TRANSPORTATION PLANNERS AND ENGINEERS

bunt &associates

Legacy Foothills RV Storage

Transportation Review

Final V2

Prepared for

Legacy Storage Inc.

Date

March 21, 2023

Project Number

02-23-0036

County File Number

22D 250

CORPORATE AUTHORIZATION

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Date: 2023-03-21
Project #: 02-23-0036
Status: Final V2

PERMIT TO PRACTICE
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Date 2023-03-21
PERMIT NUMBER: P13898
The Association of Professional Engineers
Geologists and Geophysicists of Alberta

APEGA Company Permit to Practice Stamp

PROFESSIONAL ENGINEER ALBERTA
JASON DUNN
[redacted]
LICENSED TO PRACTICE
2023-03-21

Engineer's Stamp

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This document entitled "Legacy Foothills RV Storage" was prepared by Bunt & Associates for the benefit of the client in support of their defense of their SDAB Appeal. The analysis and conclusions/recommendations in the report reflect Bunt & Associates' best professional judgment in light of the knowledge and information available to Bunt & Associates at the time of preparation.

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TABLE OF CONTENTS

1. EXECUTIVE SUMMARY 1
2. BACKGROUND 3
3. TRIP GENERATION 5
3.1 Canadian Leisure RV 5
3.2 Springbank RV – 5
3.3 Legacy Storage 5
3.4 Trip Distribution & Assignment 6
3.5 Volumes 8
3.5.1 Background 8
3.5.2 After Development 8
3.6 Intersection Analysis 8
3.7 Intersection Observation 9
3.8 Signal Warrant Analysis 9
3.9 Queuing 10
4. CONCLUSIONS & RECOMENDATIONS 11

APPENDIX A Appeal Notice

APPENDIX B Alberta Transportation Count Data

APPENDIX C Synchro Report

APPENDIX D Signal Warrant Analysis

FIGURE

Figure 1: Site Context Plan 3
Figure 2: Site Plan 4
Figure 3: Trip Distribution and Traffic Volumes 7
Figure 4: Available Storage Lengths 10

TABLES

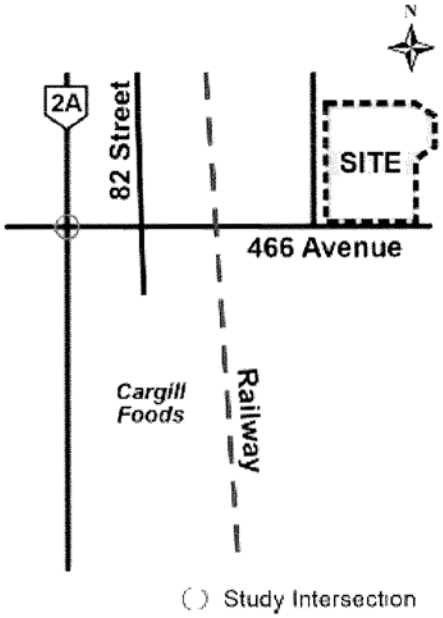
Table 3.1: Trip Generation Rates 6
Table 3.2: Vehicle Trip Generation 6
Table 3: Signal Warrant Analysis 10

1. EXECUTIVE SUMMARY

Legacy Storage Inc. is seeking a development permit for an RV storage facility located on 466 Avenue in Foothills County. The storage facility is for recreational vehicles (RVs) and boats.

Foothills County has approved the development permit application. However, it is understood that the approval has been appealed by Cargill Foods for the following reason.

> *"We disagree with the approval because Cargill is concerned that during high traffic flow times (weekend & long weekend) the traffic would be too much at the Highway 2A intersection and 466 Ave for tractor/trailers coming and leaving. On weekends or long weekends high volumes of tractor/trailers would be going through the intersection: with Cargills 500-600 tractors/trailers coming to the intersection each day. CP train coming 3 times a week to picks up rail cars on 466 Ave and block 466 Ave for 30 mins or more each time. It would be congested and traffic back up on 466 Ave and Highway 2A which would be a safety issue."*



The purpose of this report is to review the anticipated operating conditions of the Highway 2A intersection at 466 Avenue and the expected resultant queues to determine if the concerns raised are valid. This report is specific to assessing this task and has not been undertaken as a full, formal Transportation Impact Assessment. A study of that level of detail is not required for this review.

To be conservative, the following layering of traffic volumes was utilized:

- *Background Traffic:* Alberta Transportation counts were used for the background volumes. These counts represented weekday AM and PM peak periods. The background volumes on the Highway 2A corridor are larger on weekdays than on weekends and so the use of the weekday volumes represents the more conservative condition.
- *Site Traffic:* Data was acquired for several sites for weekday and weekend (including long weekend) conditions. The rates used in the analysis represent the average of the two highest observed rates.

The combination of the maximum weekday background volumes plus the maximum weekend site volumes provided results that overstate actual expected operating conditions. Given the high-level nature of this review, this level of conservative output was deemed appropriate for the purpose of analysis.

As a result of the analysis undertaken, this report provides the following conclusions:

- Based on observed trip generation rates from other RV storage facilities, the proposed site is expected to generate fewer than 45 trips during any of the weekday AM, weekday PM or weekend peak hours. This represents a total of inbound and outbound trips.

- Intersection capacity analysis confirmed queues and delays to westbound traffic on 466 Avenue. The addition of expected RV storage site-generated traffic will not appreciably affect these conditions.

- The observed westbound traffic volumes in the AM peak hour were approximately half of the AT 100th Highest Hour volumes and the observed average delay as approximately a quarter of the analysed delay value.

- Signalization of the intersection of Highway 2A and 466 Avenue is not warranted, with or without the inclusion of site-generated traffic.

- The available storage length along 466 Avenue between Hwy 2A and the Cargill site access is expected to be sufficient for the expected queue lengths during the peak hours and site-generated traffic is not expected to block the access to the Cargill site as suggested in the appellant's appeal.

This report concludes that the intersection and associated roadways will operate in a manner similar to current conditions, with no significant impact resulting from the development of the RV storage site. The intersection at Hwy 2A will continue to operate similar to how it does today and queuing will not result in undue hardship for the Cargill site. As such, it is recommended that the appeal be denied, and that the original approval be upheld.

2. BACKGROUND

Legacy Storage Inc. is seeking a development permit for an RV storage facility located on 466 Avenue in Foothills County. The storage facility is for recreational vehicles (RVs) and boats. This site is proposed to have the capacity to store 1025 units. The site context is shown in Figure 1 and the site plan is shown in Figure 2.

Figure 1: Site Context Plan

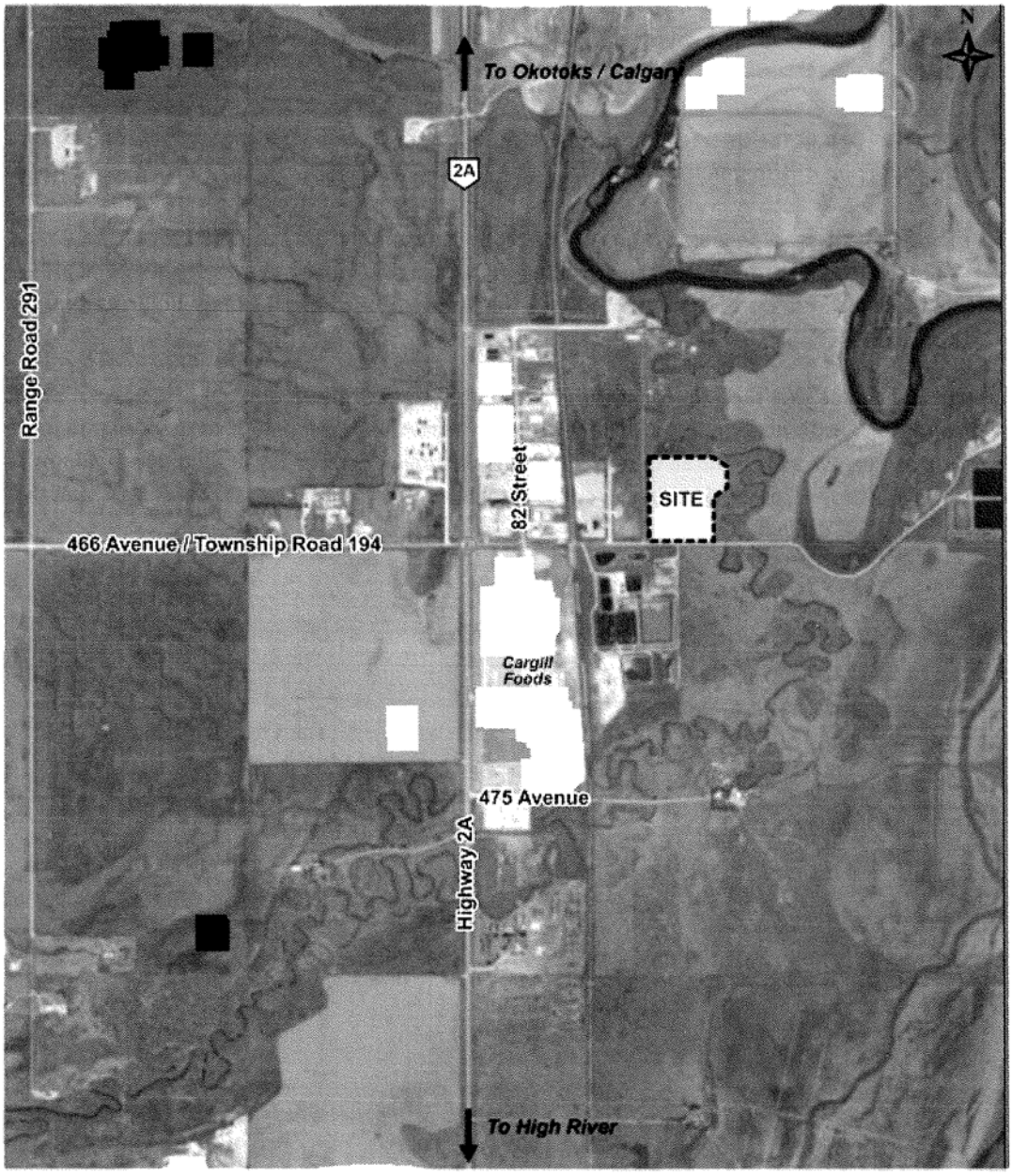
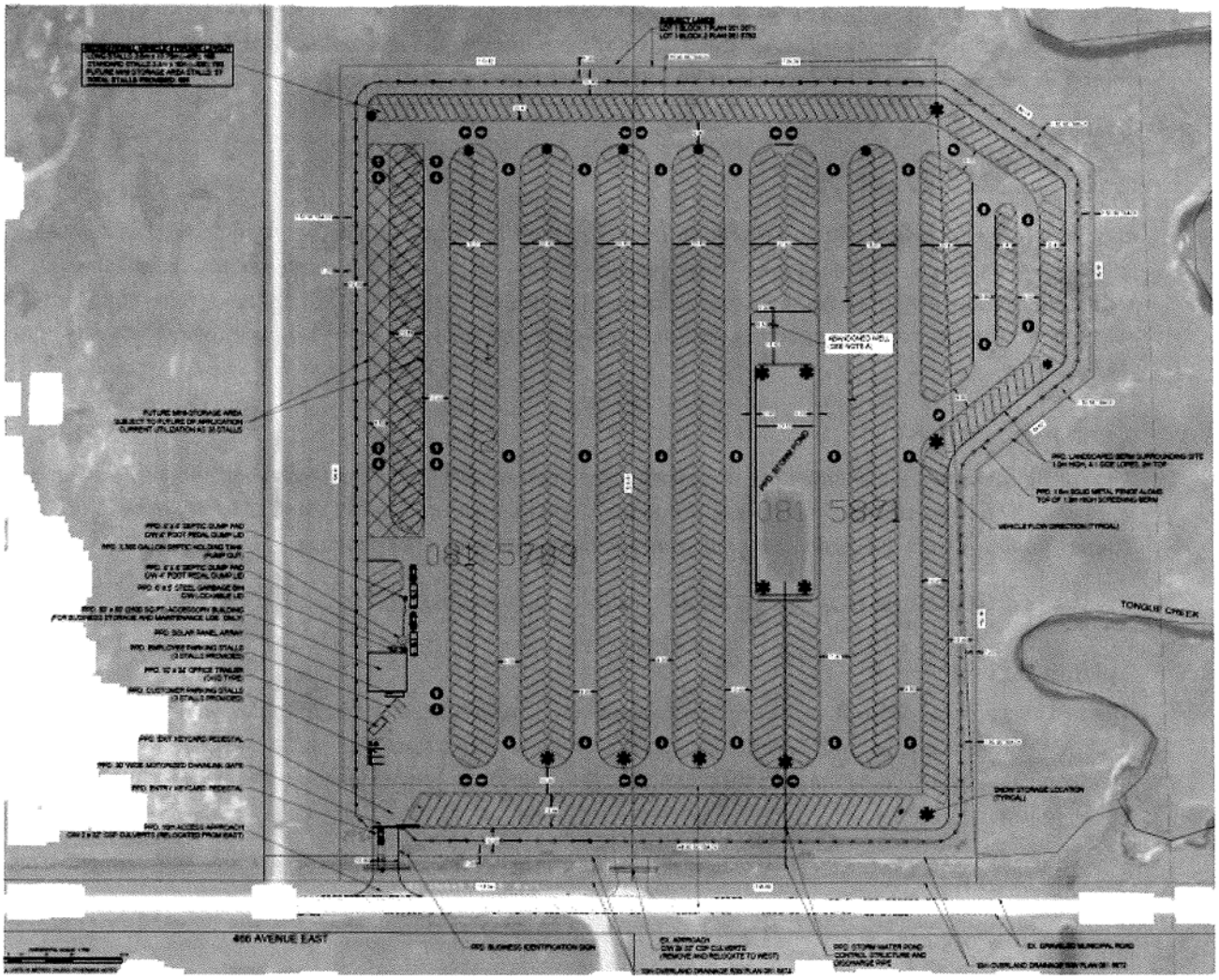


Figure 2: Site Plan



Foothills County approved the development permit application. However, the approval was appealed by Cargill for the following reason.

> *"We disagree with the approval because Cargill is concerned that during high traffic flow times (weekend & long weekend) the traffic would be too much at the Highway 2A intersection and 466 Ave for tractor/trailers coming and leaving. On weekends or long weekends high volumes of tractor/trailers would be going through the intersection: with Cargills 500-600 tractors/trailers coming to the intersection each day. CP train coming 3 times a week to picks up rail cars on 466 Ave and block 466 Ave for 30 mins or more each time. It would be congested and traffic back up on 466 Ave and Highway 2A which would be a safety issue."*

The appeal notice is contained in **Appendix A**.

The purpose of this report is to review the anticipated operating conditions of the Highway 2A intersection at 466 Avenue and the expected resultant queues to determine if the concerns raised are valid. This report is specific to assessing this task and has not been undertaken as a full, formal Transportation Impact Assessment. A study of that level of detail is not required for this review.

3. TRIP GENERATION

Bunt and Associates derived trip generation rates based on historical data collected by Bunt & Associates at similar developments. A peak hour, peak season trip rate for assessment purposes was established by using the average of the available historical data collected during the May Day and Labour Day long weekends. The RV storage locations previously surveyed and their corresponding trip generation rates are as follows:

3.1 Canadian Leisure RV[1]

The traffic count at the Canadian Leisure RV was undertaken on the Friday afternoon of the May Day long weekend. The conversion from PM peak to AM peak trip rate was calculated using the AM:PM ratio for storage land use from ITE. The observed and calculated trip rates are as follows.

- AM Peak: 0.025 trips/stall (50%/50%) and PM Peak: 0.043 trips/stall (50%/50%)

3.2 Springbank RV[2] –

The trip count at the Springbank RV on the Labour Day Long Weekend, from Thursday to Monday. The peak AM period occurred on the Thursday and the peak PM period occurred on the Monday. This reflects people picking up and dropping off their RVs at either end of the long weekend. The observed trip rates are as follows.

- AM Peak: 0.014 trips/stall (56%/44%) and PM Peak: 0.044 trips/stall (43%/57%)

3.3 Legacy Storage

Legacy Storage Inc. operate another RV storage facility in the City of Calgary. This facility has the capacity to store 750 units. Legacy Storage Inc. provided a sample of daily usage at the Calgary site, between October 2021 and September 2022. The supplied information indicates that the busiest recorded day was Sunday July 24, 2022 where 39 customers visited the site. This would equate to a total 78 trips to and from the site in the course of a full day. Applied to the 750 units, this would equate to a trip generation rate of 0.104 trips per unit per day.

The observed trip generation from the Springbank RV indicated that 12% of daily trips occurred in the AM peak hour and 18.5% of trips occurred in the PM peak hour. The calculated trips rates are as follows. As

[1] Wildcat Storage Solutions Traffic Impact Assessment, Bunt & Associates Engineering (Alberta) Ltd., October 2010.
[2] Springbank Self-Storage & RV's – Traffic Impact Statement, Bunt & Associates Engineering (Alberta) Ltd., November 2012.

these rates are lower than those observed by Bunt, the Bunt rates have been used in the review to be conservative.

- AM Peak: 0.012 trips/stall (50%/50%) and PM Peak: 0.019 trips/stall (50%/50%)

Table 3.2 summarizes the trip generation rates assumed for assessment purposes. These rates are the average of the two observed rates undertaken on long weekends.

Table 3.1: Trip Generation Rates

USE	AM PEAK HOUR			PM PEAK HOUR			DATA SOURCE
	Trip Rate	In	Out	Trip Rate	In	Out	
RV Storage	0.02 per stall	53%	47%	0.044 per stall	47%	53%	Bunt Data

The peak hour trips anticipated to be generated by the proposed development are summarized in Table 3.2.

Table 3.2: Vehicle Trip Generation

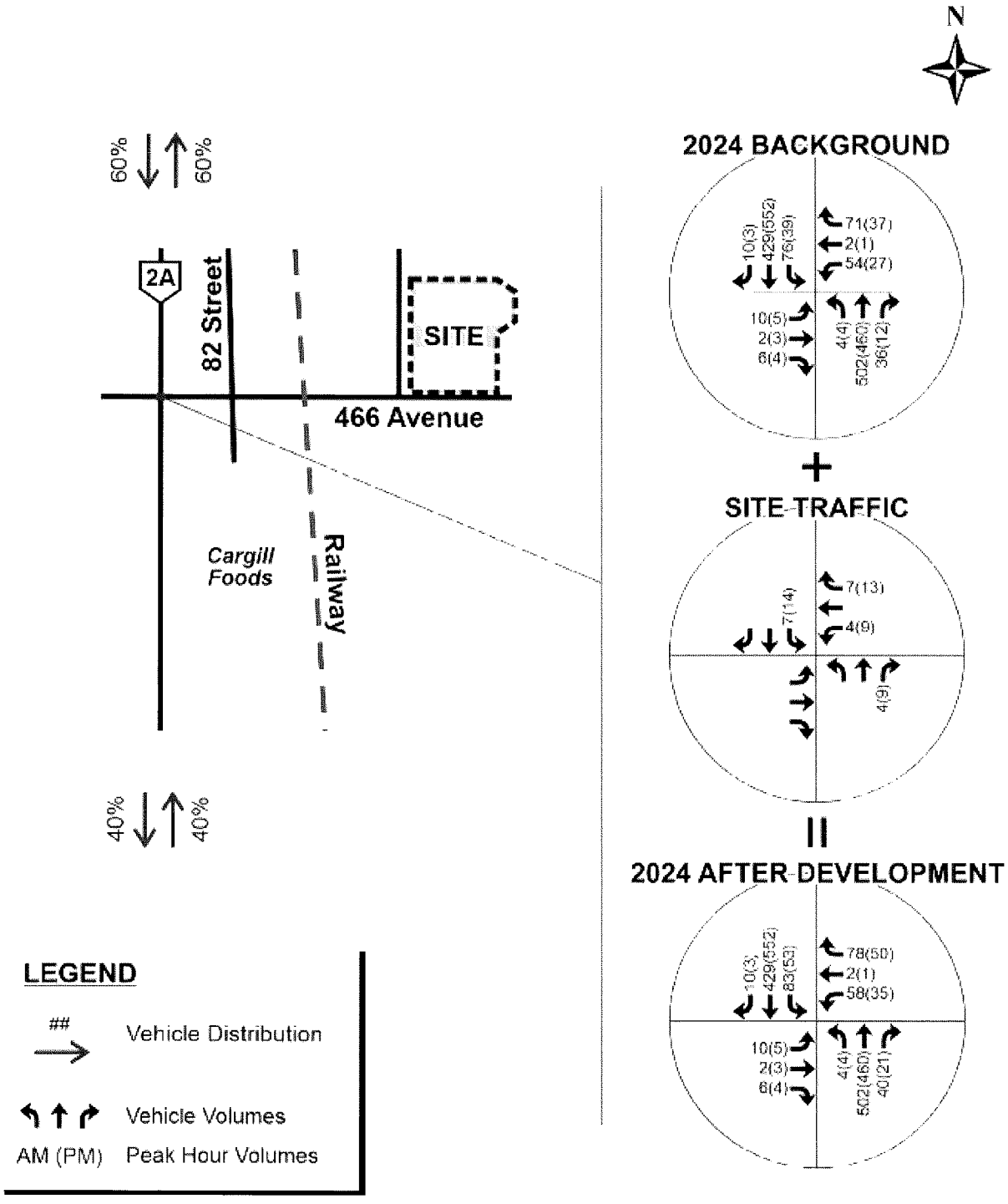
USE	DENSITY	AM PEAK HOUR			PM PEAK HOUR		
		Total	In	Out	Total	In	Out
RV Storage	1025 stalls	22	11	11	45	23	22

3.4 Trip Distribution & Assignment

Vehicle trips are distributed based on population numbers between the Town of Okotoks and High River as this is the anticipated customer based for and RV storage in this location. This results in an approximate 60/40 split between the two towns. This split approximates the distribution that was observed in the in the Alberta Transportation traffic counts for the Highway 2A / 466 Avenue intersection. Vehicle access to the development will be provided from 466 Avenue.

The distribution is shown in Figure 3.

Figure 3: Trip Distribution and Traffic Volumes



3.5 Volumes

3.5.1 Background

The existing volumes at the Highway 2A / 466 Avenue intersection were sourced from Alberta Transportation (AT). The count data is contained in **Appendix B**. These counts represent 2021 values. It is noted that the Alberta Transportation counts are factored to represent the 100th Highest Hour volume. This represents the hundredth highest volume that would occur if all the hourly volumes were ranked. The value is therefore higher than the average volume that would occur.

The volumes were grown at 2 % per annum to generate 2024 background volumes. These volumes are shown in **Figure 3.**

It is noted that the appeal notice identified weekends as specific times of concern. While the AT counts are based on a weekday count, weekdays are typically busier than weekends and so using the weekday count for the background traffic layer would produce a more conservative result. This level of conservative analysis was deemed appropriate for the analysis undertaken in this study, noting that results are expected to overstate congestion and queuing conditions.

3.5.2 After Development

Development generated traffic volumes were added to 2024 background traffic volumes to forecast the After Development traffic volumes illustrated in **Figure 3**.

3.6 Intersection Analysis

Synchro 11 traffic analysis software was used to review intersection operational conditions based on the methods outlined in the Highway Capacity Manual. Traffic operations were assessed using the performance measures of volume-to-capacity (v/c) and Level of Service (LOS).

The volume-to-capacity (v/c) ratio of an intersection movement represents the ratio between the demand volume and available capacity. A v/c ratio over 1.0 indicates a congested intersection where drivers may have to wait through more than one signal cycle. The Level of Service (LOS) rating is based on average vehicle delays ranging from LOS A (minimal delay) to LOS F (significant delay).

The analysis is completed as per Alberta Transportation TIA guidelines. Synchro output reports are provided in **Appendix C**. The volume to capacity (v/c) ratio, level of service, average control delay (in seconds), and 95th percentile queue (in metres) are summarized in **Table 3**:

Table 3: Intersection Analysis (2024 Background)

INTERSECTION	HORIZON	MOVEMENT & LANES		AM PEAK HOUR v/c	AM LOS	AM Delay	AM Queue	PM PEAK HOUR v/c	PM LOS	PM Delay	PM Queue
Hwy 2A & 466 Ave *(E-W Stop Control)*	**Background**	**EB**	1	0.17	E	37	5	0.09	D	28	<5
		WB	1	0.72	F	61	37	0.30	D	26	10
		NBTL	1	<0.02	A	0	<5	<0.02	A	0	<5
		NBR	1	0.02	A	0	<5	<5	A	0	<5
		SB	2	0.14	A	4	<5	0.18	A	1	<5
		Overall		-	B	7.9	-	-	B	2.3	-
	After Development	**EB**	1	0.18	E	39	<5	0.09	D	30	<5
		WB	1	0.79	F	71	44	0.41	D	30	15
		NBTL	1	<0.02	A	0	<5	<0.02	A	0	<5
		NBR	1	0.03	A	0	<5	<0.02	A	0	<5
		SB	2	0.14	A	3	<5	0.18	A	2	<5
		Overall		-	B	9.7	-	-	B	3.2	-

Intersection capacity analysis indicates in the 2024 background scenario the west bound movement is experiencing longer delays in the AM peak hour, resulting in a LOS F for this movement. In essence, this means that this particular movement is operating at or near to capacity. All other movements are expected to operate within acceptable capacity limits. The intersection is expected to operate within acceptable parameters in the PM peak hour.

With the addition of the site traffic, the westbound delay increases, however the overall performance of the movement and the intersection is not impacted.

3.7 Intersection Observation

The intersection was observed on March 15, 2023 between 7.30 AM and 8.30 AM to review the actual AM peak hour conditions. A summary of the observations are as follows.

- Westbound movement – 33 vehicles
- Maximum delay – 93 seconds
- Average delay – 14 seconds
- Maximum queue – two trucks
- Average queue – one truck

The observation indicated that the traffic volumes are approximately half of the AT 100th highest hour volume and that the delay was approximately a quarter of the analysed delay value.

3.8 Signal Warrant Analysis

Signal warrant analysis was completed for the Hwy 2A / 466 Ave intersection. based on the methods outlined in the Transportation Association of Canada (TAC) *Traffic Signal and Pedestrian Signal Head Warrant Handbook* (2014). A score of 100 points or more indicates a traffic signal is warranted in an urban condition, with rural conditions generally seeking signalization at slightly lower warrant thresholds, potentially in the range of 80 points. The signal warrant analysis is summarized in **Table 3** and included in **Appendix D**. It is noted that the signal warrant includes a factor for heavy vehicles to account for this higher number of heavy vehicles that utilise this intersection.

Table 3: Signal Warrant Analysis

INTERSECTION	HORIZON	SIGNAL WARRANT SCORE			COMMENT
		Total	Vehicle	Pedestrian	
Hwy 2A & 466 Ave	2024 Background	62/100	62	0	Not warranted
	After Development	69/100	72	0	Not warranted

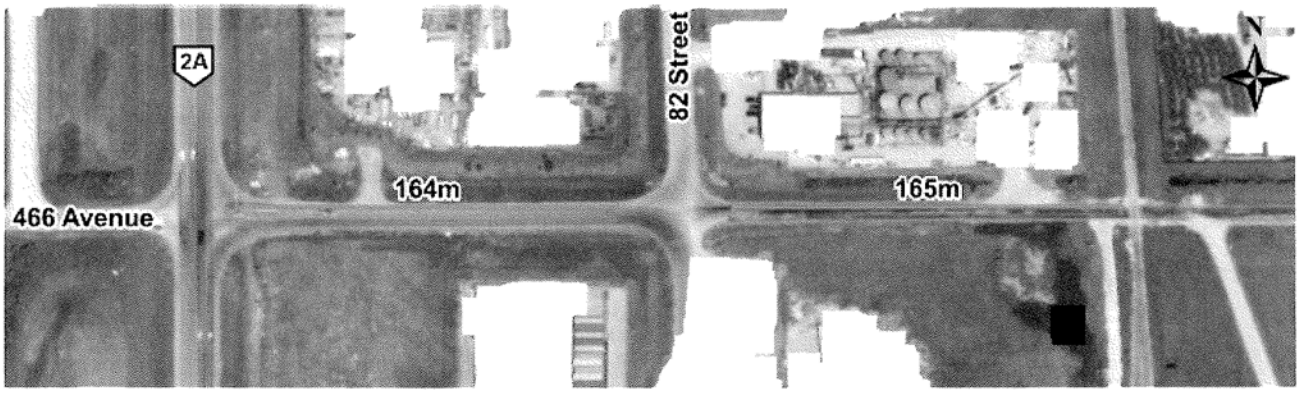
Signal warrant analysis indicates that a traffic signal is not warranted at the Hwy 2A / 466 Ave intersection.

3.9 Queuing

As a major point of concern for the appellant was potential queuing issues, a review of queuing was undertaken. The appellant was concerned with outbound queues at the intersection of Hwy 2A and 466 Ave and inbound queue at the railway crossing with 466 Ave, if a train was blocking the crossing.

The available storage lengths on each segment of 466 Ave are shown in Figure 4.

Figure 4: Available Storage Lengths



The analysis results in Table 3 indicate that the anticipated west bound queue at the intersection of Hwy 2A and 466 Ave is 45 metres with the addition of the site generated traffic. This is considerably less than the available 164 metres.

As shown in Figure 4 the available storage length between the railway crossing and the intersection of 466 Ave and 82 Street is approximately 165 metres. Assuming 15 metres per RV unit, this would allow up to 11 RV units to be queued along 466 Ave before they queued back into the intersection of 466 Ave and 82 Street. This indicates that a train would need to block the crossing with 466 Ave for an hour before the vehicle queue length would become problematic.

4. CONCLUSIONS & RECOMENDATIONS

This report makes the following conclusions;

- Based on observed trip generation rates at other RV sites, the site is expected to generate fewer than 45 trips during any of thew weekday AM, weekday PM or weekend peak hours.
- Intersection capacity analysis confirmed queues and delays to westbound traffic on 466 Avenue. The addition of expected RV storage site-generated traffic will not appreciably affect these conditions.
- The observed westbound traffic volumes in the AM peak hour were approximately half of the AT 100th Highest Hour volumes and the observed average delay as approximately a quarter of the analysed delay value.
- Signalization of the intersection of Highway 2A and 466 Avenue is not warranted, with or without the inclusion of site-generated traffic.
- The available storage length along 466 Avenue between Hwy 2A and the Cargill site access is expected to be sufficient for the expected queue lengths during the peak hours and site-generated traffic is not expected to block the access to the Cargill site as suggested in the appellant's appeal.

This report concludes that the intersection and associated roadways will operate in a manner similar to current conditions, with no significant impact resulting from the development of the RV storage site. The intersection at Hwy 2A will continue to operate within typically acceptable parameters for capacity and queuing and will not result in undue hardship for the Cargill site. As such, it is recommended that the appeal be denied, and that the original approval be upheld.

APPENDIX A

Appeal Notice

RECEIVED

FEB 2 8 2023

Notice of Development Appeal

Subdivision and Development Appeal Board (SDAB)
Foothills County **www.mdfoothills.com**
309 Macleod Trail, Box 5605, High River, AB T1V 1M7 • Tel: 403-652-2341 Fax: 403-652-7880

SEND NOTICE OF APPEAL AND APPEAL FEE VIA:

Mail/Deliver: SDAB Clerk, Foothills County
Box 5605, 309 Macleod Tr. S., High River, AB T1V 1M7

Fax: 403-652-7880 or **Email (scanned pdf):** appeals@foothillscountyAB.ca

For more information contact SDAB Clerk at: 403-652-2341 or appeals@FoothillsCountyAB.ca

Office Use Only
Appeal Received:

A notice for development appeal under section 686 of the Municipal Government Act should contain the following information and must be filed with the SDAB within 21 days after the date of the decision of the development authority or deemed refusal by the development authority in accordance with section 684.
THE APPEAL FEE MUST ACCOMPANY THE NOTICE OF DEVELOPMENT APPEAL FORM.

DEVELOPMENT APPEAL	Fee
Appeal by Landowner or Affected Party (fee to be refunded if appellant appears before SDAB)	**$100**
Appeal on application that is not within the Development Officer's discretion	**$575**
Appeal on Stop Order	**$575**

SITE INFORMATION FOR PROPERTY UNDER APPEAL

Development Permit Number:

Legal Land Description: Plan [illegible] Block

Plan | Lot | Block | ***AND/OR*** Quarter Section | Township | Range | Meridian

APPELLANT INFORMATION *(e.g. Landowner or Affected Party)*

Name of Appellant(s):

Mailing Address: [redacted]

Town/City/Village: [redacted] Province: [redacted] Postal Code: [redacted]

Home/Cell Phone: Business Phone: [redacted]

I consent to receive documents by email: ☐ Yes ☐ No Email Address: [redacted]

Legal Land Description:

Plan | Lot | Block | ***AND/OR*** Quarter Section | Township | Range | Meridian

AGENT INFORMATION AND CERTIFICATION *(complete section only if applicable)*

Name of Organization:

Contact Name:

I consent to receive documents by email: ☐ Yes ☐ No Email Address:

Phone (daytime):

Mailing Address:

Town/City/Village: Province: Postal Code:

I (We) _____ hereby authorize _____
to act on my (our) behalf on matters pertaining to this application for subdivision

_____ _____ _____ _____
Signature of Appellant(s) Date Signature of Appellant(s) Date

DECISION OF DEVELOPMENT AUTHORITY

Date of Decision (Y/M/D) _____/_____/_____

Copy of Development Authority Decision Attached ☐ YES ☐ NO

TURN OVER AND COMPLETE REVERSE SIDE ▶

REASONS FOR APPEAL *(attach separate page(s) if required)*

All development appeals should contain the reasons for the appeal, including the issues in the decision or the conditions imposed in the approval that are the subject of the appeal

☐ **APPROVAL** – Why do you disagree with the Approval or what Conditions of Approval do you disagree with and why?
OR

☐ **REFUSAL** – Why do you think your development application should be approved?
OR

☐ **STOP ORDER**

This information is being collected for the Subdivision and Development Appeal Board of Foothills County and will be used to process your appeal and to create a public record of the appeal hearing. This information is collected in accordance with Section 33(c) of the *Freedom of Information and Protection of Privacy Act*. If you have any questions regarding the collection or use of this information, contact the FOIP Coordinator at (403) 652-2341

[redacted]

Signature of Appellant(s) OR
Person Authorized to Act on Behalf of Appellant(s)

02-28-23
Date

Upon receipt of your Notice of Appeal and payment of the required appeal fee, an SDAB hearing date will be set within 30 days. You and the landowners who are adjacent to the property under appeal will receive by ordinary mail, a Written Notice of the date and time of the appeal Hearing.

****NOTE FOR EMAIL SUBMISSIONS ONLY: IF YOU DO NOT RECEIVE AN EMAIL CONFIRMATION NOTIFYING YOU OF RECEIPT OF YOUR APPEAL, PLEASE CONTACT THE SDAB CLERK IMMEDIATELY. ****

▼ PAYMENT OF APPEAL FEE ▼

If submitting the Notice of Appeal form and paying the appeal fee in person, you do not need to complete this section
If submitting the Notice of Appeal form by fax or email, you must complete this section.

CREDIT CARD INFORMATION			
Card type:	☐ Visa	☐ Master Card	☐ American Express
Name as it appears on Card:		Card Number:	Date of Expiry:
Authorization: I authorize Foothills County to charge $		to my credit card.	
Signature of Card Holder:			Date:

FOR OFFICE USE ONLY		
Authorized By:	Date:	Receipt #:

APPENDIX B

Alberta Transportation Count Data

Turning Movement Summary Diagram

Reference No.: 70000929

Intersection of:
2A & 466 AVE E N OF HIGH RIVER

2021 AADT / ASDT ESTIMATES

North On 2A		
Vehicle Type	**Vol**	**%**
A: Passenger Vehicle	7127	90.6
B: Recreational Vehicle	37	0.5
C: Bus	18	0.2
D: Single Unit Truck	244	3.1
E: Tractor Trailer Unit	444	5.6
ASDT 8430	**AADT** 7870	

West On 466 Ave E		
Vehicle Type	**Vol**	**%**
A: Passenger Vehicle	285	91.4
B: Recreational Vehicle	1	0.3
C: Bus	0	0.0
D: Single Unit Truck	19	6.6
E: Tractor Trailer Unit	5	1.7
ASDT 310	**AADT** 290	

East On 466 Ave E		
Vehicle Type	**Vol**	**%**
A: Passenger Vehicle	637	48.3
B: Recreational Vehicle	6	0.5
C: Bus	0	0.0
D: Single Unit Truck	195	14.8
E: Tractor Trailer Unit	482	36.5
ASDT 1410	**AADT** 1320	

South On 2A		
Vehicle Type	**Vol**	**%**
A: Passenger Vehicle	7149	93.1
B: Recreational Vehicle	32	0.4
C: Bus	18	0.2
D: Single Unit Truck	178	2.3
E: Tractor Trailer Unit	303	3.9
ASDT 8230	**AADT** 7680	

TURNING MOVEMENT ABBREVIATIONS

NR: Traffic From North Turning Right
NL: Traffic From North Turning Left
NT: Traffic From North Proceeding Through

SR: Traffic From South Turning Right
SL: Traffic From South Turning Left
ST: Traffic From South Proceeding Through

ER: Traffic From East Turning Right
EL: Traffic From East Turning Left
ET: Traffic From East Proceeding Through

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

TURNING MOVEMENT ABBREVIATIONS

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

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

Turning Movement Summary Diagram

Reference No.: 70000929

Intersection of:
2A & 466 AVE E N OF HIGH RIVER

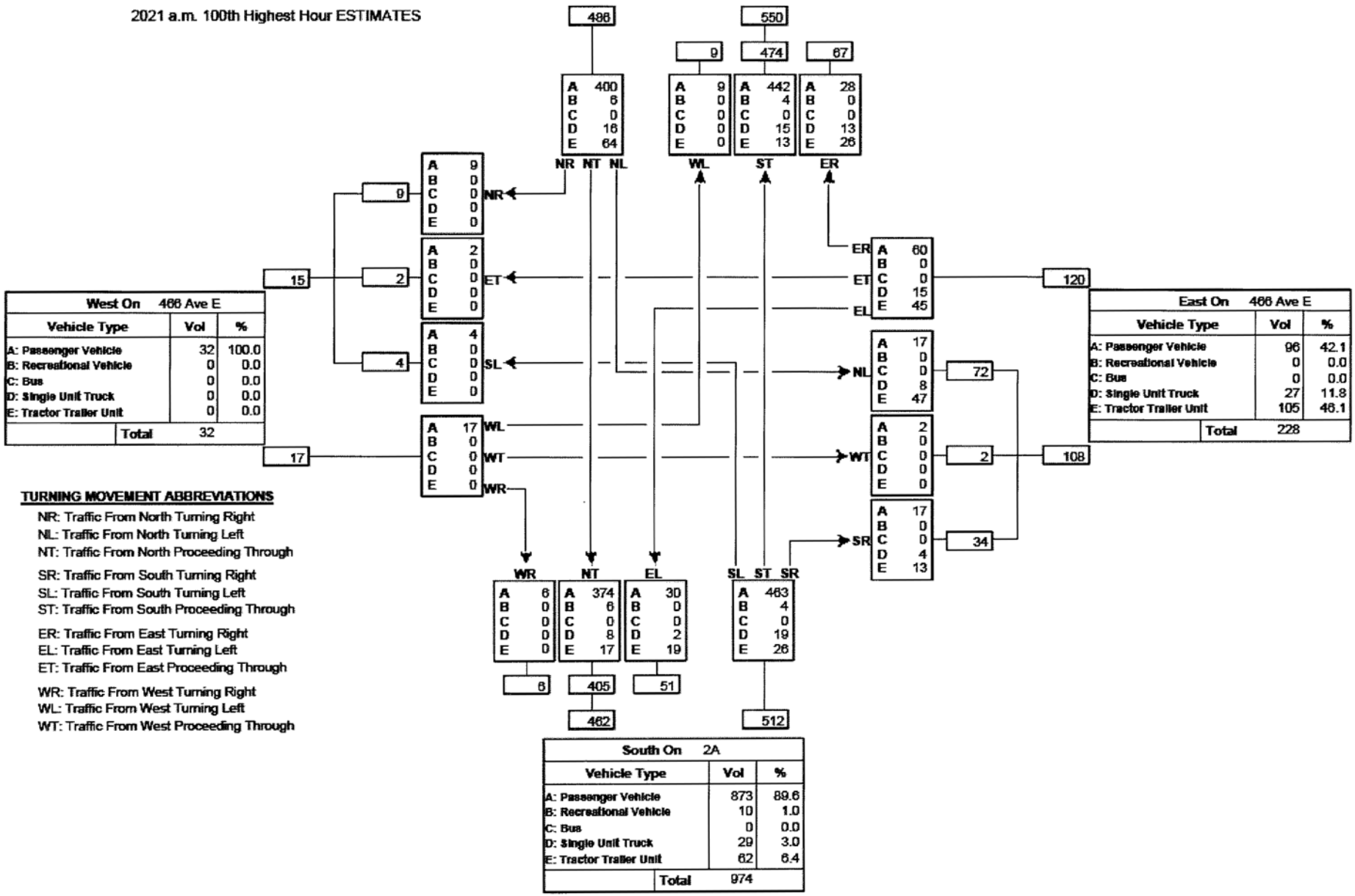
2021 a.m. 100th Highest Hour ESTIMATES

North On 2A		
Vehicle Type	**Vol**	**%**
A: Passenger Vehicle	879	84.8
B: Recreational Vehicle	10	1.0
C: Bus	0	0.0
D: Single Unit Truck	44	4.2
E: Tractor Trailer Unit	103	9.9
Total	1036	

West On 466 Ave E		
Vehicle Type	**Vol**	**%**
A: Passenger Vehicle	32	100.0
B: Recreational Vehicle	0	0.0
C: Bus	0	0.0
D: Single Unit Truck	0	0.0
E: Tractor Trailer Unit	0	0.0
Total	32	

East On 466 Ave E		
Vehicle Type	**Vol**	**%**
A: Passenger Vehicle	96	42.1
B: Recreational Vehicle	0	0.0
C: Bus	0	0.0
D: Single Unit Truck	27	11.8
E: Tractor Trailer Unit	105	46.1
Total	228	

South On 2A		
Vehicle Type	**Vol**	**%**
A: Passenger Vehicle	873	89.6
B: Recreational Vehicle	10	1.0
C: Bus	0	0.0
D: Single Unit Truck	29	3.0
E: Tractor Trailer Unit	62	6.4
Total	974	



TURNING MOVEMENT ABBREVIATIONS

NR: Traffic From North Turning Right
NL: Traffic From North Turning Left
NT: Traffic From North Proceeding Through

SR: Traffic From South Turning Right
SL: Traffic From South Turning Left
ST: Traffic From South Proceeding Through

ER: Traffic From East Turning Right
EL: Traffic From East Turning Left
ET: Traffic From East Proceeding Through

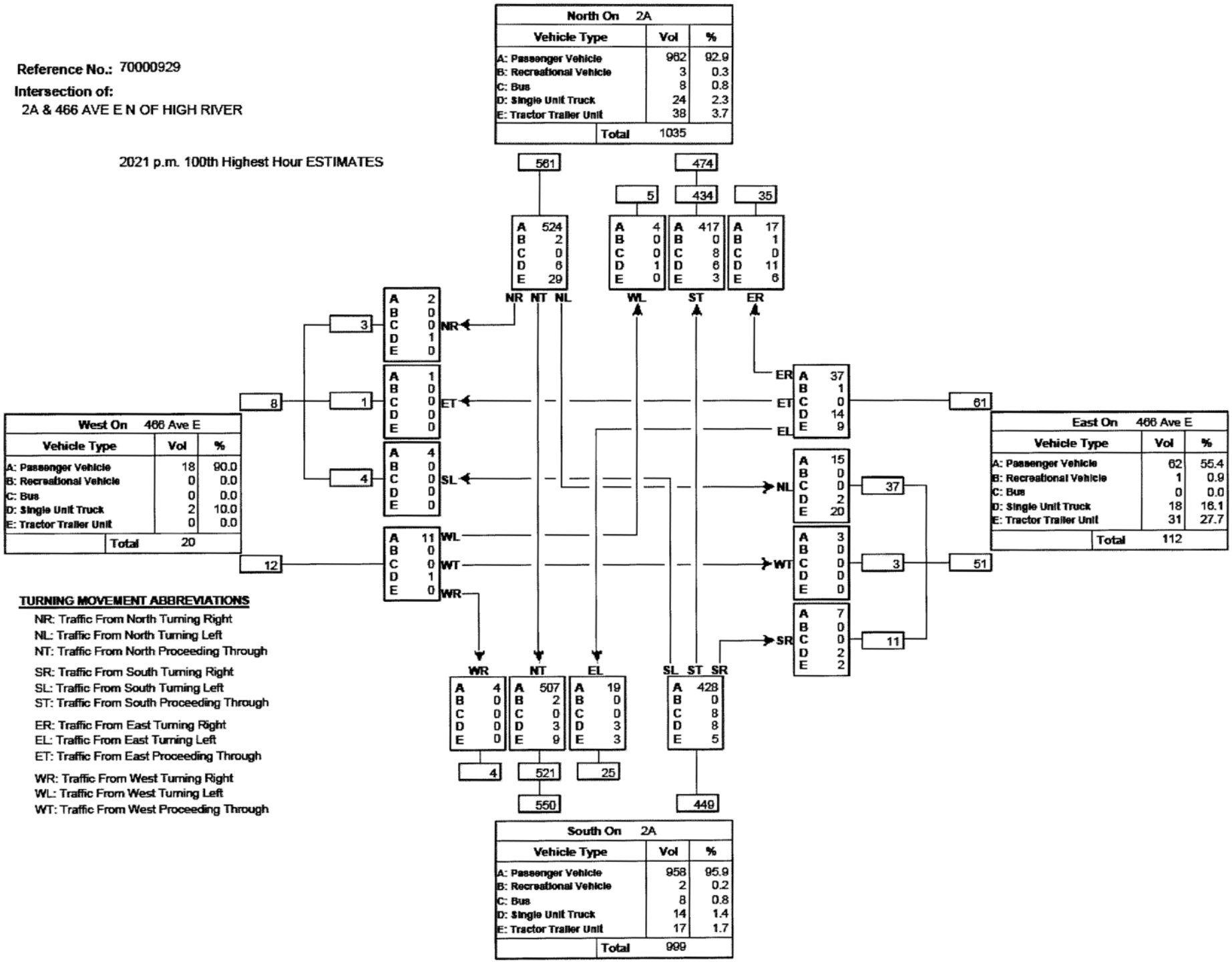
WR: Traffic From West Turning Right
WL: Traffic From West Turning Left
WT: Traffic From West Proceeding Through

Turning Movement Summary Diagram

Reference No.: 70000929

Intersection of:
2A & 466 AVE E N OF HIGH RIVER

2021 p.m. 100th Highest Hour ESTIMATES



TURNING MOVEMENT ABBREVIATIONS

NR: Traffic From North Turning Right
NL: Traffic From North Turning Left
NT: Traffic From North Proceeding Through

SR: Traffic From South Turning Right
SL: Traffic From South Turning Left
ST: Traffic From South Proceeding Through

ER: Traffic From East Turning Right
EL: Traffic From East Turning Left
ET: Traffic From East Proceeding Through

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

APPENDIX C

Synchro Report

3: Highway 2A & 466 Avenue — AM Peak Hour
03-09-2023 — Background

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↔			↔			↑	↱		↑↔	
Traffic Volume (veh/h)	10	5	6	54	5	71	5	502	36	75	429	10
Future Volume (Veh/h)	10	5	6	54	5	71	5	502	36	75	429	10
Sign Control		Stop			Stop			Free			Free	
Grade		0%			0%			0%			0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	11	5	7	59	5	77	5	545	39	83	466	11
Pedestrians												
Lane Width (m)												
Walking Speed (m/s)												
Percent Blockage												
Right turn flare (veh)												
Median type								None			None	
Median storage veh)												
Upstream signal (m)												
pX, platoon unblocked												
vC, conflicting volume	1273	1232	238	954	1199	546	477			585		
vC1, stage 1 conf vol												
vC2, stage 2 conf vo												
vCu, unblocked vol	1273	1232	238	954	1199	546	477			585		
tC, single (s)	7.5	6.5	6.9	8.7	7.7	8.1	4.3			4.4		
tC, 2 stage (s)												
tF (s)	3.5	4.0	3.3	4.1	4.6	3.9	2.3			2.3		
p0 queue free %	87	97	99	54	95	79	100			91		
cM capacity (veh/h)	87	159	763	128	108	362	1034			908		

Direction, Lane #	EB 1	WB 1	NB 1	NB 2	SB 1	SB 2
Volume Tota	23	141	551	39	316	244
Volume Left	11	59	5	0	83	0
Volume Right	7	77	0	39	0	11
cSH	138	196	1034	1700	908	1700
Volume to Capacity	0.17	0.72	0.00	0.02	0.09	0.14
Queue Length 95th (m)	4.6	37.0	0.1	0.0	2.4	0.0
Control Delay (s)	36.2	50.2	0.1	0.0	3.2	0.0
Lane LOS	E	F	A		A	
Approach Delay (s)	36.2	50.2	0.1		1.8	
Approach LOS	E	F				

Intersection Summary					
Average Delay	7.9				
Intersection Capacity Utilization	60.2%	ICU Level of Service		B	
Analysis Period (min)	15				

3: Highway 2A & 466 Avenue — PM Peak Hour
03-09-2023 — Background

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↔			↔			↑	↱		↑↔	
Traffic Volume (veh/h)	5	5	5	27	5	37	5	460	12	39	552	5
Future Volume (Veh/h)	5	5	5	27	5	37	5	460	12	39	552	5
Sign Control		Stop			Stop			Free			Free	
Grade		0%			0%			0%			0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	5	5	5	29	5	40	5	500	13	42	600	5
Pedestrians												
Lane Width (m)												
Walking Speed (m/s)												
Percent Blockage												
Right turn flare (veh)												
Median type								None			None	
Median storage veh)												
Upstream signal (m)												
pX, platoon unblocked												
vC, conflicting volume	1239	1210	302	902	1199	500	605			513		
vC1, stage 1 conf vol												
vC2, stage 2 conf vo												
vCu, unblocked vol	1239	1210	302	902	1199	500	605			513		
tC, single (s)	7.7	6.7	7.1	8.4	6.6	7.8	4.2			4.2		
tC, 2 stage (s)												
tF (s)	3.6	4.1	3.4	3.9	4.0	3.7	2.2			2.3		
p0 queue free %	95	97	99	82	97	90	99			95		
cM capacity (veh/h)	105	162	670	155	173	419	952			1021		

Direction, Lane #	EB 1	WB 1	NB 1	NB 2	SB 1	SB 2
Volume Tota	15	74	505	13	342	305
Volume Left	5	29	5	0	42	0
Volume Right	5	40	0	13	0	5
cSH	175	246	962	1700	1021	1700
Volume to Capacity	0.09	0.30	0.01	0.01	0.04	0.18
Queue Length 95th (m)	2.2	9.8	0.1	0.0	1.0	0.0
Control Delay (s)	27.5	25.8	0.2	0.0	1.4	0.0
Lane LOS	D	D	A		A	
Approach Delay (s)	27.5	25.8	0.1		0.8	
Approach LOS	D	D				

Intersection Summary					
Average Delay	2.3				
Intersection Capacity Utilization	56.7%	ICU Level of Service		B	
Analysis Period (min)	15				

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↔			↔			↑	↗		↑↔	
Traffic Volume (veh/h)	10	5	6	58	5	78	5	502	40	83	429	10
Future Volume (Veh/h)	10	5	6	58	5	78	5	502	40	83	429	10
Sign Control		Stop			Stop			Free			Free	
Grade		0%			0%			0%			0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	11	5	7	63	5	85	5	545	43	90	466	11
Pedestrians												
Lane Width (m)												
Walking Speed (m/s)												
Percent Blockage												
Right turn flare (veh)												
Median type								None			None	
Median storage veh)												
Upstream signal (m)												
pX, platoon unblocked												
vC, conflicting volume	1295	1250	238	978	1213	546	477			589		
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	1295	1250	238	978	1213	546	477			589		
tC, single (s)	7.5	6.5	6.9	8.7	7.7	6.4	4.3			4.4		
tC, 2 stage (s)												
tF (s)	3.5	4.0	3.3	4.1	4.6	3.9	2.3			2.3		
p0 queue free %	85	97	99	49	95	76	100			90		
cM capacity (veh/h)	81	154	763	123	105	362	1034			904		

Direction, Lane #	EB 1	WB 1	NB 1	NB 2	SB 1	SB 2
Volume Total	23	153	551	43	323	244
Volume Left	11	63	5	0	90	0
Volume Right	7	85	0	43	0	11
cSH	130	196	1034	1700	904	1700
Volume to Capacity	0.18	0.79	0.00	0.03	0.10	0.14
Queue Length 95th (m)	4.9	43.9	0.1	0.0	2.6	0.0
Control Delay (s)	38.5	71.1	0.1	0.0	3.4	0.0
Lane LOS	E	F	A		A	
Approach Delay (s)	38.5	71.1	0.1		1.9	
Approach LOS	E	F				

Intersection Summary					
Average Delay	9.7				
Intersection Capacity Utilization	61.2%	ICU Level of Service		B	
Analysis Period (min)	15				

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↔			↔			↑	↗		↑↔	
Traffic Volume (veh/h)	5	5	5	35	5	50	5	460	21	53	552	5
Future Volume (Veh/h)	5	5	5	35	5	50	5	460	21	53	552	5
Sign Control		Stop			Stop			Free			Free	
Grade		0%			0%			0%			0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	5	5	5	38	5	54	5	500	23	58	600	5
Pedestrians												
Lane Width (m)												
Walking Speed (m/s)												
Percent Blockage												
Right turn flare (veh)												
Median type								None			None	
Median storage veh)												
Upstream signal (m)												
pX, platoon unblocked												
vC, conflicting volume	1285	1252	302	934	1231	500	605			523		
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	1285	1252	302	934	1231	500	605			523		
tC, single (s)	7.7	6.7	7.4	8.4	6.6	7.8	4.2			4.2		
tC, 2 stage (s)												
tF (s)	3.6	4.1	3.4	3.9	4.0	3.7	2.2			2.3		
p0 queue free %	95	97	99	75	97	87	99			94		
cM capacity (veh/h)	92	150	670	153	162	419	952			1012		

Direction, Lane #	EB 1	WB 1	NB 1	NB 2	SB 1	SB 2
Volume Total	15	97	505	23	358	305
Volume Left	5	38	5	0	58	0
Volume Right	5	54	0	23	0	5
cSH	158	238	962	1700	1012	1700
Volume to Capacity	0.09	0.41	0.01	0.01	0.06	0.18
Queue Length 95th (m)	2.5	15.0	0.1	0.0	1.5	0.0
Control Delay (s)	30.2	30.2	0.2	0.0	1.9	0.0
Lane LOS	D	D	A		A	
Approach Delay (s)	30.2	30.2	0.4		1.0	
Approach LOS	D	D				

Intersection Summary					
Average Delay	3.2				
Intersection Capacity Utilization	58.8%	ICU Level of Service		B	
Analysis Period (min)	15				

APPENDIX D

Signal Warrant Analysis

Foothills County - Traffic Signal Warrant Analysis

Main Street (name)	Highway 2A
Side Street (name)	466 Avenue
Quadrant / Int #	
for Warrant Calculation Results, please hit 'Page Down'	CHECKSHEET

Direction (EW or NS)	NS
Direction (EW or NS)	EW
Comments	Background

Road Authority:	Foothills County
City:	North of High River
Analysis Date:	2023 Mar 09, Thu
Count Date:	2021 AT Count
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
Highway 2A	NB		1				--	2,000	1
Highway 2A	SB		1			1		2,000	2
466 Avenue	WB				1				
466 Avenue	EB				1				
Are the 466 Avenue WB right turns significantly impeded by through movements? (y/n)							n		
Are the 466 Avenue EB 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	(#)	0
Central Business District	(y/n)	n

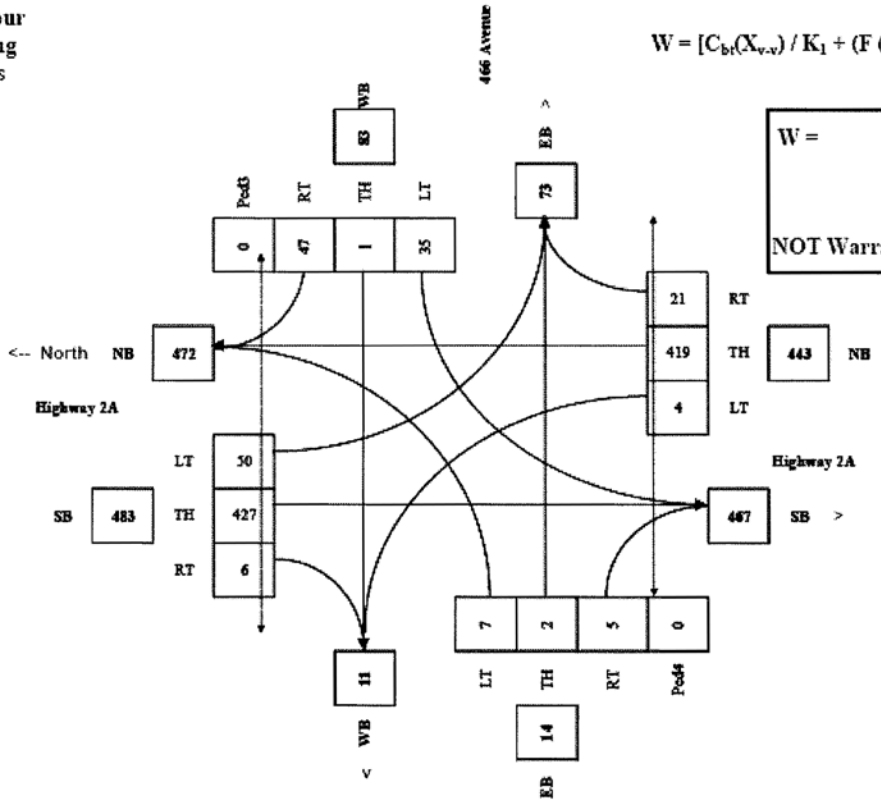
Other Input		Speed (Km/h)	Truck %	Bus Rt (y/n)	Median (m)
Highway 2A	NB	100	15.0%	n	0.0
466 Avenue	EW		58.0%	n	

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
Background (AM+PM)*2.61	22	2512	124	302	2562	33	210	8	282	39	14	28				
Total (6-hour peak)	22	2,512	124	302	2,562	33	210	8	282	39	14	28	0	0	0	0
Average (6-hour peak)	4	419	21	50	427	6	35	1	47	7	2	5	0	0	0	0

Average 6-hour Peak Turning Movements

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



W =	62	62	0
		Veh	*Ped*

NOT Warranted

RESET SHEET

Traffic Signal Warrant Spreadsheet - v3H © 2007 Transportation Association of Canada

Foothills County - Traffic Signal Warrant Analysis

Main Street (name)	Highway 2A
Side Street (name)	466 Avenue
Quadrant / Int #	
for Warrant Calculation Results, please hit 'Page Down'	CHECK SHEET
Direction (EW or NS)	NS
Direction (EW or NS)	EW
Comments	After Development
Road Authority:	Foothills County
City:	North of High River
Analysis Date:	2023 Mar 09, Thu
Count Date:	2021 AT Count
Date Entry Format:	(yyyy-mm-dd)

Lane Configuration		Excl LT	Th & LT	Through	Th+R+LT	Th & RT	Excl RT	UpStream Signal (m)	# of Thru Lanes
Highway 2A	NB		1				1	2,000	1
Highway 2A	SB		1			1		2,000	2
466 Avenue	WB				1				
466 Avenue	EB				1				

Are the 466 Avenue WB right turns significantly impeded by through movements? (y/n) n
Are the 466 Avenue EB 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	(#)	0
Central Business District	(y/n)	n

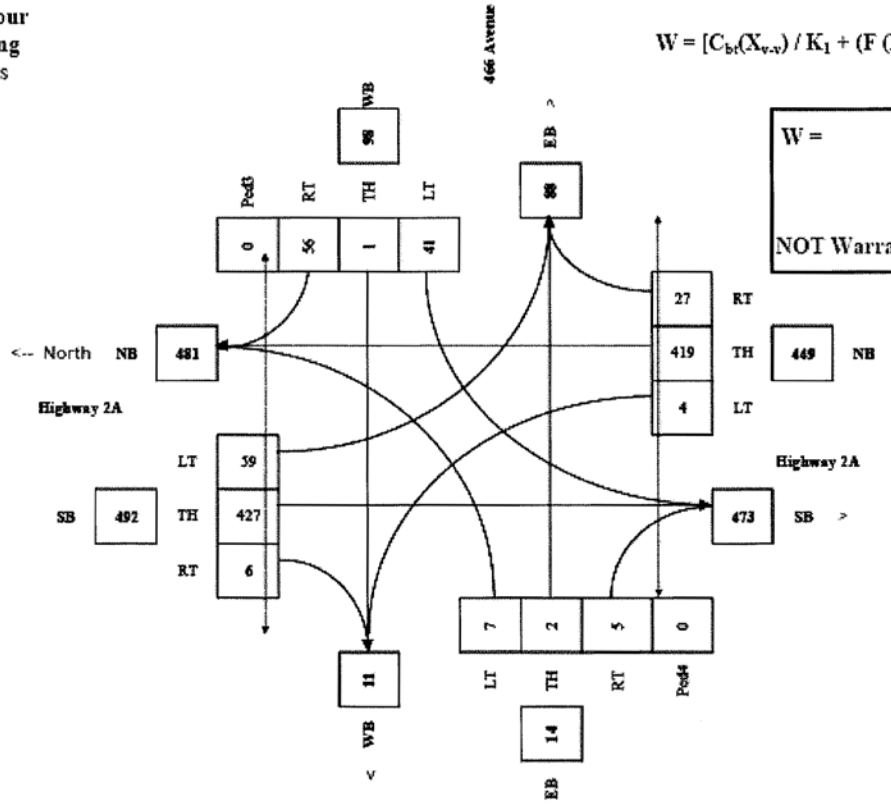
Other input		Speed (Km/h)	Truck %	Bus Rt (y/n)	Median (m)
Highway 2A	NB	100	15.0%	n	0.0
466 Avenue	EW		58.0%	n	

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
After Development (AM+PM)*2.61	22	2512	160	355	2562	33	245	8	334	39	14	28				
Total (6-hour peak)	22	2,512	160	355	2,562	33	245	8	334	39	14	28	0	0	0	0
Average (6-hour peak)	4	419	27	59	427	6	41	1	56	7	2	5	0	0	0	0

Average 6-hour Peak Turning Movements

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



W = 72 72 0
Veh *Ped*

NOT Warranted

RESET SHEET

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