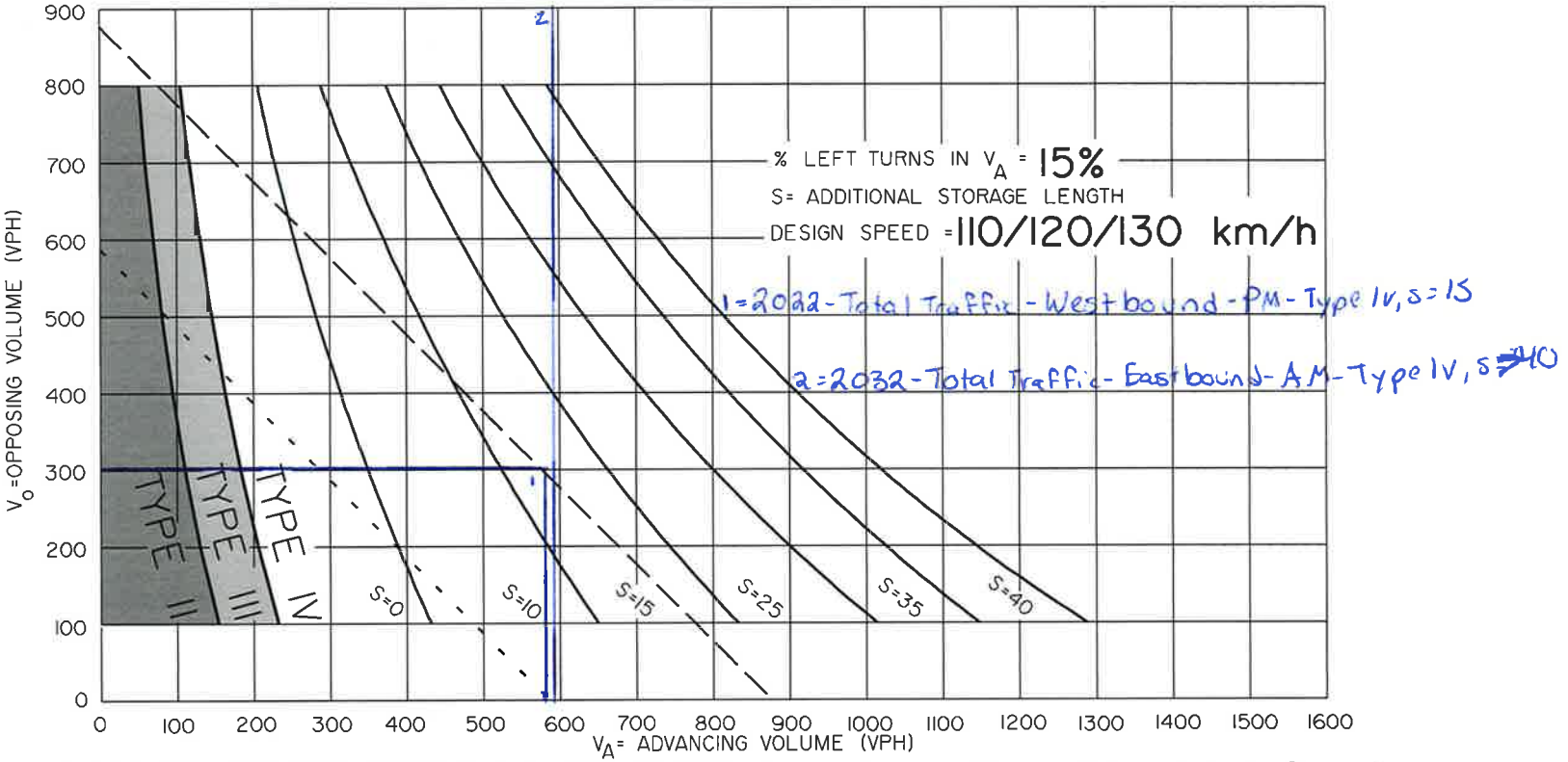


GRAPHICS FILE: debd767a.mgn

Aspelund Road / Access Road

FIGURE D-7.6-7b WARRANTS FOR LEFT TURN LANES AND STORAGE REQUIREMENTS FOR TWO-LANE HIGHWAYS DESIGN SPEED 110/120/130 KM/H, LEFT TURN 15%, 20%



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- - - - Traffic signals may be warranted in rural areas, or urban areas, with restricted flow.

—— —— —— Traffic signals may be warranted in "free flow" urban areas.

Notes:

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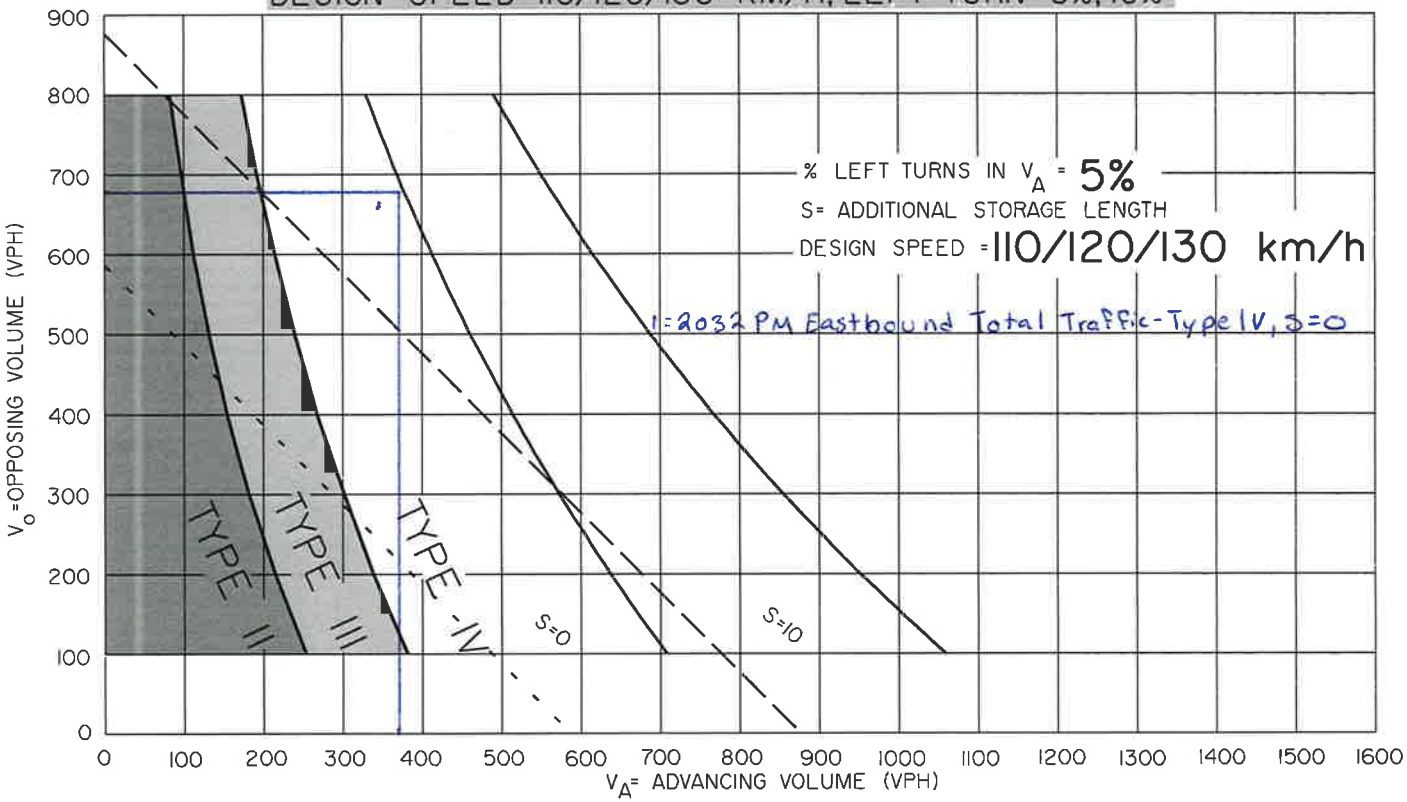
2. Warrant for Type I treatment is shown in Figure D-7.4.

Aspelund Road / Site Access Road

FIGURE D-7.6-7a WARRANTS FOR LEFT TURN LANES AND STORAGE REQUIREMENTS FOR TWO-LANE HIGHWAYS DESIGN SPEED 110/120/130 KM/H, LEFT TURN 5%, 10%



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2. Warrant for Type I treatment is shown in Figure D-7.4.

Aspelund Road / Access Road

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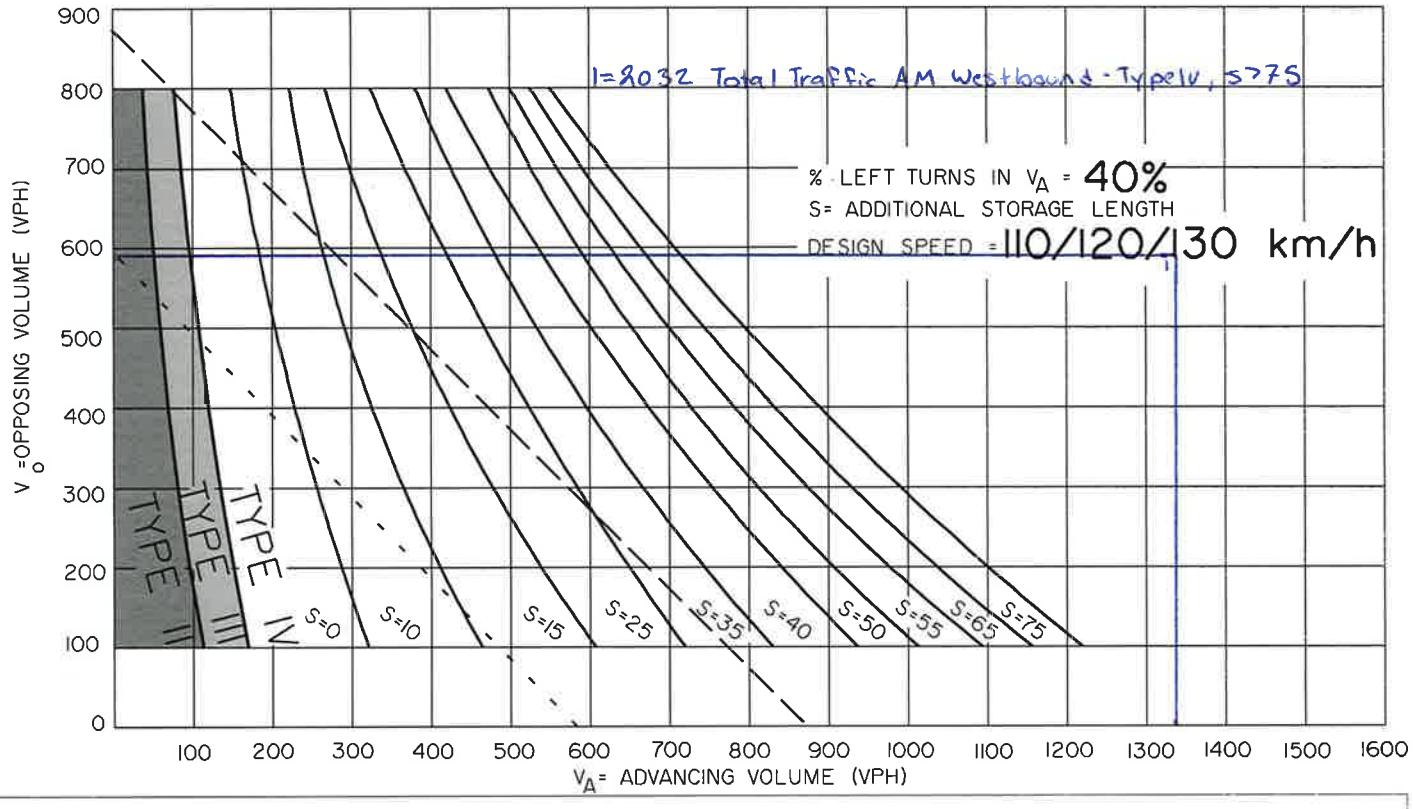

Aspelund Road / Access Road

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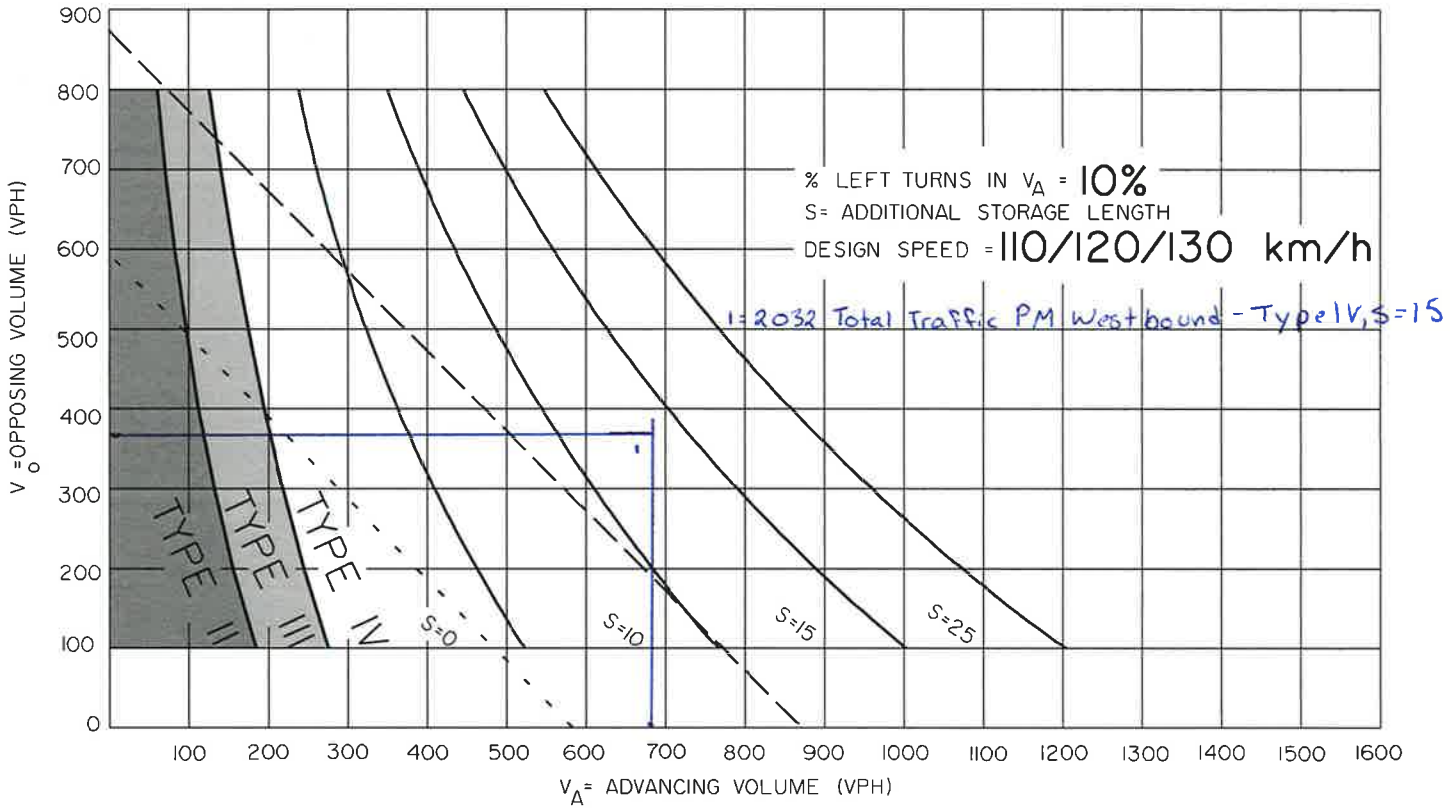


GRAPHICS FILE: debd767a.man

INTERSECTION TREATMENT ANALYSIS WORKSHEET

Project: TES TIA Addendum (112849380)
Date: Febuary 12, 2013
Sheet: 1 of 2

Design Volume:	Eastbound 2017 Total Traffic					Main Road:	Aspelund Road	Design Speed:	110
						Side Road:	RR 274	Existing Treatment:	I
AM	V_L= 28	V_A= 390	L%= 7%	V_O= 148				Treatment Required:	Type IV, s=0
	ADT_{main}= 4208	ADT_{side}= 1017	ADT_{right}= 517					Treatment Required:	Right Turn Req Therefore Type V Req
PM	V_L= 14	V_A= 178	L%= 9%	V_O= 314				Treatment Required:	Type III
	ADT_{main}= 4450	ADT_{side}= 833	ADT_{right}= 83					Treatment Required:	Right Turn Not Req
Design Volume:	Westbound 2017 Total Traffic					Main Road:	Aspelund Road	Design Speed:	110
						Side Road:	RR 274	Existing Treatment:	I
AM	V_L= 31	V_A= 148	L%= 21%	V_O= 390				Treatment Required:	Type IV, s=0
	ADT_{main}= 3842	ADT_{side}= 592	ADT_{right}= 167					Treatment Required:	Right Turn Not Req
PM	V_L= 5	V_A= 314	L%= 2%	V_O= 178				Treatment Required:	Type III
	ADT_{main}= 4275	ADT_{side}= 725	ADT_{right}= 192					Treatment Required:	Right Turn Not Req
Design Volume:	East Bound 2022 Total Traffic					Main Road:	Aspelund Road	Design Speed:	110
						Side Road:	RR 274	Existing Treatment:	I
AM	V_L= 37	V_A= 580	L%= 6%	V_O= 218				Treatment Required:	Type IV, s=0
	ADT_{main}= 6342	ADT_{side}= 1008	ADT_{right}= 516					Treatment Required:	Right Turn Req Therefore Type V Req
PM	V_L= 18	V_A= 282	L%= 6%	V_O= 498				Treatment Required:	Type IV, s=0
	ADT_{main}= 6867	ADT_{side}= 833	ADT_{right}= 83					Treatment Required:	Right Turn Not Req
Design Volume:	Westbound 2022 Total Traffic					Main Road:	Aspelund Road	Design Speed:	110
						Side Road:	RR 274	Existing Treatment:	I
AM	V_L= 31	V_A= 218	L%= 14%	V_O= 580				Treatment Required:	Type IV, s=5
	ADT_{main}= 5950	ADT_{side}= 750	ADT_{right}= 217					Treatment Required:	Right Turn Not Req
PM	V_L= 6	V_A= 498	L%= 1%	V_O= 282				Treatment Required:	Type IV, s=0
	ADT_{main}= 6692	ADT_{side}= 925	ADT_{right}= 242					Treatment Required:	Right Turn Not Req
Design Volume:	Eastbound 2032 Total Traffic					Main Road:	Aspelund Road	Design Speed:	110
						Side Road:	RR 274	Existing Treatment:	I
AM	V_L= 38	V_A= 674	L%= 6%	V_O= 255				Treatment Required:	Type IV, s=10
	ADT_{main}= 7425	ADT_{side}= 1008	ADT_{right}= 517					Treatment Required:	Right Turn Req Therefore Type V Req
PM	V_L= 21	V_A= 344	L%= 6%	V_O= 599				Treatment Required:	Type IV, s=0
	ADT_{main}= 8175	ADT_{side}= 1042	ADT_{right}= 83					Treatment Required:	Right Turn Not Req

Stantec

INTERSECTION TREATMENT ANALYSIS WORKSHEET

Project: TES TIA Addendum (112849380)

Date: Febuary 12, 2013

Sheet: 2 of 2

Design Volume:	Westbound 2032 Total Traffic			Main Road:	Aspelund Road			Design Speed:	110
				Side Road:	RR 274			Existing Treatment:	I
AM	V_L=	31	V_A= 255	L%=	12%	V_O=	674	Treatment Required:	Type IV, s=0
	ADT_{main}=	7050	ADT_{side}= 800	ADT_{right}=	233			Treatment Required:	Right Turn Not Req
PM	V_L=	5	V_A= 599	L%=	1%	V_O=	344	Treatment Required:	Type IV, s=10
	ADT_{main}=	8050	ADT_{side}= 1042	ADT_{right}=	300			Treatment Required:	Right Turn Not Req

Design Volume:				Main Road:				Design Speed:	
				Side Road:				Existing Treatment:	
AM	V_L=		V_A=	L%=		V_O=		Treatment Required:	
	ADT_{main}=		ADT_{side}=	ADT_{right}=				Treatment Required:	
PM	V_L=		V_A=	L%=		V_O=		Treatment Required:	
	ADT_{main}=		ADT_{side}=	ADT_{right}=				Treatment Required:	

Design Volume:				Main Road:				Design Speed:	
				Side Road:				Existing Treatment:	
AM	V_L=		V_A=	L%=		V_O=		Treatment Required:	
	ADT_{main}=		ADT_{side}=	ADT_{right}=				Treatment Required:	
PM	V_L=		V_A=	L%=		V_O=		Treatment Required:	
	ADT_{main}=		ADT_{side}=	ADT_{right}=				Treatment Required:	

Design Volume:				Main Road:				Design Speed:	
				Side Road:				Existing Treatment:	
AM	V_L=		V_A=	L%=		V_O=		Treatment Required:	
	ADT_{main}=		ADT_{side}=	ADT_{right}=				Treatment Required:	
PM	V_L=		V_A=	L%=		V_O=		Treatment Required:	
	ADT_{main}=		ADT_{side}=	ADT_{right}=				Treatment Required:	

Design Volume:				Main Road:				Design Speed:	
				Side Road:				Existing Treatment:	
AM	V_L=		V_A=	L%=		V_O=		Treatment Required:	
	ADT_{main}=		ADT_{side}=	ADT_{right}=				Treatment Required:	
PM	V_L=		V_A=	L%=		V_O=		Treatment Required:	
	ADT_{main}=		ADT_{side}=	ADT_{right}=				Treatment Required:	

Aspelund Road / RR 274

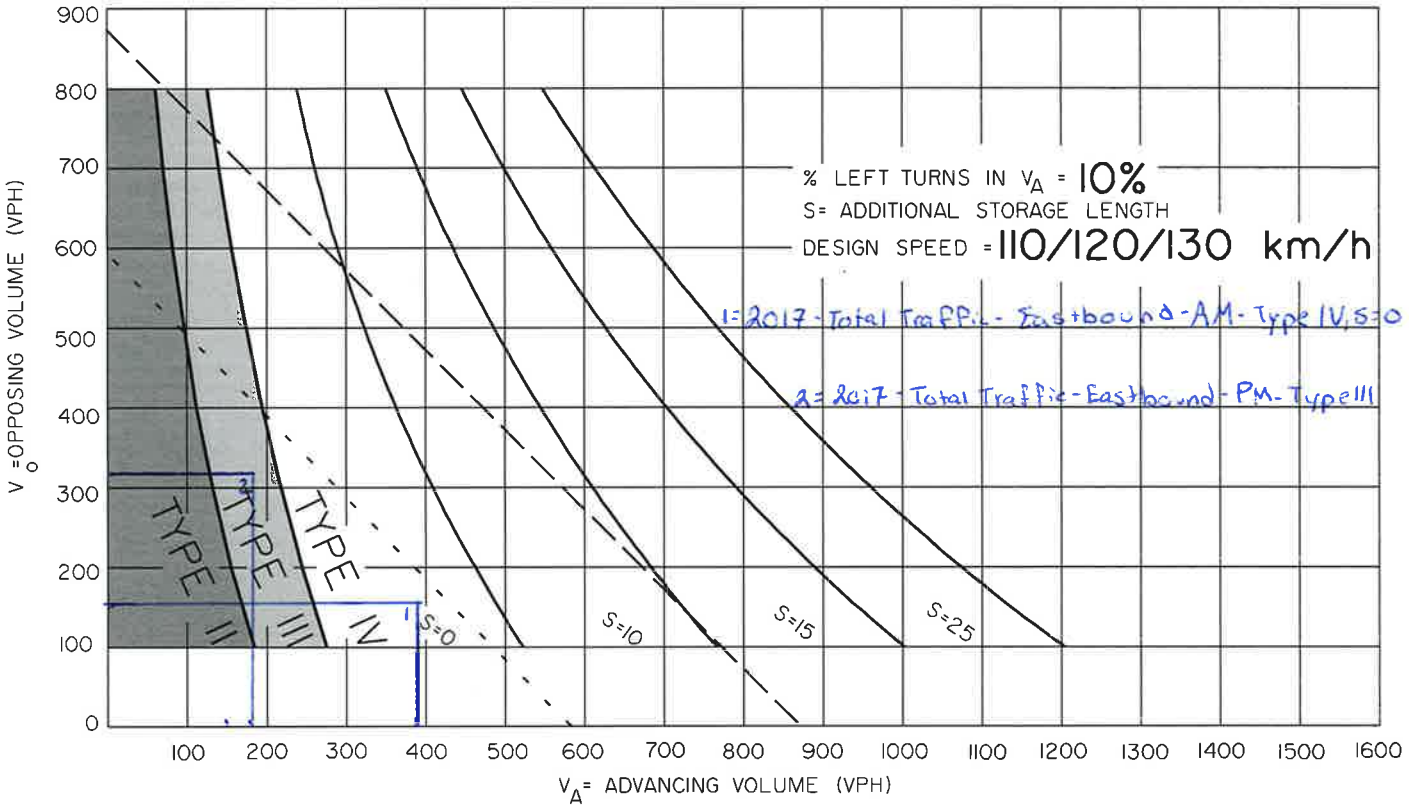
S = Additional storage length required, that is, in addition to what is shown on the appropriate Type IV standard drawing. Designers should check additional storage requirements for trucks, also see Table D.7.6a.

- - - - Traffic signals may be warranted in rural areas, or urban areas, with restricted flow.

—— —— —— Traffic signals may be warranted in "free flow" urban areas.

Notes:

1. The traffic signal warrant lines are provided for reference only. For detailed analysis of the requirements for signals, contact Roadway Engineering Branch.
2. Warrant for Type I treatment is shown in Figure D-7.4.



GRAPHICS FILE: debd767a.man

Aspelund Road / RR 274

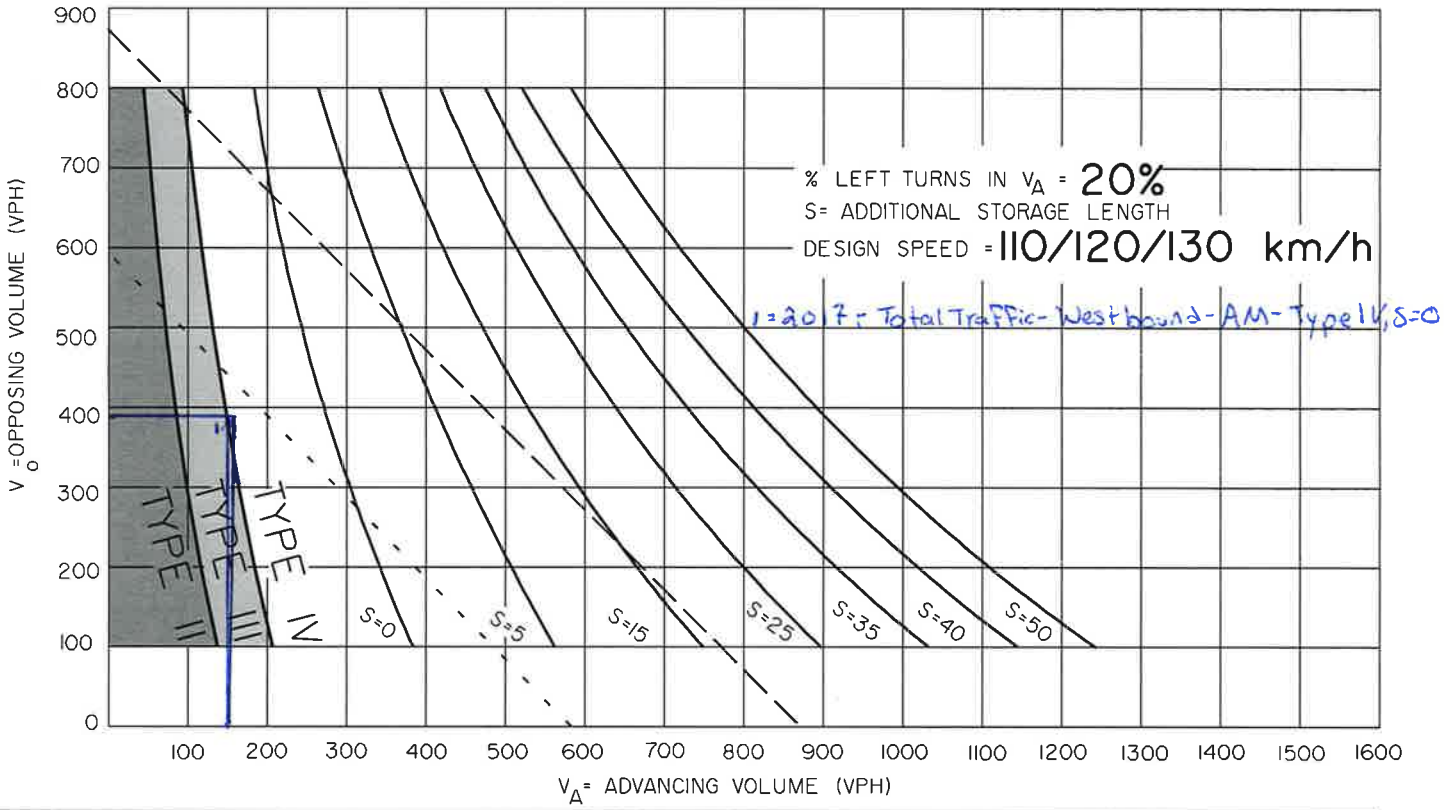
S = Additional storage length required, that is, in addition to what is shown on the appropriate Type IV standard drawing. Designer should check additional storage requirements for trucks, also see Table D.7.6a.

- - - - Traffic signals may be warranted in rural areas, or urban areas, with restricted flow.

— — — Traffic signals may be warranted in "free flow" urban areas.

Notes:

1. The traffic signal warrant lines are provided for reference only. For detailed analysis of the requirements for signals, contact Roadway Engineering Branch.
2. Warrant for Type I treatment is shown in Figure D-7.4.

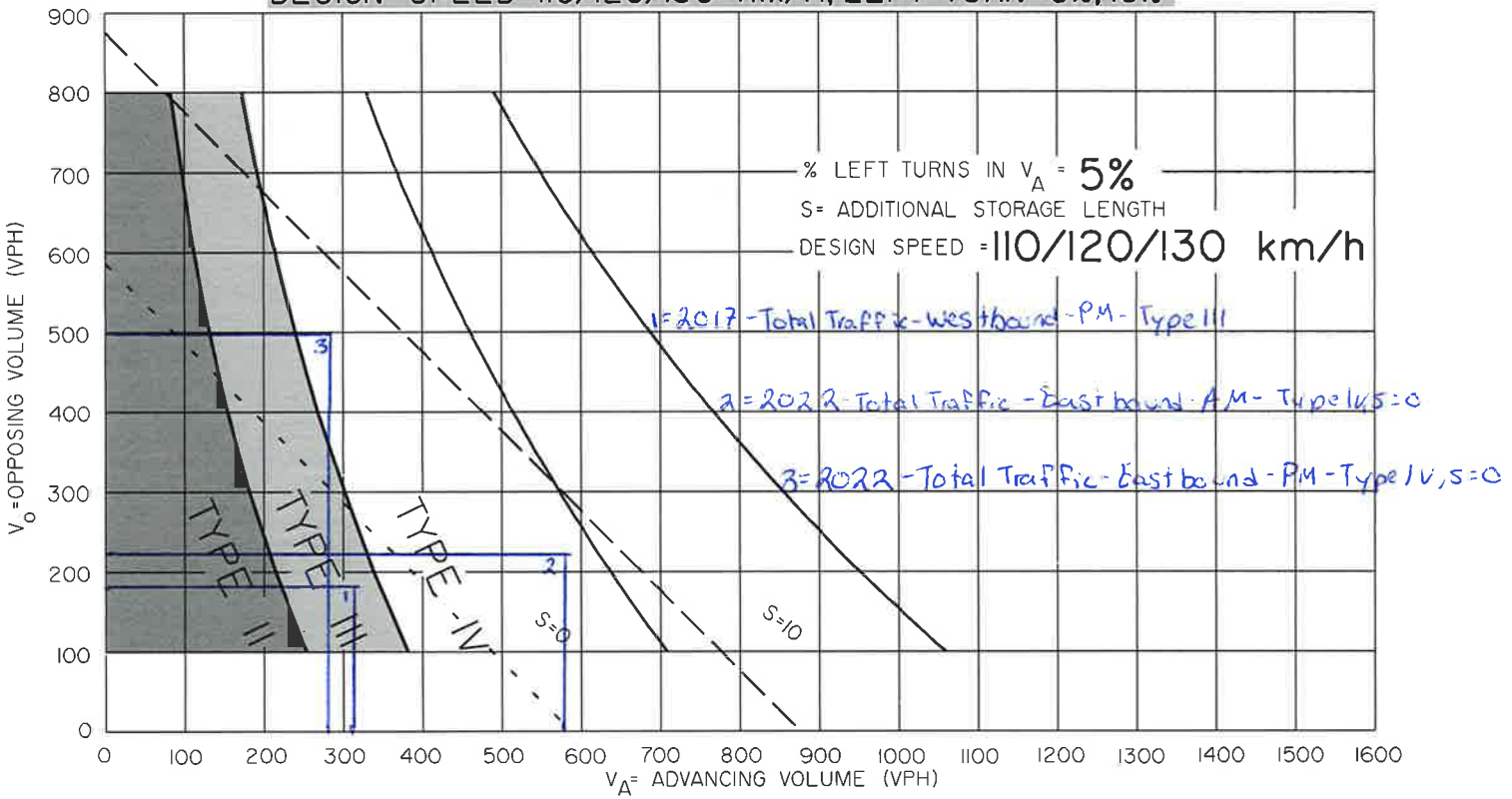


I = 2017 - Total Traffic - Westbound - AM - Type IV, S=0

GRAPHICS FILE: debd767a.man

Aspelund Road / RR 274

FIGURE D-7.6-7a WARRANTS FOR LEFT TURN LANES AND STORAGE REQUIREMENTS FOR TWO-LANE HIGHWAYS DESIGN SPEED 110/120/130 KM/H, LEFT TURN 5%, 10%



S = Additional storage length required, that is, in addition to what is shown on the appropriate Type IV standard drawing. Designers should check additional storage requirements for trucks, also see Table D.7.6a.

- - - - Traffic signals may be warranted in rural areas, or urban areas, with restricted flow.

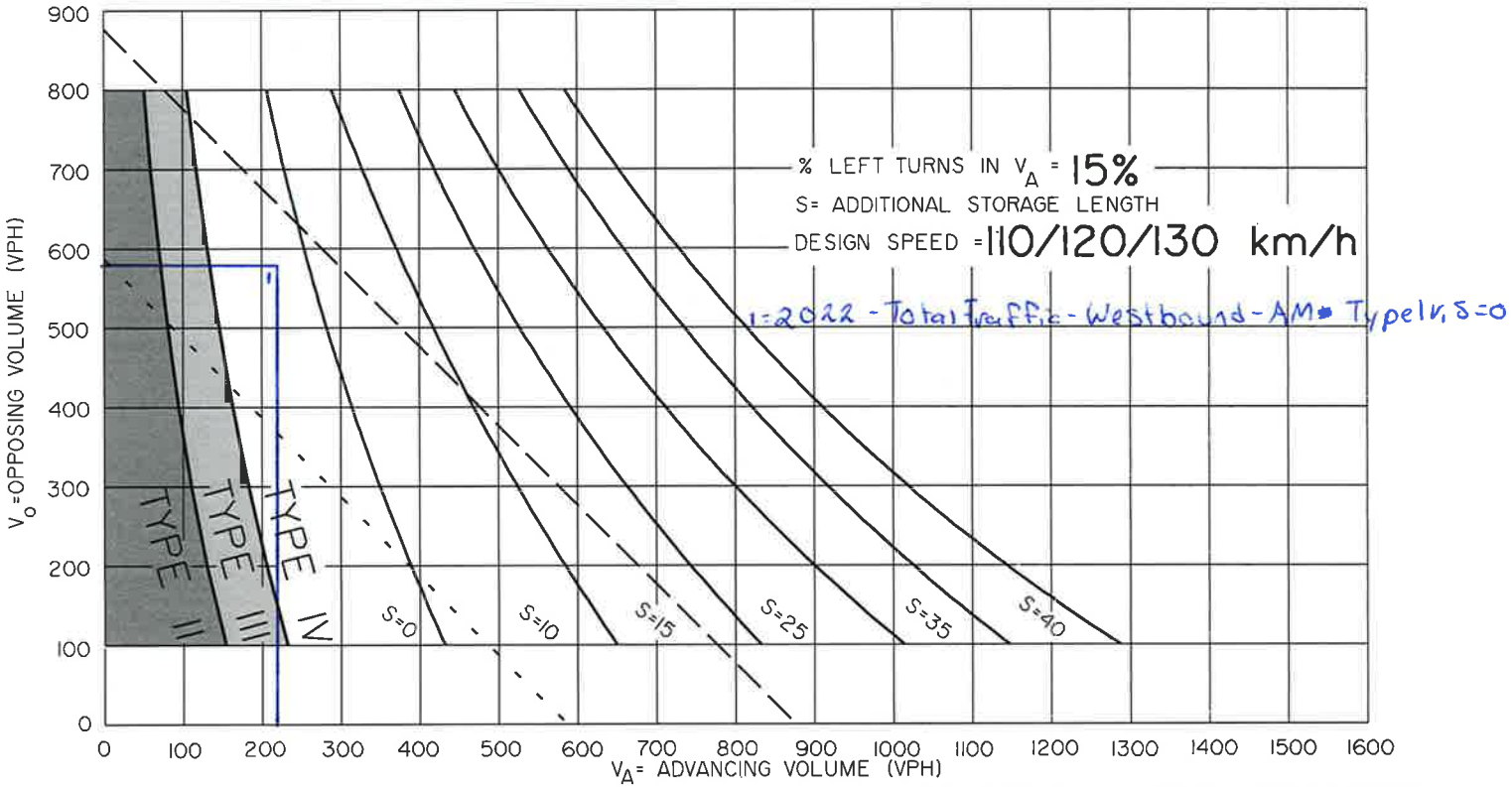
—— —— —— Traffic signals may be warranted in "free flow" urban areas.

Notes:

1. The traffic signal warrant lines are provided for reference only. For detailed analysis of the requirements for signals, contact Roadway Engineering Branch.
2. Warrant for Type I treatment is shown in Figure D-7.4.

Aspelund Road / RR 274

FIGURE D-7.6-7b WARRANTS FOR LEFT TURN LANES AND STORAGE REQUIREMENTS FOR TWO-LANE HIGHWAYS DESIGN SPEED 110/120/130 KM/H, LEFT TURN 15%, 20%



S = Additional storage length required, that is, in addition to what is shown on the appropriate Type IV standard drawing. Designer: should check additional storage requirements for trucks, also see Table D.7.6a.

- - - - Traffic signals may be warranted in rural areas, or urban areas, with restricted flow.

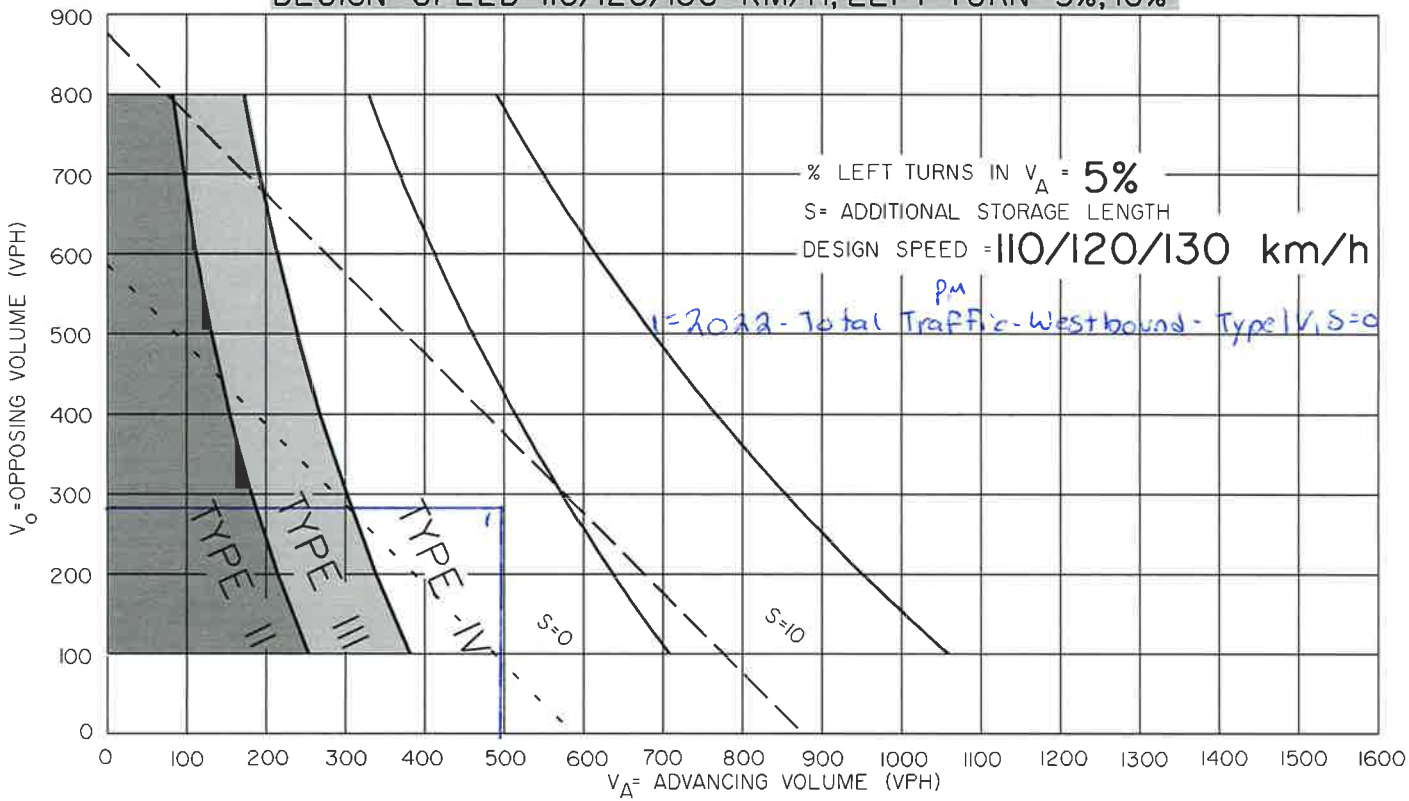
—— —— —— Traffic signals may be warranted in "free flow" urban areas.

Notes:

1. The traffic signal warrant lines are provided for reference only. For detailed analysis of the requirements for signals, contact Roadway Engineering Branch.
2. Warrant for Type I treatment is shown in Figure D-7.4.

Aspelund Road / RR274

FIGURE D-7.6-7a WARRANTS FOR LEFT TURN LANES AND STORAGE REQUIREMENTS FOR TWO-LANE HIGHWAYS DESIGN SPEED 110/120/130 KM/H, LEFT TURN 5%, 10%



S = Additional storage length required, that is, in addition to what is shown on the appropriate Type IV standard drawing. Designers should check additional storage requirements for trucks, also see Table D.7.6a.

- - - - Traffic signals may be warranted in rural areas, or urban areas, with restricted flow.

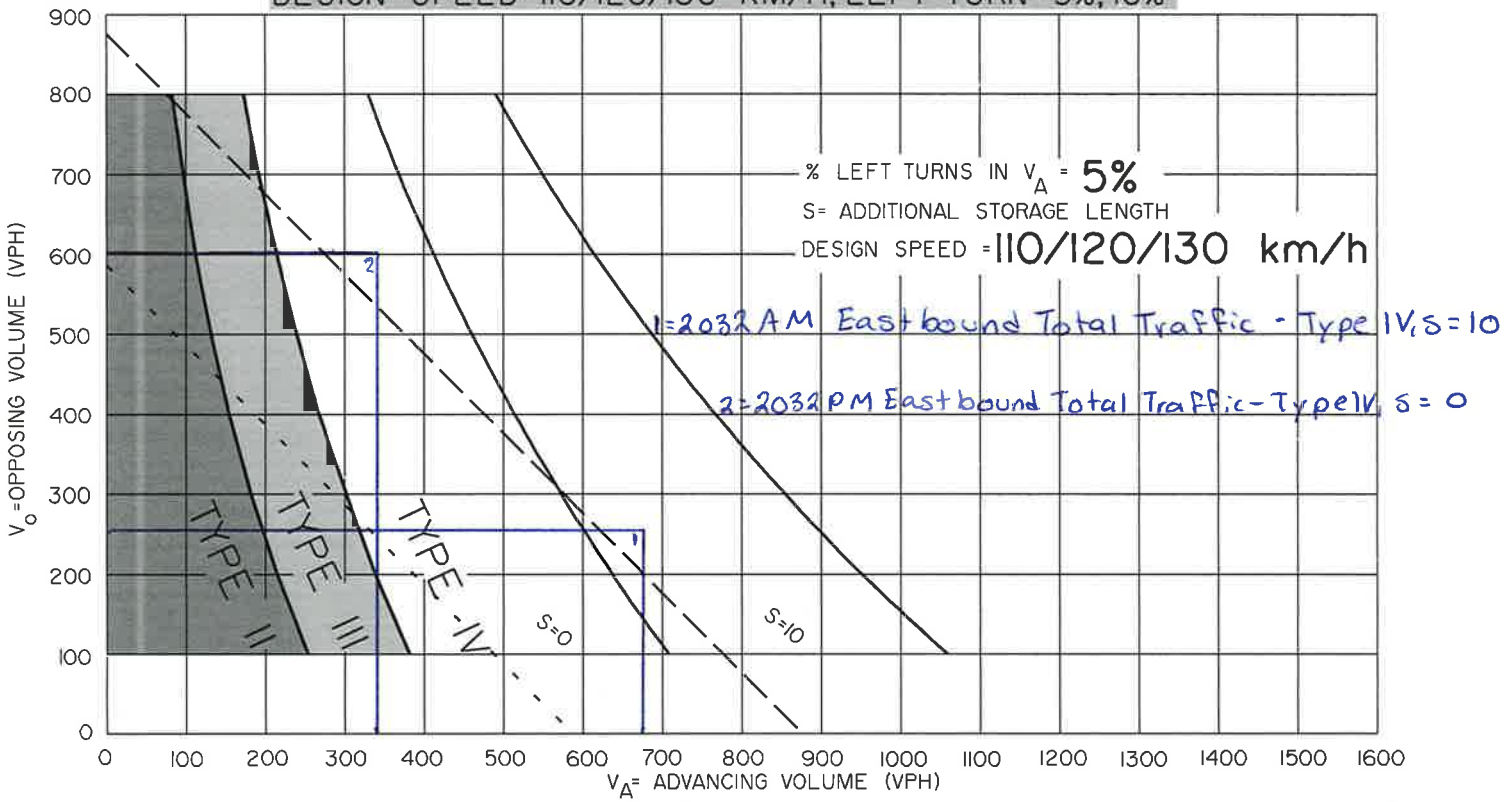
—— —— —— Traffic signals may be warranted in "free flow" urban areas.

Notes:

1. The traffic signal warrant lines are provided for reference only. For detailed analysis of the requirements for signals, contact Roadway Engineering Branch.
2. Warrant for Type I treatment is shown in Figure D-7.4.

Aspelund Road / RR 274

FIGURE D-7.6-7a WARRANTS FOR LEFT TURN LANES AND STORAGE REQUIREMENTS FOR TWO-LANE HIGHWAYS DESIGN SPEED 110/120/130 KM/H, LEFT TURN 5%, 10%



S = Additional storage length required, that is, in addition to what is shown on the appropriate Type IV standard drawing. Designers should check additional storage requirements for trucks, also see Table D.7.6a.

- - - - Traffic signals may be warranted in rural areas, or urban areas, with restricted flow.

—— —— —— Traffic signals may be warranted in "free flow" urban areas.

Notes:

1. The traffic signal warrant lines are provided for reference only. For detailed analysis of the requirements for signals, contact Roadway Engineering Branch.
2. Warrant for Type I treatment is shown in Figure D-7.4.

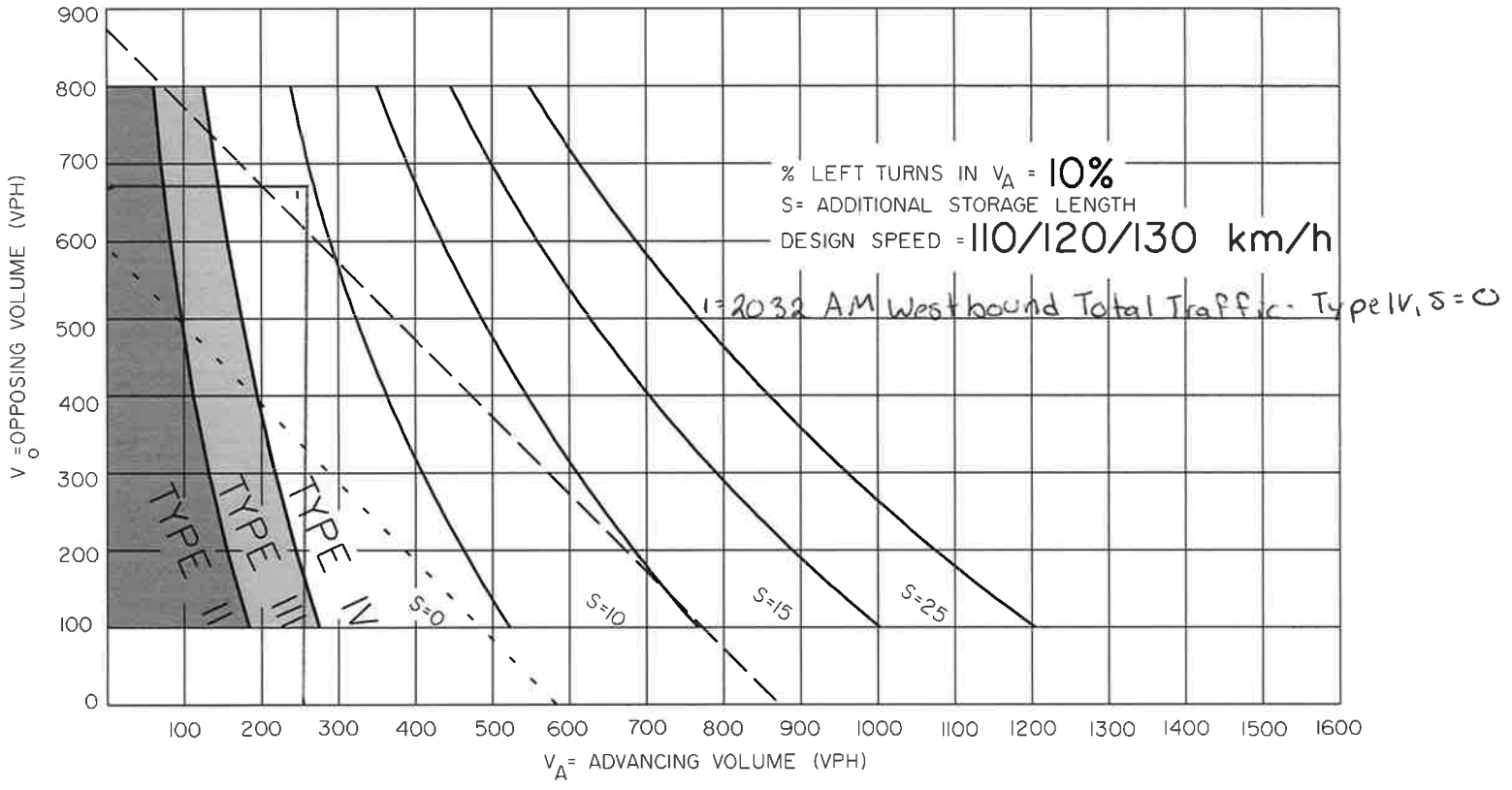
S = Additional storage length required, that is, in addition to what is shown on the appropriate Type IV standard drawing. Designers should check additional storage requirements for trucks, also see Table D.7.6a.

- - - - Traffic signals may be warranted in rural areas, or urban areas, with restricted flow.

—— —— —— Traffic signals may be warranted in "free flow" urban areas.

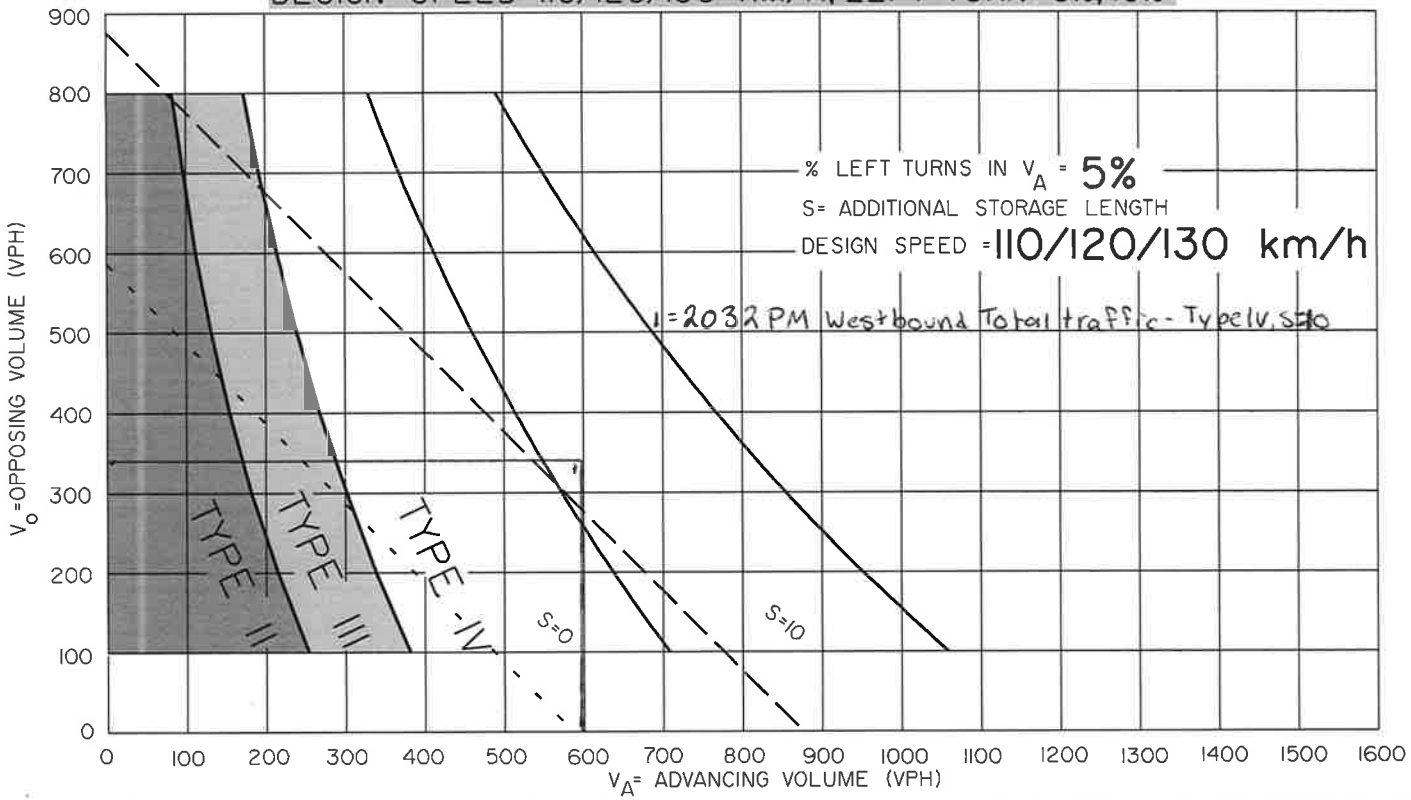
Notes:

1. The traffic signal warrant lines are provided for reference only. For detailed analysis of the requirements for signals, contact Roadway Engineering Branch.
2. Warrant for Type I treatment is shown in Figure D-7.4.



GRAPHICS FILE: debd767a.man

FIGURE D-7.6-7a WARRANTS FOR LEFT TURN LANES AND STORAGE REQUIREMENTS FOR TWO-LANE HIGHWAYS DESIGN SPEED 110/120/130 KM/H, LEFT TURN 5%, 10%



S = Additional storage length required, that is, in addition to what is shown on the appropriate Type IV standard drawing. Designers should check additional storage requirements for trucks, also see Table D.7.6a.

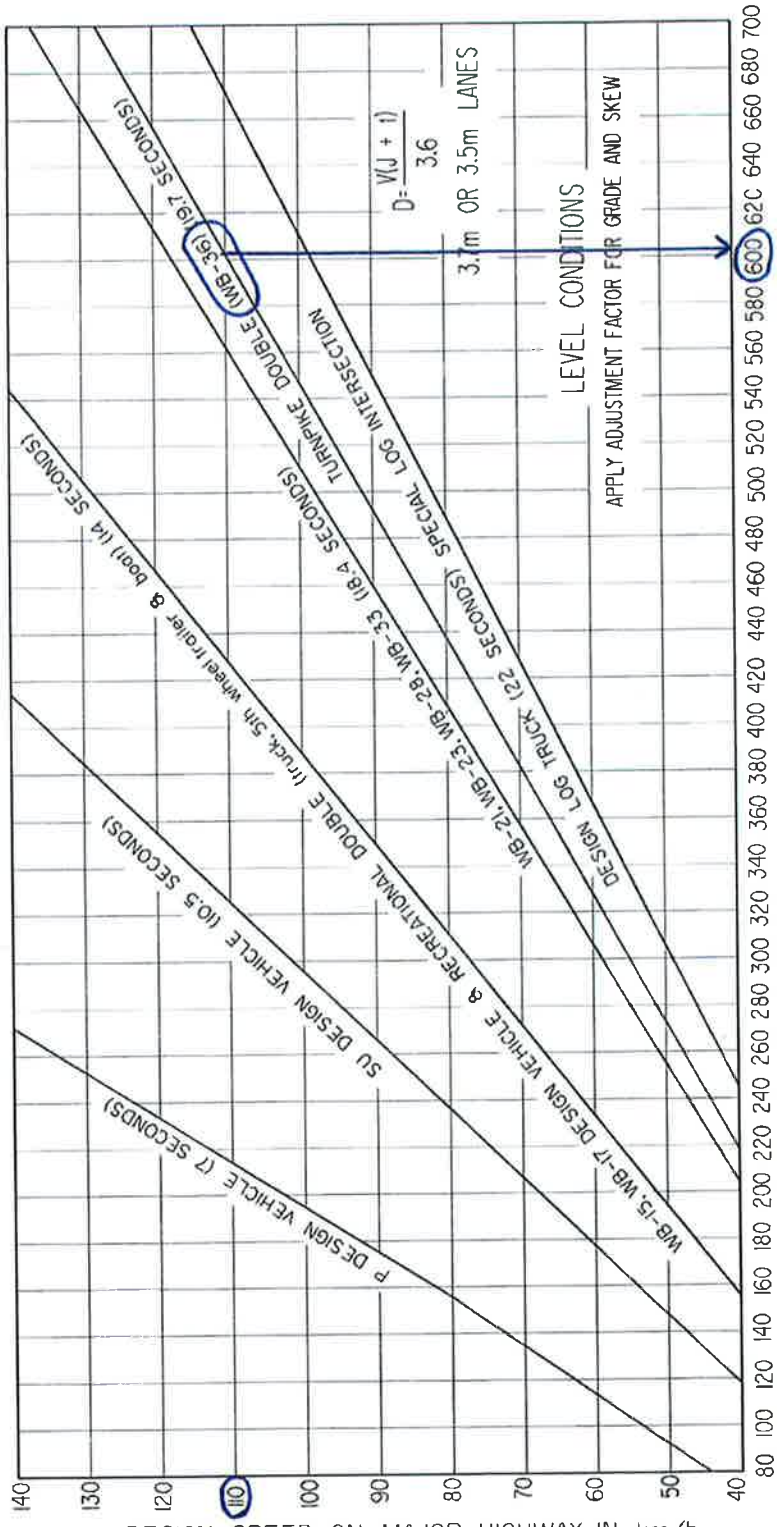
- - - - Traffic signals may be warranted in rural areas, or urban areas, with restricted flow.

—— —— —— Traffic signals may be warranted in "free flow" urban areas.

Notes:

1. The traffic signal warrant lines are provided for reference only. For detailed analysis of the requirements for signals, contact Roadway Engineering Branch.
2. Warrant for Type I treatment is shown in Figure D-7.4.

FIGURE D-4.2.2.2 SIGHT DISTANCES FOR LEFT TURN ONTO HIGHWAY*



⚠ V = DESIGN SPEED ON MAJOR HIGHWAY IN km/h

NOTES:

1. To determine the sight distance requirements at an intersection, the designer should select the longest vehicle or vehicle with the greatest I.S.D. need, that uses the intersection on a regular basis, i.e., daily. Because of the various eye heights, the I.S.D. available for several design vehicles may have to be checked.
2. The usefulness of intersection sight distances in excess of 500m has been debated and will be the subject of future research into gap acceptance by large trucks on rural highways in Alberta. Changes to this table may be made based on that research.

* INTERSECTION SIGHT DISTANCE (I.S.D.)

- THE I.S.D.'s SHOWN IN THIS FIGURE ARE BASED ON THE DISTANCE TRAVELLED AT DESIGN SPEED DURING A CRITICAL TIME (SHOWN ON THE FIGURE IN SECONDS). THE CRITICAL TIME INCLUDES THE TIME TAKEN FOR THE MANOEUVRE (LEFT TURN FROM THE MINOR ROAD) PLUS 2 SECONDS FOR PERCEPTION/REACTION TIME.
- THE INTERSECTION SIGHT DISTANCE AVAILABLE IS TO BE DETERMINED USING AN EYE HEIGHT (BASED ON THE DESIGN VEHICLE) LOCATED AT THE JUNCTION AND AN OBJECT HEIGHT OF 1.3m (REPRESENTING THE ROOF OF A PASSENGER VEHICLE) ON THE THROUGH ALIGNMENT. THE EYE HEIGHTS TO BE USED ARE SHOWN IN FIGURE D-5a.

* THIS CHART IS BASED ON CRITERIA USED BY AASHTO FOR "SIGHT DISTANCE" AT STOP LOCATIONS. THE SET OF CRITERIA IS DESCRIBED AS CASE IIIB IN THE AASHTO PUBLICATION "A POLICY ON GEOMETRIC DESIGN OF HIGHWAYS AND STREETS, 1994"

REVISIONS	No. ⚠	BY		DATE
	No. 1	BY BK	ADDED NOTE	DATE AUG / 99

GRAPHICS FILE: debd4222.man

TES Ind Dev. TIA. Aspelund Rd/RR274 2017 Total Traffic

TABLE 1(A) WARRANT FOR ILLUMINATION OF ISOLATED RURAL INTERSECTIONS: GEOMETRIC FACTORS

Classification Factor	Rating 0	1	2	3	4	Weight		Score (Rating x Weight)
channelization	none	right and/or left turn lanes on minor approach only	right turn lane(s) only on major leg(s)	left turn lane(s) on major leg(s)	left and right turn lanes on all legs	raised and operating speed less than 70 km/h on at least one channelized approach OR	15	40
						raised and operating speed 70 km/h or more on at least one channelized approach OR	20	
						painted only	5	
approach sight distance on the most constrained approach (relative to recommended minimum intersection sight distance)	100% or more	75% - 99%	50% - 74%	25% - 49%	<25%	10		
horizontal curvature (radius) at or immediately before intersection on any leg for posted speed limit of:								
110 km/h	tangent	>1,800m	1,150 to 1,800m	750 to 1,150m	<750m	5		
90 or 100 km/h	tangent	>1,400m	950 to 1,400m	600 to 950m	<600m			
70 or 80 km/h	tangent	>950m	550 to 950m	340 to 550m	<340m			
60 km/h	tangent	>575m	320 to 575m	190 to 320m	<190m			
angle of intersection OR offset intersection	90° angle	80° or 100° angle	--	70° or 110° angle	<70° or >110° OR offset intersection	5		
downhill approach grades at or immediately before intersection on any leg	<3.0%	3.1 to 3.9% and meets design guidelines for type and speed of road	4.0 to 4.9% and meets design guidelines for type and speed of road	5.0 to 7.0% and meets design guidelines for type and speed of road	>7.0% OR exceeds maximum gradient for the type and speed of road	3		
number of legs	--	3	4	5	6 or more	3		6
						SUBTOTAL (Geometric Factors)		46

TES Ind. Dev. TIA. Aspelund Road/RR274, 2017 Total Traffic

TABLE 1(B) WARRANT FOR ILLUMINATION OF ISOLATED RURAL INTERSECTIONS: OPERATIONAL FACTORS

Classification Factor	Rating 0	1	2	3	4	Weight	Score (Rating x Weight)
IF THE INTERSECTION IS SIGNALIZED, ILLUMINATION IS WARRANTED.							
IF THE INTERSECTION IS NOT SIGNALIZED, points should be calculated on the basis of *either* the AADT factor *or* the signalization warrant factor:							
either							
AADT (2-way)[1]:							
on major road and	<1,000	1,000 to 2,000	2,000 to 3,000	3,000 to 5,000	>5,000	10	30+40 = 70
on minor road	<500	500 to 1,000	1,000 to 1,500	1,500 to 2,000	>2,000	20	
or signalization warrant[1]	intersection not signalized and volume-based signal warrant is less than 20% satisfied	intersection not signalized and volume-based warrant is 20% to 40% satisfied	intersection not signalized and volume-based warrant is 40% to 60% satisfied	intersection not signalized and volume-based warrant is 60% to 80% satisfied	intersection not signalized and volume-based warrant is over 80% satisfied	30	
regular night-time hourly pedestrian volume[2]	no pedestrians	up to 10	10 to 30	30 to 50	over 50	10	
intersecting roadway classifications	no primary road involved	primary/rural major, primary/rural minor, or primary/designated community access	primary/secondary	primary/primary	intersection includes divided highway	5	5
operating speed or posted speed limit on major road[3]	50 km/h or less	60 km/h	70 km/h	80 km/h	90 km/h or over	5	20
operating speed or posted speed limit on minor road[3]	50 km/h or less	60 km/h	70 km/h	80 km/h	90 km/h or over	5	15
						SUBTOTAL (Operational Factors)[1]	110

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

TES Ind. Dev. TIA. Aspelund Rd/RR274 2017 Total Traffic

TABLE 1(C) WARRANT FOR ILLUMINATION OF ISOLATED RURAL INTERSECTIONS: ENVIRONMENTAL AND COLLISION FACTORS

Classification Factor	Rating 0	1	2	3	4	Weight		Score (Rating x Weight)
ENVIRONMENTAL FACTOR								
lighted development within 150m radius of intersection	--	in one quadrant	in two quadrants	in three quadrants	in four quadrants	5		10
						SUBTOTAL (Environmental Factors)		10
COLLISION HISTORY								
average annual night-time collision frequency[4] or rate over last 3 years (only collisions potentially attributable to inadequate lighting)	0 collisions per year	1 collision per year	--	2 collisions per year	3 or more per year OR at least 1.5 collisions per million entering vehicles per year *and* an average ratio of all night to day collisions of at least 1.5.	1 or 2 collisions per year	15	0
						3 or more collisions per year OR rate≥1.5 collisions/MEV	30	
						SUBTOTAL (Collision History)		0
						Geometric Factors Subtotal (Table 1(A))		46
						Operational Factors Subtotal (Table 1(B))		110
						Environmental Factors Subtotal (Table 1(C))		10
						Collision History Subtotal (Table 1(C))		0
						TOTAL POINTS		166

NOTE: 4. reported collisions, rounded to nearest whole number

TES Ind. Dev. TIA Aspelund Rd/RR274, 2017 Total Traffic

WARRANTING CONDITIONS	
Total Points ≥ 240	Full illumination warranted
120 ≤ Total Points < 240 166 Not warranted	Partial and/or delineation lighting warranted: • *if Geometric Factors Subtotal ≥ 80 points: partial lighting to illuminate key decision areas, potential conflict points, and/or hazards* • *if Operational Factors Subtotal ≥ 120 points: delineation lighting to illuminate pedestrians or cross street traffic* • *if Collision History Subtotal = 120 points: review collisions to determine appropriate lighting strategy*
Total Points< 120	Lighting not warranted

TES Ind Dev. TIA. Aspelund Rd/RR274 2022 and 2032 Total Traffic Horizons.

TABLE 1(A) WARRANT FOR ILLUMINATION OF ISOLATED RURAL INTERSECTIONS: GEOMETRIC FACTORS

Classification Factor	Rating 0	1	2	3	4	Weight		Score (Rating x Weight)
channelization	none	right and/or left turn lanes on minor approach only	right turn lane(s) only on major leg(s)	left turn lane(s) on major leg(s)	left and right turn lanes on all legs	raised and operating speed less than 70 km/h on at least one channelized approach OR	15	40
						raised and operating speed 70 km/h or more on at least one channelized approach OR	20	
						painted only	5	
approach sight distance on the most constrained approach (relative to recommended minimum intersection sight distance)	100% or more	75% - 99%	50% - 74%	25% - 49%	<25%	10		0
horizontal curvature (radius) at or immediately before intersection on any leg for posted speed limit of:								
110 km/h	tangent	>1,800m	1,150 to 1,800m	750 to 1,150m	<750m	5		0
90 or 100 km/h	tangent	>1,400m	950 to 1,400m	600 to 950m	<600m			
70 or 80 km/h	tangent	>950m	550 to 950m	340 to 550m	<340m			
60 km/h	tangent	>575m	320 to 575m	190 to 320m	<190m			
angle of intersection OR offset intersection	90° angle	80° or 100° angle	–	70° or 110° angle	<70° or >110° OR offset intersection	5		0
downhill approach grades at or immediately before intersection on any leg	<3.0%	3.1 to 3.9% and meets design guidelines for type and speed of road	4.0 to 4.9% and meets design guidelines for type and speed of road	5.0 to 7.0% and meets design guidelines for type and speed of road	>7.0% OR exceeds maximum gradient for the type and speed of road	3		0
number of legs	--	3	4	5	6 or more	3		6
						SUBTOTAL (Geometric Factors)		46

TES Ind Dev. TIA. Aspelund Road/RR274 2022 and 2032 Total Traffic Horizons

TABLE 1(B) WARRANT FOR ILLUMINATION OF ISOLATED RURAL INTERSECTIONS: OPERATIONAL FACTORS

Classification Factor	Rating 0	1	2	3	4	Weight	Score (Rating x Weight)
IF THE INTERSECTION IS SIGNALIZED, ILLUMINATION IS WARRANTED.							
IF THE INTERSECTION IS NOT SIGNALIZED, points should be calculated on the basis of *either* the AADT factor *or* the signalization warrant factor:							
either							
AADT (2-way)[1]:							
on major road and	<1,000	1,000 to 2,000	2,000 to 3,000	3,000 to 5,000	>5,000	10	40 + 40
on minor road	<500	500 to 1,000	1,000 to 1,500	1,500 to 2,000	>2,000	20	= 80
or signalization warrant[1]	intersection not signalized and volume-based signal warrant is less than 20% satisfied	intersection not signalized and volume-based warrant is 20% to 40% satisfied	intersection not signalized and volume-based warrant is 40% to 60% satisfied	intersection not signalized and volume-based warrant is 60% to 80% satisfied	intersection not signalized and volume-based warrant is over 80% satisfied	30	
regular night-time hourly pedestrian volume[2]	no pedestrians	up to 10	10 to 30	30 to 50	over 50	10	
intersecting roadway classifications	no primary road involved	primary/rural major, primary/rural minor, or primary/designated community access	primary/secondary	primary/primary	intersection includes divided highway	5	5
operating speed or posted speed limit on major road[3]	50 km/h or less	60 km/h	70 km/h	80 km/h	90 km/h or over	5	20
operating speed or posted speed limit on minor road[3]	50 km/h or less	60 km/h	70 km/h	80 km/h	90 km/h or over	5	15
						SUBTOTAL (Operational Factors)[1]	120

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

TES Industrial Development TIA. Aspelund Road/RR 274 2022 and 2032 Total Traffic Horizons

TABLE 1(C) WARRANT FOR ILLUMINATION OF ISOLATED RURAL INTERSECTIONS: ENVIRONMENTAL AND COLLISION FACTORS

Classification Factor	Rating 0	1	2	3	4	Weight		Score (Rating x Weight)
ENVIRONMENTAL FACTOR								
lighted development within 150m radius of intersection	--	in one quadrant	in two quadrants	in three quadrants	in four quadrants	5		10
						SUBTOTAL (Environmental Factors)		10
COLLISION HISTORY								
average annual night-time collision frequency[4] or rate over last 3 years (only collisions potentially attributable to inadequate lighting)	0 collisions per year	1 collision per year	--	2 collisions per year	3 or more per year OR at least 1.5 collisions per million entering vehicles per year *and* an average ratio of all night to day collisions of at least 1.5.	1 or 2 collisions per year	15	0
						3 or more collisions per year OR rate≥1.5 collisions/MEV	30	
						SUBTOTAL (Collision History)		
						Geometric Factors Subtotal (Table 1(A))		46
						Operational Factors Subtotal (Table 1(B))		120
						Environmental Factors Subtotal (Table 1(C))		10
						Collision History Subtotal (Table 1(C))		0
						TOTAL POINTS		176

NOTE: 4. reported collisions, rounded to nearest whole number

TES Ind. Dev. TIA Aspelund Road/RR274 2023 and 2032 Total Traffic Horizons

WARRANTING CONDITIONS	
Total Points ≥ 240	Full illumination warranted
120 ≤ Total Points < 240	Partial and/or delineation lighting warranted: • *if Geometric Factors Subtotal ≥ 80 points: partial lighting to illuminate key decision areas, potential conflict points, and/or hazards* • *if Operational Factors Subtotal ≥ 120 points: delineation lighting to illuminate pedestrians or cross street traffic* • *if Collision History Subtotal = 120 points: review collisions to determine appropriate lighting strategy*
Total Points< 120	Lighting not warranted

8.0 Appendix C – Signalization Warrant Analysis

Lacombe County - Traffic Signal Warrant Analysis

Main Street (name)	Aspelund Road	Direction (EW or NS)	EW
Side Street (name)	Site Access Road	Direction (EW or NS)	NS
Quadrant / Int #		Comments	2017 Total Traffic

for Warrant Calculation Results, please hit 'Page Down'

CHECK SHEET

Road Authority:	Lacombe County	
City:	n/a	
Analysis Date:	2013 Feb 15, Fri	
Count Date:	2017 Total Traffic	
Date Entry Format:	(yyyy-mm-dd)	

Lane Configuration		Excl LT	Th & LT	Through	Th+RT+LT	Th & RT	Excl RT	UpStream Signal (m)	# of Thru Lanes
Aspelund Road	WB	1		1			1	5,000	1
Aspelund Road	EB	1				1		5,000	1
Site Access Road	NB				1				
Site Access Road	SB				1				

Are the Site Access Road NB right turns significantly impeded by through movements?	(y/n)	n
Are the Site Access Road SB right turns significantly impeded by through movements?	(y/n)	n

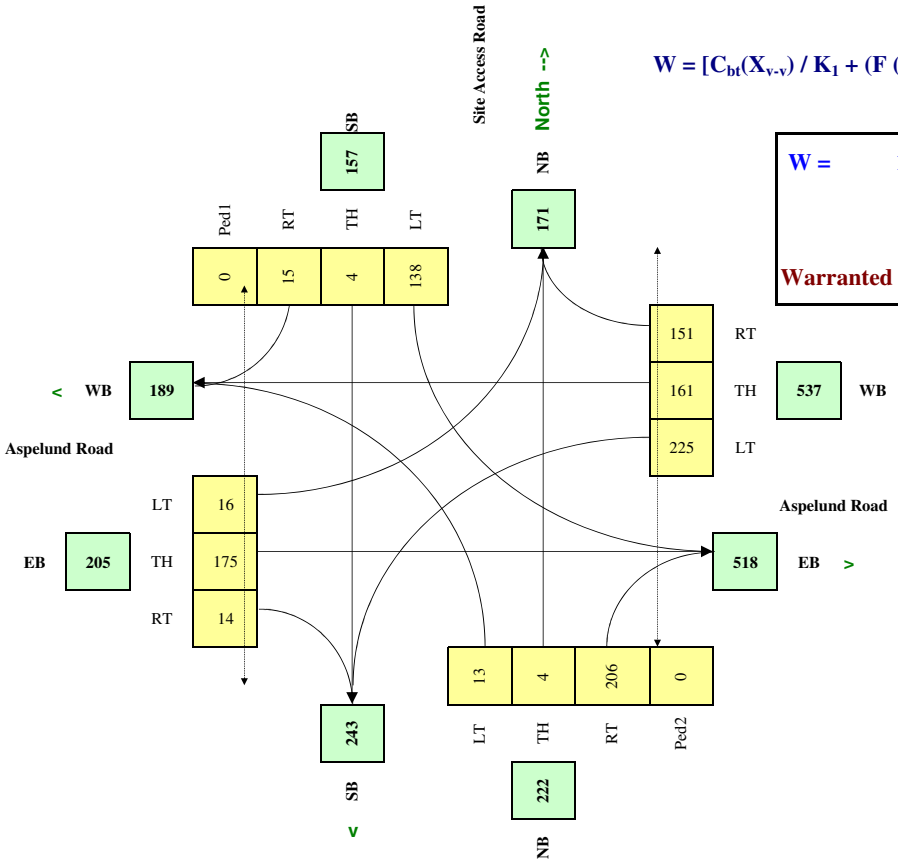
Demographics		
Elem. School/Mobility Challenged	(y/n)	n
Senior's Complex	(y/n)	n
Pathway to School	(y/n)	n
Metro Area Population	(#)	6,500
Central Business District	(y/n)	n

Other input		Speed (Km/h)	Truck %	Bus Rt (y/n)	Median (m)
Aspelund Road	EW	100	12.0%	n	0.0
Site Access Road	NS	50	15.0%	n	0.0

Set Peak Hours

Traffic Input	NB			SB			WB			EB			Ped1 NS	Ped2 NS	Ped3 EW	Ped4 EW
	LT	Th	RT	LT	Th	RT	LT	Th	RT	LT	Th	RT	W Side	E Side	N Side	S Side
press 'Set Peak Hours' Button to set the peak hour periods	4	4	68	48	4	4	359	99	240	27	176	22				
	6	5	94	66	5	5	498	137	333	38	244	31				
	4	3	56	40	3	3	299	82	200	23	146	19				
	15	3	242	161	3	19	46	155	32	2	115	3				
	25	5	403	268	5	31	77	258	53	3	191	5				
	23	5	371	247	5	29	71	237	49	3	176	5				
Total (6-hour peak)	**77**	**24**	**1,234**	**828**	**24**	**90**	**1,349**	**968**	**906**	**96**	**1,047**	**85**	**0**	**0**	**0**	**0**
Average (6-hour peak)	**13**	**4**	**206**	**138**	**4**	**15**	**225**	**161**	**151**	**16**	**175**	**14**	**0**	**0**	**0**	**0**

Average 6-hour Peak Turning Movements



$$W = [C_{bt}(X_{v\text{-}v}) / K_1 + (F\,(X_{v\text{-}p})\,L) / K_2] \times C_i$$

W =	148	148	0
		Veh	*Ped*

Warranted

RESET SHEET

Lacombe County - Traffic Signal Warrant Analysis

Main Street (name)	Aspelund Road	Direction (EW or NS)	EW
Side Street (name)	Site Access Road	Direction (EW or NS)	NS
Quadrant / Int #		Comments	2022 Total Traffic

for Warrant Calculation Results, please hit 'Page Down'

CHECK SHEET

Road Authority:	Lacombe County	
City:	n/a	
Analysis Date:	2013 Feb 06, Wed	
Count Date:	2022 Total Traffic	
Date Entry Format:	(yyyy-mm-dd)	

Lane Configuration		Excl LT	Th & LT	Through	Th+RT+LT	Th & RT	Excl RT	UpStream Signal (m)	# of Thru Lanes
Aspelund Road	WB	1		1			1	5,000	1
Aspelund Road	EB	1		1			1	5,000	1
Site Access Road	NB				1				
Site Access Road	SB				1				

Are the Site Access Road NB right turns significantly impeded by through movements? (y/n) n

Are the Site Access Road SB right turns significantly impeded by through movements? (y/n) n

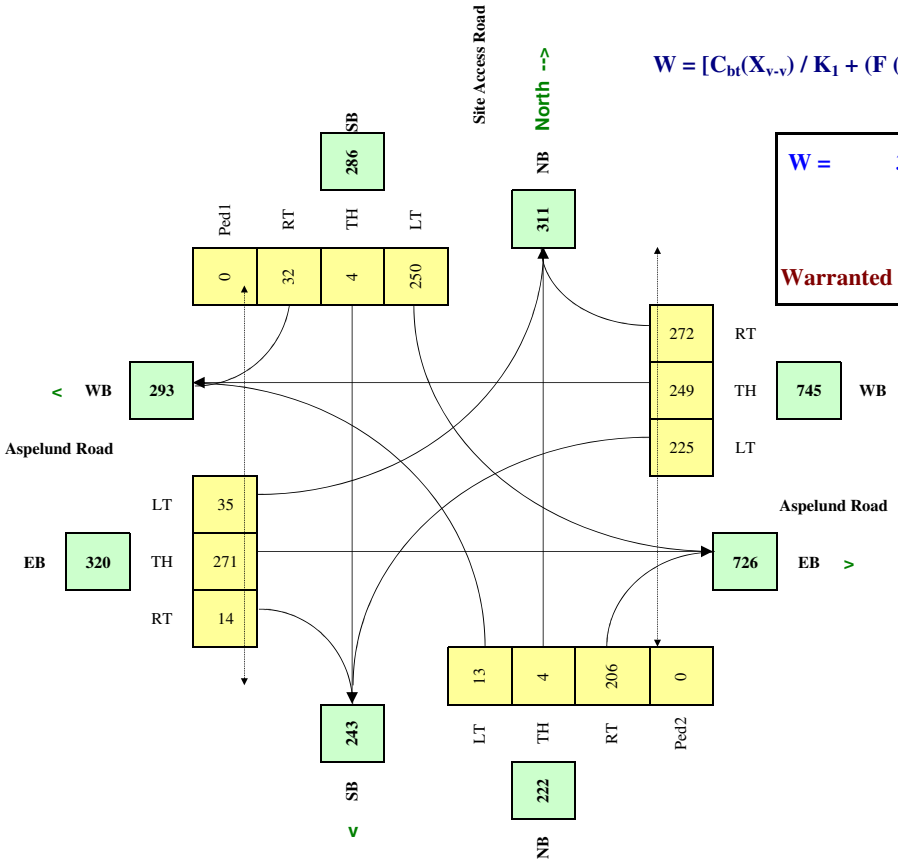
Demographics		
Elem. School/Mobility Challenged	(y/n)	n
Senior's Complex	(y/n)	n
Pathway to School	(y/n)	n
Metro Area Population	(#)	6,500
Central Business District	(y/n)	n

Other input		Speed (Km/h)	Truck %	Bus Rt (y/n)	Median (m)
Aspelund Road	EW	100	12.0%	n	0.0
Site Access Road	NS	50	15.0%	n	0.0

Set Peak Hours

Traffic Input	NB			SB			WB			EB			Ped1 NS	Ped2 NS	Ped3 EW	Ped4 EW
	LT	Th	RT	LT	Th	RT	LT	Th	RT	LT	Th	RT	W Side	E Side	N Side	S Side
press 'Set Peak Hours' Button to set the peak hour periods	4	4	68	84	4	10	359	143	434	56	279	22				
	6	5	94	116	5	14	498	198	603	78	387	31				
	4	3	56	70	3	8	299	119	362	47	232	19				
	15	3	242	293	3	38	46	246	55	7	173	3				
	25	5	403	489	5	63	77	410	92	12	288	5				
	23	5	371	450	5	58	71	377	85	11	265	5				
Total (6-hour peak)	**77**	**24**	**1,234**	**1,501**	**24**	**191**	**1,349**	**1,493**	**1,631**	**211**	**1,624**	**85**	**0**	**0**	**0**	**0**
Average (6-hour peak)	**13**	**4**	**206**	**250**	**4**	**32**	**225**	**249**	**272**	**35**	**271**	**14**	**0**	**0**	**0**	**0**

Average 6-hour Peak Turning Movements



$$W = [C_{bt}(X_{v\text{-}v}) / K_1 + (F\,(X_{v\text{-}p})\,L) / K_2] \times C_i$$

W =	305	305	0
		Veh	*Ped*

Warranted

RESET SHEET

Lacombe County - Traffic Signal Warrant Analysis

Main Street (name)	Aspelund Road	Direction (EW or NS)	EW	Road Authority:	Lacombe County
Side Street (name)	Site Access Road	Direction (EW or NS)	NS	City:	n/a
Quadrant / Int #		Comments	2032 Total Traffic	Analysis Date:	2013 Feb 06, Wed
for Warrant Calculation Results, please hit 'Page Down'	CHECK SHEET			Count Date:	2032 Total Traffic
				Date Entry Format:	(yyyy-mm-dd)

Lane Configuration		Excl LT	Th & LT	Through	Th+RT+LT	Th & RT	Excl RT	UpStream Signal (m)	# of Thru Lanes
Aspelund Road	WB	1		1			1	5,000	1
Aspelund Road	EB	1		1			1	5,000	1
Site Access Road	NB				1				
Site Access Road	SB				1				
Are the Site Access Road NB right turns significantly impeded by through movements? (y/n)							n		
Are the Site Access Road SB right turns significantly impeded by through movements? (y/n)							n		

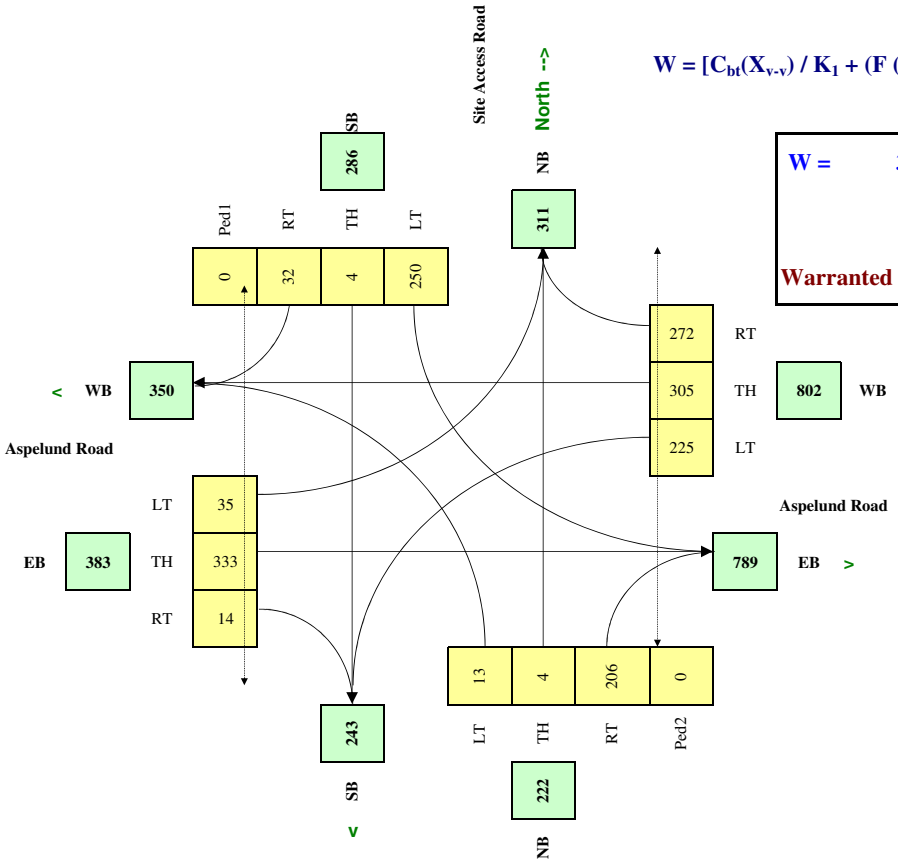
Demographics		
Elem. School/Mobility Challenged	(y/n)	n
Senior's Complex	(y/n)	n
Pathway to School	(y/n)	n
Metro Area Population	(#)	6,500
Central Business District	(y/n)	n

Other input		Speed (Km/h)	Truck %	Bus Rt (y/n)	Median (m)
Aspelund Road	EW	100	12.0%	n	0.0
Site Access Road	NS	50	15.0%	n	0.0

Set Peak Hours

Traffic Input	NB			SB			WB			EB			Ped1 NS	Ped2 NS	Ped3 EW	Ped4 EW
	LT	Th	RT	LT	Th	RT	LT	Th	RT	LT	Th	RT	W Side	E Side	N Side	S Side
press 'Set Peak Hours' Button to set the peak hour periods	4	4	68	84	4	10	359	169	434	56	347	22				
	6	5	94	116	5	14	498	235	603	78	482	31				
	4	3	56	70	3	8	299	141	362	47	289	19				
	15	3	242	293	3	38	46	307	55	7	210	3				
	25	5	403	489	5	63	77	511	92	12	350	5				
	23	5	371	450	5	58	71	470	85	11	322	5				
Total (6-hour peak)	**77**	**24**	**1,234**	**1,501**	**24**	**191**	**1,349**	**1,833**	**1,631**	**211**	**2,000**	**85**	**0**	**0**	**0**	**0**
Average (6-hour peak)	**13**	**4**	**206**	**250**	**4**	**32**	**225**	**305**	**272**	**35**	**333**	**14**	**0**	**0**	**0**	**0**

Average 6-hour Peak Turning Movements



$$W = [C_{bt}(X_{v\text{-}v}) / K_1 + (F\,(X_{v\text{-}p})\,L) / K_2] \times C_i$$

W =	353	353	0
		Veh	*Ped*

Warranted

RESET SHEET

Lacombe County - Traffic Signal Warrant Analysis

Main Street (name)	Aspelund Road	Direction (EW or NS)	EW	Road Authority:	Lacombe County
Side Street (name)	RR 274	Direction (EW or NS)	NS	City:	n/a
Quadrant / Int #		Comments	2032 Total Traffic	Analysis Date:	2013 Feb 06, Wed
for Warrant Calculation Results, please hit 'Page Down'	CHECK SHEET			Count Date:	2032 Total
				Date Entry Format:	(yyyy-mm-dd)

Lane Configuration		Excl LT	Th & LT	Through	Th+RT+LT	Th & RT	Excl RT	UpStream Signal (m)	# of Thru Lanes
Aspelund Road	WB	1				1		525	1
Aspelund Road	EB	1		1			1	5,000	1
RR 274	NB				1				
RR 274	SB				1				

Are the RR 274 NB right turns significantly impeded by through movements? (y/n) n
Are the RR 274 SB right turns significantly impeded by through movements? (y/n) n

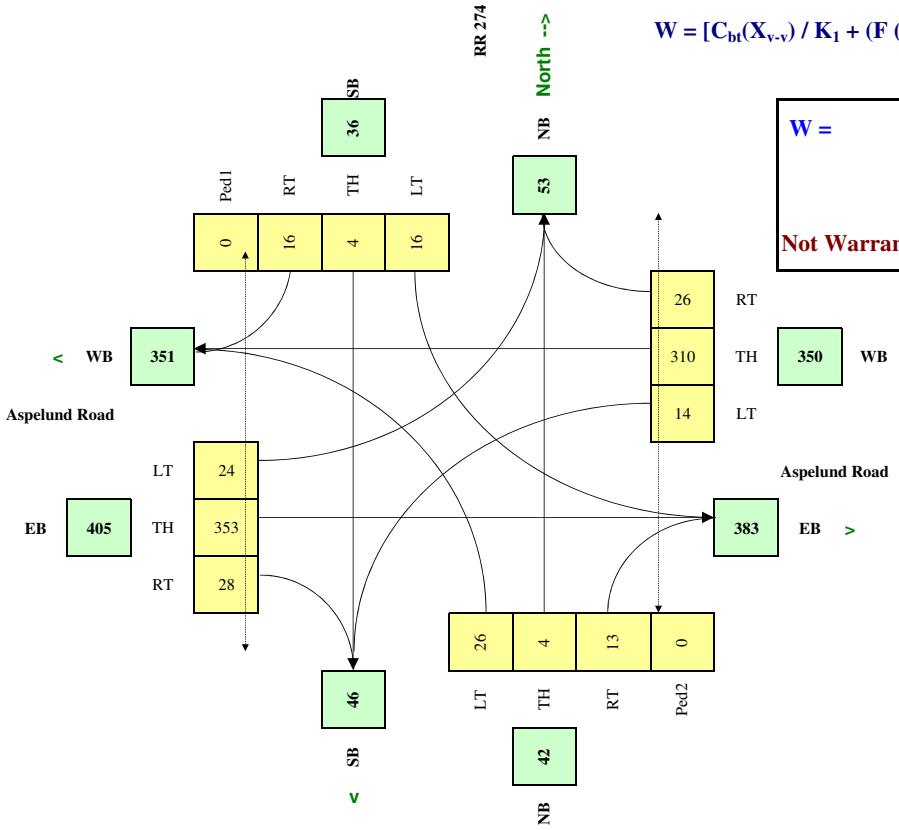
Demographics		
Elem. School/Mobility Challenged	(y/n)	n
Senior's Complex	(y/n)	n
Pathway to School	(y/n)	n
Metro Area Population	(#)	6,500
Central Business District	(y/n)	n

Other input		Speed (Km/h)	Truck %	Bus Rt (y/n)	Median (m)
Aspelund Road	EW	100	12.0%	n	0.0
RR 274	NS	80	5.0%	n	0.0

Set Peak Hours

Traffic Input	NB			SB			WB			EB			Ped1 NS	Ped2 NS	Ped3 EW	Ped4 EW
	LT	Th	RT	LT	Th	RT	LT	Th	RT	LT	Th	RT	W Side	E Side	N Side	S Side
press 'Set Peak Hours' Button to set the peak hour periods	9	4	4	8	4	6	22	141	20	27	413	45				
	12	5	6	11	5	9	31	196	28	38	574	62				
	7	3	4	7	3	5	19	118	17	23	344	37				
	30	3	15	17	3	17	3	335	22	13	188	6				
	50	5	25	29	5	29	5	558	36	21	313	10				
	46	5	23	27	5	27	5	513	33	19	288	9				
Total (6-hour peak)	154	24	77	99	24	94	85	1,861	156	141	2,120	169	0	0	0	0
Average (6-hour peak)	26	4	13	16	4	16	14	310	26	24	353	28	0	0	0	0

Average 6-hour Peak Turning Movements



$$W = [C_{bt}(X_{v\text{-}v}) / K_1 + (F\,(X_{v\text{-}p})\,L) / K_2] \times C_i$$

W =	39	39	0
		Veh	*Ped*

Not Warranted - Vs<75

RESET SHEET

9.0 Appendix D – Synchro Output

Table 4.1 - Intersection Capacity Analysis Summary - 2017														
Intersection Location - Peak Period	**Intersection Movements**												**Intersection Delay (s/veh)**	**Comments**
Description	**EB**			**WB**			**NB**			**SB**				
	L	**T**	**R**	**L**	**T**	**R**	**L**	**T**	**R**	**L**	**T**	**R**		
Aspelund Rd & Access Rd - AM Peak														
Intersection / Lane Characteristics	1	1	SH	2	1	1	SH	1	SH	1	1	SH		**2017 - Total**
Volumes(veh/h)	38	244	31	498	137	333	6	5	94	66	5	5		
Volume/Capacity Ratio (V/C)	0.14	0.67	-	0.73	0.16	0.38	-	0.19	-	0.15	0.02	-	24.5	Signalized
Level of Service (LOS)	C	D	-	D	B	A	-	A	-	C	B	-		Cycle = 90 sec
Queue Length 95th (m)	18.6	73.4	-	69.445	24.9	11.2	-	26.8	-	31.1	10.8	-		
Proposed Storage Bay Length (m)	115.0	-	-	180.0	-	100.0	-	-	-	50.0	-	-		
Aspelund Rd & Access Rd - PM Peak														
Intersection / Lane Characteristics	1	1	SH	2	1	1	SH	1	SH	1	1	SH		**2017 - Total**
Volumes(veh/h)	3	191	5	77	258	53	25	5	403	268	5	31		
Volume/Capacity Ratio (V/C)	0.01	0.52	-	0.33	0.48	0.11	-	0.56	-	0.58	0.04	-	18.7	Signalized
Level of Service (LOS)	C	D	-	C	C	A	-	A	-	B	A	-		Cycle = 90 sec
Queue Length 95th (m)	4.4	57.8	-	23.1	63.9	-	-	63.0	-	50.1	42.1	-		
Propsoed Storage Bay Length (m)	115.0	-	-	180.0	-	-	-	-	-	50.0	-	-		
Aspelund Rd & RR 274 - AM Peak														
Intersection / Lane Characteristics	1	1	1	1	1	SH	SH	1	SH	SH	1	SH		**2017 - Total**
Volumes(veh/h)	28	300	62	31	97	20	12	5	6	7	5	6		
Volume/Capacity Ratio (V/C)	0.02	-	-	0.03	-	-	-	0.05	-	-	0.03	-	1.7	Unsignalized
Level of Service (LOS)	A	-	-	A	-	-	-	B	-	-	B	-		(TWSC)
Queue Length 95th (m)	4.4	-	-	8.6	-	-	-	10.8	-	-	9.6	-		
Proposed Storage Bay Length (m)	100.0	-	100.0	100.0	-	-	-	-	-	-	-	-		
Aspelund Rd & RR 274 - PM Peak														
Intersection / Lane Characteristics	1	1	1	1	1	SH	SH	1	SH	SH	1	SH		**2017 - Total**
Volumes(veh/h)	14	154	10	5	286	23	50	5	25	20	5	20		
Volume/Capacity Ratio (V/C)	0.01	-	-	0.00	-	-	-	0.15	-	-	0.08	-	2.8	Unsignalized
Level of Service (LOS)	A	-	-	A	-	-	-	B	-	-	B	-		(TWSC)
Queue Length 95th (m)	5.0	-	-	2.1	-	-	-	15.1	-	-	14.2	-		
Propsoed Storage Bay Length (m)	100.0	-	100.0	100.0	-	-	-	-	-	-	-	-		

Note:
SH = Shared

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	38	244	31	498	137	333	6	5	94	66	5	5
Lane Util. Factor	1.00	1.00	1.00	0.97	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Frt		0.982				0.850		0.879			0.925	
Flt Protected	0.950			0.950				0.997		0.950		
Satd. Flow (prot)	1587	1692	0	3278	1715	1420	0	1559	0	1587	1594	0
Flt Permitted	0.669			0.950				0.990		0.726		
Satd. Flow (perm)	1118	1692	0	3278	1715	1420	0	1548	0	1213	1594	0
Satd. Flow (RTOR)		7				333		102			5	
Peak Hour Factor	1.00	1.00	0.92	0.92	1.00	1.00	0.92	0.92	0.92	1.00	0.92	1.00
Heavy Vehicles (%)	15%	12%	8%	8%	12%	15%	8%	8%	8%	15%	8%	15%
Adj. Flow (vph)	38	244	34	541	137	333	7	5	102	66	5	5
Shared Lane Traffic (%)												
Lane Group Flow (vph)	38	278	0	541	137	333	0	114	0	66	10	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	0.99	0.99	0.99	0.99	0.99	0.99	0.99	0.99	0.99	0.99	0.99	0.99
Turning Speed (k/h)	24		14	24		14	24		14	24		14
Turn Type	Perm	NA		Prot	NA	Perm	Perm	NA		Perm	NA	
Protected Phases		4		3	8			2			6	
Permitted Phases	4					8	2			6		
Detector Phase	4	4		3	8	8	2	2		6	6	
Switch Phase												
Minimum Initial (s)	20.0	20.0		7.0	20.0	20.0	10.0	10.0		10.0	10.0	
Minimum Split (s)	27.0	27.0		10.0	27.0	27.0	22.0	22.0		22.0	22.0	
Total Split (s)	27.0	27.0		41.0	68.0	68.0	22.0	22.0		22.0	22.0	
Total Split (%)	30.0%	30.0%		45.6%	75.6%	75.6%	24.4%	24.4%		24.4%	24.4%	
Yellow Time (s)	5.0	5.0		3.0	5.0	5.0	4.0	4.0		4.0	4.0	
All-Red Time (s)	2.0	2.0		0.0	2.0	2.0	2.0	2.0		2.0	2.0	
Lost Time Adjust (s)	0.0	0.0		0.0	0.0	0.0		0.0		0.0	0.0	
Total Lost Time (s)	7.0	7.0		3.0	7.0	7.0		6.0		6.0	6.0	
Lead/Lag	Lag	Lag		Lead								
Lead-Lag Optimize?	Yes	Yes		Yes								
Recall Mode	None	None		None	None	None	C-Max	C-Max		C-Max	C-Max	
Act Effct Green (s)	21.7	21.7		20.5	45.2	45.2		31.8		31.8	31.8	
Actuated g/C Ratio	0.24	0.24		0.23	0.50	0.50		0.35		0.35	0.35	
v/c Ratio	0.14	0.67		0.73	0.16	0.38		0.19		0.15	0.02	
Control Delay	27.3	38.7		37.7	11.4	2.3		7.6		24.3	18.4	
Queue Delay	0.0	0.0		0.0	0.0	0.0		0.0		0.0	0.0	
Total Delay	27.3	38.7		37.7	11.4	2.3		7.6		24.3	18.4	
LOS	C	D		D	B	A		A		C	B	
Approach Delay		37.3			22.5			7.6			23.5	
Approach LOS		D			C			A			C	
Queue Length 50th (m)	5.3	43.7		44.7	12.7	0.0		1.3		7.5	0.5	
Queue Length 95th (m)	12.3	64.4		56.8	16.7	9.5		14.1		20.0	4.5	

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Internal Link Dist (m)		499.0			255.1			31.3			46.0	
Turn Bay Length (m)	115.0			180.0		100.0				50.0		
Base Capacity (vph)	269	413		1384	1162	1069		613		428	566	
Starvation Cap Reductn	0	0		0	0	0		0		0	0	
Spillback Cap Reductn	0	0		0	0	0		0		0	0	
Storage Cap Reductn	0	0		0	0	0		0		0	0	
Reduced v/c Ratio	0.14	0.67		0.39	0.12	0.31		0.19		0.15	0.02	

Intersection Summary	
Cycle Length: 90	
Actuated Cycle Length: 90	
Offset: 0 (0%), Referenced to phase 2:NBTL and 6:SBTL, Start of Green	
Natural Cycle: 60	
Control Type: Actuated-Coordinated	
Maximum v/c Ratio: 0.73	
Intersection Signal Delay: 24.5	Intersection LOS: C
Intersection Capacity Utilization 62.3%	ICU Level of Service B
Analysis Period (min) 15	

Splits and Phases: 1: Aspelund Rd & Site Access Rd

Intersection	
Intersection Delay, s/veh	1.7

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Vol, veh/h	28	300	62	31	97	20	12	5	6	7	5	6
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Free	Free	Stop	Stop	Stop	Stop	Stop	Stop
RT Channelized	Yield	Yield	Yield	None	None	None	None	None	None	None	None	None
Storage Length	100.0		100.0	100.0		0.0	0.0		0.0	0.0		0.0
Median Width		3.7			3.7			0.0			0.0	
Grade, %		0%			0%			0%			0%	
Peak Hour Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Heavy Vehicles, %	5	12	5	5	12	5	5	5	5	5	5	5
Mvmt Flow	28	300	62	31	97	20	12	5	6	7	5	6
Number of Lanes	1	1	1	1	1	0	0	1	0	0	1	0

Major/Minor	Major 1			Major 2			Minor 1			Minor 2		
Conflicting Flow All	117	0	0	300	0	0	531	535	300	531	525	107
Stage 1	-	-	-	-	-	-	356	356	-	169	169	-
Stage 2	-	-	-	-	-	-	175	179	-	362	356	-
Follow-up Headway	2.245	-	-	2.245	-	-	3.545	4.045	3.345	3.545	4.045	3.345
Pot Capacity-1 Maneuver	1453	-	-	1244	-	-	454	447	733	454	453	939
Stage 1	-	-	-	-	-	-	655	624	-	826	753	-
Stage 2	-	-	-	-	-	-	820	746	-	650	624	-
Time blocked-Platoon, %	0	-	-	0	-	-	0	0	0	0	0	0
Mov Capacity-1 Maneuver	1453	-	-	1244	-	-	432	427	733	431	433	939
Mov Capacity-2 Maneuver	-	-	-	-	-	-	432	427	-	431	433	-
Stage 1	-	-	-	-	-	-	642	612	-	810	734	-
Stage 2	-	-	-	-	-	-	789	727	-	627	612	-

Approach	EB	WB	NB	SB
HCM Control Delay, s	0.5	1.7	12.8	12.1
HCM LOS	-	-	B	B

Minor Lane / Major Mvmt	NBLn1	EBL	EBT	EBR	WBL	WBT	WBR	SBLn1
Cap, veh/h	482	1453	-	-	1244	-	-	527
HCM Control Delay, s	12.8	7.526	-	-	7.968	-	-	12.1
HCM Lane V/C Ratio	0.05	0.02	-	-	0.03	-	-	0.03
HCM Lane LOS	B	A	-	-	A	-	-	B
HCM 95th-tile Q, veh	0.1	0.1	-	-	0.1	-	-	0.1

Notes

~ : Volume Exceeds Capacity; $: Delay Exceeds 300 Seconds; Error : Computation Not Defined

Intersection: 1: Aspelund Rd & Site Access Rd

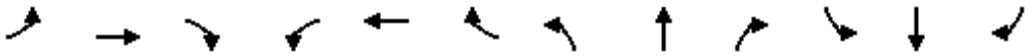
Movement	EB	EB	WB	WB	WB	WB	NB	SB	SB
Directions Served	L	TR	L	L	T	R	LTR	L	TR
Maximum Queue (m)	25.7	91.4	73.2	92.2	32.8	23.0	37.6	38.7	17.0
Average Queue (m)	7.0	42.2	40.2	52.4	10.0	1.5	13.6	14.3	2.5
95th Queue (m)	18.6	73.4	63.1	75.8	24.9	11.2	26.8	31.1	10.8
Link Distance (m)		507.1			267.0		46.4		53.7
Upstream Blk Time (%)							0	0	
Queuing Penalty (veh)							0	0	
Storage Bay Dist (m)	115.0		180.0	180.0		100.0		50.0	
Storage Blk Time (%)		0						0	
Queuing Penalty (veh)		0						0	

Intersection: 2: RR 274 & Aspelund Rd

Movement	EB	WB	NB	SB
Directions Served	L	L	LTR	LTR
Maximum Queue (m)	6.9	12.3	12.4	10.1
Average Queue (m)	0.7	1.9	3.9	3.2
95th Queue (m)	4.4	8.6	10.8	9.6
Link Distance (m)			203.5	240.2
Upstream Blk Time (%)				
Queuing Penalty (veh)				
Storage Bay Dist (m)	100.0	100.0		
Storage Blk Time (%)				
Queuing Penalty (veh)				

Zone Summary

Zone wide Queuing Penalty: 0

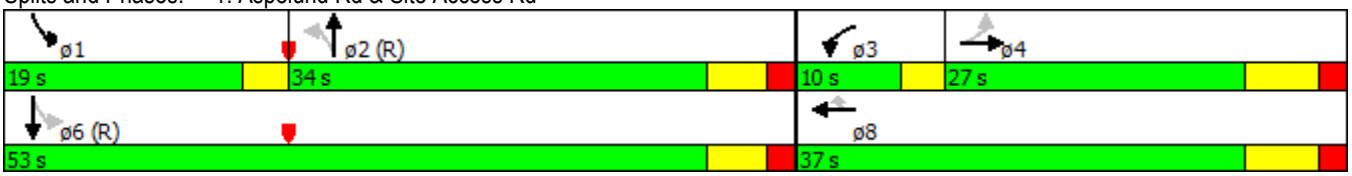


Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	3	191	5	77	258	53	25	5	403	268	5	31
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Storage Length (m)	115.0		100.0	180.0		100.0	0.0		0.0	50.0		0.0
Storage Lanes	1		0	2		1	0		0	1		0
Taper Length (m)	50.0			50.0			2.5			2.5		
Lane Util. Factor	1.00	1.00	1.00	0.97	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Frt		0.996				0.850		0.874			0.871	
Flt Protected	0.950			0.950				0.997		0.950		
Satd. Flow (prot)	1587	1710	0	3278	1715	1420	0	1550	0	1587	1467	0
Flt Permitted	0.600			0.950				0.984		0.325		
Satd. Flow (perm)	1002	1710	0	3278	1715	1420	0	1530	0	543	1467	0
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)		1				73		438			31	
Link Speed (k/h)		100			100			48			50	
Link Distance (m)		523.0			279.1			55.3			70.0	
Travel Time (s)		18.8			10.0			4.1			5.0	
Peak Hour Factor	1.00	1.00	0.92	0.92	1.00	1.00	0.92	0.92	0.92	1.00	0.92	1.00
Heavy Vehicles (%)	15%	12%	8%	8%	12%	15%	8%	8%	8%	15%	8%	15%
Adj. Flow (vph)	3	191	5	84	258	53	27	5	438	268	5	31
Shared Lane Traffic (%)												
Lane Group Flow (vph)	3	196	0	84	258	53	0	470	0	268	36	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	0.99	0.99	0.99	0.99	0.99	0.99	0.99	0.99	0.99	0.99	0.99	0.99
Turning Speed (k/h)	24		14	24		14	24		14	24		14
Turn Type	Perm	NA		Prot	NA	Perm	Perm	NA		pm+pt	NA	
Protected Phases		4		3	8			2		1	6	
Permitted Phases	4					8	2			6		
Detector Phase	4	4		3	8	8	2	2		1	6	
Switch Phase												
Minimum Initial (s)	20.0	20.0		7.0	20.0	20.0	10.0	10.0		7.0	10.0	
Minimum Split (s)	27.0	27.0		10.0	27.0	27.0	22.0	22.0		10.0	22.0	
Total Split (s)	27.0	27.0		10.0	37.0	37.0	34.0	34.0		19.0	53.0	
Total Split (%)	30.0%	30.0%		11.1%	41.1%	41.1%	37.8%	37.8%		21.1%	58.9%	
Yellow Time (s)	5.0	5.0		3.0	5.0	5.0	4.0	4.0		3.0	4.0	
All-Red Time (s)	2.0	2.0		0.0	2.0	2.0	2.0	2.0		0.0	2.0	
Lost Time Adjust (s)	0.0	0.0		0.0	0.0	0.0		0.0		0.0	0.0	
Total Lost Time (s)	7.0	7.0		3.0	7.0	7.0		6.0		3.0	6.0	
Lead/Lag	Lag	Lag		Lead			Lag	Lag		Lead		
Lead-Lag Optimize?	Yes	Yes		Yes			Yes	Yes		Yes		
Recall Mode	None	None		None	None	None	C-Max	C-Max		None	C-Max	
Act Effct Green (s)	20.0	20.0		7.0	28.0	28.0		33.0		52.0	49.0	
Actuated g/C Ratio	0.22	0.22		0.08	0.31	0.31		0.37		0.58	0.54	
v/c Ratio	0.01	0.52		0.33	0.48	0.11		0.56		0.58	0.04	

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Control Delay	27.7	36.2		43.1	28.0	3.7		6.4		15.7	4.7	
Queue Delay	0.0	0.0		0.0	0.0	0.0		0.0		0.0	0.0	
Total Delay	27.7	36.2		43.1	28.0	3.7		6.4		15.7	4.7	
LOS	C	D		D	C	A		A		B	A	
Approach Delay		36.1			28.0			6.4			14.4	
Approach LOS		D			C			A			B	
Queue Length 50th (m)	0.4	29.8		7.2	34.7	0.0		3.7		23.2	0.4	
Queue Length 95th (m)	2.6	50.6		14.1	56.3	5.1		28.2		37.6	4.6	
Internal Link Dist (m)		499.0			255.1			31.3			46.0	
Turn Bay Length (m)	115.0			180.0		100.0				50.0		
Base Capacity (vph)	222	380		254	571	522		837		499	812	
Starvation Cap Reductn	0	0		0	0	0		0		0	0	
Spillback Cap Reductn	0	0		0	0	0		0		0	0	
Storage Cap Reductn	0	0		0	0	0		0		0	0	
Reduced v/c Ratio	0.01	0.52		0.33	0.45	0.10		0.56		0.54	0.04	

Intersection Summary			
Area Type:	Other		
Cycle Length: 90			
Actuated Cycle Length: 90			
Offset: 0 (0%), Referenced to phase 2:NBTL and 6:SBTL, Start of Green			
Natural Cycle: 70			
Control Type: Actuated-Coordinated			
Maximum v/c Ratio: 0.58			
Intersection Signal Delay: 18.7		Intersection LOS: B	
Intersection Capacity Utilization 90.2%		ICU Level of Service E	
Analysis Period (min) 15			

Splits and Phases: 1: Aspelund Rd & Site Access Rd



Intersection	
Intersection Delay, s/veh	2.8

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Vol, veh/h	14	154	10	5	286	23	50	5	25	20	5	20
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Free	Free	Stop	Stop	Stop	Stop	Stop	Stop
RT Channelized	Yield	Yield	Yield	None	None	None	None	None	None	None	None	None
Storage Length	100.0		100.0	100.0		0.0	0.0		0.0	0.0		0.0
Median Width		3.7			3.7			0.0			0.0	
Grade, %		0%			0%			0%			0%	
Peak Hour Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Heavy Vehicles, %	5	12	5	5	12	5	5	5	5	5	5	5
Mvmt Flow	14	154	10	5	286	23	50	5	25	20	5	20
Number of Lanes	1	1	1	1	1	0	0	1	0	0	1	0

Major/Minor	Major 1			Major 2			Minor 1			Minor 2		
Conflicting Flow All	309	0	0	154	0	0	502	501	154	505	490	298
Stage 1	-	-	-	-	-	-	182	182	-	308	308	-
Stage 2	-	-	-	-	-	-	320	319	-	197	182	-
Follow-up Headway	2.245	-	-	2.245	-	-	3.545	4.045	3.345	3.545	4.045	3.345
Pot Capacity-1 Maneuver	1235	-	-	1408	-	-	475	468	884	473	475	734
Stage 1	-	-	-	-	-	-	813	743	-	696	655	-
Stage 2	-	-	-	-	-	-	685	648	-	798	743	-
Time blocked-Platoon, %	0	-	-	0	-	-	0	0	0	0	0	0
Mov Capacity-1 Maneuver	1235	-	-	1408	-	-	453	461	884	451	468	734
Mov Capacity-2 Maneuver	-	-	-	-	-	-	453	461	-	451	468	-
Stage 1	-	-	-	-	-	-	804	735	-	688	653	-
Stage 2	-	-	-	-	-	-	659	646	-	761	735	-

Approach	EB	WB	NB	SB
HCM Control Delay, s	0.6	0.1	12.9	12.2
HCM LOS	-	-	B	B

Minor Lane / Major Mvmt	NBLn1	EBL	EBT	EBR	WBL	WBT	WBR	SBLn1
Cap, veh/h	535	1235	-	-	1408	-	-	547
HCM Control Delay, s	12.9	7.948	-	-	7.566	-	-	12.2
HCM Lane V/C Ratio	0.15	0.01	-	-	0.00	-	-	0.08
HCM Lane LOS	B	A	-	-	A	-	-	B
HCM 95th-tile Q, veh	0.5	0.0	-	-	0.0	-	-	0.3

Notes

~ : Volume Exceeds Capacity; $: Delay Exceeds 300 Seconds; Error : Computation Not Defined

Intersection: 1: Aspelund Rd & Site Access Rd

Movement	EB	EB	WB	WB	WB	NB	SB	SB	B8
Directions Served	L	TR	L	L	T	LTR	L	TR	T
Maximum Queue (m)	7.5	69.2	28.2	38.1	74.8	61.2	50.7	61.6	12.2
Average Queue (m)	0.8	32.7	4.2	15.5	35.1	43.6	32.0	10.5	0.9
95th Queue (m)	4.4	57.8	15.8	30.3	63.9	63.0	50.1	42.1	11.2
Link Distance (m)		507.1			267.0	46.4		53.7	243.8
Upstream Blk Time (%)						12	1	2	
Queuing Penalty (veh)						0	0	0	
Storage Bay Dist (m)	115.0		180.0	180.0			50.0		
Storage Blk Time (%)					0		2	1	
Queuing Penalty (veh)					0		1	4	

Intersection: 2: RR 274 & Aspelund Rd

Movement	EB	WB	NB	SB
Directions Served	L	L	LTR	LTR
Maximum Queue (m)	8.3	5.2	18.1	17.3
Average Queue (m)	0.9	0.2	8.5	6.8
95th Queue (m)	5.0	2.1	15.1	14.2
Link Distance (m)			203.5	240.2
Upstream Blk Time (%)				
Queuing Penalty (veh)				
Storage Bay Dist (m)	100.0	100.0		
Storage Blk Time (%)				
Queuing Penalty (veh)				

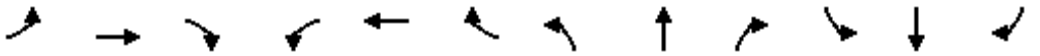
Zone Summary

Zone wide Queuing Penalty: 4

Table 4.2 - Intersection Capacity Analysis Summary - 2022

Intersection Location - Peak Period	Intersection Movements												Intersection Delay (s/veh)	Comments
Description	EB			WB			NB			SB				
	L	T	R	L	T	R	L	T	R	L	T	R		
Aspelund Rd & Access Rd - AM Peak														
Intersection / Lane Characteristics	1	1	SH	2	1	1	SH	1	SH	2	1	SH		**2022 - Total**
Volumes(veh/h)	78	387	31	498	198	603	6	5	64	116	5	14		
Volume/Capacity Ratio (V/C)	0.25	0.83	-	0.84	0.59	0.58	-	0.25	-	0.46	0.03	-	30.2	Signalized
Level of Service (LOS)	C	D	-	D	B	A	-	A	-	D	B	-		Cycle = 90 sec
Queue Length 95th (m)	51.3	122.1	-	80.6	44.0	38.3	-	26.8	-	34.5	11.1	-		
Proposed Storage Bay Length (m)	140.0	-	-	180.0	-	100.0	-	-	-	75.0	-	-		
Aspelund Rd & Access Rd - PM Peak														
Intersection / Lane Characteristics	1	1	SH	2	1	1	SH	1	SH	2	1	SH		**2022 - Total**
Volumes(veh/h)	12	288	5	77	410	92	25	5	403	489	5	63		
Volume/Capacity Ratio (V/C)	0.07	0.74	-	0.33	0.75	0.18	-	0.74	-	0.73	0.08	-	32.1	Signalized
Level of Service (LOS)	C	D	-	D	D	A	-	C	-	D	A	-		Cycle = 90 sec
Queue Length 95th (m)	12.8	81.5	-	23.8	90.2		-	60.4	-	74.5	51.3	-		
Propsoed Storage Bay Length (m)	140.0	-	-	180.0	-	100.0	-	-	-	75.0	-	-		
Aspelund Rd & RR 274 - AM Peak														
Intersection / Lane Characteristics	1	1	1	1	1	SH	SH	1	SH	SH	1	SH		**2022 - Total**
Volumes(veh/h)	37	481	62	31	161	26	2	5	6	8	5	8		
Volume/Capacity Ratio (V/C)	0.03	-	-	0.03	-	-	-	0.07	-	-	0.05	-	1.5	Unsignalized
Level of Service (LOS)	A	-	-	A	-	-	-	C	-	-	B	-		(TWSC)
Queue Length 95th (m)	6.8	-	-	9.5	0.9	-	-	12.9	-	-	10.4	-		
Proposed Storage Bay Length (m)	100.0	-	100.0	100.0	-	-	-	-	-	-	-	-		
Aspelund Rd & RR 274 - PM Peak														
Intersection / Lane Characteristics	1	1	1	1	1	SH	SH	1	SH	SH	1	SH		**2022 - Total**
Volumes(veh/h)	18	254	10	5	464	29	50	5	25	26	5	28		
Volume/Capacity Ratio (V/C)	0.02	-	-	0.00	-	-	-	0.23	-	-	0.16	-	2.8	Unsignalized
Level of Service (LOS)	A	-	-	A	-	-	-	C	-	-	C	-		(TWSC)
Queue Length 95th (m)	6.9	-	-	3.7	-	-	-	19.7	-	-	14.6	-		
Propsoed Storage Bay Length (m)	100.0	-	100.0	100.0	-	-	-	-	-	-	-	-		

Note:
SH = Shared

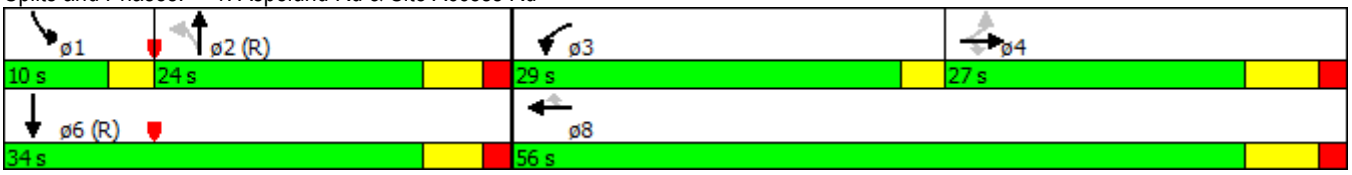


Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	78	387	31	498	198	603	6	5	94	116	5	14
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Storage Length (m)	140.0		100.0	180.0		100.0	0.0		0.0	75.0		0.0
Storage Lanes	1		1	2		1	0		0	2		0
Taper Length (m)	50.0			50.0			2.5			2.5		
Lane Util. Factor	1.00	1.00	1.00	0.97	1.00	1.00	1.00	1.00	1.00	0.97	1.00	1.00
Frt			0.850			0.850		0.879			0.889	
Flt Protected	0.950			0.950				0.997		0.950		
Satd. Flow (prot)	1587	1715	1512	3278	1715	1420	0	1559	0	3079	1509	0
Flt Permitted	0.633			0.950				0.987		0.950		
Satd. Flow (perm)	1057	1715	1512	3278	1715	1420	0	1543	0	3079	1509	0
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)			109			603		102			14	
Link Speed (k/h)		100			100			48			50	
Link Distance (m)		275.9			279.1			55.3			97.2	
Travel Time (s)		9.9			10.0			4.1			7.0	
Peak Hour Factor	1.00	1.00	0.92	0.92	1.00	1.00	0.92	0.92	0.92	1.00	0.92	1.00
Heavy Vehicles (%)	15%	12%	8%	8%	12%	15%	8%	8%	8%	15%	8%	15%
Adj. Flow (vph)	78	387	34	541	198	603	7	5	102	116	5	14
Shared Lane Traffic (%)												
Lane Group Flow (vph)	78	387	34	541	198	603	0	114	0	116	19	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			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	0.99	0.99	0.99	0.99	0.99	0.99	0.99	0.99	0.99	0.99	0.99	0.99
Turning Speed (k/h)	24		14	24		14	24		14	24		14
Turn Type	Perm	NA	Perm	Prot	NA	Perm	Perm	NA		Prot	NA	
Protected Phases		4		3	8			2		1	6	
Permitted Phases	4		4			8	2					
Detector Phase	4	4	4	3	8	8	2	2		1	6	
Switch Phase												
Minimum Initial (s)	20.0	20.0	20.0	7.0	20.0	20.0	10.0	10.0		7.0	10.0	
Minimum Split (s)	27.0	27.0	27.0	10.0	27.0	27.0	22.0	22.0		10.0	22.0	
Total Split (s)	27.0	27.0	27.0	29.0	56.0	56.0	24.0	24.0		10.0	34.0	
Total Split (%)	30.0%	30.0%	30.0%	32.2%	62.2%	62.2%	26.7%	26.7%		11.1%	37.8%	
Yellow Time (s)	5.0	5.0	5.0	3.0	5.0	5.0	4.0	4.0		3.0	4.0	
All-Red Time (s)	2.0	2.0	2.0	0.0	2.0	2.0	2.0	2.0		0.0	2.0	
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	0.0		0.0		0.0	0.0	
Total Lost Time (s)	7.0	7.0	7.0	3.0	7.0	7.0		6.0		3.0	6.0	
Lead/Lag	Lag	Lag	Lag	Lead			Lag	Lag		Lead		
Lead-Lag Optimize?	Yes	Yes	Yes	Yes			Yes	Yes		Yes		
Recall Mode	None	None	None	None	None	None	C-Max	C-Max		None	C-Max	
Act Effct Green (s)	25.0	25.0	25.0	20.0	48.1	48.1		20.9		7.0	28.9	
Actuated g/C Ratio	0.28	0.28	0.28	0.22	0.53	0.53		0.23		0.08	0.32	
v/c Ratio	0.27	0.81	0.07	0.74	0.22	0.58		0.26		0.48	0.04	

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Control Delay	29.5	46.7	0.3	38.9	11.5	3.5		9.9		46.9	12.7	
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0		0.0		0.0	0.0	
Total Delay	29.5	46.7	0.3	38.9	11.5	3.5		9.9		46.9	12.7	
LOS	C	D	A	D	B	A		A		D	B	
Approach Delay		40.8			18.9			9.9			42.1	
Approach LOS		D			B			A			D	
Queue Length 50th (m)	10.3	61.3	0.0	45.0	16.5	0.0		1.7		10.1	0.6	
Queue Length 95th (m)	23.8	#120.6	0.0	57.8	28.0	14.2		15.1		18.4	5.4	
Internal Link Dist (m)		251.9			255.1			31.3			73.2	
Turn Bay Length (m)	140.0		100.0	180.0		100.0				75.0		
Base Capacity (vph)	294	477	499	946	933	1047		436		240	494	
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	0.81	0.07	0.57	0.21	0.58		0.26		0.48	0.04	

Intersection Summary			
Area Type:	Other		
Cycle Length: 90			
Actuated Cycle Length: 90			
Offset: 0 (0%), Referenced to phase 2:NBTL and 6:SBT, Start of Green			
Natural Cycle: 75			
Control Type: Actuated-Coordinated			
Maximum v/c Ratio: 0.81			
Intersection Signal Delay: 25.2		Intersection LOS: C	
Intersection Capacity Utilization 79.0%		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: 1: Aspelund Rd & Site Access Rd



Intersection	
Intersection Delay, s/veh	1.5

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Vol, veh/h	37	481	62	31	161	26	12	5	6	8	5	8
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Free	Free	Stop	Stop	Stop	Stop	Stop	Stop
RT Channelized	Yield	Yield	Yield	None	None	None	None	None	None	None	None	None
Storage Length	100.0		100.0	100.0		0.0	0.0		0.0	0.0		0.0
Median Width		3.7			3.7			0.0			0.0	
Grade, %		0%			0%			0%			0%	
Peak Hour Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Heavy Vehicles, %	5	12	5	5	12	5	5	5	5	5	5	5
Mvmt Flow	37	481	62	31	161	26	12	5	6	8	5	8
Number of Lanes	1	1	1	1	1	0	0	1	0	0	1	0

Major/Minor	Major 1			Major 2			Minor 1			Minor 2		
Conflicting Flow All	187	0	0	481	0	0	798	804	481	797	791	174
Stage 1	-	-	-	-	-	-	555	555	-	236	236	-
Stage 2	-	-	-	-	-	-	243	249	-	561	555	-
Follow-up Headway	2.245	-	-	2.245	-	-	3.545	4.045	3.345	3.545	4.045	3.345
Pot Capacity-1 Maneuver	1369	-	-	1066	-	-	301	313	579	301	319	862
Stage 1	-	-	-	-	-	-	511	508	-	760	704	-
Stage 2	-	-	-	-	-	-	754	695	-	507	508	-
Time blocked-Platoon, %	0	-	-	0	-	-	0	0	0	0	0	0
Mov Capacity-1 Maneuver	1369	-	-	1066	-	-	282	296	579	282	301	862
Mov Capacity-2 Maneuver	-	-	-	-	-	-	282	296	-	282	301	-
Stage 1	-	-	-	-	-	-	497	494	-	739	684	-
Stage 2	-	-	-	-	-	-	720	675	-	483	494	-

Approach	EB	WB	NB	SB
HCM Control Delay, s	0.5	1.2	16.8	14.8
HCM LOS	-	-	C	B

Minor Lane / Major Mvmt	NBLn1	EBL	EBT	EBR	WBL	WBT	WBR	SBLn1
Cap, veh/h	329	1369	-	-	1066	-	-	387
HCM Control Delay, s	16.8	7.703	-	-	8.478	-	-	14.8
HCM Lane V/C Ratio	0.07	0.03	-	-	0.03	-	-	0.05
HCM Lane LOS	C	A	-	-	A	-	-	B
HCM 95th-tile Q, veh	0.2	0.1	-	-	0.1	-	-	0.2

Notes

~ : Volume Exceeds Capacity; $: Delay Exceeds 300 Seconds; Error : Computation Not Defined

Intersection: 1: Aspelund Rd & Site Access Rd

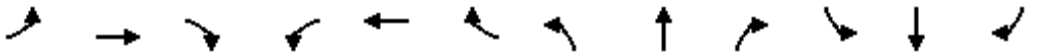
Movement	EB	EB	EB	WB	WB	WB	WB	NB	SB	SB	SB
Directions Served	L	T	R	L	L	T	R	LTR	L	L	TR
Maximum Queue (m)	64.1	150.3	60.8	78.3	86.0	45.6	60.5	38.0	42.1	52.2	26.5
Average Queue (m)	15.9	82.2	8.2	39.8	52.8	19.5	6.7	14.3	12.8	24.4	3.6
95th Queue (m)	42.8	144.9	44.1	66.2	76.9	37.6	35.5	27.8	35.5	44.5	15.7
Link Distance (m)		258.8				265.5		42.8			83.3
Upstream Blk Time (%)								0			
Queuing Penalty (veh)								0			
Storage Bay Dist (m)	140.0		100.0	180.0	180.0		100.0		75.0	75.0	
Storage Blk Time (%)		10								0	0
Queuing Penalty (veh)		11								0	0

Intersection: 2: RR 274 & Aspelund Rd

Movement	EB	WB	NB	SB
Directions Served	L	L	LTR	LTR
Maximum Queue (m)	8.6	13.5	13.8	9.1
Average Queue (m)	1.5	2.5	4.5	3.8
95th Queue (m)	6.7	9.3	12.1	10.1
Link Distance (m)			203.5	240.2
Upstream Blk Time (%)				
Queuing Penalty (veh)				
Storage Bay Dist (m)	100.0	100.0		
Storage Blk Time (%)				
Queuing Penalty (veh)				

Zone Summary

Zone wide Queuing Penalty: 11

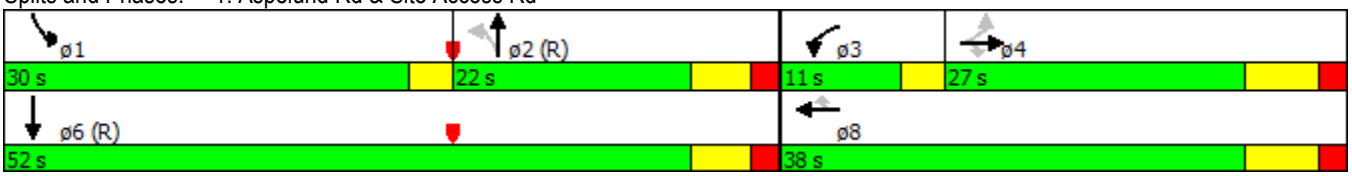


Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	12	288	5	77	410	92	25	5	403	489	5	63
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Storage Length (m)	140.0		100.0	180.0		100.0	0.0		0.0	75.0		0.0
Storage Lanes	1		1	2		1	0		0	2		0
Taper Length (m)	50.0			50.0			2.5			2.5		
Lane Util. Factor	1.00	1.00	1.00	0.97	1.00	1.00	1.00	1.00	1.00	0.97	1.00	1.00
Frt			0.850			0.850		0.874			0.861	
Flt Protected	0.950			0.950				0.997		0.950		
Satd. Flow (prot)	1587	1715	1512	3278	1715	1420	0	1550	0	3079	1445	0
Flt Permitted	0.474			0.950				0.981		0.950		
Satd. Flow (perm)	792	1715	1512	3278	1715	1420	0	1525	0	3079	1445	0
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)			109			92		294			63	
Link Speed (k/h)		100			100			48			50	
Link Distance (m)		242.8			279.1			55.3			98.1	
Travel Time (s)		8.7			10.0			4.1			7.1	
Peak Hour Factor	1.00	1.00	0.92	0.92	1.00	1.00	0.92	0.92	0.92	1.00	0.92	1.00
Heavy Vehicles (%)	15%	12%	8%	8%	12%	15%	8%	8%	8%	15%	8%	15%
Adj. Flow (vph)	12	288	5	84	410	92	27	5	438	489	5	63
Shared Lane Traffic (%)												
Lane Group Flow (vph)	12	288	5	84	410	92	0	470	0	489	68	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			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	0.99	0.99	0.99	0.99	0.99	0.99	0.99	0.99	0.99	0.99	0.99	0.99
Turning Speed (k/h)	24		14	24		14	24		14	24		14
Turn Type	Perm	NA	Perm	Prot	NA	Perm	Perm	NA		Prot	NA	
Protected Phases		4		3	8			2		1	6	
Permitted Phases	4		4			8	2					
Detector Phase	4	4	4	3	8	8	2	2		1	6	
Switch Phase												
Minimum Initial (s)	20.0	20.0	20.0	7.0	20.0	20.0	10.0	10.0		7.0	10.0	
Minimum Split (s)	27.0	27.0	27.0	10.0	27.0	27.0	22.0	22.0		10.0	22.0	
Total Split (s)	27.0	27.0	27.0	11.0	38.0	38.0	22.0	22.0		30.0	52.0	
Total Split (%)	30.0%	30.0%	30.0%	12.2%	42.2%	42.2%	24.4%	24.4%		33.3%	57.8%	
Yellow Time (s)	5.0	5.0	5.0	3.0	5.0	5.0	4.0	4.0		3.0	4.0	
All-Red Time (s)	2.0	2.0	2.0	0.0	2.0	2.0	2.0	2.0		0.0	2.0	
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	0.0		0.0		0.0	0.0	
Total Lost Time (s)	7.0	7.0	7.0	3.0	7.0	7.0		6.0		3.0	6.0	
Lead/Lag	Lag	Lag	Lag	Lead			Lag	Lag		Lead		
Lead-Lag Optimize?	Yes	Yes	Yes	Yes			Yes	Yes		Yes		
Recall Mode	None	None	None	None	None	None	C-Max	C-Max		None	C-Max	
Act Effct Green (s)	20.1	20.1	20.1	7.5	28.6	28.6		25.9		19.5	48.4	
Actuated g/C Ratio	0.22	0.22	0.22	0.08	0.32	0.32		0.29		0.22	0.54	
v/c Ratio	0.07	0.75	0.01	0.31	0.75	0.18		0.73		0.73	0.08	

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Control Delay	29.0	46.8	0.0	41.8	36.7	5.6		20.0		39.4	3.8	
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0		0.0		0.0	0.0	
Total Delay	29.0	46.8	0.0	41.8	36.7	5.6		20.0		39.4	3.8	
LOS	C	D	A	D	D	A		C		D	A	
Approach Delay		45.4			32.6			20.0			35.1	
Approach LOS		D			C			C			D	
Queue Length 50th (m)	1.6	46.6	0.0	7.1	60.3	0.0		27.2		40.7	0.4	
Queue Length 95th (m)	6.2	#83.0	0.0	14.0	92.8	9.6		#84.3		53.0	6.5	
Internal Link Dist (m)		218.8			255.1			31.3			74.1	
Turn Bay Length (m)	140.0		100.0	180.0		100.0				75.0		
Base Capacity (vph)	176	382	421	291	590	549		648		923	806	
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	0.07	0.75	0.01	0.29	0.69	0.17		0.73		0.53	0.08	

Intersection Summary			
Area Type:	Other		
Cycle Length: 90			
Actuated Cycle Length: 90			
Offset: 0 (0%), Referenced to phase 2:NBTL and 6:SBT, Start of Green			
Natural Cycle: 75			
Control Type: Actuated-Coordinated			
Maximum v/c Ratio: 0.75			
Intersection Signal Delay: 32.3		Intersection LOS: C	
Intersection Capacity Utilization 89.3%		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.			

Splits and Phases: 1: Aspelund Rd & Site Access Rd



Intersection	
Intersection Delay, s/veh	2.8

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Vol, veh/h	18	254	10	5	464	29	50	5	25	26	5	28
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Free	Free	Stop	Stop	Stop	Stop	Stop	Stop
RT Channelized	Yield	Yield	Yield	None	None	None	None	None	None	None	None	None
Storage Length	100.0		100.0	100.0		0.0	0.0		0.0	0.0		0.0
Median Width		3.7			3.7			0.0			0.0	
Grade, %		0%			0%			0%			0%	
Peak Hour Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Heavy Vehicles, %	5	12	5	5	12	5	5	5	5	5	5	5
Mvmt Flow	18	254	10	5	464	29	50	5	25	26	5	28
Number of Lanes	1	1	1	1	1	0	0	1	0	0	1	0

Major/Minor	Major 1			Major 2			Minor 1			Minor 2		
Conflicting Flow All	493	0	0	254	0	0	795	793	254	794	779	479
Stage 1	-	-	-	-	-	-	290	290	-	489	489	-
Stage 2	-	-	-	-	-	-	505	503	-	305	290	-
Follow-up Headway	2.245	-	-	2.245	-	-	3.545	4.045	3.345	3.545	4.045	3.345
Pot Capacity-1 Maneuver	1055	-	-	1294	-	-	302	318	777	302	324	581
Stage 1	-	-	-	-	-	-	711	667	-	555	544	-
Stage 2	-	-	-	-	-	-	544	536	-	698	667	-
Time blocked-Platoon, %	0	-	-	0	-	-	0	0	0	0	0	0
Mov Capacity-1 Maneuver	1055	-	-	1294	-	-	279	311	777	284	317	581
Mov Capacity-2 Maneuver	-	-	-	-	-	-	279	311	-	284	317	-
Stage 1	-	-	-	-	-	-	699	656	-	546	542	-
Stage 2	-	-	-	-	-	-	511	534	-	659	656	-

Approach	EB	WB	NB	SB
HCM Control Delay, s	0.5	0.1	18.2	16.2
HCM LOS	-	-	C	C

Minor Lane / Major Mvmt	NBLn1	EBL	EBT	EBR	WBL	WBT	WBR	SBLn1
Cap, veh/h	352	1055	-	-	1294	-	-	379
HCM Control Delay, s	18.2	8.472	-	-	7.793	-	-	16.2
HCM Lane V/C Ratio	0.23	0.02	-	-	0.00	-	-	0.16
HCM Lane LOS	C	A	-	-	A	-	-	C
HCM 95th-tile Q, veh	0.9	0.1	-	-	0.0	-	-	0.5

Notes

~ : Volume Exceeds Capacity; $: Delay Exceeds 300 Seconds; Error : Computation Not Defined

Intersection: 1: Aspelund Rd & Site Access Rd

Movement	EB	EB	EB	WB	WB	WB	NB	SB	SB	SB	B8
Directions Served	L	T	R	L	L	T	LTR	L	L	TR	T
Maximum Queue (m)	16.0	98.7	7.9	26.3	35.8	108.2	58.3	70.5	75.4	80.6	3.5
Average Queue (m)	3.1	52.3	0.9	4.2	14.6	57.8	43.7	47.0	55.0	13.1	0.2
95th Queue (m)	11.3	90.3	5.0	15.8	28.9	94.3	60.2	69.3	73.5	46.2	3.0
Link Distance (m)		225.8				265.6	42.8			85.0	214.4
Upstream Blk Time (%)							23			0	
Queuing Penalty (veh)							0			0	
Storage Bay Dist (m)	140.0		100.0	180.0	180.0			75.0	75.0		
Storage Blk Time (%)		1				1		0	1	0	
Queuing Penalty (veh)		0				1		0	0	1	

Intersection: 2: RR 274 & Aspelund Rd

Movement	EB	WB	NB	SB
Directions Served	L	L	LTR	LTR
Maximum Queue (m)	8.6	5.2	21.5	17.7
Average Queue (m)	1.3	0.3	9.0	7.8
95th Queue (m)	6.2	2.7	17.1	14.6
Link Distance (m)			203.5	240.2
Upstream Blk Time (%)				
Queuing Penalty (veh)				
Storage Bay Dist (m)	100.0	100.0		
Storage Blk Time (%)				
Queuing Penalty (veh)				

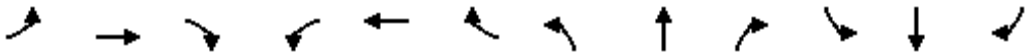
Network Summary

Network wide Queuing Penalty: 3

Table 4.3 - Intersection Capacity Analysis Summary - 2032

Intersection Location - Peak Period	Intersection Movements												Intersection Delay (s/veh)	Comments
Description	EB			WB			NB			SB				
	L	T	R	L	T	R	L	T	R	L	T	R		
Aspelund Rd & Access Rd - AM Peak														
Intersection / Lane Characteristics	1	1	SH	2	1	1	SH	1	SH	2	1	SH		**2032 - Total**
Volumes(veh/h)	78	482	31	498	234	603	6	5	94	116	5	14		
Volume/Capacity Ratio (V/C)	0.22	0.87	-	0.87	0.25	0.59	-	0.29	-	0.53	0.04	-	32.8	Signalized
Level of Service (LOS)	C	D	-	E	B	A	-	B	-	E	B	-		Cycle = 120 sec
Queue Length 95th (m)	32.3	144.0	-	89.0	42.9	44.4	-	41.5	-	41.5	12.2	-		
Proposed Storage Bay Length (m)	140.0	-	-	180.0	-	100.0	-	-	-	80.0	-	-		
Aspelund Rd & Access Rd - PM Peak														
Intersection / Lane Characteristics	1	1	SH	2	1	1	SH	1	SH	2	1	SH		**2032 - Total**
Volumes(veh/h)	12	350	5	77	511	92	25	5	403	489	5	63		
Volume/Capacity Ratio (V/C)	0.09	0.79	-	0.29	0.84	0.16	-	0.79	-	0.83	0.10	-	34.9	Signalized
Level of Service (LOS)	C	D	-	D	D	A	-	C	-	D	A	-		Cycle = 90 sec
Queue Length 95th (m)	12.1	88.6	-	22.8	101.5	19.2	-	114.8	-	77.4	61.8	-		
Propsoed Storage Bay Length (m)	140.0	-	-	180.0	-	100.0	-	-	-	60.0	-	-		
Aspelund Rd & RR 274 - AM Peak														
Intersection / Lane Characteristics	1	1	1	1	1	SH	SH	1	SH	2	1	SH		**2032 - Total**
Volumes(veh/h)	38	574	62	31	196	28	12	5	6	11	5	6		
Volume/Capacity Ratio (V/C)	0.03	-	-	0.04	-	-	-	0.10	-	-	0.01	-	1.6	Unsignalized
Level of Service (LOS)	A	-	-	A	-	-	-	C	-	-	C	-		(TWSC)
Queue Length 95th (m)	6.7	-	-	9.7	-	-	-	12.2	-	-	13.1	-		
Proposed Storage Bay Length (m)	110.0	-	100.0	110.0	-	-	-	-	-	-	-	-		
Aspelund Rd & RR 274 - PM Peak														
Intersection / Lane Characteristics	1	1	1	1	1	SH	SH	1	SH	2	1	SH		**2032 - Total**
Volumes(veh/h)	21	313	10	5	558	36	50	5	25	29	5	29		
Volume/Capacity Ratio (V/C)	0.03	-	-	0.01	-	-	-	0.36	-	-	0.26	-	3.6	Unsignalized
Level of Service (LOS)	A	-	-	A	-	-	-	D	-	-	C	-		(TWSC)
Queue Length 95th (m)	8.9	-	-	2.8	-	-	-	20.2	-	-	18.4	-		
Propsoed Storage Bay Length (m)	110.0	-	100.0	110.0	-	-	-	-	-	-	-	-		

Note:
SH = Shared

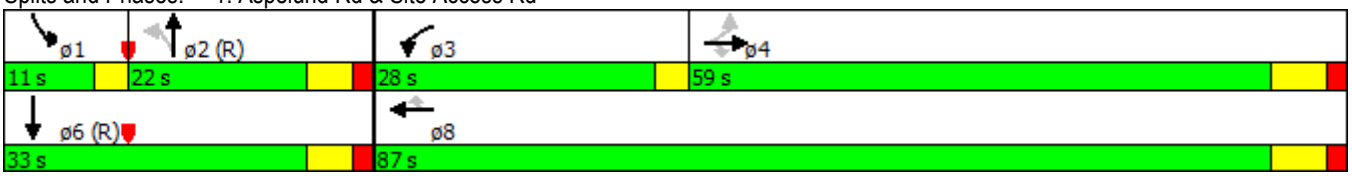


Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	78	482	31	498	234	603	6	5	94	116	5	14
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Storage Length (m)	140.0		100.0	180.0		100.0	0.0		60.0	80.0		0.0
Storage Lanes	1		1	2		1	0		0	2		0
Taper Length (m)	50.0			50.0			2.5			2.5		
Lane Util. Factor	1.00	1.00	1.00	0.97	1.00	1.00	1.00	1.00	1.00	0.97	1.00	1.00
Frt			0.850			0.850		0.879			0.887	
Flt Protected	0.950			0.950				0.997		0.950		
Satd. Flow (prot)	1587	1715	1512	3278	1715	1420	0	1559	0	3079	1505	0
Flt Permitted	0.602			0.950				0.987		0.950		
Satd. Flow (perm)	1006	1715	1512	3278	1715	1420	0	1543	0	3079	1505	0
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)			82			655		102			15	
Link Speed (k/h)		100			100			48			50	
Link Distance (m)		269.1			279.1			146.5			97.2	
Travel Time (s)		9.7			10.0			11.0			7.0	
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
Heavy Vehicles (%)	15%	12%	8%	8%	12%	15%	8%	8%	8%	15%	8%	15%
Adj. Flow (vph)	85	524	34	541	254	655	7	5	102	126	5	15
Shared Lane Traffic (%)												
Lane Group Flow (vph)	85	524	34	541	254	655	0	114	0	126	20	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			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	0.99	0.99	0.99	0.99	0.99	0.99	0.99	0.99	0.99	0.99	0.99	0.99
Turning Speed (k/h)	24		14	24		14	24		14	24		14
Turn Type	Perm	NA	Perm	Prot	NA	Perm	Perm	NA		Prot	NA	
Protected Phases		4		3	8			2		1	6	
Permitted Phases	4		4			8	2					
Detector Phase	4	4	4	3	8	8	2	2		1	6	
Switch Phase												
Minimum Initial (s)	20.0	20.0	20.0	7.0	20.0	20.0	10.0	10.0		7.0	10.0	
Minimum Split (s)	27.0	27.0	27.0	10.0	27.0	27.0	22.0	22.0		10.0	22.0	
Total Split (s)	59.0	59.0	59.0	28.0	87.0	87.0	22.0	22.0		11.0	33.0	
Total Split (%)	49.2%	49.2%	49.2%	23.3%	72.5%	72.5%	18.3%	18.3%		9.2%	27.5%	
Yellow Time (s)	5.0	5.0	5.0	3.0	5.0	5.0	4.0	4.0		3.0	4.0	
All-Red Time (s)	2.0	2.0	2.0	0.0	2.0	2.0	2.0	2.0		0.0	2.0	
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	0.0		0.0		0.0	0.0	
Total Lost Time (s)	7.0	7.0	7.0	3.0	7.0	7.0		6.0		3.0	6.0	
Lead/Lag	Lag	Lag	Lag	Lead			Lag	Lag		Lead		
Lead-Lag Optimize?	Yes	Yes	Yes	Yes			Yes	Yes		Yes		
Recall Mode	None	None	None	None	None	None	C-Max	C-Max		None	C-Max	
Act Effct Green (s)	42.9	42.9	42.9	23.4	69.2	69.2		25.6		9.2	37.8	
Actuated g/C Ratio	0.36	0.36	0.36	0.20	0.58	0.58		0.21		0.08	0.32	
v/c Ratio	0.24	0.86	0.06	0.85	0.26	0.60		0.28		0.54	0.04	

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Control Delay	26.8	49.4	0.2	59.9	12.3	3.1		13.3		62.1	18.9	
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0		0.0		0.0	0.0	
Total Delay	26.8	49.4	0.2	59.9	12.3	3.1		13.3		62.1	18.9	
LOS	C	D	A	E	B	A		B		E	B	
Approach Delay		43.8			25.9			13.3			56.2	
Approach LOS		D			C			B			E	
Queue Length 50th (m)	13.8	111.9	0.0	62.7	26.6	0.0		2.4		14.8	0.8	
Queue Length 95th (m)	23.3	139.5	0.0	82.5	32.5	11.4		19.1		25.2	7.4	
Internal Link Dist (m)		245.1			255.1			122.5			73.2	
Turn Bay Length (m)	140.0		100.0	180.0		100.0				80.0		
Base Capacity (vph)	435	743	701	682	1143	1165		409		239	484	
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	0.20	0.71	0.05	0.79	0.22	0.56		0.28		0.53	0.04	

Intersection Summary			
Area Type:	Other		
Cycle Length: 120			
Actuated Cycle Length: 120			
Offset: 0 (0%), Referenced to phase 2:NBTL and 6:SBT, Start of Green			
Natural Cycle: 90			
Control Type: Actuated-Coordinated			
Maximum v/c Ratio: 0.86			
Intersection Signal Delay: 32.0		Intersection LOS: C	
Intersection Capacity Utilization 79.0%		ICU Level of Service D	
Analysis Period (min) 15			

Splits and Phases: 1: Aspelund Rd & Site Access Rd



Intersection	
Intersection Delay, s/veh	1.6

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Vol, veh/h	38	574	62	31	196	28	12	5	6	11	5	9
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Free	Free	Stop	Stop	Stop	Stop	Stop	Stop
RT Channelized	Yield	Yield	Yield	None	None	None	None	None	None	None	None	None
Storage Length	110.0		100.0	110.0		0.0	0.0		0.0	0.0		0.0
Median Width		3.7			3.7			0.0			0.0	
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
Heavy Vehicles, %	5	12	5	5	12	5	5	5	5	5	5	5
Mvmt Flow	41	624	67	34	213	30	13	5	7	12	5	10
Number of Lanes	1	1	1	1	1	0	0	1	0	0	1	0

Major/Minor	Major 1			Major 2			Minor 1			Minor 2		
Conflicting Flow All	243	0	0	624	0	0	1010	1018	624	1009	1003	228
Stage 1	-	-	-	-	-	-	707	707	-	296	296	-
Stage 2	-	-	-	-	-	-	303	311	-	713	707	-
Follow-up Headway	2.245	-	-	2.245	-	-	3.545	4.045	3.345	3.545	4.045	3.345
Pot Capacity-1 Maneuver	1306	-	-	943	-	-	216	234	480	216	239	804
Stage 1	-	-	-	-	-	-	421	434	-	706	663	-
Stage 2	-	-	-	-	-	-	700	653	-	418	434	-
Time blocked-Platoon, %	0	-	-	0	-	-	0	0	0	0	0	0
Mov Capacity-1 Maneuver	1306	-	-	943	-	-	199	218	480	198	223	804
Mov Capacity-2 Maneuver	-	-	-	-	-	-	199	218	-	198	223	-
Stage 1	-	-	-	-	-	-	408	420	-	684	639	-
Stage 2	-	-	-	-	-	-	661	629	-	394	420	-

Approach	EB	WB	NB	SB
HCM Control Delay, s	0.4	1.1	21.7	19.2
HCM LOS	-	-	C	C

Minor Lane / Major Mvmt	NBLn1	EBL	EBT	EBR	WBL	WBT	WBR	SBLn1
Cap, veh/h	240	1306	-	-	943	-	-	280
HCM Control Delay, s	21.7	7.847	-	-	8.959	-	-	19.2
HCM Lane V/C Ratio	0.10	0.03	-	-	0.04	-	-	0.10
HCM Lane LOS	C	A	-	-	A	-	-	C
HCM 95th-tile Q, veh	0.3	0.1	-	-	0.1	-	-	0.3

Notes

~ : Volume Exceeds Capacity; $: Delay Exceeds 300 Seconds; Error : Computation Not Defined

Intersection: 1: Aspelund Rd & Site Access Rd

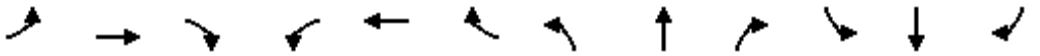
Movement	EB	EB	WB	WB	WB	WB	NB	SB	SB	SB
Directions Served	L	T	L	L	T	R	LTR	L	L	TR
Maximum Queue (m)	38.5	154.9	97.6	107.6	63.0	74.0	43.2	43.9	53.0	18.3
Average Queue (m)	15.1	81.9	56.6	66.8	26.4	13.7	15.1	14.2	25.7	4.3
95th Queue (m)	32.0	130.4	83.3	93.4	50.8	46.8	31.2	37.0	46.1	13.7
Link Distance (m)		251.4			265.2		133.8			83.3
Upstream Blk Time (%)										
Queuing Penalty (veh)										
Storage Bay Dist (m)	140.0		180.0	180.0		100.0		80.0	80.0	
Storage Blk Time (%)		6				0				
Queuing Penalty (veh)		6				0				

Intersection: 2: RR 274 & Aspelund Rd

Movement	EB	WB	NB	SB
Directions Served	L	L	LTR	LTR
Maximum Queue (m)	10.3	11.7	16.6	17.1
Average Queue (m)	1.4	2.6	5.3	5.2
95th Queue (m)	6.7	8.9	13.0	12.9
Link Distance (m)			203.5	240.2
Upstream Blk Time (%)				
Queuing Penalty (veh)				
Storage Bay Dist (m)	110.0	110.0		
Storage Blk Time (%)				
Queuing Penalty (veh)				

Zone Summary

Zone wide Queuing Penalty: 7

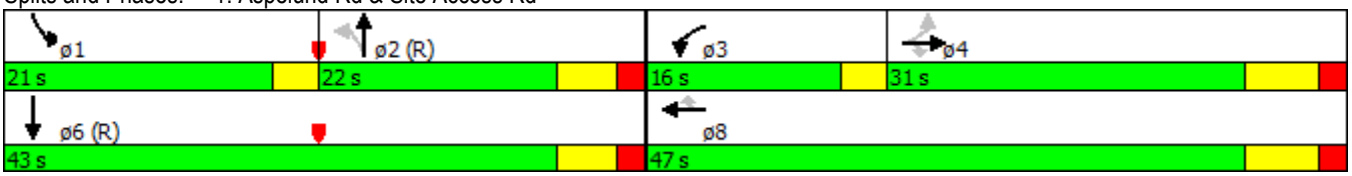


Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	12	350	5	77	511	92	25	5	403	489	5	63
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Storage Length (m)	140.0		100.0	180.0		100.0	0.0		60.0	80.0		0.0
Storage Lanes	1		1	2		1	0		0	2		0
Taper Length (m)	50.0			50.0			2.5			2.5		
Lane Util. Factor	1.00	1.00	1.00	0.97	1.00	1.00	1.00	1.00	1.00	0.97	1.00	1.00
Frt			0.850			0.850		0.874			0.860	
Flt Protected	0.950			0.950				0.997		0.950		
Satd. Flow (prot)	1587	1715	1512	3278	1715	1420	0	1550	0	3079	1443	0
Flt Permitted	0.321			0.950				0.978		0.950		
Satd. Flow (perm)	536	1715	1512	3278	1715	1420	0	1520	0	3079	1443	0
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)			109			100		341			68	
Link Speed (k/h)		100			100			48			50	
Link Distance (m)		269.1			279.1			127.0			97.2	
Travel Time (s)		9.7			10.0			9.5			7.0	
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
Heavy Vehicles (%)	15%	12%	8%	8%	12%	15%	8%	8%	8%	15%	8%	15%
Adj. Flow (vph)	13	380	5	84	555	100	27	5	438	532	5	68
Shared Lane Traffic (%)												
Lane Group Flow (vph)	13	380	5	84	555	100	0	470	0	532	73	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			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	0.99	0.99	0.99	0.99	0.99	0.99	0.99	0.99	0.99	0.99	0.99	0.99
Turning Speed (k/h)	24		14	24		14	24		14	24		14
Turn Type	Perm	NA	Perm	Prot	NA	Perm	Perm	NA		Prot	NA	
Protected Phases		4		3	8			2		1	6	
Permitted Phases	4		4			8	2					
Detector Phase	4	4	4	3	8	8	2	2		1	6	
Switch Phase												
Minimum Initial (s)	20.0	20.0	20.0	7.0	20.0	20.0	10.0	10.0		7.0	10.0	
Minimum Split (s)	27.0	27.0	27.0	10.0	27.0	27.0	22.0	22.0		10.0	22.0	
Total Split (s)	31.0	31.0	31.0	16.0	47.0	47.0	22.0	22.0		21.0	43.0	
Total Split (%)	34.4%	34.4%	34.4%	17.8%	52.2%	52.2%	24.4%	24.4%		23.3%	47.8%	
Yellow Time (s)	5.0	5.0	5.0	3.0	5.0	5.0	4.0	4.0		3.0	4.0	
All-Red Time (s)	2.0	2.0	2.0	0.0	2.0	2.0	2.0	2.0		0.0	2.0	
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	0.0		0.0		0.0	0.0	
Total Lost Time (s)	7.0	7.0	7.0	3.0	7.0	7.0		6.0		3.0	6.0	
Lead/Lag	Lag	Lag	Lag	Lead			Lag	Lag		Lead		
Lead-Lag Optimize?	Yes	Yes	Yes	Yes			Yes	Yes		Yes		
Recall Mode	None	None	None	None	None	None	C-Max	C-Max		None	C-Max	
Act Effct Green (s)	25.9	25.9	25.9	8.0	34.8	34.8		20.6		18.6	42.2	
Actuated g/C Ratio	0.29	0.29	0.29	0.09	0.39	0.39		0.23		0.21	0.47	
v/c Ratio	0.08	0.77	0.01	0.29	0.84	0.16		0.77		0.84	0.10	

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Control Delay	24.2	41.1	0.0	40.7	36.5	3.9		20.5		47.7	5.3	
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0		0.0		0.0	0.0	
Total Delay	24.2	41.1	0.0	40.7	36.5	3.9		20.5		47.7	5.3	
LOS	C	D	A	D	D	A		C		D	A	
Approach Delay		40.0			32.6			20.5			42.6	
Approach LOS		D			C			C			D	
Queue Length 50th (m)	1.7	60.0	0.0	7.1	82.3	0.0		20.6		43.8	0.5	
Queue Length 95th (m)	6.0	#91.9	0.0	13.7	115.3	8.3		#74.8		#72.5	8.2	
Internal Link Dist (m)		245.1			255.1			103.0			73.2	
Turn Bay Length (m)	140.0		100.0	180.0		100.0				80.0		
Base Capacity (vph)	155	497	516	473	762	686		610		647	712	
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	0.08	0.76	0.01	0.18	0.73	0.15		0.77		0.82	0.10	

Intersection Summary			
Area Type:	Other		
Cycle Length: 90			
Actuated Cycle Length: 90			
Offset: 0 (0%), Referenced to phase 2:NBTL and 6:SBT, Start of Green			
Natural Cycle: 80			
Control Type: Actuated-Coordinated			
Maximum v/c Ratio: 0.84			
Intersection Signal Delay: 34.1		Intersection LOS: C	
Intersection Capacity Utilization 89.3%		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.			

Splits and Phases: 1: Aspelund Rd & Site Access Rd



Intersection	
Intersection Delay, s/veh	3.6

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Vol, veh/h	21	313	10	5	558	36	50	5	25	29	5	29
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Free	Free	Stop	Stop	Stop	Stop	Stop	Stop
RT Channelized	Yield	Yield	Yield	None	None	None	None	None	None	None	None	None
Storage Length	110.0		100.0	110.0		0.0	0.0		0.0	0.0		0.0
Median Width		3.7			3.7			0.0			0.0	
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
Heavy Vehicles, %	5	12	5	5	12	5	5	5	5	5	5	5
Mvmt Flow	23	340	11	5	607	39	54	5	27	32	5	32
Number of Lanes	1	1	1	1	1	0	0	1	0	0	1	0

Major/Minor	Major 1			Major 2			Minor 1			Minor 2		
Conflicting Flow All	646	0	0	340	0	0	1041	1043	340	1039	1023	626
Stage 1	-	-	-	-	-	-	386	386	-	637	637	-
Stage 2	-	-	-	-	-	-	655	657	-	402	386	-
Follow-up Headway	2.245	-	-	2.245	-	-	3.545	4.045	3.345	3.545	4.045	3.345
Pot Capacity-1 Maneuver	925	-	-	1203	-	-	205	227	696	206	233	479
Stage 1	-	-	-	-	-	-	631	605	-	460	467	-
Stage 2	-	-	-	-	-	-	450	457	-	619	605	-
Time blocked-Platoon, %	0	-	-	0	-	-	0	0	0	0	0	0
Mov Capacity-1 Maneuver	925	-	-	1203	-	-	184	220	696	190	226	479
Mov Capacity-2 Maneuver	-	-	-	-	-	-	184	220	-	190	226	-
Stage 1	-	-	-	-	-	-	615	590	-	449	465	-
Stage 2	-	-	-	-	-	-	414	455	-	575	590	-

Approach	EB	WB	NB	SB
HCM Control Delay, s	0.5	0.1	28	23
HCM LOS	-	-	D	C

Minor Lane / Major Mvmt	NBLn1	EBL	EBT	EBR	WBL	WBT	WBR	SBLn1
Cap, veh/h	242	925	-	-	1203	-	-	268
HCM Control Delay, s	28	8.99	-	-	8.006	-	-	23
HCM Lane V/C Ratio	0.36	0.03	-	-	0.01	-	-	0.26
HCM Lane LOS	D	A	-	-	A	-	-	C
HCM 95th-tile Q, veh	1.6	0.1	-	-	0.0	-	-	1.0

Notes

~ : Volume Exceeds Capacity; $: Delay Exceeds 300 Seconds; Error : Computation Not Defined

Intersection: 1: Aspelund Rd & Site Access Rd

Movement	EB	EB	WB	WB	WB	WB	NB	SB	SB	SB	B8
Directions Served	L	T	L	L	T	R	LTR	L	L	TR	T
Maximum Queue (m)	19.1	89.7	26.0	34.2	128.5	25.0	126.3	78.0	81.4	93.9	12.9
Average Queue (m)	4.1	48.8	3.7	14.0	61.3	0.8	70.6	50.9	60.1	18.4	0.6
95th Queue (m)	13.2	76.6	15.0	27.7	104.9	19.2	122.9	76.4	79.9	62.7	6.3
Link Distance (m)		251.4			265.2		114.4			83.3	207.6
Upstream Blk Time (%)							5	0	0	1	
Queuing Penalty (veh)							0	0	0	0	
Storage Bay Dist (m)	140.0		180.0	180.0		100.0		80.0	80.0		
Storage Blk Time (%)		0			1			0	1	1	
Queuing Penalty (veh)		0			2			0	0	3	

Intersection: 2: RR 274 & Aspelund Rd

Movement	EB	WB	WB	NB	SB
Directions Served	L	L	TR	LTR	LTR
Maximum Queue (m)	9.5	4.8	1.2	22.0	19.6
Average Queue (m)	2.4	0.2	0.0	10.0	8.3
95th Queue (m)	8.5	2.4	0.9	18.4	16.0
Link Distance (m)			243.4	203.5	240.2
Upstream Blk Time (%)					
Queuing Penalty (veh)					
Storage Bay Dist (m)	110.0	110.0			
Storage Blk Time (%)					
Queuing Penalty (veh)					

Zone Summary

Zone wide Queuing Penalty: 5