Grand Valley River's Edge Subdivision

Transportation Impact and Parking Study

Town of Grand Valley

Prepared for:
Thomasfield Homes

October 2023

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1 Introduction

This Transportation Impact Study (TIS) has been prepared in support of applications for Zoning By-law Amendment and Draft Plan of Subdivision for the lands owned by Thomasfield Homes in the Town of Grand Valley that are intended for residential uses. The site is located in the northeast part of the Town on the east side of Main Street North (County Road 25 or CR 25) and north of Amaranth Street East. The study was undertaken as a submission requirement in accordance with pre-submission consultation with Town staff and their consultants, RJ Burnside. The study is based on a Draft Plan of Subdivision prepared by GSP Group. The scope of the TIS was discussed and agreed upon with Town staff and their consultants.

The primary purpose of this study is to assess the impact of the proposed draft plan on the transportation network in the area and identify any improvements that are needed to support the proposal.

It is the finding of this study that the proposal will generate about 193 and 247 trips in the weekday morning and afternoon peak hours, respectively. Site traffic can be accommodated at the study area intersections as described in this study.

2 Proposal and Site Transportation Context

The application proposes the development of about 36 hectares of land in the northeast part of the Town for residential uses. The site is presently vacant. The development concept includes 330 residential units in a mix of single detached, semi detached, townhouse and apartment uses. A Site Location Plan and the proposed Draft Plan of Subdivision are attached to this report as figures in Appendix A.

The site has frontage on Main Street/CR 25 north of Luther Road and sits north of Scott Street with a connection through a planned extension of Bielby Street. Bielby Street will extend northerly from its current terminus and then extend westerly through the subdivision to connect to Main Street/CR 25. The alignment of Bielby Street has been developed in accordance with the Town's Transportation Master Plan. A planned extension of Luther Road will connect into Bielby Street as illustrated in the proposed Draft Plan of Subdivision. Additional public roads (Streets A, B and C) are created to serve the various lots throughout the site.

The study area includes the following intersections:

- Main/CR 25/Bielby
- Main/CR 25/Luther
- Main/CR 25/Amaranth
- Amaranth/Bielby
- Amaranth/Townline

Weekday morning and afternoon peak hours were chosen for study when both site traffic and traffic on the adjacent roads will peak.

Main Street/CR 25 is a public road under the jurisdiction of Dufferin County. In the study area, Main Street has a single lane in each direction and sidewalks on the east side south of Luther Road. In the vicinity of the intersection with Amaranth Street there are sidewalks on both sides.

The speed limit is 40 kph south of Luther Road and 60 kph north of Luther Road. Further north outside the study area, the speed limit increases to 80 kph.

Amaranth Street is a public road under the jurisdiction of the Town of Grand Valley. In the study area, Amaranth Street has a single lane in each direction and a posted speed limit of 40 kph. There are sidewalks on both sides within the study area west of Bielby Street. East of Bielby Street, the sidewalk on the south side of Amaranth Street does not continue, but the sidewalk on the north side continues to the bridge over the Grand River.

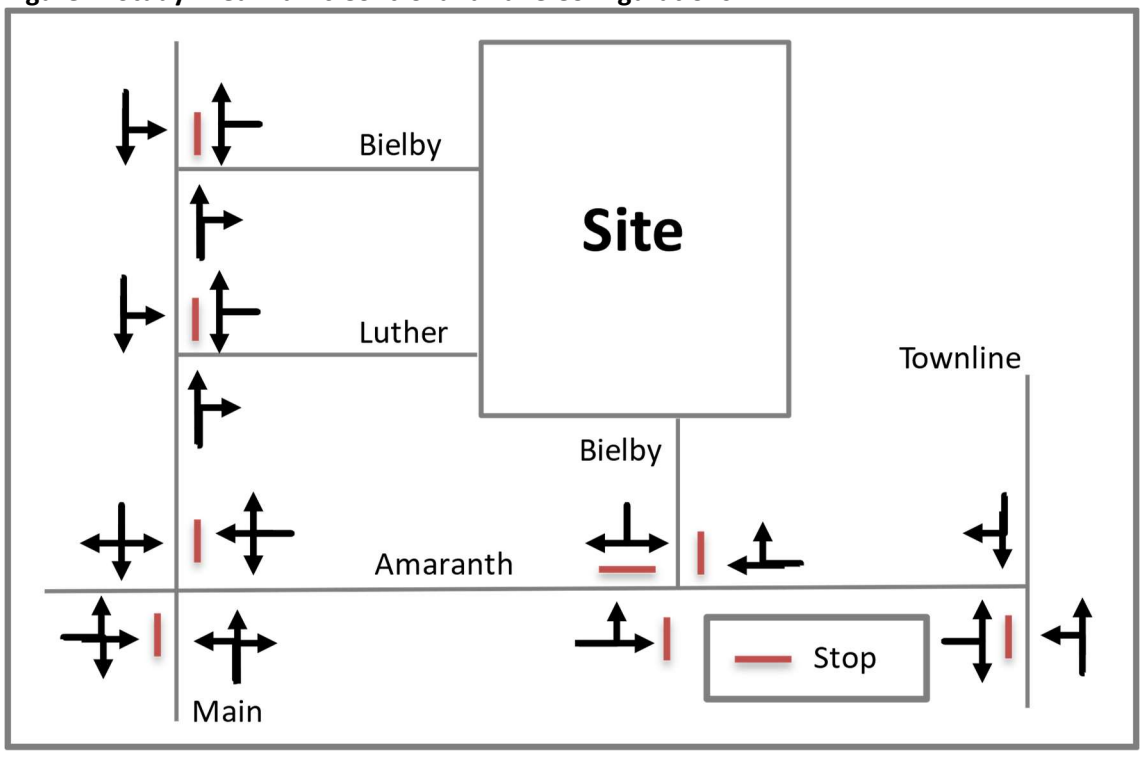
Townline is a public road under the jurisdiction of the Town of Grand Valley. In the study area there are two paved lanes north of Amaranth Street and two gravel lanes south of Amaranth Street. The speed limit is posted at 60 kph. The Town has plans to upgrade Townline south of Amaranth Street to a paved surface in the future.

Bielby Street is a public road under the jurisdiction of the Town of Grand Valley. There are two lanes and a sidewalk on the east side of the road. The speed limit is unposted.

Scott Street and Luther Road are two lane roads under the jurisdiction of the Town of Grand Valley with no sidewalks and unposted speed limits.

There are no auxiliary turn lanes in the study area. The traffic control and lane configurations in the study area are illustrated in Figure 1 below.

Figure 1: Study Area Traffic Control and Lane Configurations



3 Existing Traffic

3.1 Sight Distance Assessment – Main/CR 25/Bielby Intersection

Sight distances were reviewed at the proposed new intersection of Bielby Street and Main Street/CR 25. Main Street has a posted speed limit of 60 kph. A design speed of 80 kph was chosen to assess the available sight distance. The left turn from stop on Bielby Street is the governing sight distance requirement and an intersection sight distance of 170 metres in both directions is required in accordance with guidance from the Transportation Association of Canada (Table 9.9.4 of the Geometric Design Guide for Canadian Roads).

Figures illustrating the available sight distance at the new Bielby Street intersection with Main Street are attached in Appendix A.

3.2 Existing Traffic Assessment

Traffic count data was collected at the existing study area intersections on Wednesday, April 5, 2023, during the morning and afternoon peak periods. The traffic count data is attached in Appendix B. [1]

The existing traffic data at the study area intersections in the weekday morning and afternoon peak hours are illustrated in the figures attached in Appendix A.

Traffic capacity analysis was undertaken using Synchro 11 software to assess the intersection operations at the study area intersections in both peak hours. The detailed Synchro worksheets are attached in Appendix C and summarized in the table below.

Table 1: Existing Traffic Operations

Intersection	Measure of Effectiveness	Approach Lane							
		AM Peak Hour				PM Peak Hour			
		EB	WB	NB	SB	EB	WB	NB	SB
Amaranth and Townline	Level of Service	A	-	A	-	A	-	A	-
	Delay (s)	8.7	-	1.2	-	8.9	-	2.2	-
	Volume/Capacity	0.02	-	-	-	0.03	-	-	-
	95th Percentile Q (m)	0.4	-	-	-	0.7	-	0.1	-
Amaranth and Bielby	Level of Service	A	A	-	A	A	A	-	A
	Delay (s)	7.4	7.1	-	6.9	7.5	7.2	-	6.7
	Volume/Capacity	0.02	0.03	-	0.02	0.06	0.04	-	0.01
	95th Percentile Q (m)	-	-	-	-	-	-	-	-
Main and Amaranth	Level of Service	B	B	A	A	B	B	A	A
	Delay (s)	10.4	11.5	1.1	0.7	11.6	13.1	2.3	0.4
	Volume/Capacity	0.11	0.09	0.01	0.01	0.13	0.11	0.04	0.01
	95th Percentile Q (m)	2.7	2.4	0.3	0.2	3.3	2.7	1.1	0.1
Main and Luther	Level of Service	-	A	-	A	-	A	-	A
	Delay (s)	-	8.9	-	0.2	-	9.7	-	0.2
	Volume/Capacity	-	0.01	-	-	-	0.01	-	-
	95th Percentile Q (m)	-	0.2	-	-	-	0.2	-	-

[1] Traffic data collected at the Main/Luther intersection is labelled as Main/Fife. The name of the road was changed from Fife Road to Luther Road after the data was collected.

The assessment indicates that the study area intersections are currently operating at acceptable levels.

4 Background Traffic

A ten-year future horizon year was chosen for study in consultation with Township staff and their consultants.

The Town of Grand Valley has significant planned development in its Official Plan; the Town's Transportation Master Plan considers the transportation network needs to accommodate the planned growth. Growth is not occurring as quickly as the Transportation Master Plan considered that it could, and the impacts of the Covid-19 pandemic on how people work and travel have changed some of the travel patterns in the area. Traffic volumes at the Main/Amaranth intersection have in fact decreased by 10 to 20 percent in the peak hours when comparing the 2023 traffic data to 2015 traffic data.

The Town's Transportation Master Plan (TMP) includes growth in traffic of about 35 percent over the 2021 to 2031 horizon, which includes background growth along with planned development in the Town. The background growth rate included in the TMP was 2.2 percent per year. In discussion with the Town's consultant, who is also the author of the TMP, a 3.5 percent per year growth rate was chosen for the study area compounded over the 10 year study horizon.

The background traffic volumes are illustrated in the figures in Appendix A for both weekday peak hours.

Traffic capacity analysis was undertaken to assess the intersection operations at the study area intersections in both peak hours. The detailed Synchro worksheets are attached in Appendix D and summarized in the table below.

Table 2: Future Background Traffic Operations

Intersection	Measure of Effectiveness	Approach Lane							
		AM Peak Hour				PM Peak Hour			
		EB	WB	NB	SB	EB	WB	NB	SB
Amaranth and Townline	Level of Service	A	-	-	-	A	-	A	-
	Delay (s)	8.7	-	-	-	9.0	-	2.6	-
	Volume/Capacity	0.02	-	-	-	0.04	-	0.01	-
	95th Percentile Q (m)	0.6	-	-	-	1.0	-	0.1	-
Amaranth and Bielby	Level of Service	A	A	-	A	A	A	-	A
	Delay (s)	7.5	7.2	-	7.0	7.6	7.4	-	6.8
	Volume/Capacity	0.03	0.03	-	0.04	0.08	0.06	-	0.02
	95th Percentile Q (m)	-	-	-	-	-	-	-	-
Main and Amaranth	Level of Service	B	B	A	A	B	C	A	A
	Delay (s)	11.9	13.7	1.2	0.8	14.2	17.4	2.5	0.4
	Volume/Capacity	0.17	0.16	0.02	0.01	0.22	0.20	0.07	0.01
	95th Percentile Q (m)	4.7	4.4	0.4	0.3	6.4	5.7	1.6	0.2
Main and Luther	Level of Service	-	A	-	A	-	B	-	A
	Delay (s)	-	9.1	-	0.2	-	10.3	-	0.2
	Volume/Capacity	-	0.01	-	-	-	0.01	-	-
	95th Percentile Q (m)	-	0.3	-	-	-	0.3	-	-

The assessment indicates that the study area intersections are expected to continue to operate at acceptable levels under future background traffic conditions in both weekday peak hours.

5 Site Traffic

The amount of traffic generated by the proposed subdivision was estimated based on information in the Institute of Transportation Engineers (ITE) Trip Generation Manual, 11th Edition.

Three land use categories were chosen to best represent the proposed residential land uses. For the single and semi-detached homes, the Single-Family Detached Housing (land use code 210) category was chosen. For the townhomes, the Single-Family Attached Housing (land use code 215) category was chosen. For the apartment uses, the Multifamily Housing (Mid-Rise) (land use code 221) category was chosen. Average rates were used to estimate site traffic because they generally resulted in higher trip generation estimates. The traffic generation estimates for the site are summarized in the table below.

Table 3: Site Traffic Generation Rates and Estimated Trips

Land Use	ITE Code	Description	Units	AM Peak Hour			PM Peak Hour		
				In	Out	Total	In	Out	Total
Single Detached Housing	210	Rate (t/unit)	-	0.18	0.53	0.70	0.59	0.35	0.94
		Trips (t)	189	33	99	132	112	66	178
Single Attached Housing	215	Rate (t/unit)	-	0.12	0.36	0.48	0.34	0.23	0.57
		Trips (t)	78	9	28	37	26	18	44
Multifamily Housing (Mid-Rise)	221	Rate (t/unit)	-	0.09	0.28	0.37	0.24	0.15	0.39
		Trips (t)	63	5	18	23	15	10	25
Total Trips			330	48	145	193	153	94	247

The resulting estimated site traffic is 193 and 247 vehicle trips measured in both directions (inbound and outbound) in the weekday morning and afternoon peak hours, respectively.

Site traffic was assigned to the road network in accordance with traffic patterns at the edges of the study area. The distribution is illustrated in the figures in Appendix A. The traffic for the apartment and townhouse uses was assigned to enter and exit the site at the Main/Bielby intersection. Traffic from the single and semi-detached homes was assigned to enter and exit the site at the Bielby Street connections to both Main Street and Amaranth Street. Site traffic assignment is illustrated in the figures in Appendix A for the apartment and townhouse traffic separately from the single and semi-detached traffic and also for total site traffic.

6 Future Total Traffic

Future total traffic was determined by adding the site traffic to future background traffic. The future total traffic volumes for the two study peak hours are illustrated in the figures in Appendix A.

6.1 Turn Lane Assessment – Main/CR 25 and Bielby Street

Turn lanes can be provided at intersections to minimize delay to through traffic and to provide additional capacity where they are needed. Typically, in locations like Grand Valley, right turn lanes are considered when peak hour right turn volumes reach about 60 vehicles in one or both peak hours. In the future total scenario, the northbound right turn volume from Main Street/CR 25 to Bielby Street is estimated to be 19 vehicles in the weekday morning peak hour. In the afternoon peak hour, the northbound right turn volume is estimated to be 67 vehicles. Given that through volumes on Main Street are expected to be relatively low in the afternoon peak hour northbound (169 vehicles), it is unlikely that a right turn lane is needed in the study horizon. The intersection was assessed with a shared through and right turn lane in the northbound direction to understand the capacity implications. If a right turn lane is provided in future, the capacity will increase and intersection operations for cars will improve. However, the provision of auxiliary turn lanes can also cause an increase in speed, which should also be considered.

The need for a left turn lane is typically assessed using information from the Ministry of Transportation Geometric Design Guide for Ontario Highways. The assessment is based on the design speed of the road, the percent left turns in the stream of traffic and the traffic volumes at the intersection.

A design speed of 80 kph was chosen for Main Street/CR 25 given the posted speed of 60 kph. At the subject intersection, the southbound left turning volumes make up between 10 and 20 percent of the traffic stream. The appropriate nomographs were chosen to assess the warrant for a left turn lane from Main Street to Bielby Street. Traffic volumes advancing with and opposing the left turns were plotted on the chosen nomographs and they are illustrated in the figures in Appendix E.

A left turn lane will not be warranted southbound on Main Street at Bielby Street.

6.2 Turn Lane Assessment – Amaranth Street and Bielby Street

Right turn volumes from Amaranth Street to Bielby Street are estimated to be far less than 60 vehicles in the future total traffic scenario in both peak hours. A right turn lane westbound on Amaranth Street to Bielby Street will not be needed.

A design speed of 50 kph was chosen for Amaranth Street given the posted speed of 40 kph. At the intersection with Bielby Street, the eastbound left turning volumes make up between 40 and 65 percent of the traffic stream. For the two peak hours, traffic volumes advancing with and opposing the left turns were plotted on the chosen nomographs (40 percent for both the morning and afternoon peak hours) and they are illustrated in the figures in Appendix E.

A left turn lane will not be warranted eastbound on Amaranth Street at Bielby Street.

6.3 Traffic Operations Assessment

A traffic operations assessment was undertaken for the study area intersections in both the weekday morning and afternoon peak hours for future total traffic conditions. The results of the analysis are summarized in the table below and the detailed worksheets are included in Appendix F.

Table 4: Future Total Traffic Operations

Intersection	Measure of Effectiveness	Approach Lane							
		AM Peak Hour				PM Peak Hour			
		EB	WB	NB	SB	EB	WB	NB	SB
Amaranth and Townline	Level of Service	A	-	A	-	A	-	A	-
	Delay (s)	8.8	-	0.8	-	9.2	-	3.5	-
	Volume/Capacity	0.03	-	-	-	0.05	-	0.01	-
	95th Percentile Q (m)	0.8	-	-	-	1.3	-	0.2	-
Amaranth and Bielby	Level of Service	A	A	-	A	A	A	-	A
	Delay (s)	7.8	7.3	-	7.2	8.0	7.7	-	7.1
	Volume/Capacity	0.05	0.04	-	0.09	0.13	0.08	-	0.05
	95th Percentile Q (m)	-	-	-	-	-	-	-	-
Main and Amaranth	Level of Service	B	C	A	A	C	C	A	A
	Delay (s)	13.8	17.4	1.2	0.7	19.7	23.4	2.2	0.5
	Volume/Capacity	0.23	0.30	0.02	0.02	0.37	0.34	0.07	0.01
	95th Percentile Q (m)	6.7	9.3	0.4	0.4	12.6	11.2	1.7	0.2
Main and Luther	Level of Service	-	A	-	A	-	B	-	A
	Delay (s)	-	9.6	-	0.2	-	11.2	-	0.2
	Volume/Capacity	-	0.02	-	-	-	0.02	-	-
	95th Percentile Q (m)	-	0.5	-	-	-	0.5	-	-
Main and Bielby	Level of Service	-	B	-	A	-	B	-	A
	Delay (s)	-	10.6	-	0.8	-	11.2	-	1.7
	Volume/Capacity	-	0.14	-	0.01	-	0.11	-	0.03
	95th Percentile Q (m)	-	3.7	-	0.2	-	2.7	-	0.6

The analysis indicates that the study area intersections are expected to operate at acceptable levels under future total traffic conditions in both peak hours. The Bielby Street approach to Main Street was modelled as a single shared lane for left and right turns and is forecast to operate at acceptable levels in both peak hours.

7 Active Transportation Considerations

There is limited active transportation infrastructure nearby the site. On Main Street/CR 25 there is a sidewalk on the east side of the road south of Luther Road. On Amaranth Street there are sidewalks on both sides of the street west of Bielby Street and the sidewalk on the north side continues eastward to the Grand River. There is sidewalk on the west side of existing Bielby Street. Townline, Luther Road and Scott Street do not have sidewalks. It appears that a widened paved area is available on parts of the west side of Main Street that likely operate as a multiuse trail to also accommodate cyclists.

Within the proposed subdivision, sidewalks are proposed on both sides of Bielby Street and on both sides of the other local roads.

Along Main Street/CR 25, it is anticipated that the County would like to see sidewalks and curbs installed on the east side of the road, and potentially a reduction in the speed limit along the site frontage in the area where the posted speed limit is 60 kph to 40 kph to match the speed limit further south.

Together these elements will form an active transportation network within the proposed subdivision and enhance the adjacent active transportation facilities, providing good connections for nearby destinations.

8 Parking

Parking for the various components of the draft plan is proposed to be provided to meet the general requirements of the Town's Zoning By-law. The units with private driveways (single detached and semi-detached units) will have driveways to accommodate one or two cars along with a garage for one or two cars.

The proposed public roads in the subdivision will be wide enough to accommodate parking on one side of the street. A Preliminary Parking Plan was prepared by GM BluePlan Engineering (attached in Appendix A) illustrating the location of driveways and where on-street parking can be provided to serve the short-term parking needs of street-fronting residents. 189 of the units are proposed to be street fronting. 134 on-street parking spaces have been identified throughout the subdivision with a length of 6.5 metres. Allowances have been made for providing access to the various blocks in the subdivision. The 134 spaces represent a provision of 0.7 spaces per unit for the 189 units.

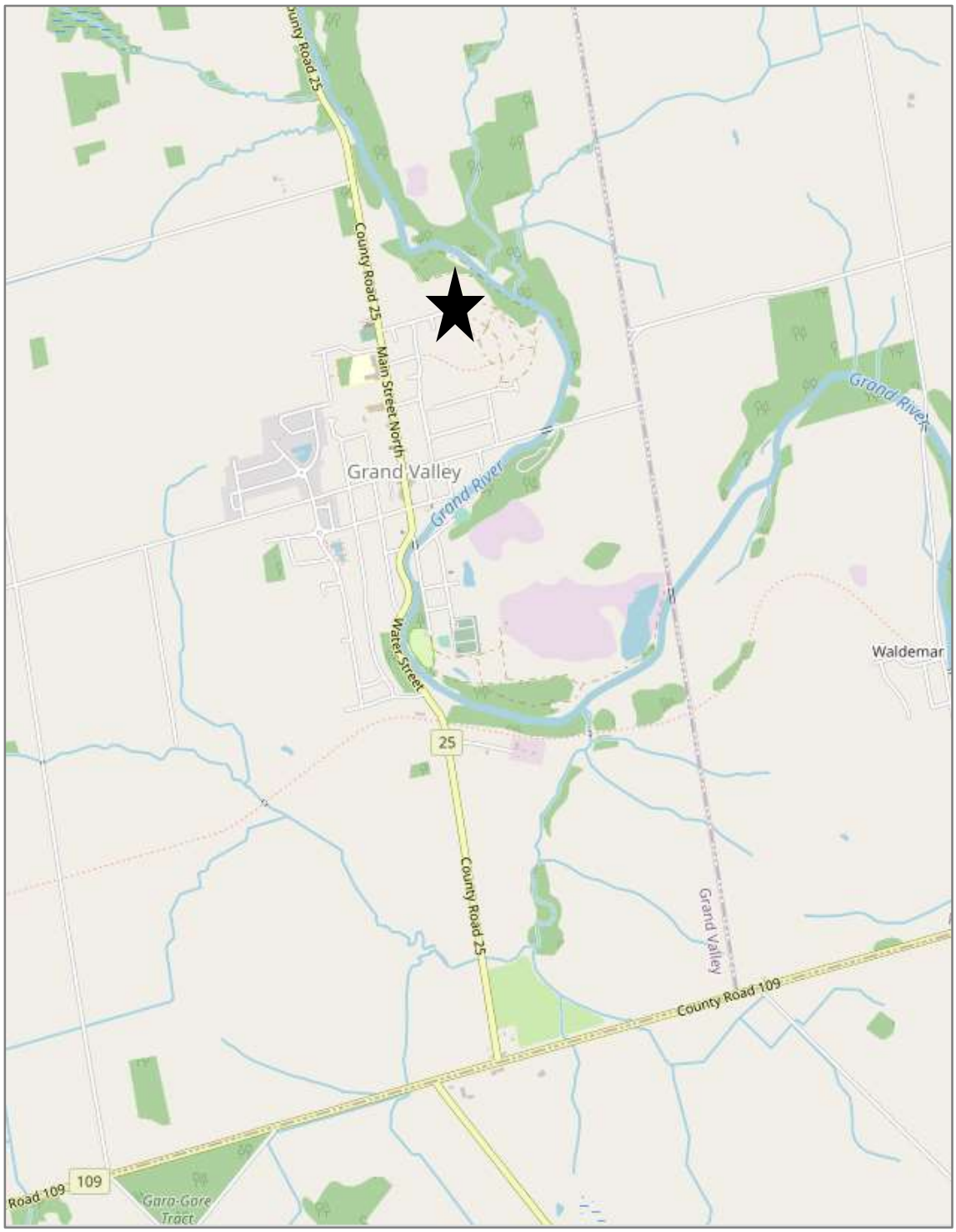
Within the larger development blocks, additional short-term parking will be provided to meet the needs of residents.

9 Conclusions and Recommendations

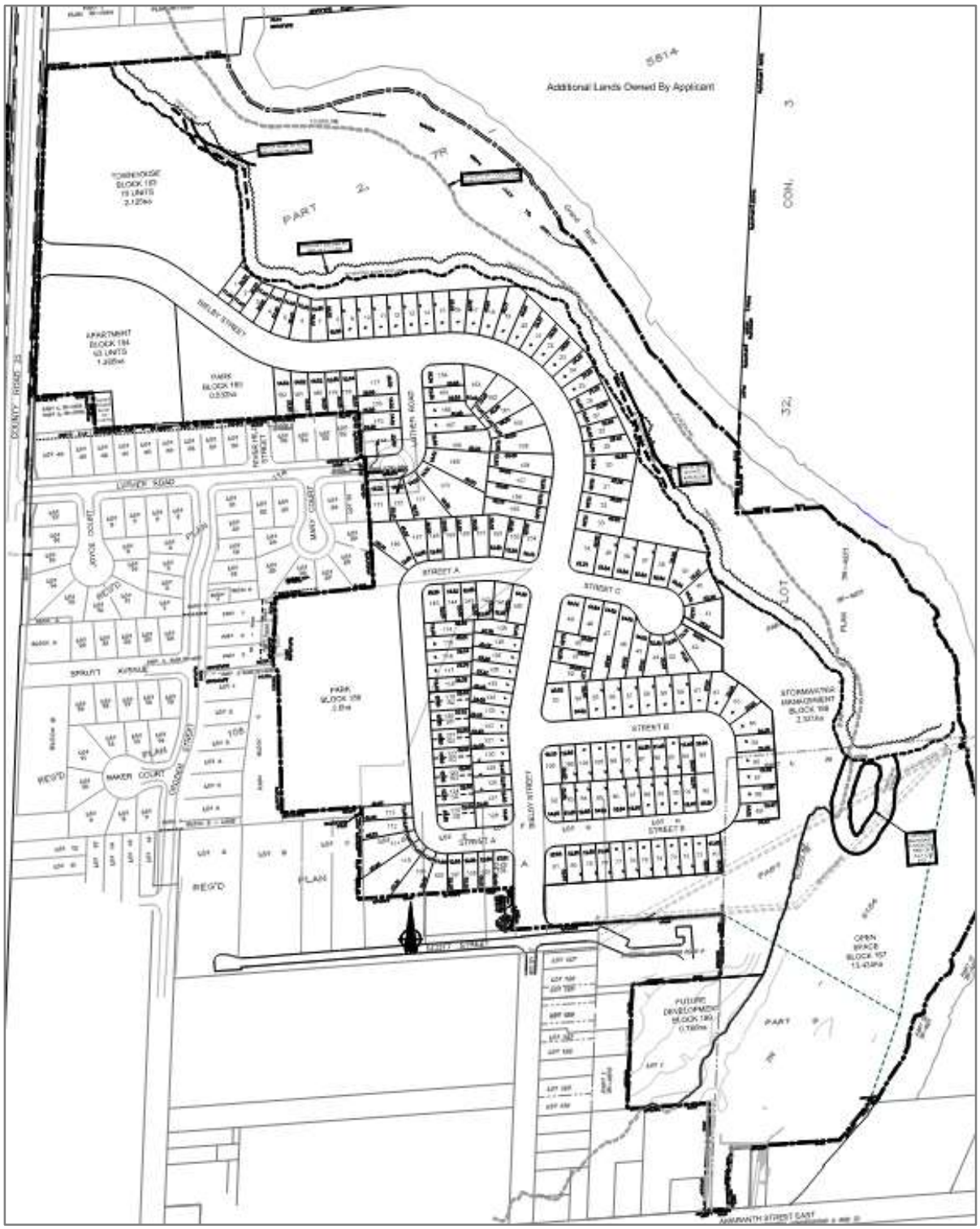
This Transportation Impact Study has been undertaken in accordance with Town requirements in order to understand the transportation context and infrastructure required to support the proposed Draft Plan of Subdivision. The conclusions of this study are as follows:

- The Site is estimated to generate 197 and 251 vehicle trips in each of the weekday morning and afternoon peak hours, respectively.
- The concept includes new public road access to Main Street/CR 25 that meets sight distance criteria from the Transportation Association of Canada.
- Turn lanes from Amaranth Street to existing Bielby Street will not be needed or warranted.
- A left turn lane southbound at the Main/Bielby intersection will not be warranted. There is the option of providing a northbound right turn lane at the Main/Bielby intersection given that peak hour right turn volumes are expected to exceed 60 vehicles per hour in the afternoon peak hour (67 vehicles); however, northbound through traffic is forecast to be relatively low on Main Street and the northbound movements are expected to operate at level of service A indicating that a right turn lane is not needed to provide additional capacity. No turn lanes are recommended at the Main/Bielby intersection.
- All of the study area intersections are expected to operate at acceptable levels of service under future total traffic conditions in both weekday peak hours.
- Sidewalks are proposed within the subdivision to accommodate pedestrian travel and to connect to the existing active transportation network. In addition, it is likely that the County will want to see the sidewalk on the east side of Main Street/CR 25 extended northerly from Luther Road to the new Bielby Street intersection to facilitate pedestrian travel into town.
- An on-street parking plan has been developed that indicates that there will be 134 on-street parking spaces available for the 189 street fronting units representing a provision of 0.7 parking spaces per unit to accommodate short term parking demand in the subdivision. The townhouse and apartment blocks will be developed with parking in accordance with the Town's Zoning By-law requirements and will accommodate both longer term resident and shorter term visitor parking needs on-site.

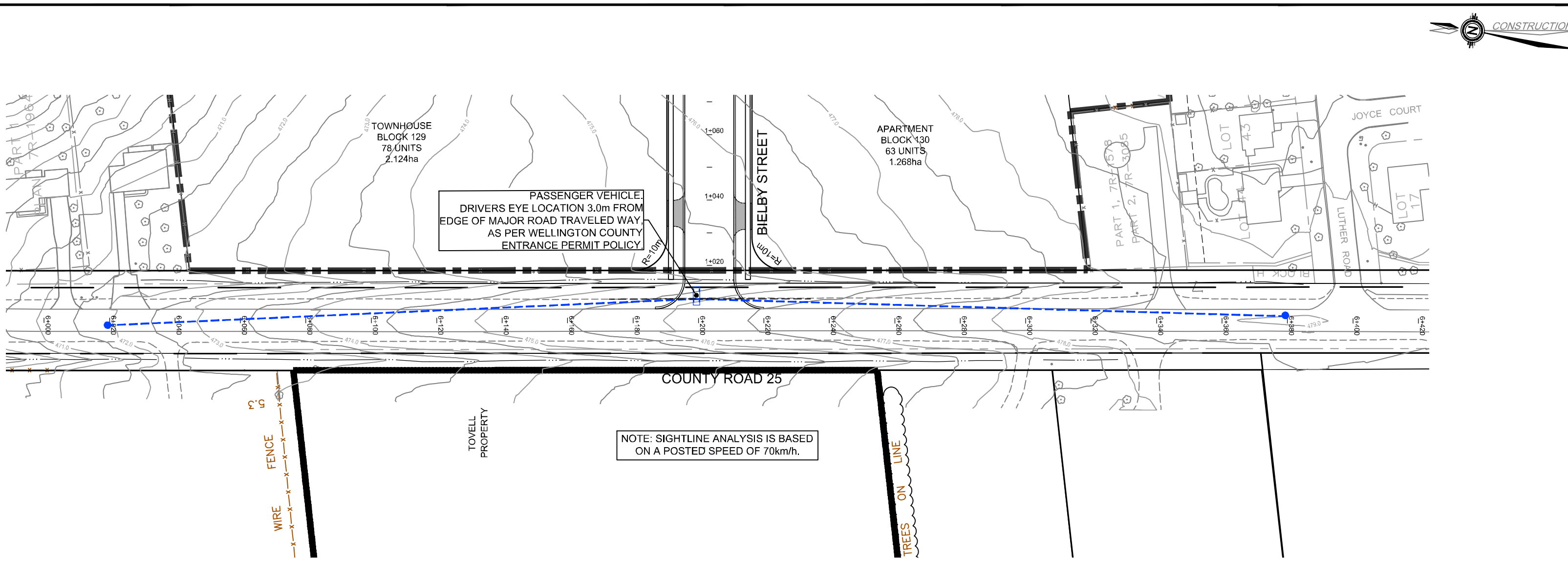
Appendix A: Figures



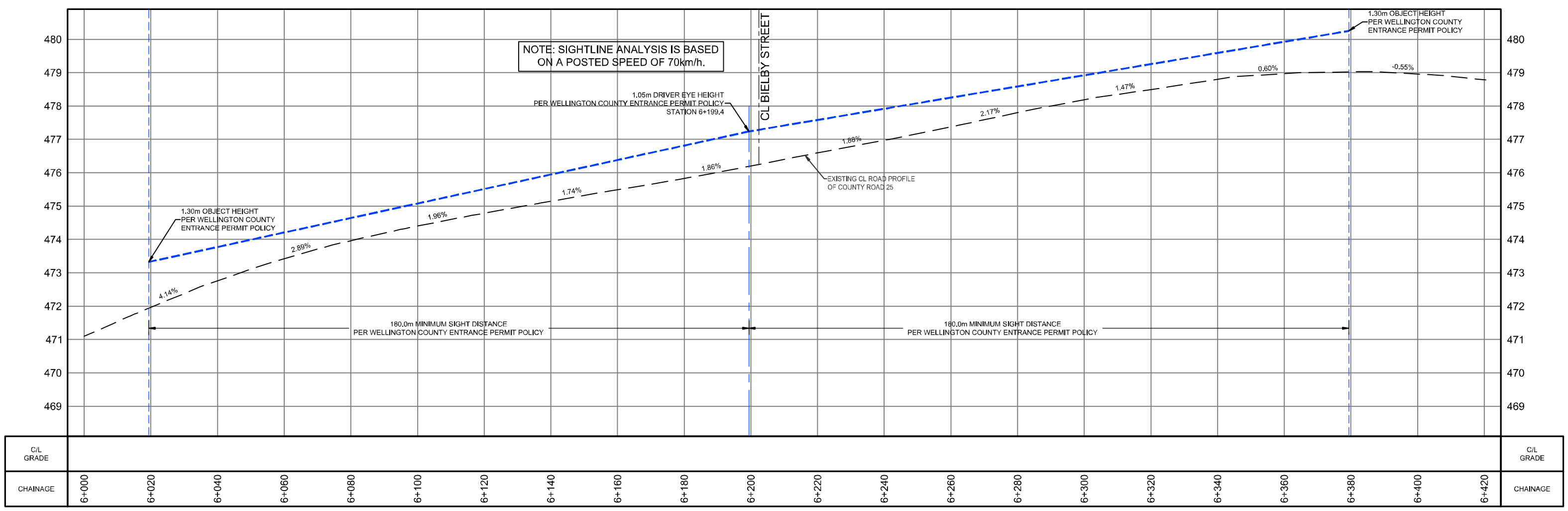
Site Location Plan

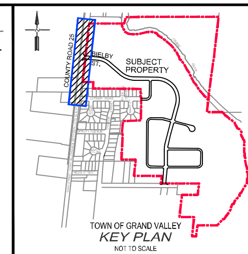


River's Edge Residential Draft Plan of Subdivision
Source: GSP Group



COUNTY ROAD 25





NOTES:

1. DRAFT PLAN LAYOUT FROM GSP GROUP DATED SEPTEMBER 5, 2023.
2. LEGAL INFORMATION, IN UTM GRID COORDINATES, FROM VAN HARTEN SURVEYING INC., SEPTEMBER 29, 2022.
3. TREE INVENTORY FROM NRSI, JANUARY 19, 2022
4. SUBJECT PROPERTY, TOPOGRAPHICAL SURVEY PROVIDED BY NORTHWAY MAPPING, DATED 2005.
5. TOPOGRAPHICAL CONTOUR INFORMATION, NORTH AND SOUTH OF SUBJECT PROPERTY, FROM GRCA GIS DATA.
6. TOPOGRAPHICAL CONTOUR INFORMATION OF COUNTY RD 25 AND PROPOSED SWM OUTLET LANDS SURVEYED BY GM BLUEPLAN ENGINEERING, FEBRUARY 8, 2023.
7. BOREHOLES FROM PETO MACCALLUM, MARCH 3, 2012. MONITORING WELL DATA FROM JLP, APRIL 21 2022.
8. DIGITAL FILES NOT TO BE USED FOR LAYOUT

BENCH MARKS :

1ST ORDER BM - ELEV = 479.355
TWO STOREY BRICK AND ALUMINUM SIDING HOUSE ON EAST SIDE OF HWY 25 AND NORTH SIDE OF LUTHER RD, 0.9KM NORTH OF THE ROYAL BANK AT GRAND VALLEY, 19.0m NORTH OF CENTERLINE OF LUTHER RD, 30.3m EAST OF CENTERLINE OF HWY 25.
TABLET IS SET HORIZONTALLY IN WEST FACE OF CONCRETE FOUNDATION, 3.08m SOUTH OF N.W. CORNER, 18cm ABOVE GROUND LEVEL.

THE POSITION OF POLE LINES, CONDUITS, WATERMAINS, SEWERS AND OTHER UNDERGROUND AND OVERGROUND UTILITIES AND STRUCTURES IS NOT NECESSARILY SHOWN ON THE CONTRACT DRAWINGS, AND, WHERE SHOWN, THE ACCURACY OF THE POSITION OF SUCH UTILITIES AND STRUCTURES IS NOT GUARANTEED.

BEFORE STARTING WORK, THE CONTRACTOR SHALL INFORM HIMSELF OF THE EXACT LOCATION OF ALL SUCH UTILITIES AND STRUCTURES, AND SHALL ASSUME ALL LIABILITY FOR ANY DAMAGE TO THEM.

NO.	DATE	REVISION DESCRIPTION	CH'KD
1.	2023-09-12	ISSUED FOR REVIEW	A.E.K.

GM BluePlan ENGINEERING
GUELPH | OWEN SOUND | LISTOWEL | KITCHENER | LONDON | HAMILTON | GTA
650 WOODLAWN ROAD WEST, BLOCK C, UNIT 2, GUELPH, ON N1K 1B8
TEL. 519-824-8150 www.gmblueplan.ca

RIVER'S EDGE SUBDIVISION

THOMASFIELD HOMES LTD.

TOWN OF GRAND VALLEY

COUNTY RD 25
SIGHTLINE ANALYSIS PLAN

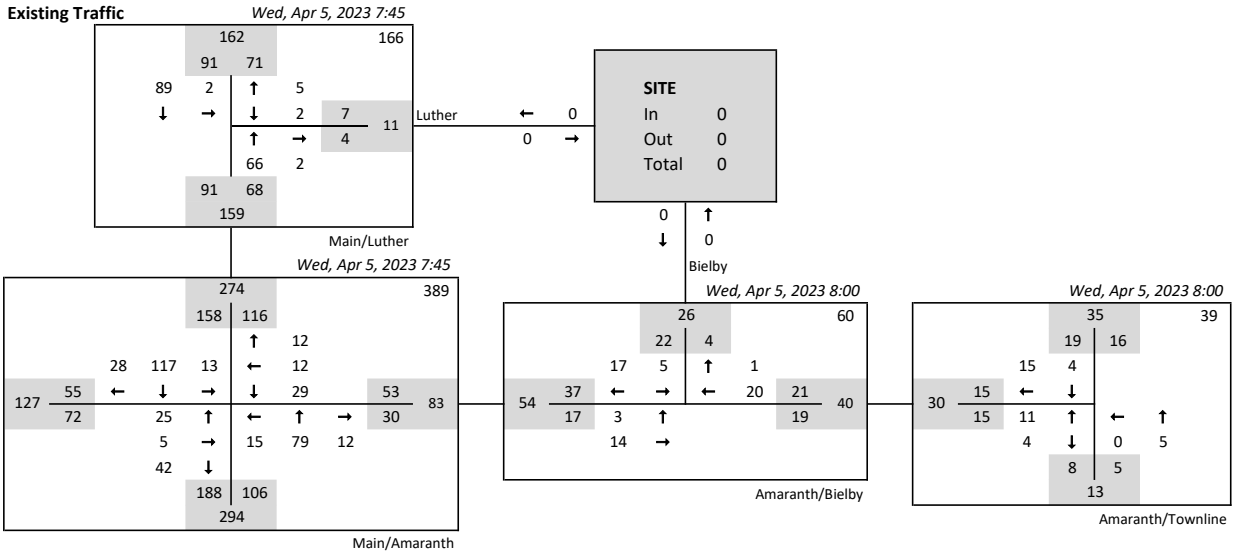
DRAWN BY :	APPROVED BY :	PROJECT NO. :	DRAWING NO. :
RPM	AEK	104104	SL1
DESIGNED BY : RPM	DATE : 2023-08-02	SCALE : HORIZ = 1:750 VERT = 1:50	

Thomasfield River's Edge

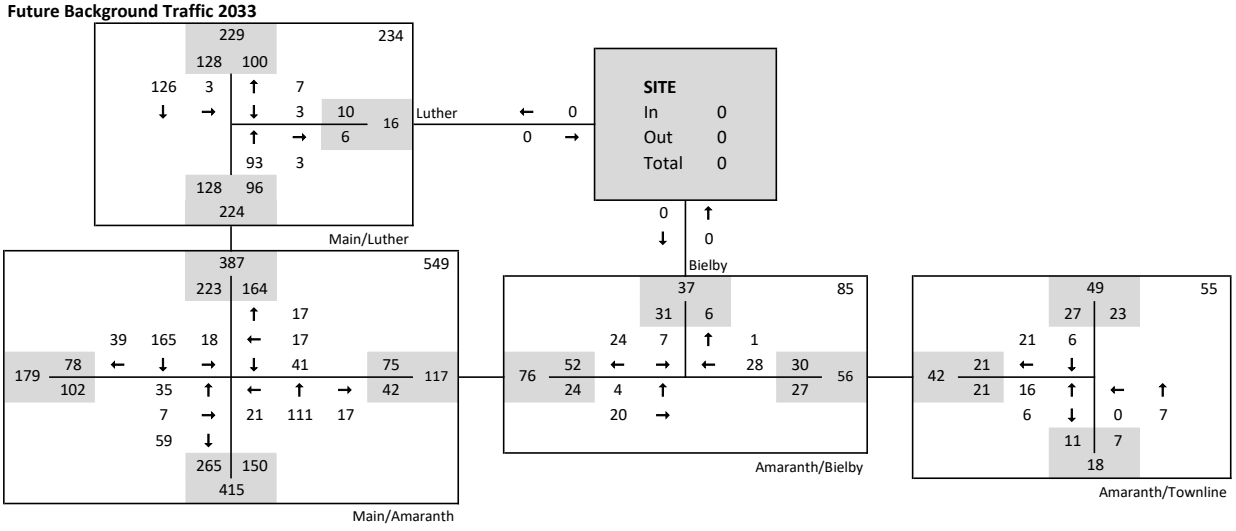
Traffic Diagrams

AM Peak Hour

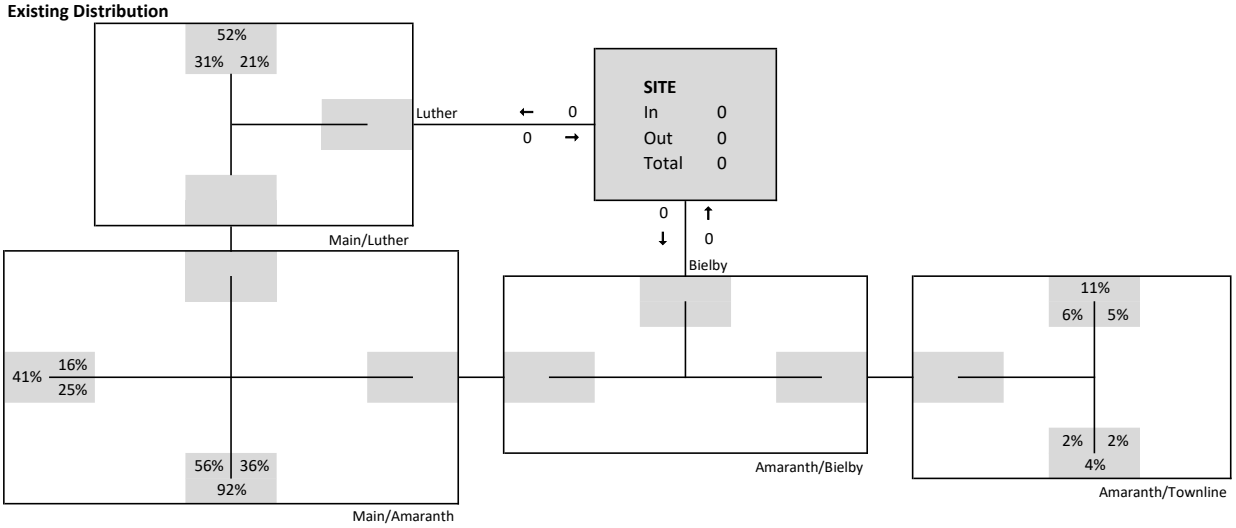
Existing Traffic



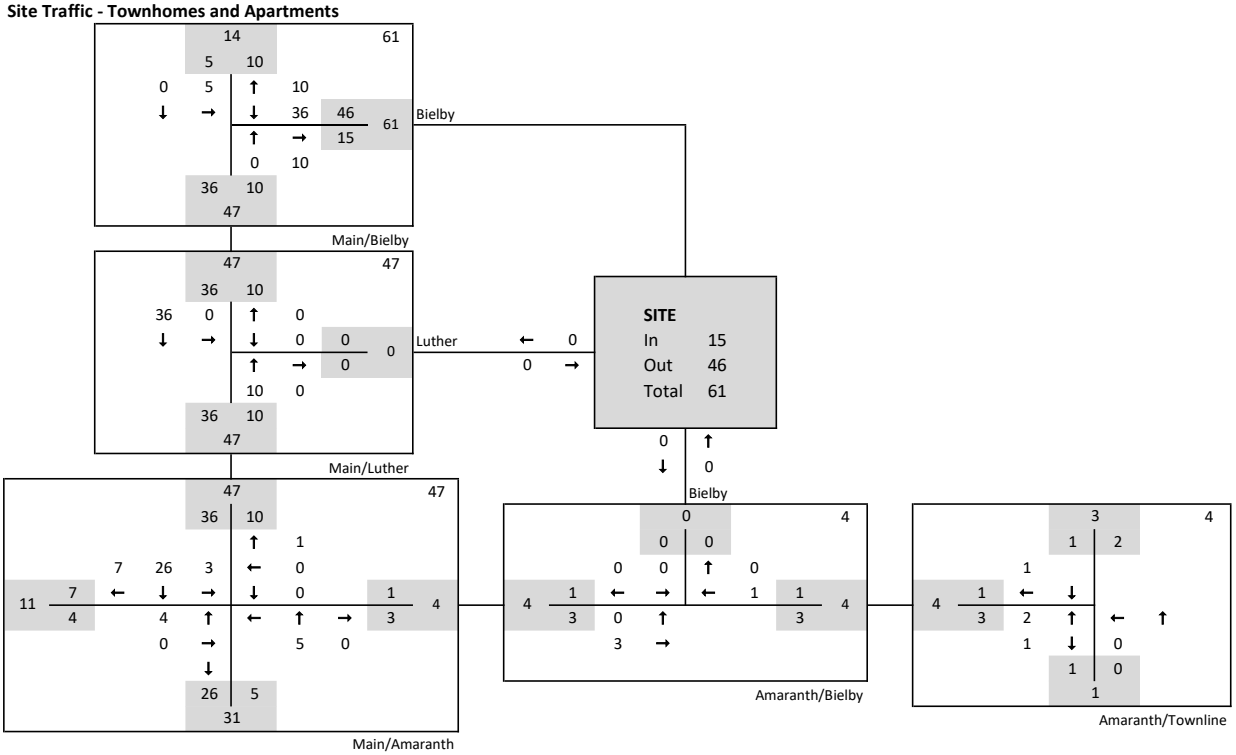
Future Background Traffic 2033



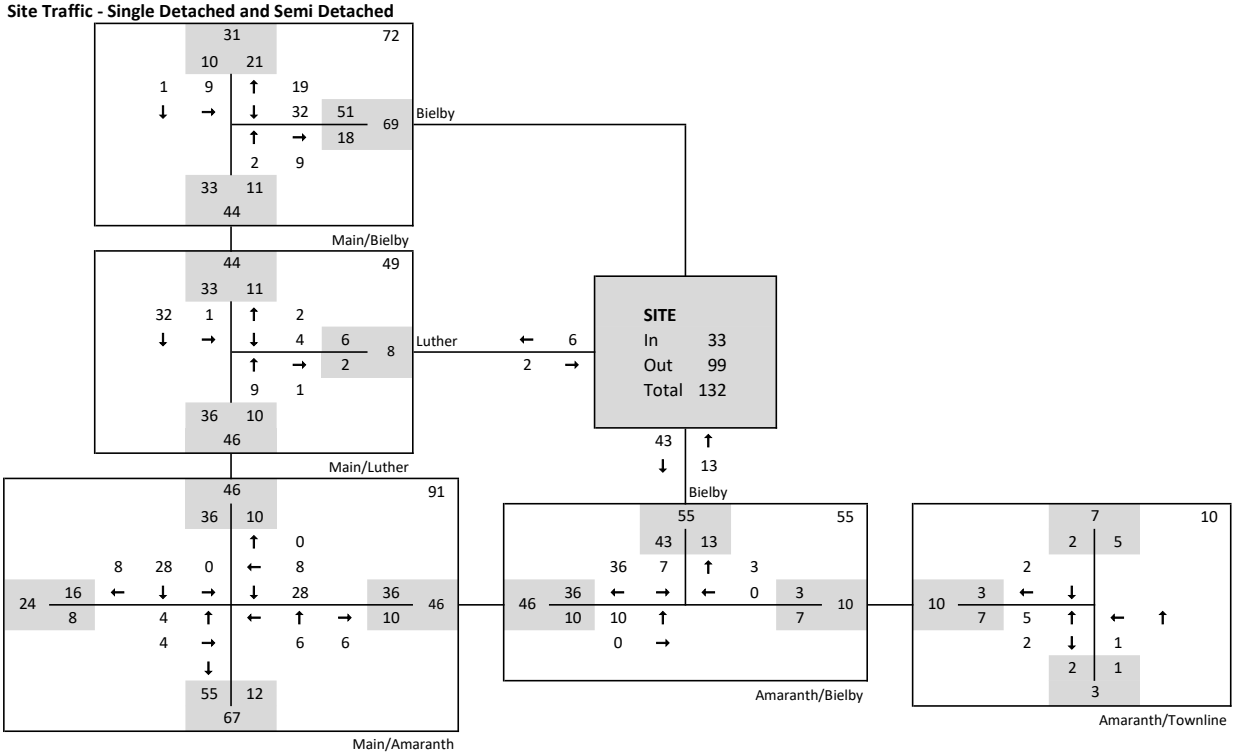
Existing Distribution



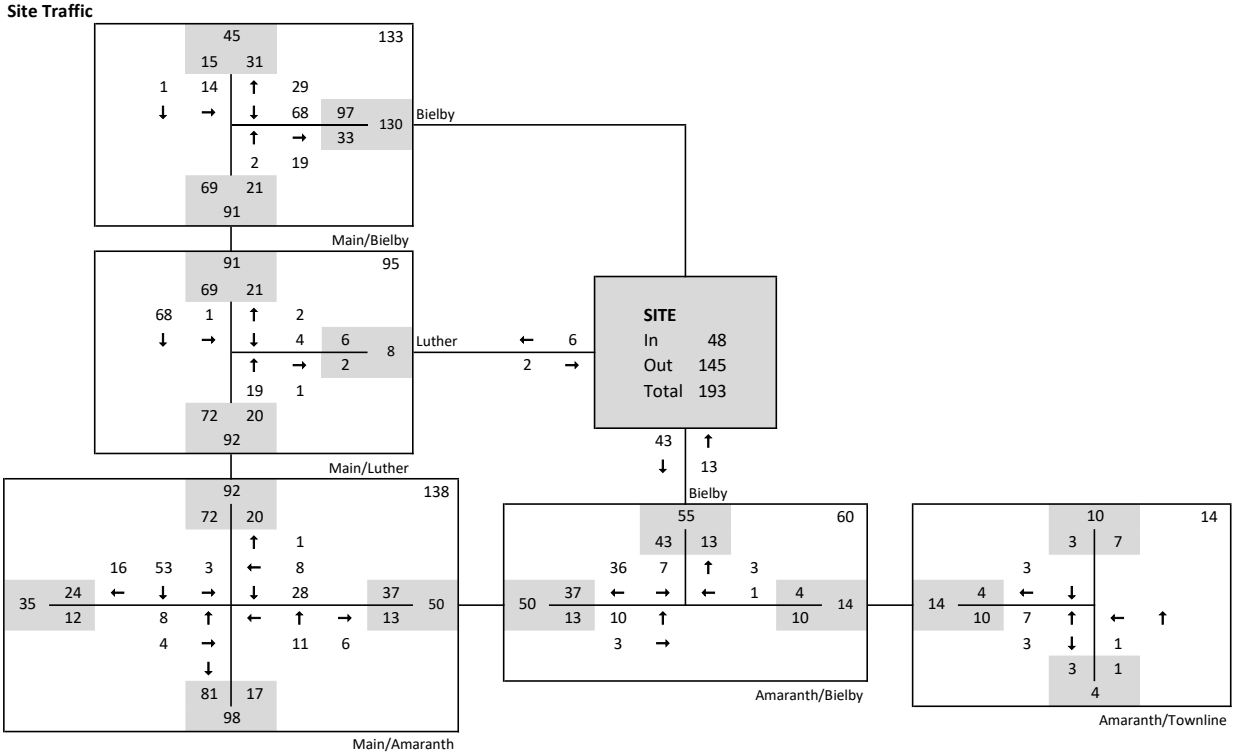
Site Traffic - Townhomes and Apartments



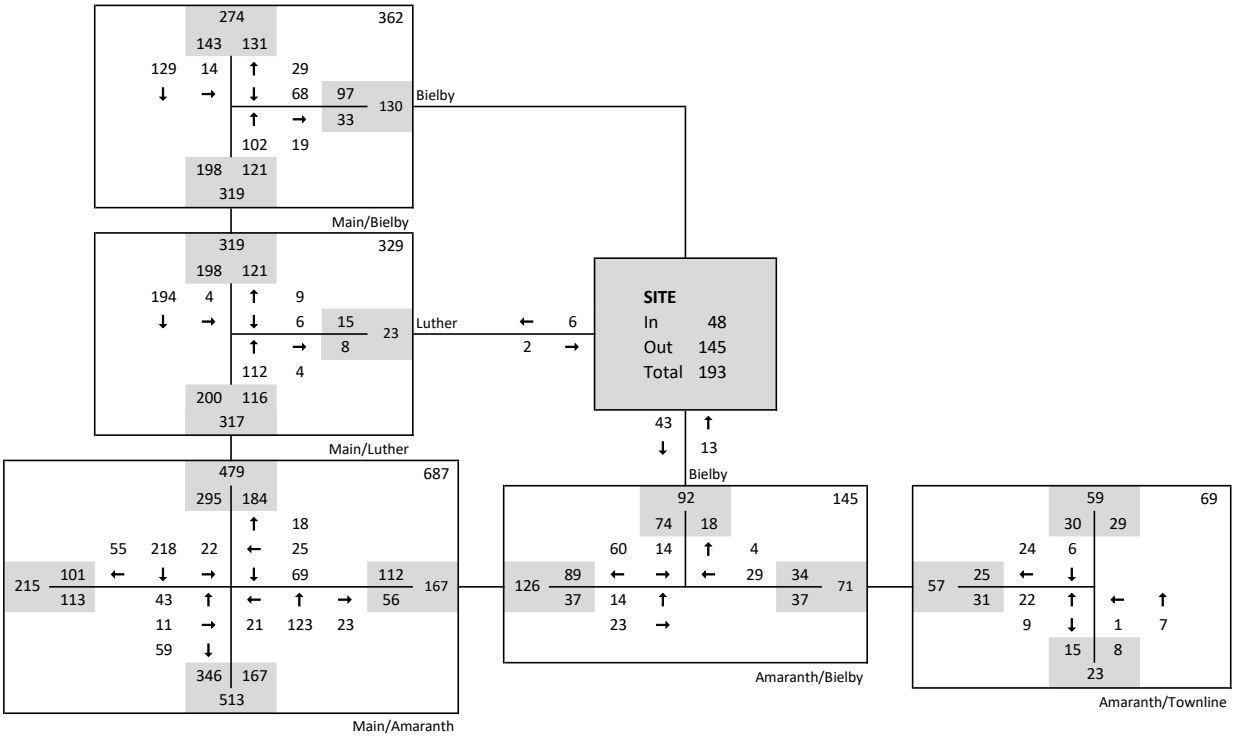
Site Traffic - Single Detached and Semi Detached



Site Traffic

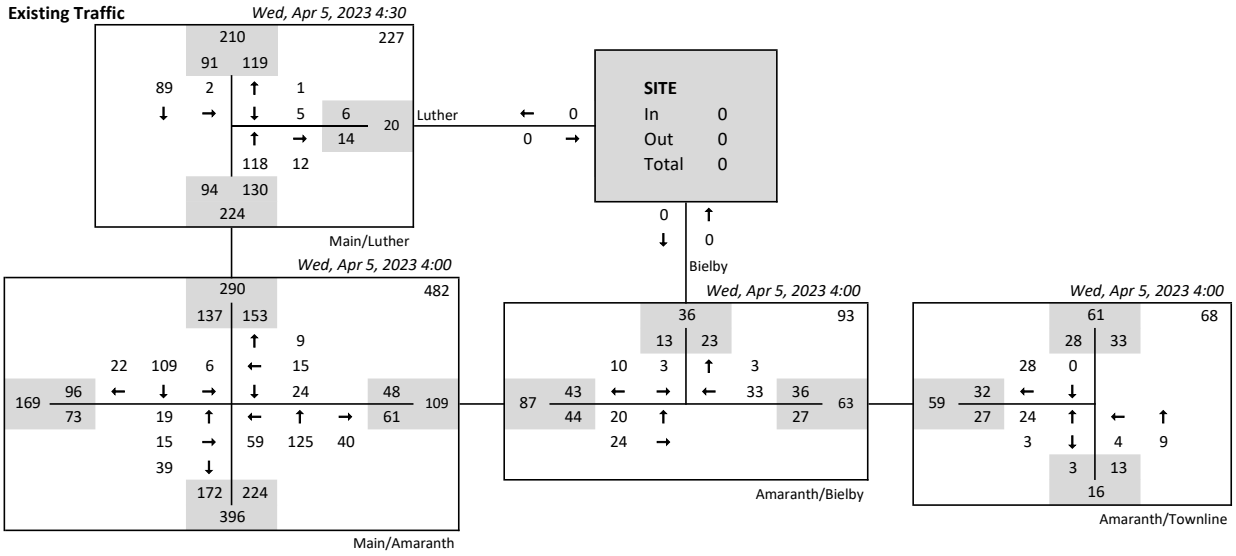


Future Total Traffic 2033

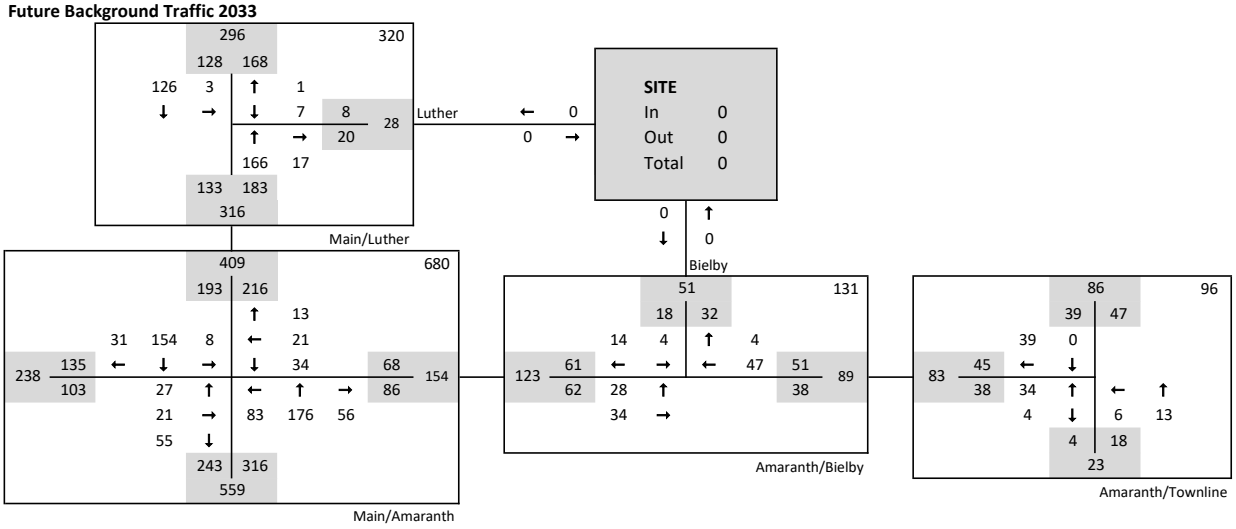


PM Peak Hour

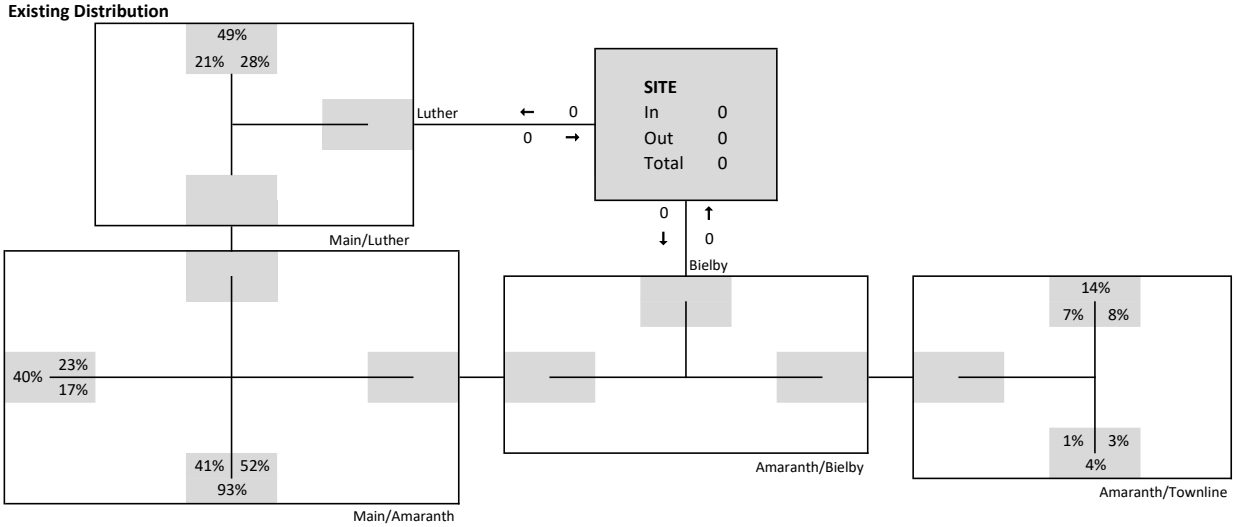
Existing Traffic



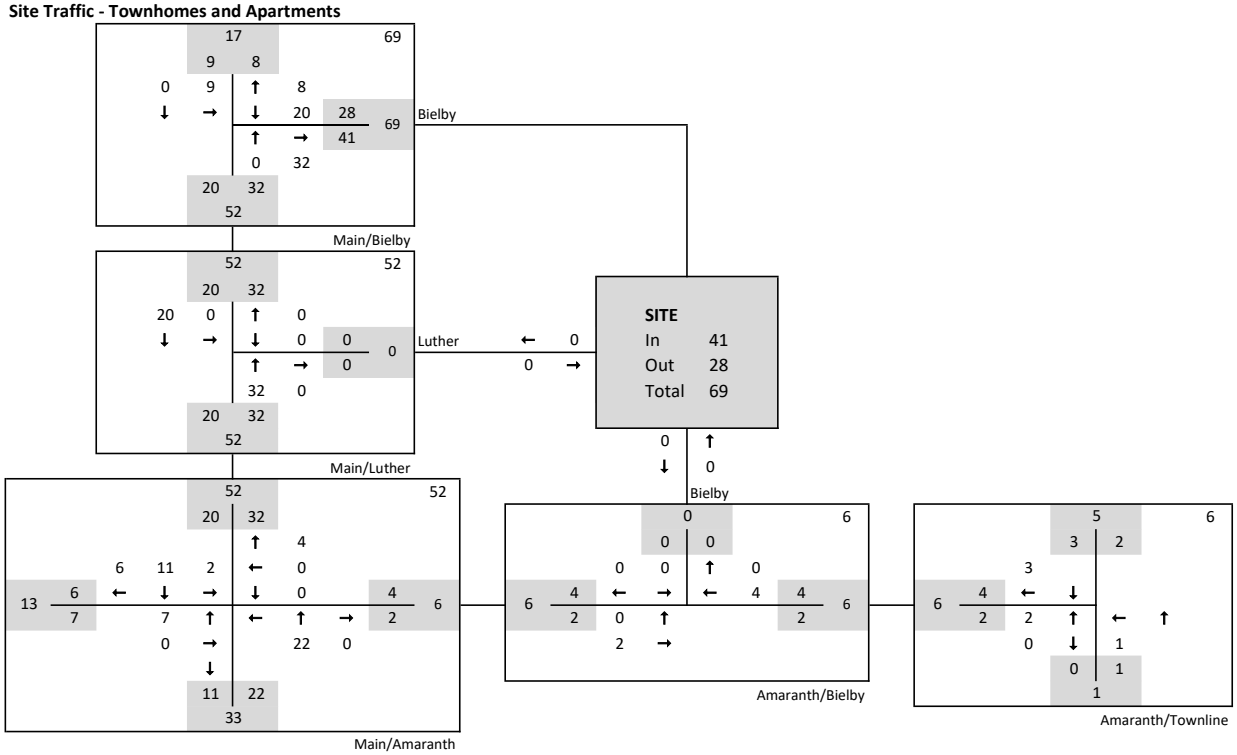
Future Background Traffic 2033



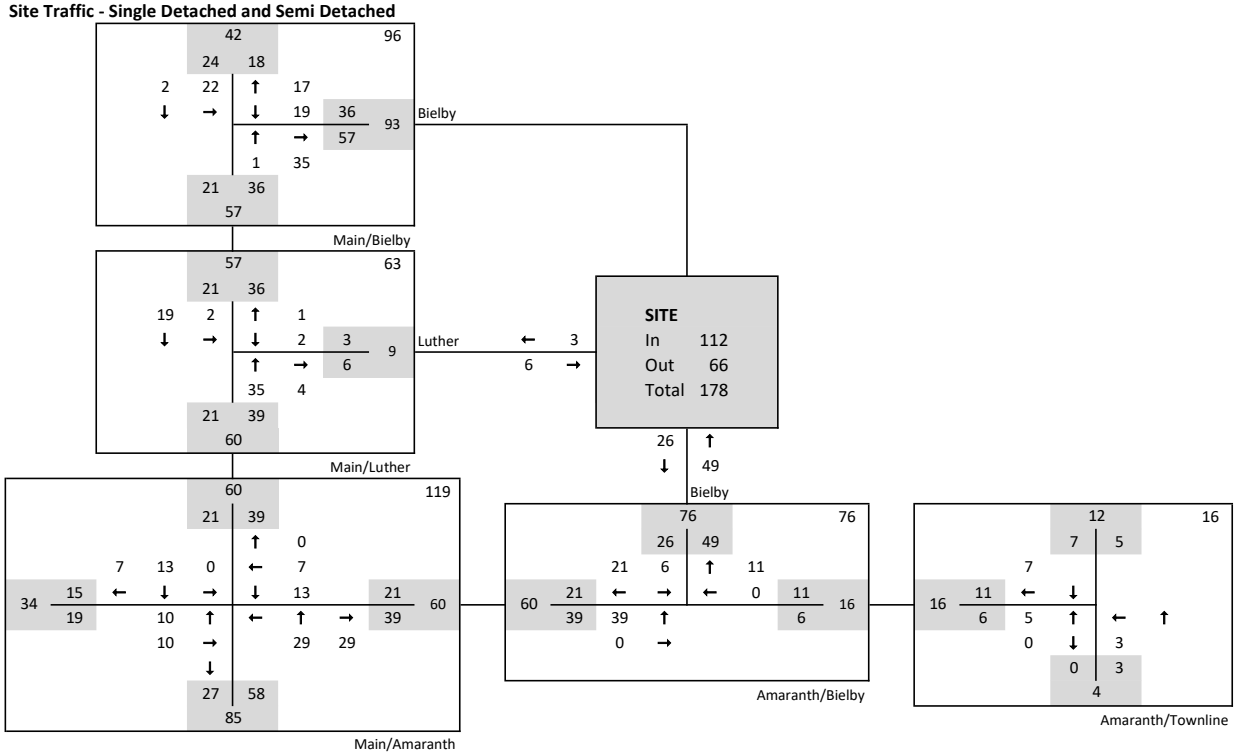
Existing Distribution



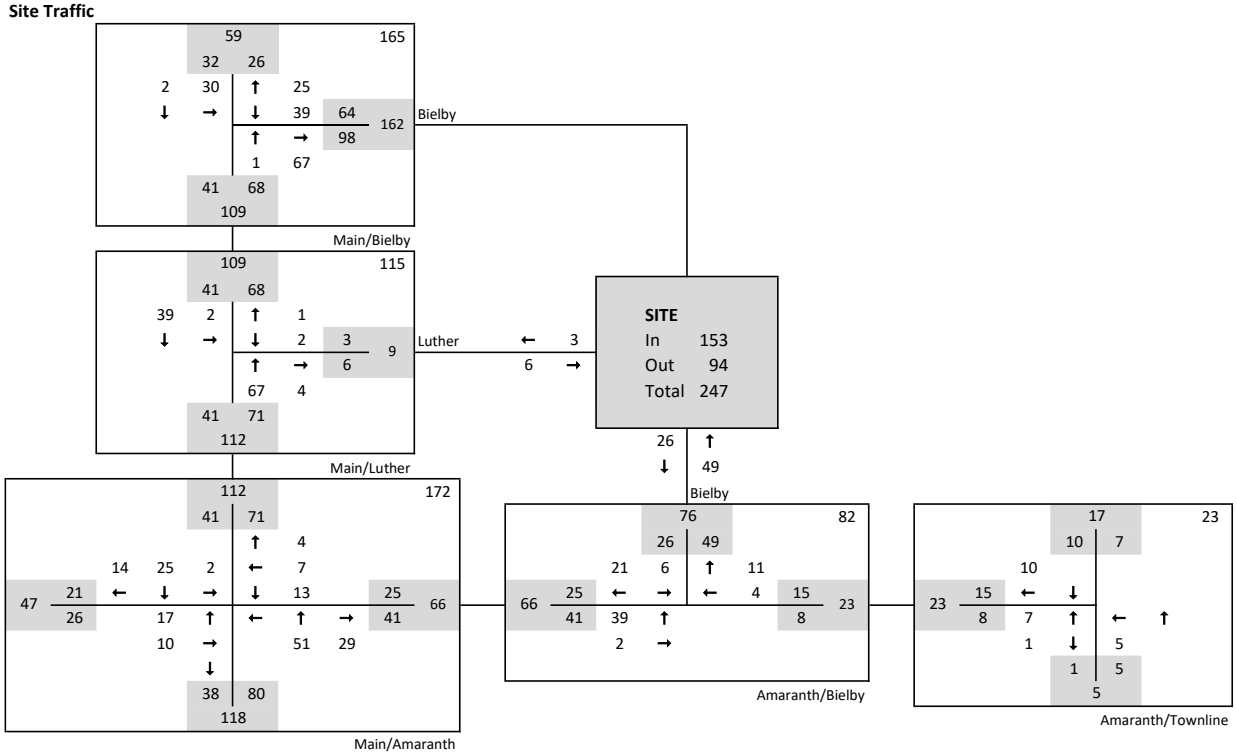
Site Traffic - Townhomes and Apartments



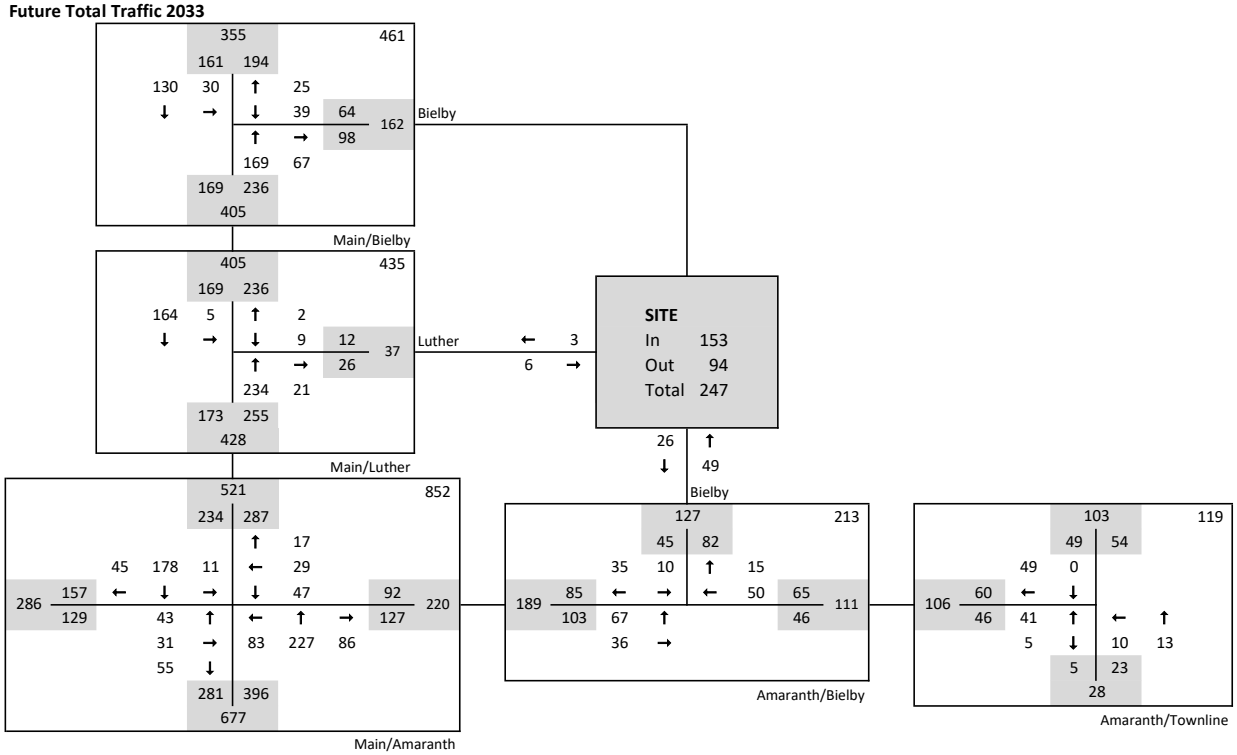
Site Traffic - Single Detached and Semi Detached

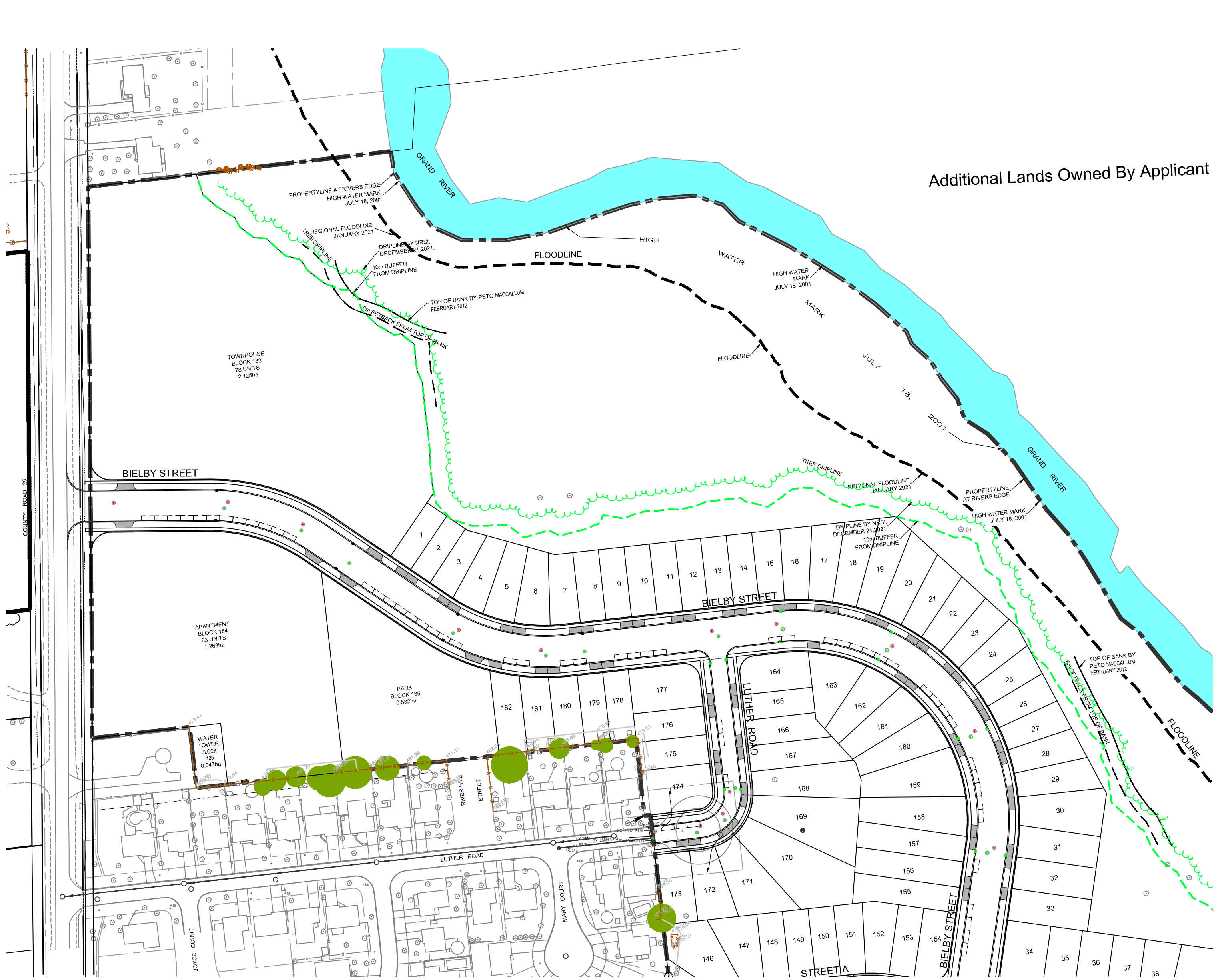


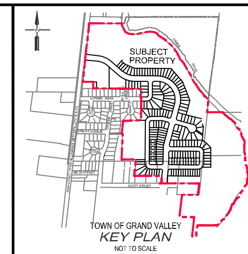
Site Traffic



Future Total Traffic 2033







NOTES:

1. DRAFT PLAN LAYOUT FROM GSP GROUP DATED SEPTEMBER 5, 2023.
2. LEGAL INFORMATION, IN UTM GRID COORDINATES, FROM VAN HARTEN SURVEYING INC., SEPTEMBER 29, 2022.
3. TREE INVENTORY FROM NRSI, JANUARY 19, 2022
4. SUBJECT PROPERTY, TOPOGRAPHICAL SURVEY PROVIDED BY NORTHWAY MAPPING, DATED 2005.
5. TOPOGRAPHICAL CONTOUR INFORMATION, NORTH AND SOUTH OF SUBJECT PROPERTY, FROM GRCA GIS DATA.
6. TOPOGRAPHICAL CONTOUR INFORMATION OF COUNTY RD 25 AND PROPOSED SWM OUTLET LANDS SURVEYED BY GM BLUEPLAN ENGINEERING, FEBRUARY 8, 2023.
7. BOREHOLES FROM PETO MACCALLUM, MARCH 3, 2012. MONITORING WELL DATA FROM JLP, APRIL 21 2022.
8. DIGITAL FILES NOT TO BE USED FOR LAYOUT

BENCH MARKS :

1ST ORDER BM - ELEV = 479.355
TWO STOREY BRICK AND ALUMINUM SIDING HOUSE ON EAST SIDE OF HWY 25 AND NORTH SIDE OF LUTHER RD, 0.9KM NORTH OF THE ROYAL BANK AT GRAND VALLEY, 19.0m NORTH OF CENTERLINE OF LUTHER RD, 30.3m EAST OF CENTERLINE OF HWY 25.
TABLET IS SET HORIZONTALLY IN WEST FACE OF CONCRETE FOUNDATION, 3.08m SOUTH OF N.W. CORNER, 18cm ABOVE GROUND LEVEL.

THE POSITION OF POLE LINES, CONDUITS, WATERMAINS, SEWERS AND OTHER UNDERGROUND AND OVERGROUND UTILITIES AND STRUCTURES IS NOT NECESSARILY SHOWN ON THE CONTRACT DRAWINGS, AND, WHERE SHOWN, THE ACCURACY OF THE POSITION OF SUCH UTILITIES AND STRUCTURES IS NOT GUARANTEED.

BEFORE STARTING WORK, THE CONTRACTOR SHALL INFORM HIMSELF OF THE EXACT LOCATION OF ALL SUCH UTILITIES AND STRUCTURES, AND SHALL ASSUME ALL LIABILITY FOR ANY DAMAGE TO THEM.

LEGEND

- PROPERTY LINE
- EX. STORM SEWER
- EX. DITCH
- EX. BELL LINE
- EX. GAS LINE
- EX. FENCE LINE
- EX. CONTOURS
- CB EX. CATCH BASIN
- HYD EX. FIRE HYDRANT
- LS EX. LIGHT STANDARD
- HEDGE
- CONIFEROUS AND DECIDUOUS TREES
- PR. STORM MH / CB
- PR. SANITARY MH
- PR. PARKING SPACE 134 SPACES @ 6.5m x 2.5m (TYP)

NO.	DATE	REVISION DESCRIPTION	CH'KD
1.	2023-09-12	ISSUED FOR REVIEW	A.E.K.

GM BluePlan ENGINEERING

GUELPH | OWEN SOUND | LISTOWEL | KITCHENER | LONDON | HAMILTON | GTA
650 WOODLAWN ROAD WEST, BLOCK C, UNIT 2, GUELPH, ON N1K 1B8
TEL. 519-824-8150 www.gmblueplan.ca

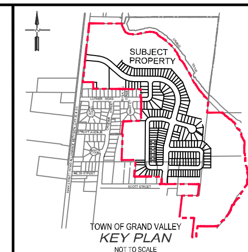
RIVER'S EDGE SUBDIVISION

THOMASFIELD HOMES LTD.

TOWN OF GRAND VALLEY

PRELIMINARY PARKING PLAN 1

DRAWN BY :	APPROVED BY :	PROJECT NO. :	DRAWING NO. :
RPM	AEK	104104	P1
DESIGNED BY :	DATE :	SCALE :	
RPM	2023-09-12	1:1000	



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- PR. STORM MH / CB
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- PR. PARKING SPACE 134 SPACES @ 6.5m x 2.5m (TYP)

NO.	DATE	REVISION DESCRIPTION	CH'KD
1.	2023-09-12	ISSUED FOR REVIEW	A.E.K.

GM BluePlan ENGINEERING

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TEL. 519-824-8150 www.gmblueplan.ca

RIVER'S EDGE SUBDIVISION

THOMASFIELD HOMES LTD.

TOWN OF GRAND VALLEY

PRELIMINARY PARKING PLAN 2

DRAWN BY :	APPROVED BY :	PROJECT NO. :	DRAWING NO. :
RPM	AEK	104104	P2
DESIGNED BY :	DATE :	SCALE :	
RPM	2023-09-12	1:1000	

Appendix B: Turning Movement Count Data

Amaranth St @ Amaranth East Luther Townline

Morning Peak Diagram

Specified Period
From: 7:00:00
To: 9:00:00

One Hour Peak
From: 7:00:00
To: 8:00:00

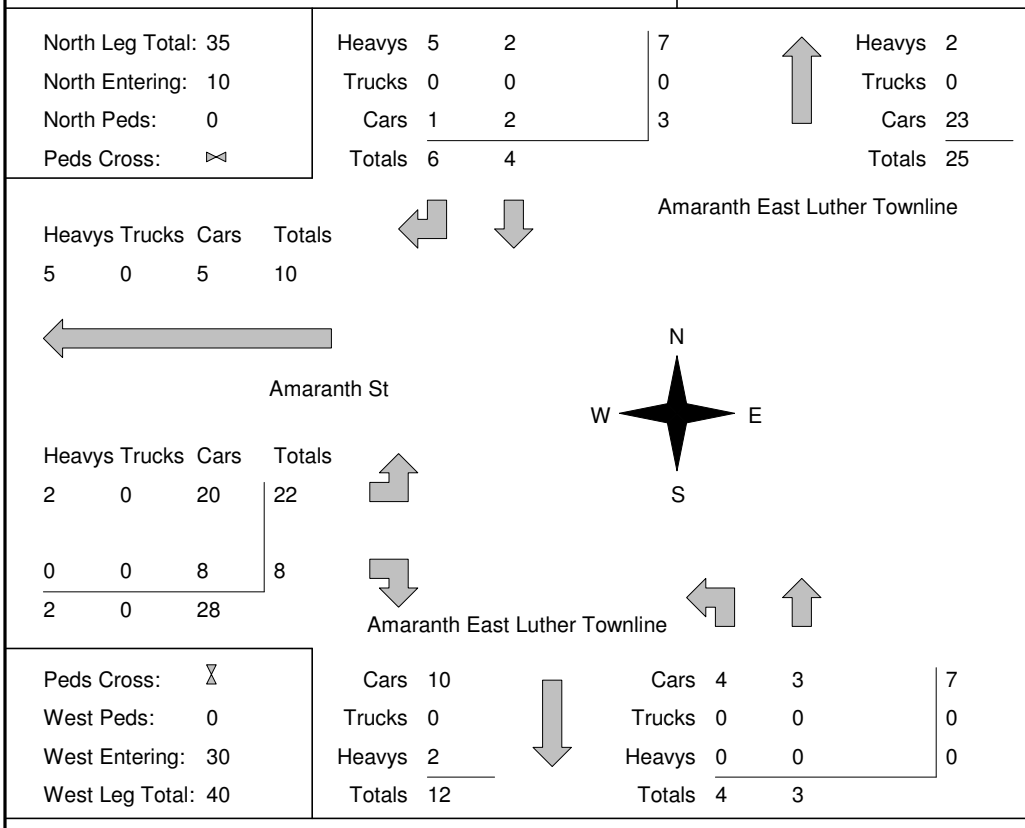
Municipality: Grand Valley
Site #: 0000000003
Intersection: Amaranth East Luther Townline & A
TFR File #: 3
Count date: 5-Apr-2023

Weather conditions:
Cloudy/Dry

Person(s) who counted:
Cam

**** Non-Signalized Intersection ****

Major Road: Amaranth East Luther Townline runs



Comments

Amaranth St @ Amaranth East Luther Townline

Afternoon Peak Diagram

Specified Period
From: 15:00:00
To: 18:00:00

One Hour Peak
From: 16:00:00
To: 17:00:00

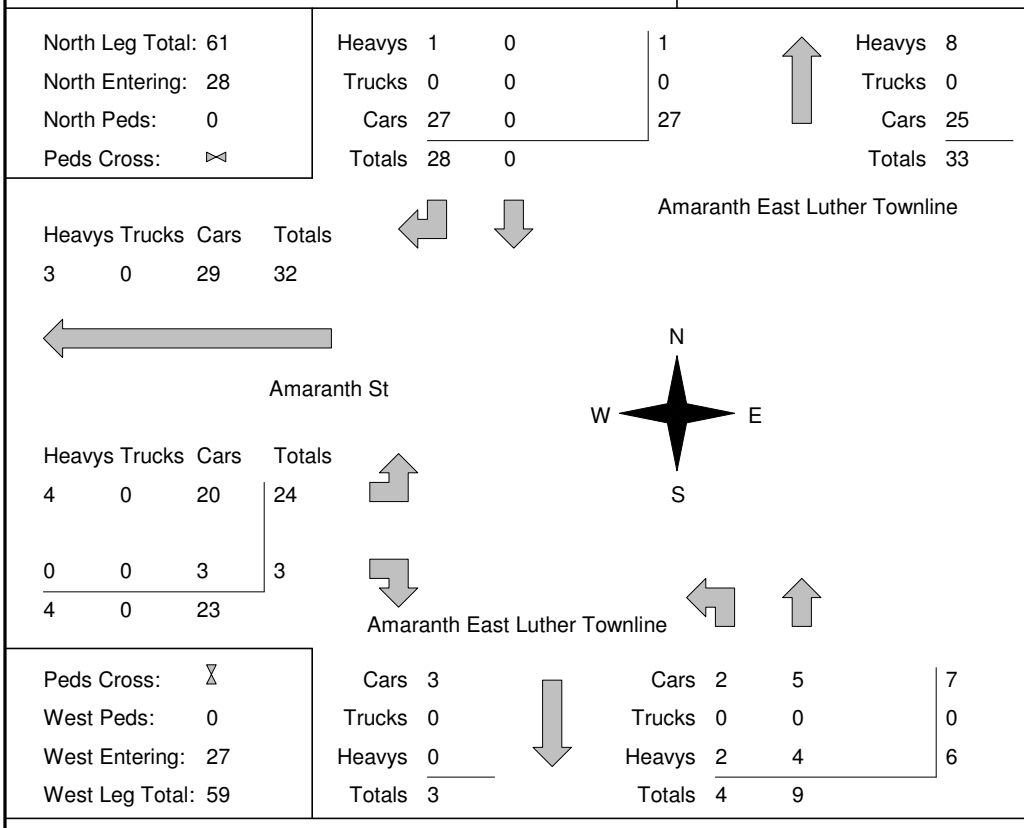
Municipality: Grand Valley
Site #: 0000000003
Intersection: Amaranth East Luther Townline & A
TFR File #: 3
Count date: 5-Apr-2023

Weather conditions:
Cloudy/Dry

Person(s) who counted:
Cam

**** Non-Signalized Intersection ****

Major Road: Amaranth East Luther Townline runs



Comments

Amaranth St @ Amaranth East Luther Townline

Total Count Diagram

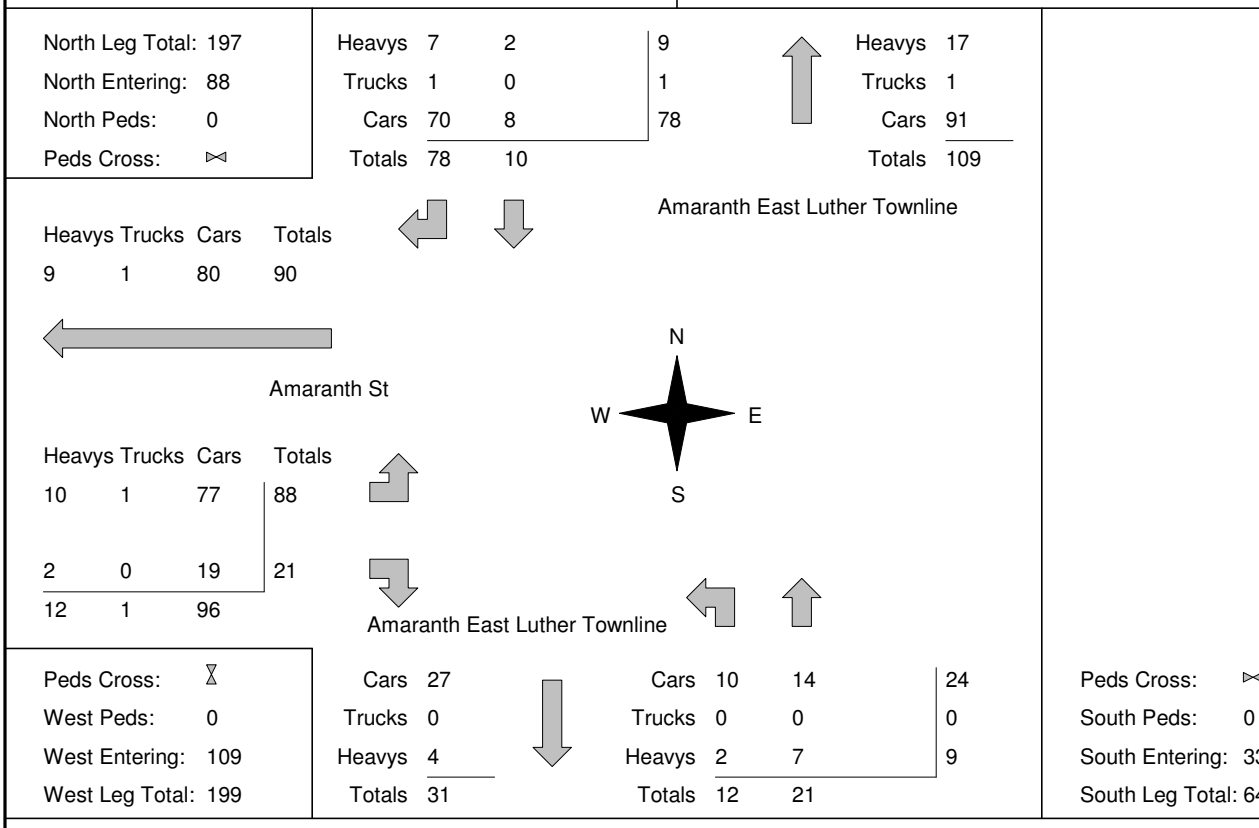
Municipality: Grand Valley
Site #: 0000000003
Intersection: Amaranth East Luther Townline & A
TFR File #: 3
Count date: 5-Apr-2023

Weather conditions:
Cloudy/Dry

Person(s) who counted:
Cam

**** Non-Signalized Intersection ****

Major Road: Amaranth East Luther Townline runs



Comments

Amaranth St @ Bielby St

Morning Peak Diagram

Specified Period
From: 7:00:00
To: 9:00:00

One Hour Peak
From: 8:00:00
To: 9:00:00

Municipality: Grand Valley
Site #: 0000000002
Intersection: Amaranth St & Bielby St
TFR File #: 2
Count date: 5-Apr-2023

Weather conditions:
Cloudy/Dry

Person(s) who counted:
Cam

**** Non-Signalized Intersection ****

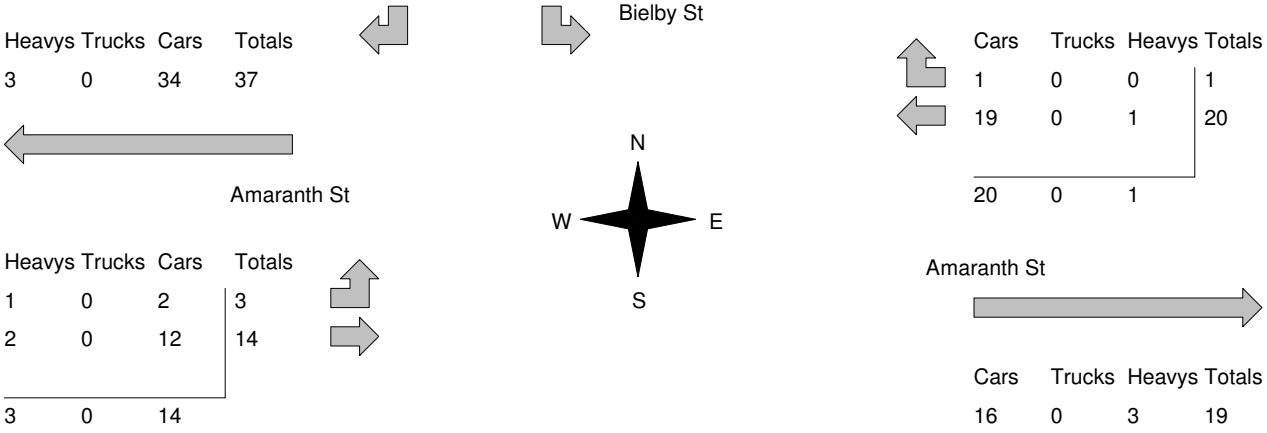
Major Road: Amaranth St runs W/E

North Leg Total: 26
North Entering: 22
North Peds: 0
Peds Cross: ⋈

Heavys	2	1	3
Trucks	0	0	0
Cars	15	4	19
Totals	17	5	

Heavys	1
Trucks	0
Cars	3
Totals	4

East Leg Total: 40
East Entering: 21
East Peds: 1
Peds Cross: ⧖



Peds Cross: ⧖
West Peds: 0
West Entering: 17
West Leg Total: 54

Comments

Amaranth St @ Bielby St

Afternoon Peak Diagram

Specified Period
From: 15:00:00
To: 18:00:00

One Hour Peak
From: 16:00:00
To: 17:00:00

Municipality: Grand Valley
Site #: 0000000002
Intersection: Amaranth St & Bielby St
TFR File #: 2
Count date: 5-Apr-2023

Weather conditions:
Cloudy/Dry

Person(s) who counted:
Cam

**** Non-Signalized Intersection ****

Major Road: Amaranth St runs W/E

North Leg Total: 36
North Entering: 13
North Peds: 1
Peds Cross: ⋈

Heavys	0	0	0
Trucks	0	0	0
Cars	10	3	13
Totals	10	3	

Heavys	2
Trucks	0
Cars	21
Totals	23

East Leg Total: 63
East Entering: 36
East Peds: 0
Peds Cross: ⧖

Bielby St

Heavys	Trucks	Cars	Totals
1	0	42	43

Cars	Trucks	Heavys	Totals
1	0	2	3
32	0	1	33
33	0	3	

Amaranth St

N
W E
S

Heavys	Trucks	Cars	Totals
0	0	20	20
4	0	20	24
4	0	40	

Amaranth St

Cars	Trucks	Heavys	Totals
23	0	4	27

Peds Cross: ⧖
West Peds: 0
West Entering: 44
West Leg Total: 87

Comments

Amaranth St @ Bielby St

Total Count Diagram

Municipality: Grand Valley
Site #: 0000000002
Intersection: Amaranth St & Bielby St
TFR File #: 2
Count date: 5-Apr-2023

Weather conditions:
Cloudy/Dry

Person(s) who counted:
Cam

**** Non-Signalized Intersection ****

Major Road: Amaranth St runs W/E

North Leg Total:	122		
North Entering:	62		
North Peds:	2		
Peds Cross:	⋈		

Heavys	2	2	4
Trucks	0	0	0
Cars	43	15	58
Totals	45	17	

Heavys	3		
Trucks	2		
Cars	55		
Totals	60		

East Leg Total:	220		
East Entering:	100		
East Peds:	1		
Peds Cross:	⧖		

Bielby St

Heavys	Trucks	Cars	Totals
9	0	129	138

Amaranth St

Heavys	Trucks	Cars	Totals
1	1	51	53
11	1	91	103
12	2	142	

N
W E
S

Cars	Trucks	Heavys	Totals
4	1	2	7
86	0	7	93
90	1	9	

Amaranth St

Cars	Trucks	Heavys	Totals
106	1	13	120

Peds Cross:	⧖
West Peds:	2
West Entering:	156
West Leg Total:	294

Comments

Main St @ Amaranth St

Morning Peak Diagram

Specified Period
From: 7:00:00
To: 9:00:00

One Hour Peak
From: 7:45:00
To: 8:45:00

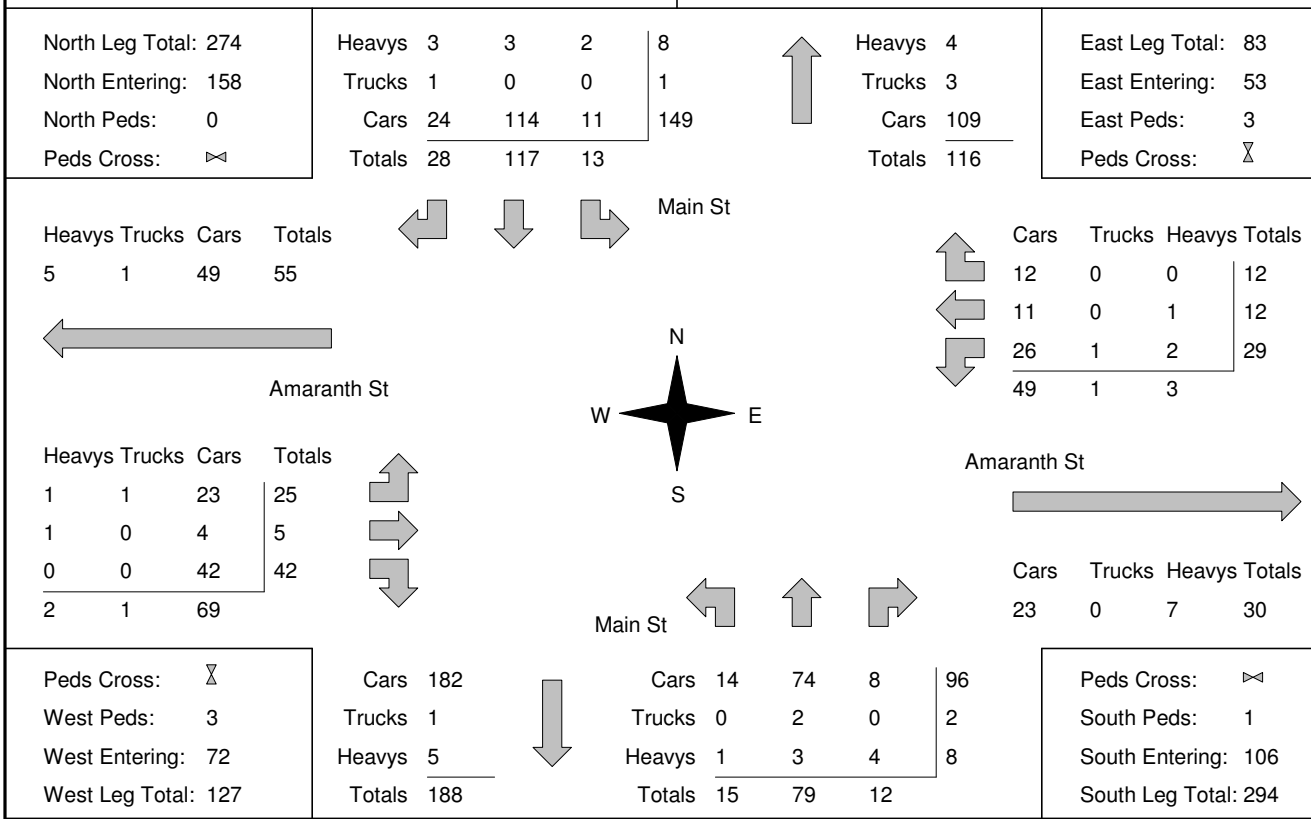
Municipality: Grand Valley
Site #: 0000000001
Intersection: Main St & Amaranth St
TFR File #: 1
Count date: 5-Apr-2023

Weather conditions:
Cloudy/Dry

Person(s) who counted:
Cam

**** Non-Signalized Intersection ****

Major Road: Main St runs N/S



Comments

Main St @ Amaranth St

Afternoon Peak Diagram

Specified Period
From: 15:00:00
To: 18:00:00

One Hour Peak
From: 16:00:00
To: 17:00:00

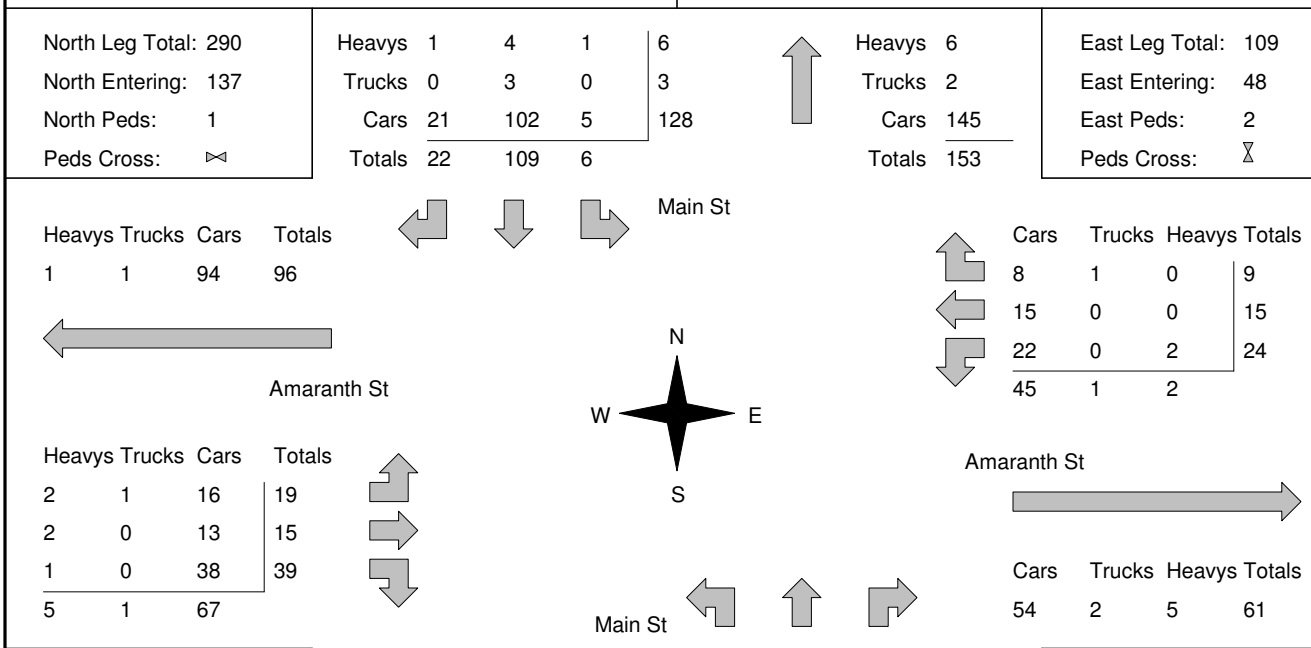
Municipality: Grand Valley
Site #: 0000000001
Intersection: Main St & Amaranth St
TFR File #: 1
Count date: 5-Apr-2023

Weather conditions:
Cloudy/Dry

Person(s) who counted:
Cam

**** Non-Signalized Intersection ****

Major Road: Main St runs N/S



Comments

Main St @ Amaranth St

Total Count Diagram

Municipality: Grand Valley
Site #: 0000000001
Intersection: Main St & Amaranth St
TFR File #: 1
Count date: 5-Apr-2023

Weather conditions:
Cloudy/Dry

Person(s) who counted:
Cam

**** Non-Signalized Intersection ****

Major Road: Main St runs N/S

North Leg Total:	1288			
North Entering:	672			
North Peds:	11			
Peds Cross:	⋈			
Heavys	7	17	5	29
Trucks	5	10	0	15
Cars	108	484	36	628
Totals	120	511	41	
Heavys	18			
Trucks	14			
Cars	584			
Totals	616			
East Leg Total:	414			
East Entering:	207			
East Peds:	18			
Peds Cross:	⧖			

Main St

Heavys	Trucks	Cars	Totals
17	7	363	387

Amaranth St

Heavys	Trucks	Cars	Totals
4	3	86	93
5	0	29	34
2	3	185	190
11	6	300	

Cars	Trucks	Heavys	Totals
41	3	1	45
49	0	5	54
100	2	6	108
190	5	12	

N
W E
S

Amaranth St

Cars	Trucks	Heavys	Totals
189	2	16	207

Main St

Peds Cross:	⧖			
West Peds:	20			
West Entering:	317			
West Leg Total:	704			
Cars	769			
Trucks	15			
Heavys	25			
Totals	809			
Cars	206	457	124	787
Trucks	2	8	2	12
Heavys	5	13	6	24
Totals	213	478	132	
Peds Cross:	⋈			
South Peds:	13			
South Entering:	823			
South Leg Total:	1632			

Comments

Main St @ Fife St

Morning Peak Diagram

Specified Period
From: 7:00:00
To: 9:00:00

One Hour Peak
From: 7:45:00
To: 8:45:00

Municipality: Grand Valley
Site #: 0000000004
Intersection: Main St & Fife St
TFR File #: 4
Count date: 5-Apr-2023

Weather conditions:
Cloudy/Dry

Person(s) who counted:
Cam

**** Non-Signalized Intersection ****

Major Road: Main St runs N/S

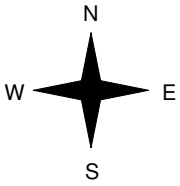
North Leg Total: 162
North Entering: 91
North Peds: 0
Peds Cross: ⋈

Heavys	7	0	7
Trucks	1	0	1
Cars	81	2	83
Totals	89	2	

Heavys	3	
Trucks	3	
Cars	65	
Totals	71	

East Leg Total: 11
East Entering: 7
East Peds: 0
Peds Cross: ⋈

	Cars	Trucks	Heavys	Totals
	5	0	0	5
	2	0	0	2
	7	0	0	



Fife St

	Cars	Trucks	Heavys	Totals
	4	0	0	4

Main St

Cars	83		
Trucks	1		
Heavys	7		
Totals	91		

Cars	60	2	62
Trucks	3	0	3
Heavys	3	0	3
Totals	66	2	

Peds Cross: ⋈
South Peds: 0
South Entering: 68
South Leg Total: 159

Comments

Main St @ Fife St

Afternoon Peak Diagram

Specified Period
From: 15:00:00
To: 18:00:00

One Hour Peak
From: 16:30:00
To: 17:30:00

Municipality: Grand Valley
Site #: 0000000004
Intersection: Main St & Fife St
TFR File #: 4
Count date: 5-Apr-2023

Weather conditions:
Cloudy/Dry

Person(s) who counted:
Cam

**** Non-Signalized Intersection ****

Major Road: Main St runs N/S

North Leg Total: 210
North Entering: 91
North Peds: 0
Peds Cross: ⋈

Heavys	2	0	2
Trucks	4	0	4
Cars	83	2	85
Totals	89	2	

Heavys	2
Trucks	4
Cars	113
Totals	119

East Leg Total: 20
East Entering: 6
East Peds: 0
Peds Cross: ⋈

Main St

Cars	Trucks	Heavys	Totals
1	0	0	1
5	0	0	5
6	0	0	

N
W E
S

Fife St

Cars	Trucks	Heavys	Totals
14	0	0	14

Main St

Cars	88		
Trucks	4		
Heavys	2		
Totals	94		

Cars	112	12	124
Trucks	4	0	4
Heavys	2	0	2
Totals	118	12	

Peds Cross: ⋈
South Peds: 0
South Entering: 130
South Leg Total: 224

Comments

Main St @ Fife St

Total Count Diagram

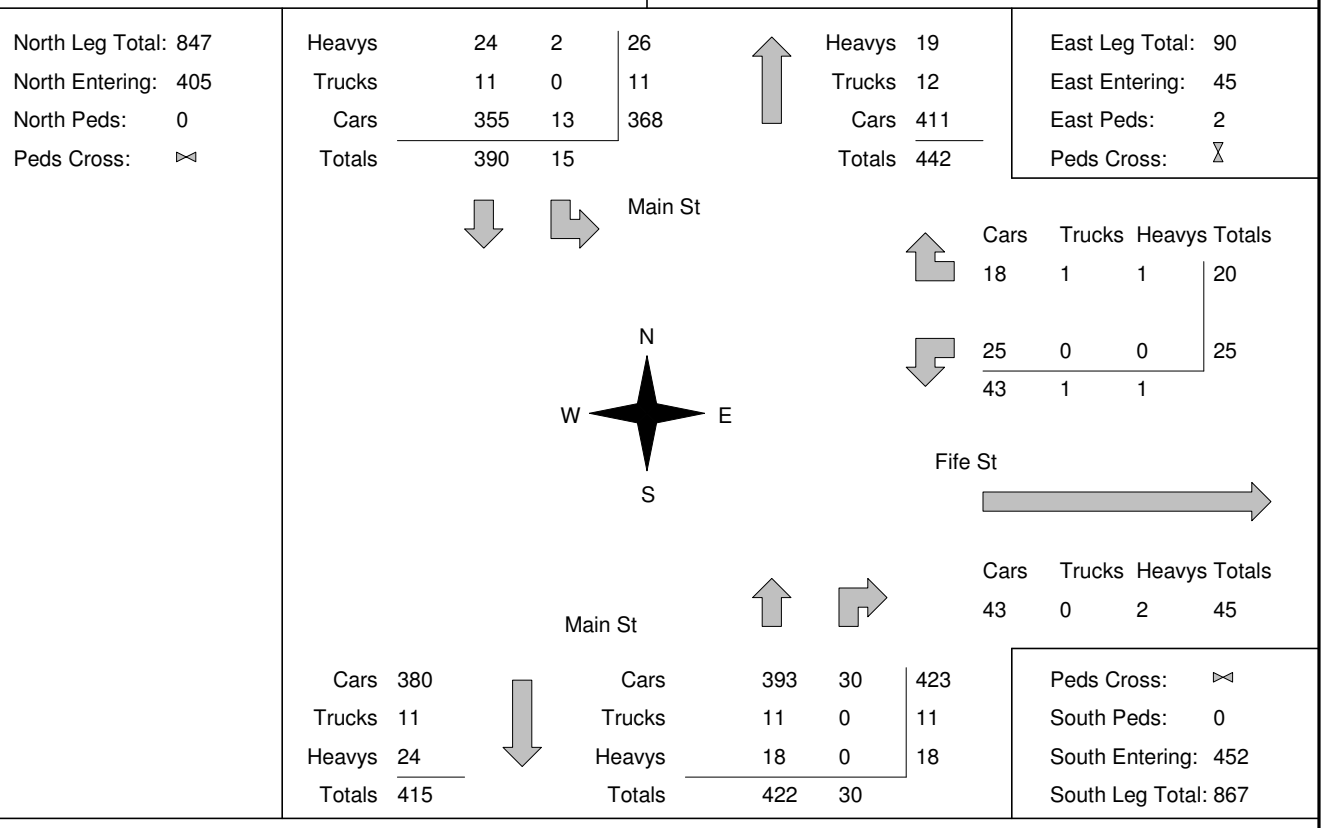
Municipality: Grand Valley
Site #: 0000000004
Intersection: Main St & Fife St
TFR File #: 4
Count date: 5-Apr-2023

Weather conditions:
Cloudy/Dry

Person(s) who counted:
Cam

**** Non-Signalized Intersection ****

Major Road: Main St runs N/S



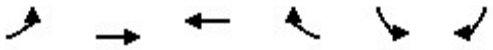
Comments

Appendix C: Existing Traffic Capacity Analysis

Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Traffic Volume (veh/h)	11	4	1	5	4	15
Future Volume (Veh/h)	11	4	1	5	4	15
Sign Control	Stop			Free	Free	
Grade	0%			0%	0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	12	4	1	5	4	16
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	19	12	20			
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	19	12	20			
tC, single (s)	6.5	6.2	4.1			
tC, 2 stage (s)						
tF (s)	3.6	3.3	2.2			
p0 queue free %	99	100	100			
cM capacity (veh/h)	980	1074	1609			

Direction, Lane #	EB 1	NB 1	SB 1
Volume Total	16	6	20
Volume Left	12	1	0
Volume Right	4	0	16
cSH	1002	1609	1700
Volume to Capacity	0.02	0.00	0.01
Queue Length 95th (m)	0.4	0.0	0.0
Control Delay (s)	8.7	1.2	0.0
Lane LOS	A	A	
Approach Delay (s)	8.7	1.2	0.0
Approach LOS	A		

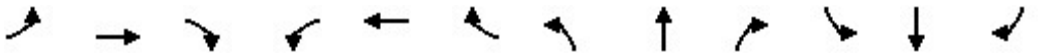
Intersection Summary			
Average Delay	3.5		
Intersection Capacity Utilization	13.3%	ICU Level of Service	A
Analysis Period (min)	15		



Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Sign Control		Stop	Stop		Stop	
Traffic Volume (vph)	3	14	20	1	5	17
Future Volume (vph)	3	14	20	1	5	17
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	3	15	22	1	5	18

Direction, Lane #	EB 1	WB 1	SB 1
Volume Total (vph)	18	23	23
Volume Left (vph)	3	0	5
Volume Right (vph)	0	1	18
Hadj (s)	0.33	0.06	-0.19
Departure Headway (s)	4.3	4.0	3.8
Degree Utilization, x	0.02	0.03	0.02
Capacity (veh/h)	827	885	925
Control Delay (s)	7.4	7.1	6.9
Approach Delay (s)	7.4	7.1	6.9
Approach LOS	A	A	A

Intersection Summary			
Delay		7.1	
Level of Service		A	
Intersection Capacity Utilization		13.7%	ICU Level of Service A
Analysis Period (min)		15	



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	25	5	42	29	12	12	15	79	12	13	117	28
Future Volume (Veh/h)	25	5	42	29	12	12	15	79	12	13	117	28
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)	27	5	46	32	13	13	16	86	13	14	127	30
Pedestrians		3			3			1				
Lane Width (m)		3.7			3.7			3.7				
Walking Speed (m/s)		1.1			1.1			1.1				
Percent Blockage		0			0			0				
Right turn flare (veh)												
Median type								None			None	
Median storage veh)												
Upstream signal (m)												
pX, platoon unblocked												
vC, conflicting volume	317	307	146	347	316	96	160			102		
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	317	307	146	347	316	96	160			102		
tC, single (s)	7.2	6.7	6.2	7.2	6.6	6.2	4.2			4.2		
tC, 2 stage (s)												
tF (s)	3.6	4.2	3.3	3.6	4.1	3.3	2.3			2.3		
p0 queue free %	95	99	95	94	98	99	99			99		
cM capacity (veh/h)	591	563	903	545	575	964	1385			1408		

Direction, Lane #	EB 1	WB 1	NB 1	SB 1
Volume Total	78	58	115	171
Volume Left	27	32	16	14
Volume Right	46	13	13	30
cSH	739	612	1385	1408
Volume to Capacity	0.11	0.09	0.01	0.01
Queue Length 95th (m)	2.7	2.4	0.3	0.2
Control Delay (s)	10.4	11.5	1.1	0.7
Lane LOS	B	B	A	A
Approach Delay (s)	10.4	11.5	1.1	0.7
Approach LOS	B	B		

Intersection Summary				
Average Delay	4.1			
Intersection Capacity Utilization	22.1%	ICU Level of Service	A	
Analysis Period (min)	15			

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Volume (veh/h)	2	5	66	2	2	89
Future Volume (Veh/h)	2	5	66	2	2	89
Sign Control	Stop		Free			Free
Grade	0%		0%			0%
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	2	5	72	2	2	97
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	174	73			74	
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	174	73			74	
tC, single (s)	6.4	6.2			4.1	
tC, 2 stage (s)						
tF (s)	3.5	3.3			2.2	
p0 queue free %	100	99			100	
cM capacity (veh/h)	819	995			1538	

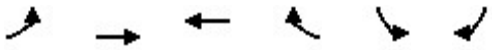
Direction, Lane #	WB 1	NB 1	SB 1
Volume Total	7	74	99
Volume Left	2	0	2
Volume Right	5	2	0
cSH	937	1700	1538
Volume to Capacity	0.01	0.04	0.00
Queue Length 95th (m)	0.2	0.0	0.0
Control Delay (s)	8.9	0.0	0.2
Lane LOS	A		A
Approach Delay (s)	8.9	0.0	0.2
Approach LOS	A		

Intersection Summary			
Average Delay	0.4		
Intersection Capacity Utilization	16.3%	ICU Level of Service	A
Analysis Period (min)	15		

Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Traffic Volume (veh/h)	24	3	4	9	0	28
Future Volume (Veh/h)	24	3	4	9	0	28
Sign Control	Stop			Free	Free	
Grade	0%			0%	0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	26	3	4	10	0	30
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	33	15	30			
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	33	15	30			
tC, single (s)	6.6	6.2	4.6			
tC, 2 stage (s)						
tF (s)	3.7	3.3	2.7			
p0 queue free %	97	100	100			
cM capacity (veh/h)	941	1070	1322			

Direction, Lane #	EB 1	NB 1	SB 1
Volume Total	29	14	30
Volume Left	26	4	0
Volume Right	3	0	30
cSH	953	1322	1700
Volume to Capacity	0.03	0.00	0.02
Queue Length 95th (m)	0.7	0.1	0.0
Control Delay (s)	8.9	2.2	0.0
Lane LOS	A	A	
Approach Delay (s)	8.9	2.2	0.0
Approach LOS	A		

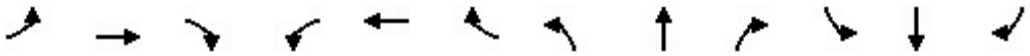
Intersection Summary			
Average Delay	4.0		
Intersection Capacity Utilization	14.0%	ICU Level of Service	A
Analysis Period (min)	15		



Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Sign Control		Stop	Stop		Stop	
Traffic Volume (vph)	20	24	33	3	3	10
Future Volume (vph)	20	24	33	3	3	10
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	22	26	36	3	3	11

Direction, Lane #	EB 1	WB 1	SB 1
Volume Total (vph)	48	39	14
Volume Left (vph)	22	0	3
Volume Right (vph)	0	3	11
Hadj (s)	0.25	0.09	-0.43
Departure Headway (s)	4.2	4.1	3.7
Degree Utilization, x	0.06	0.04	0.01
Capacity (veh/h)	844	876	948
Control Delay (s)	7.5	7.2	6.7
Approach Delay (s)	7.5	7.2	6.7
Approach LOS	A	A	A

Intersection Summary			
Delay	7.3		
Level of Service	A		
Intersection Capacity Utilization	19.4%	ICU Level of Service	A
Analysis Period (min)	15		



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	19	15	39	24	15	9	59	125	40	6	109	22
Future Volume (Veh/h)	19	15	39	24	15	9	59	125	40	6	109	22
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)	21	16	42	26	16	10	64	136	43	7	118	24
Pedestrians					2			3			1	
Lane Width (m)					3.7			3.7			3.7	
Walking Speed (m/s)					1.1			1.1			1.1	
Percent Blockage					0			0			0	
Right turn flare (veh)												
Median type								None			None	
Median storage veh)												
Upstream signal (m)												
pX, platoon unblocked												
vC, conflicting volume	448	453	133	484	444	160	142			181		
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	448	453	133	484	444	160	142			181		
tC, single (s)	7.3	6.6	6.2	7.2	6.5	6.3	4.1			4.3		
tC, 2 stage (s)												
tF (s)	3.6	4.1	3.3	3.6	4.0	3.4	2.2			2.4		
p0 queue free %	95	97	95	94	97	99	96			99		
cM capacity (veh/h)	460	461	911	429	485	859	1441			1306		

Direction, Lane #	EB 1	WB 1	NB 1	SB 1
Volume Total	79	52	243	149
Volume Left	21	26	64	7
Volume Right	42	10	43	24
cSH	625	494	1441	1306
Volume to Capacity	0.13	0.11	0.04	0.01
Queue Length 95th (m)	3.3	2.7	1.1	0.1
Control Delay (s)	11.6	13.1	2.3	0.4
Lane LOS	B	B	A	A
Approach Delay (s)	11.6	13.1	2.3	0.4
Approach LOS	B	B		

Intersection Summary				
Average Delay	4.2			
Intersection Capacity Utilization	35.3%	ICU Level of Service	A	
Analysis Period (min)	15			

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Volume (veh/h)	5	1	118	12	2	89
Future Volume (Veh/h)	5	1	118	12	2	89
Sign Control	Stop		Free			Free
Grade	0%		0%			0%
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	5	1	128	13	2	97
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	236	134			141	
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	236	134			141	
tC, single (s)	6.4	6.2			4.1	
tC, 2 stage (s)						
tF (s)	3.5	3.3			2.2	
p0 queue free %	99	100			100	
cM capacity (veh/h)	756	920			1455	

Direction, Lane #	WB 1	NB 1	SB 1
Volume Total	6	141	99
Volume Left	5	0	2
Volume Right	1	13	0
cSH	779	1700	1455
Volume to Capacity	0.01	0.08	0.00
Queue Length 95th (m)	0.2	0.0	0.0
Control Delay (s)	9.7	0.0	0.2
Lane LOS	A		A
Approach Delay (s)	9.7	0.0	0.2
Approach LOS	A		

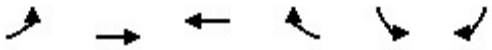
Intersection Summary			
Average Delay	0.3		
Intersection Capacity Utilization	16.9%	ICU Level of Service	A
Analysis Period (min)	15		

Appendix D: Future Background Traffic Capacity Analysis

Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Traffic Volume (veh/h)	16	6	0	7	6	21
Future Volume (Veh/h)	16	6	0	7	6	21
Sign Control	Stop			Free	Free	
Grade	0%			0%	0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	17	7	0	8	7	23
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	26	18	30			
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	26	18	30			
tC, single (s)	6.5	6.2	4.1			
tC, 2 stage (s)						
tF (s)	3.6	3.3	2.2			
p0 queue free %	98	99	100			
cM capacity (veh/h)	971	1066	1596			

Direction, Lane #	EB 1	NB 1	SB 1
Volume Total	24	8	30
Volume Left	17	0	0
Volume Right	7	0	23
cSH	997	1596	1700
Volume to Capacity	0.02	0.00	0.02
Queue Length 95th (m)	0.6	0.0	0.0
Control Delay (s)	8.7	0.0	0.0
Lane LOS	A		
Approach Delay (s)	8.7	0.0	0.0
Approach LOS	A		

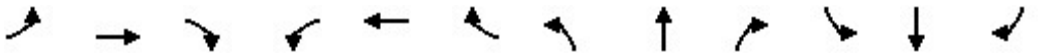
Intersection Summary			
Average Delay	3.4		
Intersection Capacity Utilization	13.3%	ICU Level of Service	A
Analysis Period (min)	15		



Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Sign Control		Stop	Stop		Stop	
Traffic Volume (vph)	4	20	28	1	7	24
Future Volume (vph)	4	20	28	1	7	24
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	4	22	30	1	8	26

Direction, Lane #	EB 1	WB 1	SB 1
Volume Total (vph)	26	31	34
Volume Left (vph)	4	0	8
Volume Right (vph)	0	1	26
Hadj (s)	0.32	0.06	-0.18
Departure Headway (s)	4.3	4.1	3.8
Degree Utilization, x	0.03	0.03	0.04
Capacity (veh/h)	820	874	909
Control Delay (s)	7.5	7.2	7.0
Approach Delay (s)	7.5	7.2	7.0
Approach LOS	A	A	A

Intersection Summary			
Delay		7.2	
Level of Service		A	
Intersection Capacity Utilization		14.5%	ICU Level of Service
Analysis Period (min)		15	



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	35	7	59	41	17	17	21	111	17	18	165	39
Future Volume (Veh/h)	35	7	59	41	17	17	21	111	17	18	165	39
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)	38	8	64	45	18	18	23	121	18	20	179	42
Pedestrians		3			3			1				
Lane Width (m)		3.7			3.7			3.7				
Walking Speed (m/s)		1.1			1.1			1.1				
Percent Blockage		0			0			0				
Right turn flare (veh)												
Median type								None			None	
Median storage veh)												
Upstream signal (m)												
pX, platoon unblocked												
vC, conflicting volume	446	431	204	488	443	133	224			142		
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	446	431	204	488	443	133	224			142		
tC, single (s)	7.2	6.7	6.2	7.2	6.6	6.2	4.2			4.2		
tC, 2 stage (s)												
tF (s)	3.6	4.2	3.3	3.6	4.1	3.3	2.3			2.3		
p0 queue free %	92	98	92	89	96	98	98			99		
cM capacity (veh/h)	473	472	838	421	481	919	1312			1361		

Direction, Lane #	EB 1	WB 1	NB 1	SB 1
Volume Total	110	81	162	241
Volume Left	38	45	23	20
Volume Right	64	18	18	42
cSH	633	494	1312	1361
Volume to Capacity	0.17	0.16	0.02	0.01
Queue Length 95th (m)	4.7	4.4	0.4	0.3
Control Delay (s)	11.9	13.7	1.2	0.8
Lane LOS	B	B	A	A
Approach Delay (s)	11.9	13.7	1.2	0.8
Approach LOS	B	B		

Intersection Summary				
Average Delay	4.7			
Intersection Capacity Utilization	27.7%	ICU Level of Service	A	
Analysis Period (min)	15			

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Volume (veh/h)	3	7	93	3	3	126
Future Volume (Veh/h)	3	7	93	3	3	126
Sign Control	Stop		Free			Free
Grade	0%		0%			0%
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	3	8	101	3	3	137
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	246	102			104	
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	246	102			104	
tC, single (s)	6.4	6.2			4.1	
tC, 2 stage (s)						
tF (s)	3.5	3.3			2.2	
p0 queue free %	100	99			100	
cM capacity (veh/h)	746	958			1500	

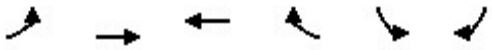
Direction, Lane #	WB 1	NB 1	SB 1
Volume Total	11	104	140
Volume Left	3	0	3
Volume Right	8	3	0
cSH	889	1700	1500
Volume to Capacity	0.01	0.06	0.00
Queue Length 95th (m)	0.3	0.0	0.0
Control Delay (s)	9.1	0.0	0.2
Lane LOS	A		A
Approach Delay (s)	9.1	0.0	0.2
Approach LOS	A		

Intersection Summary			
Average Delay		0.5	
Intersection Capacity Utilization		19.0%	ICU Level of Service A
Analysis Period (min)		15	

Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Traffic Volume (veh/h)	34	4	6	13	0	39
Future Volume (Veh/h)	34	4	6	13	0	39
Sign Control	Stop			Free	Free	
Grade	0%			0%	0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	37	4	7	14	0	42
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	49	21	42			
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	49	21	42			
tC, single (s)	6.6	6.2	4.6			
tC, 2 stage (s)						
tF (s)	3.7	3.3	2.7			
p0 queue free %	96	100	99			
cM capacity (veh/h)	919	1062	1308			

Direction, Lane #	EB 1	NB 1	SB 1
Volume Total	41	21	42
Volume Left	37	7	0
Volume Right	4	0	42
cSH	931	1308	1700
Volume to Capacity	0.04	0.01	0.02
Queue Length 95th (m)	1.0	0.1	0.0
Control Delay (s)	9.0	2.6	0.0
Lane LOS	A	A	
Approach Delay (s)	9.0	2.6	0.0
Approach LOS	A		

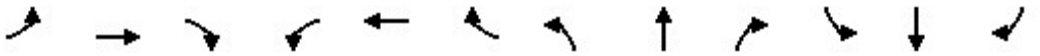
Intersection Summary			
Average Delay	4.1		
Intersection Capacity Utilization	16.0%	ICU Level of Service	A
Analysis Period (min)	15		



Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Sign Control		Stop	Stop		Stop	
Traffic Volume (vph)	28	34	47	4	4	14
Future Volume (vph)	28	34	47	4	4	14
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	30	37	51	4	4	15

Direction, Lane #	EB 1	WB 1	SB 1
Volume Total (vph)	67	55	19
Volume Left (vph)	30	0	4
Volume Right (vph)	0	4	15
Hadj (s)	0.25	0.09	-0.43
Departure Headway (s)	4.2	4.1	3.7
Degree Utilization, x	0.08	0.06	0.02
Capacity (veh/h)	838	869	923
Control Delay (s)	7.6	7.4	6.8
Approach Delay (s)	7.6	7.4	6.8
Approach LOS	A	A	A

Intersection Summary			
Delay	7.4		
Level of Service	A		
Intersection Capacity Utilization	20.3%	ICU Level of Service	A
Analysis Period (min)	15		



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	27	21	55	34	21	13	83	176	56	8	154	31
Future Volume (Veh/h)	27	21	55	34	21	13	83	176	56	8	154	31
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)	29	23	60	37	23	14	90	191	61	9	167	34
Pedestrians					2			3			1	
Lane Width (m)					3.7			3.7			3.7	
Walking Speed (m/s)					1.1			1.1			1.1	
Percent Blockage					0			0			0	
Right turn flare (veh)												
Median type								None			None	
Median storage veh)												
Upstream signal (m)												
pX, platoon unblocked												
vC, conflicting volume	630	636	187	680	622	224	201			254		
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	630	636	187	680	622	224	201			254		
tC, single (s)	7.3	6.6	6.2	7.2	6.5	6.3	4.1			4.3		
tC, 2 stage (s)												
tF (s)	3.6	4.1	3.3	3.6	4.0	3.4	2.2			2.4		
p0 queue free %	91	93	93	88	94	98	93			99		
cM capacity (veh/h)	331	353	850	296	375	791	1371			1226		

Direction, Lane #	EB 1	WB 1	NB 1	SB 1
Volume Total	112	74	342	210
Volume Left	29	37	90	9
Volume Right	60	14	61	34
cSH	502	363	1371	1226
Volume to Capacity	0.22	0.20	0.07	0.01
Queue Length 95th (m)	6.4	5.7	1.6	0.2
Control Delay (s)	14.2	17.4	2.5	0.4
Lane LOS	B	C	A	A
Approach Delay (s)	14.2	17.4	2.5	0.4
Approach LOS	B	C		

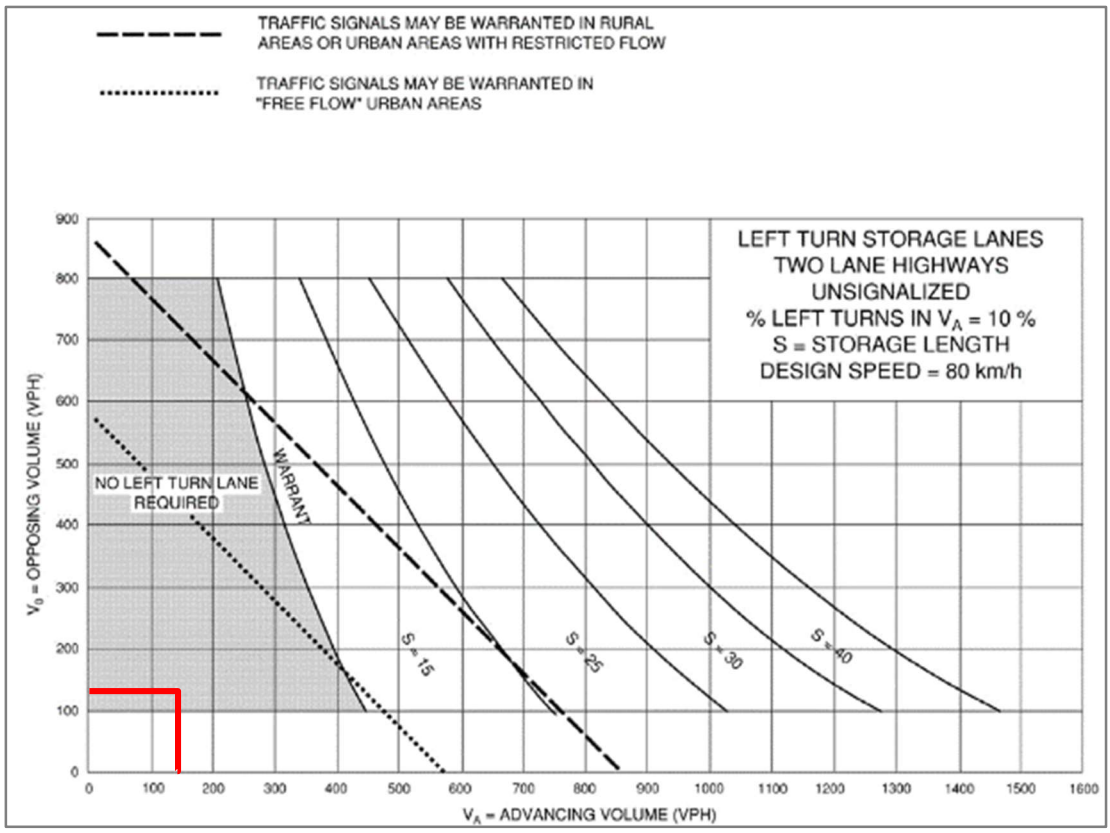
Intersection Summary				
Average Delay	5.2			
Intersection Capacity Utilization	44.9%	ICU Level of Service	A	
Analysis Period (min)	15			

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Volume (veh/h)	7	1	166	17	3	126
Future Volume (Veh/h)	7	1	166	17	3	126
Sign Control	Stop		Free			Free
Grade	0%		0%			0%
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	8	1	180	18	3	137
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	332	189			198	
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	332	189			198	
tC, single (s)	6.4	6.2			4.1	
tC, 2 stage (s)						
tF (s)	3.5	3.3			2.2	
p0 queue free %	99	100			100	
cM capacity (veh/h)	666	858			1387	

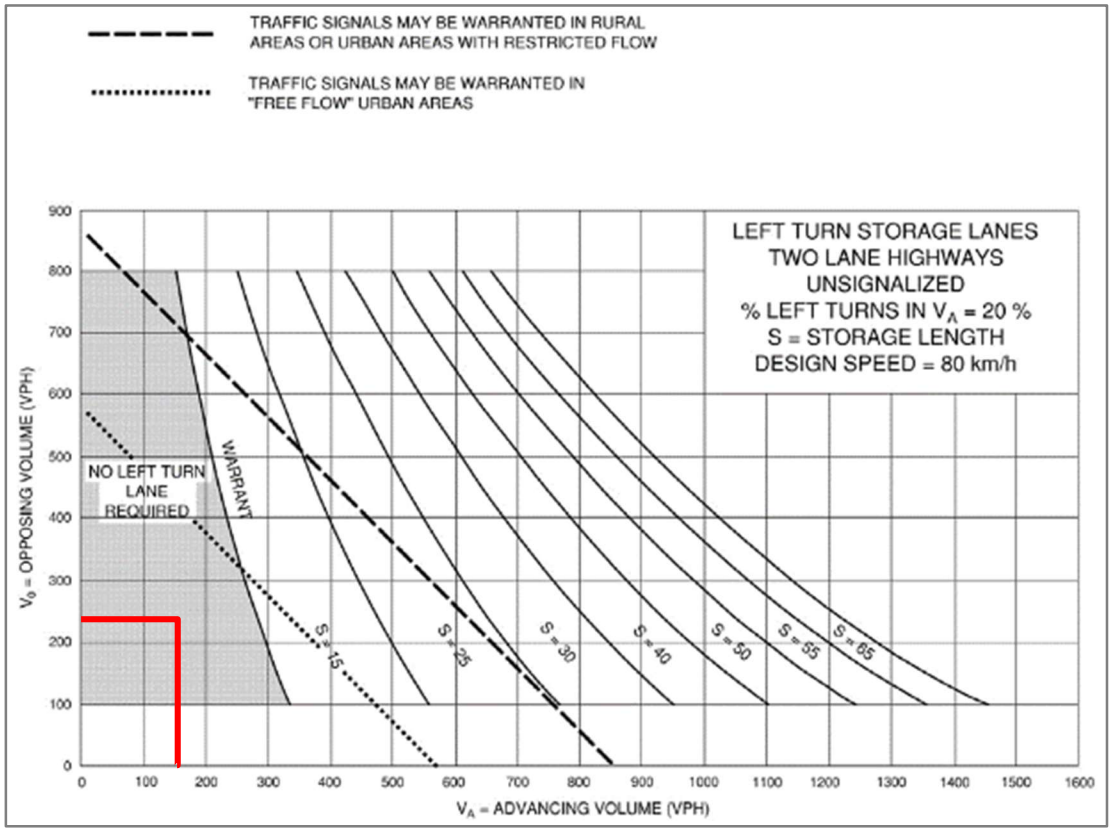
Direction, Lane #	WB 1	NB 1	SB 1
Volume Total	9	198	140
Volume Left	8	0	3
Volume Right	1	18	0
cSH	683	1700	1387
Volume to Capacity	0.01	0.12	0.00
Queue Length 95th (m)	0.3	0.0	0.0
Control Delay (s)	10.3	0.0	0.2
Lane LOS	B		A
Approach Delay (s)	10.3	0.0	0.2
Approach LOS	B		

Intersection Summary			
Average Delay		0.3	
Intersection Capacity Utilization		19.8%	ICU Level of Service A
Analysis Period (min)		15	

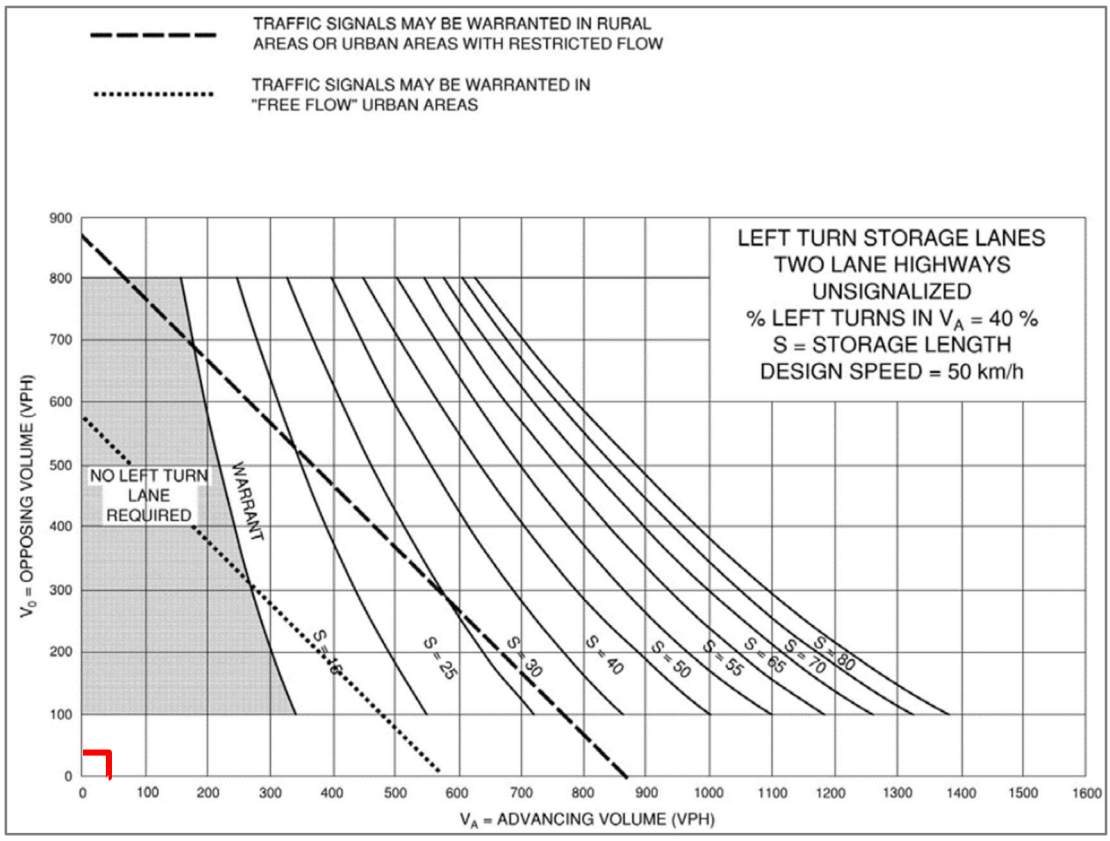
Appendix E: Left Turn Lane Warrant Assessment Main/Bielby and Amaranth/Bielby Intersections



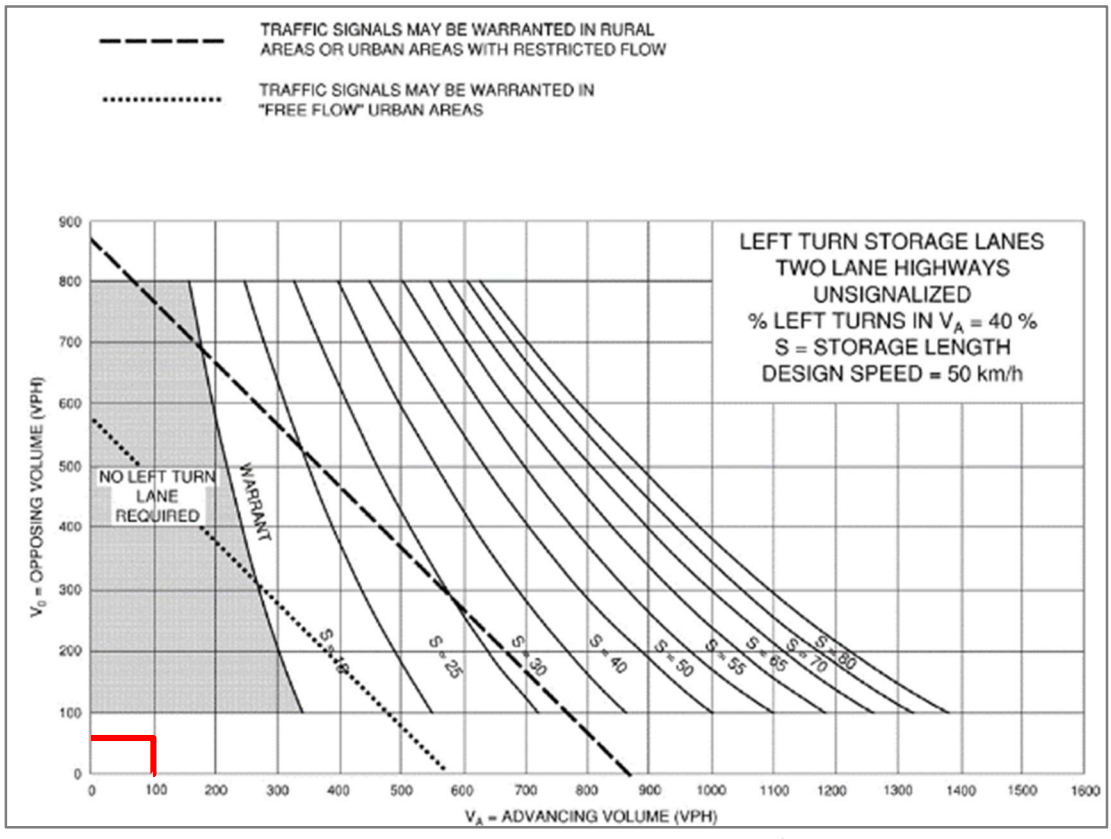
Future Total AM Peak Hour Left Turn Lane Warrant – Main/Bielby



Future Total PM Peak Hour Left Turn Lane Warrant – Main/Bielby



Future Total AM Peak Hour Left Turn Lane Warrant – Amaranth/Bielby



Future Total PM Peak Hour Left Turn Lane Warrant – Amaranth/Bielby

Appendix F: Future Total Traffic Capacity Analysis

Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Traffic Volume (veh/h)	22	9	1	7	6	24
Future Volume (Veh/h)	22	9	1	7	6	24
Sign Control	Stop			Free	Free	
Grade	0%			0%	0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	24	10	1	8	7	26
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	30	20	33			
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	30	20	33			
tC, single (s)	6.5	6.2	4.1			
tC, 2 stage (s)						
tF (s)	3.6	3.3	2.2			
p0 queue free %	98	99	100			
cM capacity (veh/h)	966	1064	1592			

Direction, Lane #	EB 1	NB 1	SB 1
Volume Total	34	9	33
Volume Left	24	1	0
Volume Right	10	0	26
cSH	993	1592	1700
Volume to Capacity	0.03	0.00	0.02
Queue Length 95th (m)	0.8	0.0	0.0
Control Delay (s)	8.8	0.8	0.0
Lane LOS	A	A	
Approach Delay (s)	8.8	0.8	0.0
Approach LOS	A		

Intersection Summary			
Average Delay	4.0		
Intersection Capacity Utilization	13.3%	ICU Level of Service	A
Analysis Period (min)	15		

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Sign Control		Stop	Stop		Stop	
Traffic Volume (vph)	14	23	29	4	14	60
Future Volume (vph)	14	23	29	4	14	60
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	15	25	32	4	15	65

Direction, Lane #	EB 1	WB 1	SB 1
Volume Total (vph)	40	36	80
Volume Left (vph)	15	0	15
Volume Right (vph)	0	4	65
Hadj (s)	0.43	0.01	-0.22
Departure Headway (s)	4.5	4.1	3.9
Degree Utilization, x	0.05	0.04	0.09
Capacity (veh/h)	774	852	906
Control Delay (s)	7.8	7.3	7.2
Approach Delay (s)	7.8	7.3	7.2
Approach LOS	A	A	A

Intersection Summary			
Delay	7.4		
Level of Service	A		
Intersection Capacity Utilization	19.8%	ICU Level of Service	A
Analysis Period (min)	15		

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	43	11	59	69	25	18	21	123	23	22	218	55
Future Volume (Veh/h)	43	11	59	69	25	18	21	123	23	22	218	55
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)	47	12	64	75	27	20	23	134	25	24	237	60
Pedestrians		3			3			1				
Lane Width (m)		3.7			3.7			3.7				
Walking Speed (m/s)		1.1			1.1			1.1				
Percent Blockage		0			0			0				
Right turn flare (veh)												
Median type								None			None	
Median storage veh)												
Upstream signal (m)												
pX, platoon unblocked												
vC, conflicting volume	544	526	271	582	544	150	300			162		
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	544	526	271	582	544	150	300			162		
tC, single (s)	7.2	6.7	6.2	7.2	6.6	6.2	4.2			4.2		
tC, 2 stage (s)												
tF (s)	3.6	4.2	3.3	3.6	4.1	3.3	2.3			2.3		
p0 queue free %	88	97	92	79	94	98	98			98		
cM capacity (veh/h)	396	414	770	357	420	900	1230			1338		

Direction, Lane #	EB 1	WB 1	NB 1	SB 1
Volume Total	123	122	182	321
Volume Left	47	75	23	24
Volume Right	64	20	25	60
cSH	533	411	1230	1338
Volume to Capacity	0.23	0.30	0.02	0.02
Queue Length 95th (m)	6.7	9.3	0.4	0.4
Control Delay (s)	13.8	17.4	1.2	0.7
Lane LOS	B	C	A	A
Approach Delay (s)	13.8	17.4	1.2	0.7
Approach LOS	B	C		

Intersection Summary				
Average Delay	5.7			
Intersection Capacity Utilization	35.9%	ICU Level of Service	A	
Analysis Period (min)	15			

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Volume (veh/h)	6	9	112	4	4	194
Future Volume (Veh/h)	6	9	112	4	4	194
Sign Control	Stop		Free			Free
Grade	0%		0%			0%
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	7	10	122	4	4	211
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	343	124			126	
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	343	124			126	
tC, single (s)	6.4	6.2			4.1	
tC, 2 stage (s)						
tF (s)	3.5	3.3			2.2	
p0 queue free %	99	99			100	
cM capacity (veh/h)	656	932			1473	

Direction, Lane #	WB 1	NB 1	SB 1
Volume Total	17	126	215
Volume Left	7	0	4
Volume Right	10	4	0
cSH	794	1700	1473
Volume to Capacity	0.02	0.07	0.00
Queue Length 95th (m)	0.5	0.0	0.1
Control Delay (s)	9.6	0.0	0.2
Lane LOS	A		A
Approach Delay (s)	9.6	0.0	0.2
Approach LOS	A		

Intersection Summary			
Average Delay	0.6		
Intersection Capacity Utilization	23.4%	ICU Level of Service	A
Analysis Period (min)	15		

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Volume (veh/h)	68	29	102	19	14	129
Future Volume (Veh/h)	68	29	102	19	14	129
Sign Control	Stop		Free			Free
Grade	0%		0%			0%
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	74	32	111	21	15	140
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	292	122			132	
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	292	122			132	
tC, single (s)	6.4	6.2			4.1	
tC, 2 stage (s)						
tF (s)	3.5	3.3			2.2	
p0 queue free %	89	97			99	
cM capacity (veh/h)	692	930			1453	

Direction, Lane #	WB 1	NB 1	SB 1
Volume Total	106	132	155
Volume Left	74	0	15
Volume Right	32	21	0
cSH	750	1700	1453
Volume to Capacity	0.14	0.08	0.01
Queue Length 95th (m)	3.7	0.0	0.2
Control Delay (s)	10.6	0.0	0.8
Lane LOS	B		A
Approach Delay (s)	10.6	0.0	0.8
Approach LOS	B		

Intersection Summary			
Average Delay	3.2		
Intersection Capacity Utilization	29.6%	ICU Level of Service	A
Analysis Period (min)	15		

Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Traffic Volume (veh/h)	41	5	10	13	0	49
Future Volume (Veh/h)	41	5	10	13	0	49
Sign Control	Stop			Free	Free	
Grade	0%			0%	0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	45	5	11	14	0	53
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	62	26	53			
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	62	26	53			
tC, single (s)	6.6	6.2	4.6			
tC, 2 stage (s)						
tF (s)	3.7	3.3	2.7			
p0 queue free %	95	100	99			
cM capacity (veh/h)	900	1055	1294			

Direction, Lane #	EB 1	NB 1	SB 1
Volume Total	50	25	53
Volume Left	45	11	0
Volume Right	5	0	53
cSH	913	1294	1700
Volume to Capacity	0.05	0.01	0.03
Queue Length 95th (m)	1.3	0.2	0.0
Control Delay (s)	9.2	3.5	0.0
Lane LOS	A	A	
Approach Delay (s)	9.2	3.5	0.0
Approach LOS	A		

Intersection Summary			
Average Delay	4.3		
Intersection Capacity Utilization	17.9%	ICU Level of Service	A
Analysis Period (min)	15		

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Sign Control		Stop	Stop		Stop	
Traffic Volume (vph)	67	36	50	15	10	35
Future Volume (vph)	67	36	50	15	10	35
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	73	39	54	16	11	38

Direction, Lane #	EB 1	WB 1	SB 1
Volume Total (vph)	112	70	49
Volume Left (vph)	73	0	11
Volume Right (vph)	0	16	38
Hadj (s)	0.23	0.16	-0.42
Departure Headway (s)	4.3	4.3	3.9
Degree Utilization, x	0.13	0.08	0.05
Capacity (veh/h)	820	824	877
Control Delay (s)	8.0	7.7	7.1
Approach Delay (s)	8.0	7.7	7.1
Approach LOS	A	A	A

Intersection Summary			
Delay	7.7		
Level of Service	A		
Intersection Capacity Utilization	22.6%	ICU Level of Service	A
Analysis Period (min)	15		

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	43	31	55	47	29	17	83	227	86	11	178	45
Future Volume (Veh/h)	43	31	55	47	29	17	83	227	86	11	178	45
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)	47	34	60	51	32	18	90	247	93	12	193	49
Pedestrians					2			3			1	
Lane Width (m)					3.7			3.7			3.7	
Walking Speed (m/s)					1.1			1.1			1.1	
Percent Blockage					0			0			0	
Right turn flare (veh)												
Median type								None			None	
Median storage veh)												
Upstream signal (m)												
pX, platoon unblocked												
vC, conflicting volume	750	764	220	797	742	296	242			342		
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	750	764	220	797	742	296	242			342		
tC, single (s)	7.3	6.6	6.2	7.2	6.5	6.3	4.1			4.3		
tC, 2 stage (s)												
tF (s)	3.6	4.1	3.3	3.6	4.0	3.4	2.2			2.4		
p0 queue free %	82	89	93	78	90	98	93			99		
cM capacity (veh/h)	263	296	814	235	319	720	1324			1136		

Direction, Lane #	EB 1	WB 1	NB 1	SB 1
Volume Total	141	101	430	254
Volume Left	47	51	90	12
Volume Right	60	18	93	49
cSH	384	295	1324	1136
Volume to Capacity	0.37	0.34	0.07	0.01
Queue Length 95th (m)	12.6	11.2	1.7	0.2
Control Delay (s)	19.7	23.4	2.2	0.5
Lane LOS	C	C	A	A
Approach Delay (s)	19.7	23.4	2.2	0.5
Approach LOS	C	C		

Intersection Summary				
Average Delay	6.7			
Intersection Capacity Utilization	53.3%	ICU Level of Service	A	
Analysis Period (min)	15			

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Volume (veh/h)	9	2	234	21	5	164
Future Volume (Veh/h)	9	2	234	21	5	164
Sign Control	Stop		Free			Free
Grade	0%		0%			0%
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	10	2	254	23	5	178
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	454	266			277	
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	454	266			277	
tC, single (s)	6.4	6.2			4.1	
tC, 2 stage (s)						
tF (s)	3.5	3.3			2.2	
p0 queue free %	98	100			100	
cM capacity (veh/h)	566	778			1298	

Direction, Lane #	WB 1	NB 1	SB 1
Volume Total	12	277	183
Volume Left	10	0	5
Volume Right	2	23	0
cSH	593	1700	1298
Volume to Capacity	0.02	0.16	0.00
Queue Length 95th (m)	0.5	0.0	0.1
Control Delay (s)	11.2	0.0	0.2
Lane LOS	B		A
Approach Delay (s)	11.2	0.0	0.2
Approach LOS	B		

Intersection Summary			
Average Delay	0.4		
Intersection Capacity Utilization	23.6%	ICU Level of Service	A
Analysis Period (min)	15		

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Volume (veh/h)	39	25	169	67	30	130
Future Volume (Veh/h)	39	25	169	67	30	130
Sign Control	Stop		Free			Free
Grade	0%		0%			0%
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	42	27	184	73	33	141
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	428	220			257	
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	428	220			257	
tC, single (s)	6.4	6.2			4.1	
tC, 2 stage (s)						
tF (s)	3.5	3.3			2.2	
p0 queue free %	93	97			97	
cM capacity (veh/h)	569	819			1308	

Direction, Lane #	WB 1	NB 1	SB 1
Volume Total	69	257	174
Volume Left	42	0	33
Volume Right	27	73	0
cSH	646	1700	1308
Volume to Capacity	0.11	0.15	0.03
Queue Length 95th (m)	2.7	0.0	0.6
Control Delay (s)	11.2	0.0	1.7
Lane LOS	B		A
Approach Delay (s)	11.2	0.0	1.7
Approach LOS	B		

Intersection Summary			
Average Delay	2.1		
Intersection Capacity Utilization	35.2%	ICU Level of Service	A
Analysis Period (min)	15		