

1873 LONDON LINE

RESIDENTIAL DEVELOPMENT

CITY OF SARNIA

TRAFFIC IMPACT STUDY

Prepared for:



Prepared by:



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1873 LONDON LINE RESIDENTIAL DEVELOPMENT, CITY OF SARNIA

TRAFFIC IMPACT STUDY

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1.0 INTRODUCTION AND BACKGROUND

A development has been proposed for the south side of London Line (also known as County Road 22) on the outskirts of the City of Sarnia, Ontario. The property is located at 1873 London Line between Blackwell Side Road and Airport Road, just south of King's Highway 402 and the Chris Hadfield Airport. The area is illustrated on Figure 1.

London Line (County Road 22) is a highly used east/west four-lane arterial road which provides a major access corridor into Sarnia. For the remainder of this study, any reference to London Line should be considered as being synonymous with County Road 22. This east/west arterial road is south of and runs parallel to King's Highway 402. It also facilitates access to commercial, retail and residential land uses along its entire length from Sarnia eastward to London.

The study area is considered to be the length of London Line between Blackwell Side Road at the west and Airport Road at the east. London Line intersects with collector road Blackwell Side Road at a signalized intersection at the westerly limits of the study area. London Line also intersects with arterial road Airport Road at a signalized tee intersection at the easterly limits of the study area. Airport Road provides direct access to King's Highway 402 via a partial cloverleaf interchange.

The proposed redevelopment of a former golf course and mini golf facility into a residential subdivision of 169 single family dwellings is planned to commence at the time the developer receives all of the necessary approvals. The site plan (draft plan of subdivision) is provided on Figure 2. The proposed redevelopment also sets aside 0.68 hectares of the existing lands for commercially zoned land use, but currently, there is no detailed plan regarding its specific use. For that reason, this study will only consider the impact of the proposed residential subdivision development.

With no specific commencement of construction date on record, it is suggested that a conservative analysis be undertaken to consider full build-out of the residential subdivision in year 2025. In keeping with the City of Sarnia's Transportation Impact Study Guidelines, the "horizon year will be taken as five years from the full build-out of the site/area." In this case, the year 2030 will be the horizon year.

The purpose of this study is to examine the traffic implications of the proposed development on traffic operations in the defined study area under existing and projected traffic scenarios.



2.0 EXISTING CONDITIONS

Traffic counts for the signalized intersection of London Line at Blackwell Side Road, the non-signalized intersection of London Line at Garden Centre / Furniture Store and the signalized intersection of London Line at Airport Road were obtained by Pyramid Traffic on 17 October 2018. The results are contained in Appendix A. These traffic counts provided the basis for analysis in the Synchro 10 program, which calculates various parameters of intersection performance, such as Level of Service (LOS), Intersection Capacity Utilization (ICU), and queue lengths on individual approaches.

From west to east along the corridor, the results of the analysis show that the signalized intersection of London Line and Blackwell Side Road is performing very well under existing conditions in both AM and PM peak time periods, with an overall LOS A during the AM and PM peak hours. The ICU is 41.7% in the AM peak hour and 50.7% in the PM peak hour. The critical period is the PM peak hour, which is the result of the maximum east/west flow of traffic volumes.

The non-signalized intersection of London Line and Garden Centre / Furniture Store performs well in both AM and PM peak time periods. Northbound and southbound egress from the two aforementioned commercial developments is a typical challenge (at worst a LOS C) when finding an acceptable gap in traffic volumes on a four-lane arterial road in either of the peak hours. The critical period is the PM peak hour, which is the result of the maximum east/west flow of traffic volumes.

Finally, the signalized tee intersection of London Line and Airport Road is also performing very well under existing conditions in both AM and PM peak time periods, with an overall LOS A during the AM and PM peak hours. The ICU is 26.2% in the AM peak hour and 26.4% in the PM peak hour. The critical period is the PM peak hour, which is the result of the maximum east/west flow of traffic volumes.

3.0 TRIP GENERATION AND DISTRIBUTION

The most appropriate land use code for the proposed residential subdivision is ITE No. 210 – Single-Family Detached Housing, which was obtained from the ITE Trip Generation Manual – 10th Edition. This reference was used to determine an estimation of trips generated by the proposed site. No reductions were made to the trips generated by the proposed development, as there is no established alternative mode of transportation other than the passenger vehicle within the study area.



Based on ITE Trip Generation Manual, Land Use Code 210, the AM peak hour average trip generation rate is 0.74 trips per dwelling unit with 25% entering and 75% exiting. The PM peak hour average rate is 0.99 trips per dwelling unit with 63% entering and 37% exiting.

The trip generation estimates were calculated based on the aforementioned rates and values. As calculated in Appendix B, the proposed site is estimated to generate a total of 125 trips in the AM peak hour, with 31 trips entering the site and 94 trips exiting the site, as well as 167 trips in the PM peak hour, with 105 trips entering the site and 62 exiting the site.

The distribution of trips to and from the proposed site was estimated as per the distributions exhibited by existing traffic patterns recorded during the AM and PM peak hours. As identified on the site plan, vehicles can only access the proposed redevelopment site to and from London Line (County Road 22). The distribution of trips to and from the proposed site was estimated with respect to these access parameters. The site generated traffic schematics for both AM and PM peak periods are identified on Figure 3. These site generated traffic volumes were then added to existing and anticipated future background traffic volumes to analyze the traffic impact of the development.

4.0 CAPACITY AND LEVEL OF SERVICE ANALYSIS

Figure 4 illustrates the existing traffic volumes for AM and PM peak hours. In order to accommodate future growth, existing volumes at the intersections of London Line (County Road 22) at Blackwell Side Road, London Line at Garden Centre / Furniture Store and London Line at Airport Road were increased by 1% per year compounded over 6 and 11 years to the horizon years 2025 and 2030. The increased traffic volumes were then distributed to the proposed driveway access (at the intersection of London Line and Street A) for the 2025 and 2030 horizon years. Site generated traffic was added to these future background traffic scenarios, and the results are illustrated in Figures 5 to 8. Intersection-specific figures indicating how existing traffic volumes are projected to increase as a result of site generated traffic and background growth are made available in Appendix C.

The data from Figures 4 to 8 was used in the Synchro analysis of intersection performance. The results from the Synchro reports are summarized in Tables 1 through 6, and the detailed Synchro results are provided in Appendix D.

The proposed development access was modelled to ensure that the access provided for safe and normal traffic operations into and out of the site. To improve efficiency of operations at the access, separate left and right turns were assumed right from the onset of the analysis.

Table 1: Overall Signalized Intersection Level of Service – London Line at Blackwell Side Road

Scenario	London Line at Blackwell Side Road	
	AM Peak Hour	PM Peak Hour
Existing Traffic	A	A
Background Traffic 2025	A	A
Background Traffic 2030	A	A
Total Traffic 2025	A	A
Total Traffic 2030	A	A

Table 2: Overall Signalized Intersection Level of Service – London Line at Airport Road

Scenario	London Line at Airport Road	
	AM Peak Hour	PM Peak Hour
Existing Traffic	A	A
Background Traffic 2025	A	A
Background Traffic 2030	A	A
Total Traffic 2025	A	A
Total Traffic 2030	A	A

Table 3: Level of Service by Approach – London Line at Blackwell Side Road

Scenario	London Line at Blackwell Side Road							
	AM Peak Hour				PM Peak Hour			
	E/B	W/B	N/B	S/B	E/B	W/B	N/B	S/B
Existing Traffic	A	A	B	A	A	A	B	A
Background Traffic 2025	A	A	B	A	A	A	B	A
Background Traffic 2030	A	A	B	A	A	A	B	A
Total Traffic 2025	A	A	B	A	A	A	B	A
Total Traffic 2030	A	A	B	A	A	A	B	A

Table 4: Level of Service by Approach – London Line at Garden Centre / Furniture Store

Scenario	London Line at Garden Centre / Furniture Store							
	AM Peak Hour				PM Peak Hour			
	E/B	W/B	N/B	S/B	E/B	W/B	N/B	S/B
Existing Traffic	A	A	A	B	A	A	C	B
Background Traffic 2025	A	A	A	B	A	A	C	B
Background Traffic 2030	A	A	A	B	A	A	C	B
Total Traffic 2025	A	A	A	B	A	A	C	B
Total Traffic 2030	A	A	A	B	A	A	C	B



Table 5: Level of Service by Approach – London Line at Site Access (Street A)

Scenario	London Line at Site Access (Street A)							
	AM Peak Hour				PM Peak Hour			
	E/B	W/B	N/B	S/B	E/B	W/B	N/B	S/B
Existing Traffic	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Background Traffic 2025	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Background Traffic 2030	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Total Traffic 2025	A	A	B	N/A	A	A	B	N/A
Total Traffic 2030	A	A	B	N/A	A	A	B	N/A

Table 6: Level of Service by Approach – London Line at Airport Road

Scenario	London Line at Airport Road							
	AM Peak Hour				PM Peak Hour			
	E/B	W/B	N/B	S/B	E/B	W/B	N/B	S/B
Existing Traffic	A	A	N/A	A	A	A	N/A	B
Background Traffic 2025	A	A	N/A	A	A	A	N/A	B
Background Traffic 2030	A	A	N/A	A	A	A	N/A	B
Total Traffic 2025	A	A	N/A	A	A	A	N/A	B
Total Traffic 2030	A	A	N/A	A	A	A	N/A	B

4.1 London Line (County Road 22) at Blackwell Side Road

It is observed that there is no adverse effect when adding site generated traffic to existing traffic volumes at the intersection of London Line and Blackwell Side Road. From Tables 1 and 3, it is apparent that, although traffic conditions begin to slightly deteriorate in the approaches as background traffic volumes increase for the 2025 and 2030 horizon years, the intersection of London Line at Blackwell Side Road does not deteriorate beyond an overall LOS A in either peak hour. Individual approaches maintain LOS A to B for all future growth scenarios. This suggests that the proposed development 1873 London Line will not have a significant impact on traffic operations at Blackwell Side Road and that the existing signal will continue to operate at an acceptable level of service. It can be concluded that changes to existing traffic signal timings are not required.

4.2 London Line (County Road 22) at Garden Centre / Furniture Store

From Table 4, it is evident from the levels of service at the intersection of London Line and Garden Centre / Furniture Store will continue to operate at an acceptable level of service.

4.3 London Line (County Road 22) at Site Access

From Table 5, it is evident from the levels of service at the intersection of London Line and the Site Access (Street A) will operate at a very favourable level of service. As previously indicated, to improve efficiency of traffic operations at the access, separate left and right egress lanes were assumed right from the onset of the analysis.

Looking into the specific lane by lane levels of service provided in the detailed Synchro results (Appendix D), average control delay of 13.1 seconds is anticipated for the northbound left turn movement out of the proposed development in the AM peak hour, and 17.2 seconds of average control delay is anticipated in the PM peak hour. These control delay values translate to LOS B and C respectively, which are favourable results.

Average control delay of 9.3 seconds is anticipated for the northbound right turn movement out of the proposed development in the AM peak hour, and 10.7 seconds of average control delay is anticipated in the PM peak hour. These control delay values translate to LOS A and B respectively, which are very favourable results.

4.4 London Line (County Road 22) at Airport Road

From Tables 2 and 6, it is apparent that the signalized tee intersection of London Line at Airport Road operates very well for London Line traffic, with LOS A for all growth scenarios. Although traffic conditions begin to slightly deteriorate in the approaches as background traffic volumes increase for the 2025 and 2030 horizon years, all individual approaches maintain a LOS A for all future growth scenarios. This suggests that the proposed development on London Line will not have a significant impact on traffic operations at Airport Road; the existing signal will continue to operate at an acceptable level of service. Further, it can be concluded that changes to existing traffic signal timings are not required.

5.0 INTERSECTION QUEUING ANALYSIS

From the detailed Synchro reports, in the “worst case” scenario (i.e. Total Traffic 2030 – PM Peak), all three intersections of interest, London Line (County Road 22) at Blackwell Side Road, Airport Road, and the Site Access (Street A), continue to operate without any adverse effect on queuing. All legs of the respective intersections currently provide sufficient storage for anticipated queue lengths.

In the aforementioned “worst-case scenario”, for the three-legged unsignalized intersection that results when the proposed residential subdivision development accesses London Line, the analysis indicates that the stop-controlled northbound left turn lane exhibits average queues of less than one vehicle. Therefore, it can be stated that queuing resulting from egress from the proposed development is nominal and can be accommodated on-site under standard geometric conditions. It is the engineers’ recommendation that the left turn lane meet the minimum storage and taper lengths as stipulated by the TAC Geometric Design Guide for Canadian Roads (2017), whereby storage length be no less than 15m and taper be no less than a 1:8 ratio, with 1:10 being the preferred taper ratio at 50 km/h design speed.

6.0 SIGNAL WARRANT ANALYSIS

6.1 London Line (County Road 22) at Garden Centre / Furniture Store

A signal warrant analysis was completed for the intersection of London Line (County Road 22) at the Garden Centre / Furniture Store according to Ontario Traffic Manual Book 12 warrants. The detailed results of the signal warrant analysis are presented in Appendix E. The intersection does not meet minimum warrants for Total Traffic 2025 and Total Traffic 2030, and therefore, it is the engineers’ recommendation that it not be considered for signalization under the studied existing and future scenarios.

6.2 London Line (County Road 22) at Site Access (Street A)

A signal warrant analysis was completed for the intersection of London Line (County Road 22) at the Site Access (Street A), which provides access to the proposed development. The detailed results of the signal warrant analysis are presented in Appendix E. The intersection will not meet minimum warrants as it will be a three-legged intersection. According to OTM Book 12, the benchmark for three-legged intersections is increased by 50%, and as a result, three-legged intersections require a significant amount of traffic on the minor approach to warrant a traffic signal installation.

Nevertheless, the warrant was completed to better quantify a benchmark for the City of Sarnia’s future traffic planning needs. The intersection does not meet minimum warrants for Total Traffic 2025 and Total Traffic 2030, and therefore, it is the engineers’ recommendation that it not be considered for signalization under the studied existing and future scenarios.



7.0 SIGHT LINE ANALYSIS

Regarding sight distance requirements, Figure F1 in Appendix F provides a detailed summary of available decision sight distance and compares it to the required decision sight distances as stipulated by Transportation Association of Canada's Geometric Design Guide for Canadian Roads. As shown in Appendix F, the guidelines indicate a minimum decision sight distance of 146m for a design speed of 70km/h on London Line. Available sight distance in both directions exceeds the minimum on London Line, so the sight lines appear to be clear. A field visit should take place under site plan control to further ensure that any obstructions caused by the development be removed or evaluated prior to allowing egress from the proposed driveway access onto London Line.

8.0 SUMMARY AND CONCLUSIONS

A development has been proposed for the south side of London Line (also known as County Road 22) on the outskirts of the City of Sarnia, Ontario. The property is located at 1873 London Line between Blackwell Side Road and Airport Road, just south of Highway 402 and the Chris Hadfield Airport. This former golf course and mini golf facility will support the proposed development of 169 single family dwellings.

Using recent traffic counts and the best available trip generation and distribution data, an analysis was completed to measure the operational impact of the development on traffic conditions on London Line between Blackwell Side Road and Airport Road. Existing conditions, 2025, and 2030 horizon years were considered in the analysis.

The results indicate the following:

- The proposed development will not have a noticeable effect on the east-west traffic conditions along the London Line corridor, as the change to operating levels of service at all locations analyzed is relatively unnoticeable;
- The signalized intersection of London Line and Blackwell Side Road will continue to operate at a very good level of service under full site development, even with future traffic growth of 1% per year above existing for the 2025 and 2030 horizon years;
- The signalized tee intersection of London Line and Airport Road will continue to operate at a very good level of service under full site development, even with future traffic growth of 1% per year above existing for the 2025 and 2030 horizon years;
- Intersections of London Line (County Road 22) at Blackwell Side Road, Airport Road, and the Site Access (Street A), continue to operate without any adverse effect on queuing;



- All legs of the analyzed intersections currently provide sufficient storage for anticipated queue lengths; no geometric changes are recommended;
- The left turn lane exiting the proposed development should meet the minimum storage and taper lengths as stipulated by the TAC Geometric Design Guide for Canadian Roads (2017), whereby storage length be no less than 15m and taper be no less than a 1:8 ratio, with 1:10 being the preferred taper ratio at 50 km/h design speed;
- The intersections of London Line at the Garden Centre / Furniture Store and at the Site Access (Street A) do not meet the warrants for traffic signalization;
- Available intersection sight distance in both directions exceeds the minimum 146m required for a design speed of 70 km/h, so the sight lines appear to be clear.

Therefore, it is the engineers' opinion that the proposed development will have no adverse effect on traffic operations within the study area, and pending no significant changes, approval of the draft plan of subdivision should not be withheld on behalf of traffic operations considerations.

All of which is respectfully submitted,

RC Spencer Associates Inc.



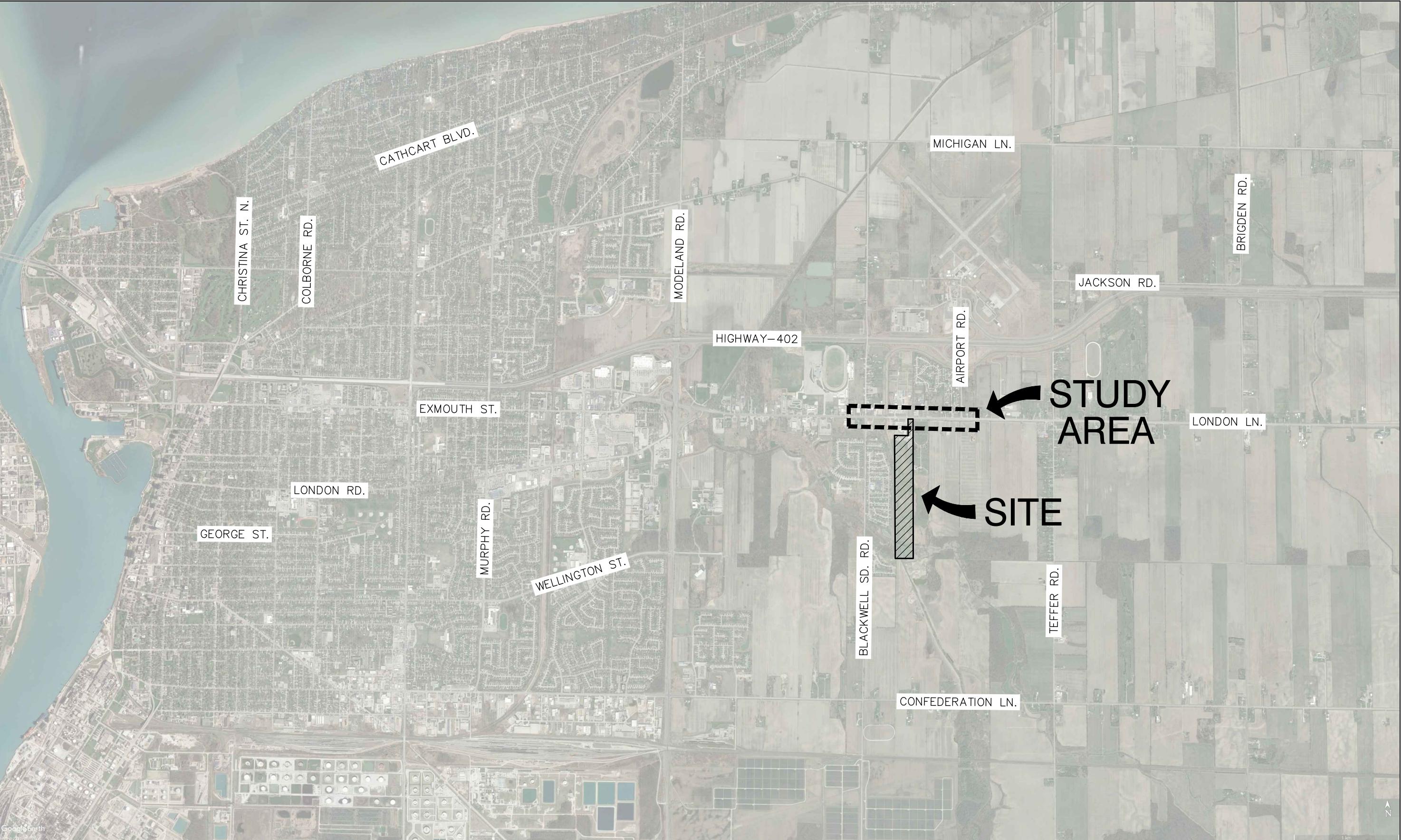
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RC SPENCER ASSOCIATES INC.
Consulting Engineers



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LAND USE SCHEDULE		
LAND USE	AREA IN Ha	%
SINGLE DETACHED RESIDENTIAL LOTS 1 TO 169	9.63	55.9
STREETS	4.60	26.7
PARKLAND BLOCK	1.50	8.7

SWM POND BLOCK	0.81	4.7
COMMERCIAL BLOCK	0.68	3.9
DEVELOPABLE TOTAL	17.22	100.0
NATURAL HERITAGE	2.05	
TOTAL SITE AREA	19.27	

LEGE

- SUBJECT LANDS
 - PROPOSED LOTLINE
 - PROPOSED STREETLINE
 - 100 YEAR FLOOLINE (GRECK, 2018)
 - PROPOSED MULTI USE PATH
 - EXISTING ASPHALT PATH

LONDON LINE RES. DEVELOPMENT – T.I.S.

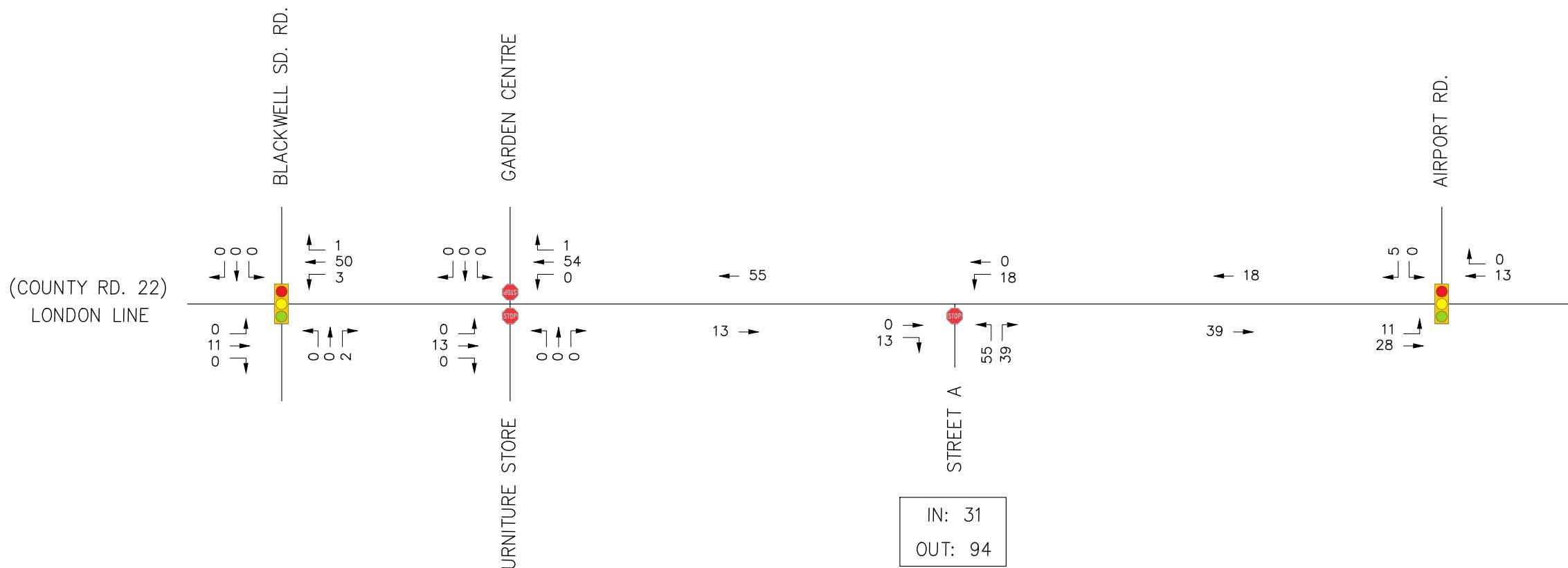
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SITE PLAN

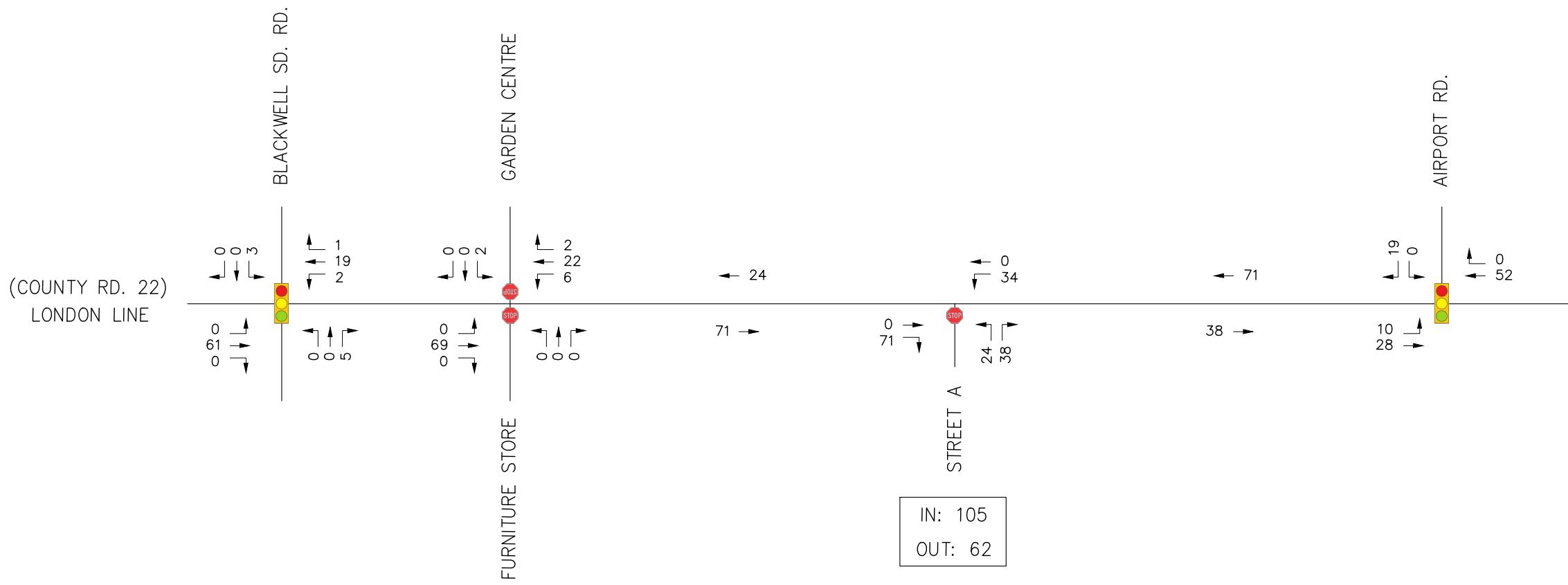
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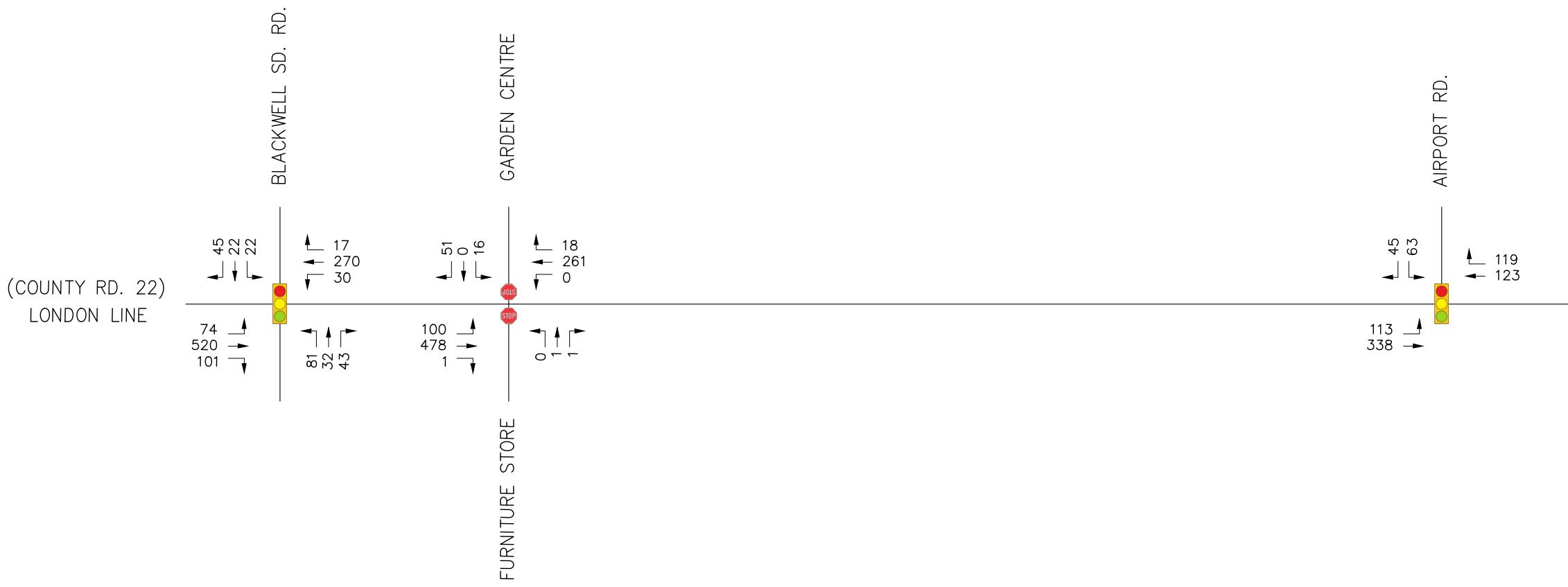
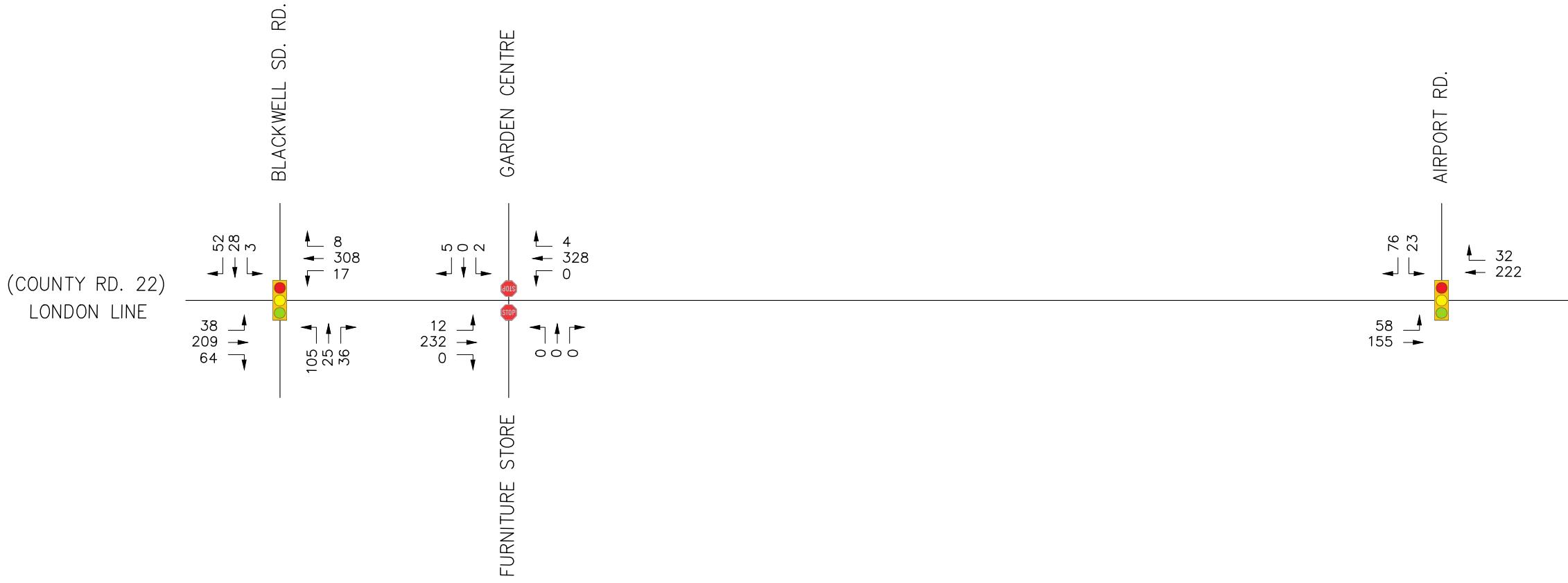
SITE GENERATED TRAFFIC (AM)



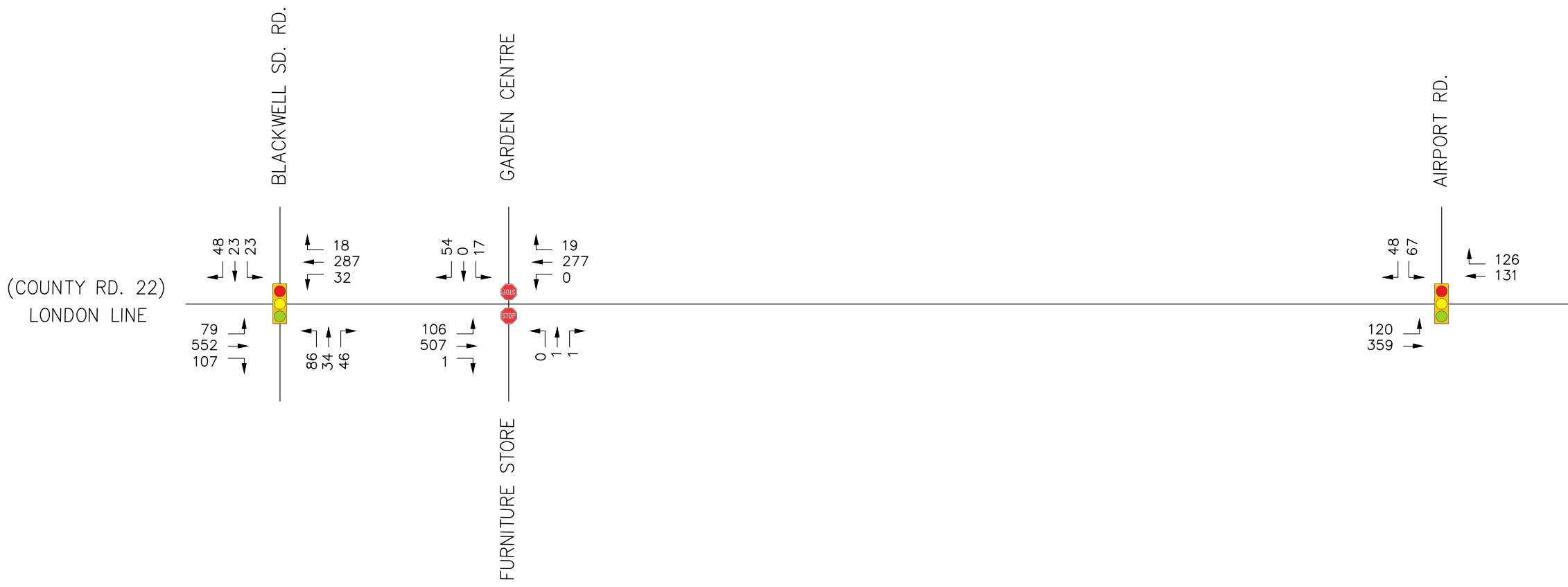
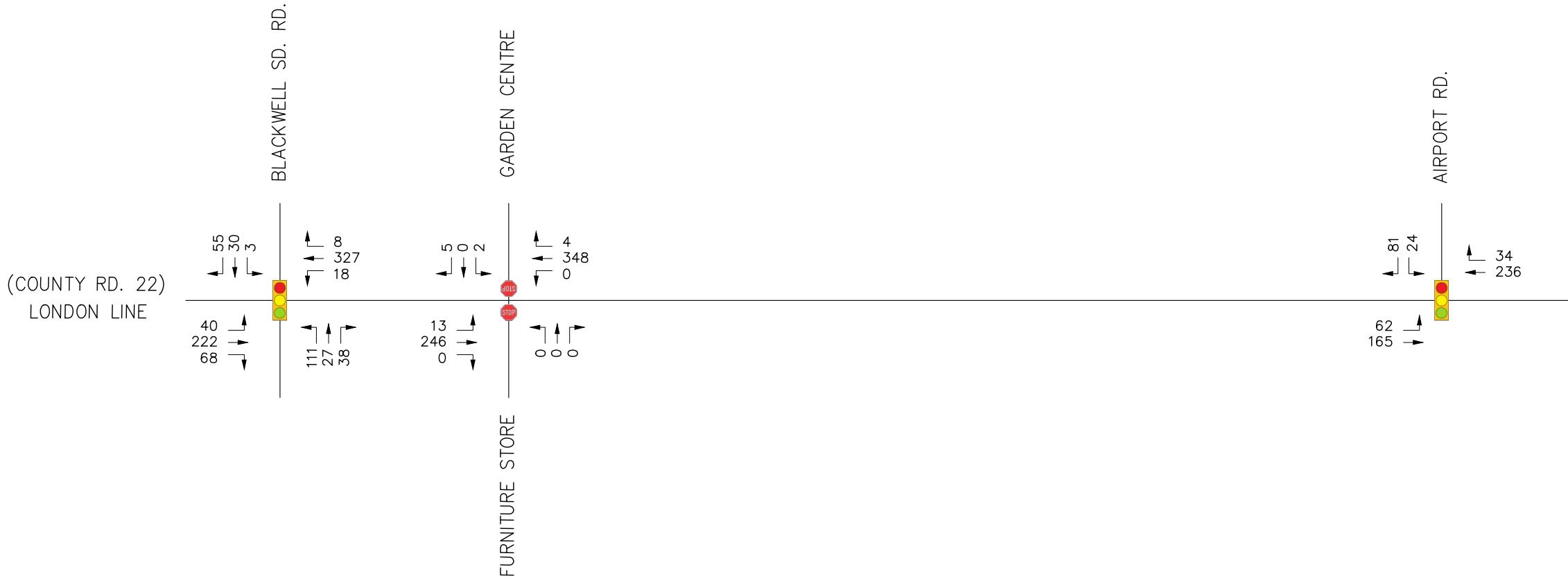
SITE GENERATED TRAFFIC (PM)



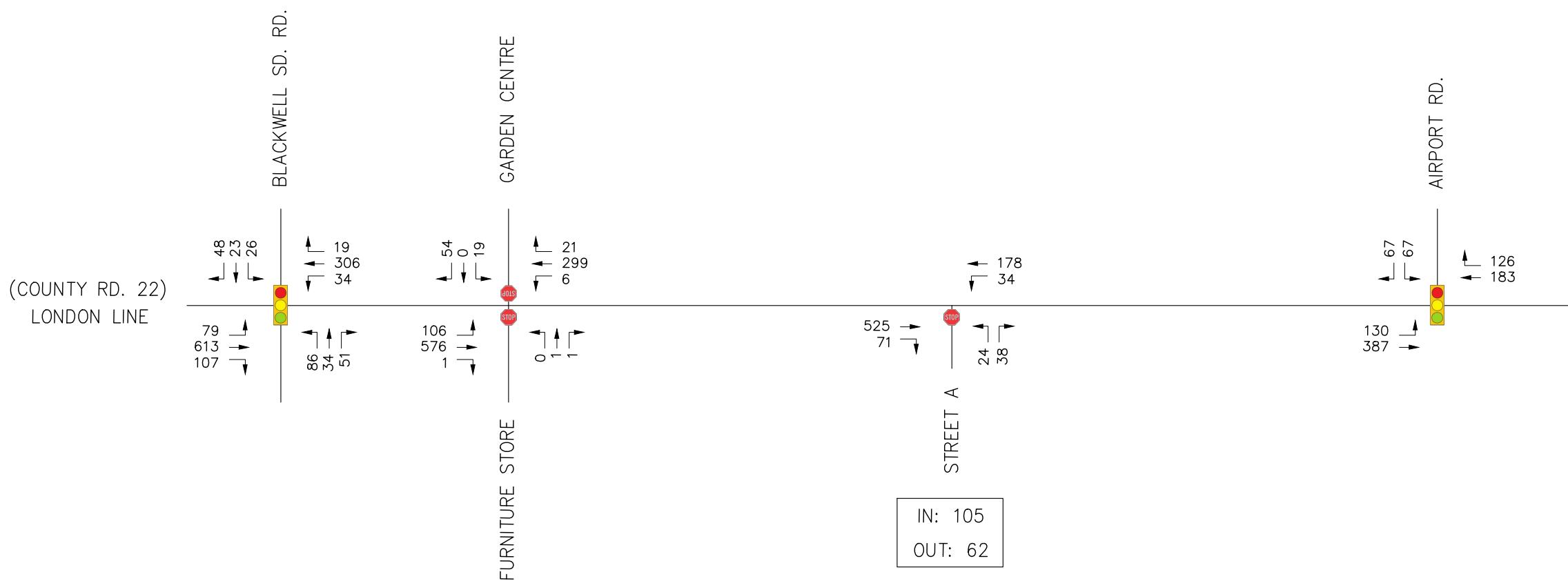
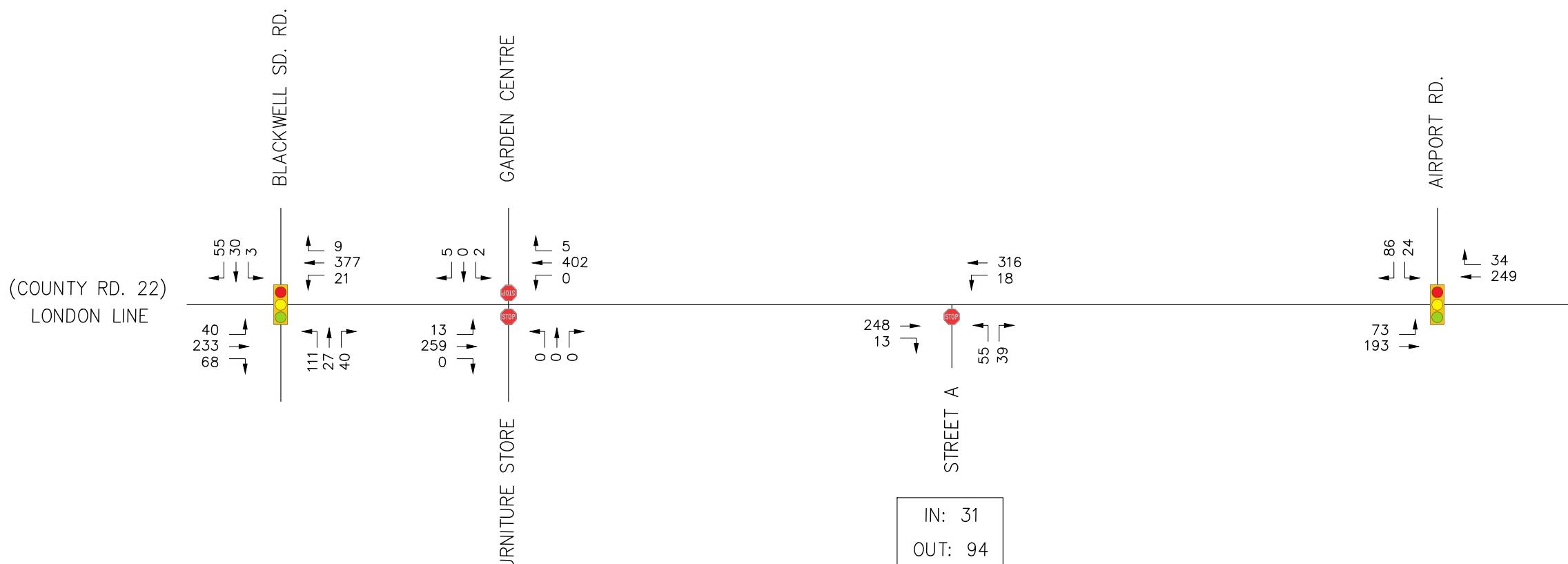
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					SITE GENERATED TRAFFIC (AM/PM PEAK HOUR)	FIGURE NO. 3 OF 8																							



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			Professional Engineers Ontario	NO. REVISION DATE BY APP SCALE N.T.S.	EXISTING TRAFFIC (AM/PM PEAK HOUR)	FIGURE NO. 4 OF 8



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					LONDON LINE RES. DEVELOPMENT – T.I.S. BACKGROUND TRAFFIC 2025 (AM/PM PEAK HOUR)



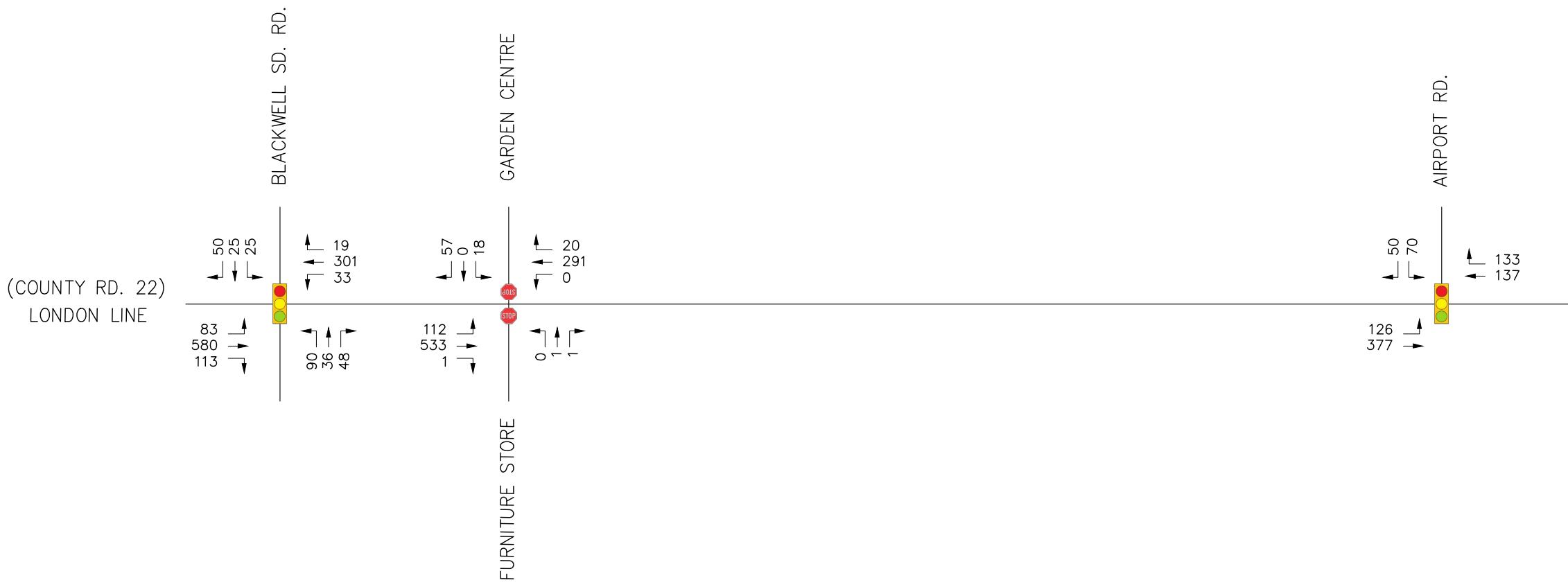
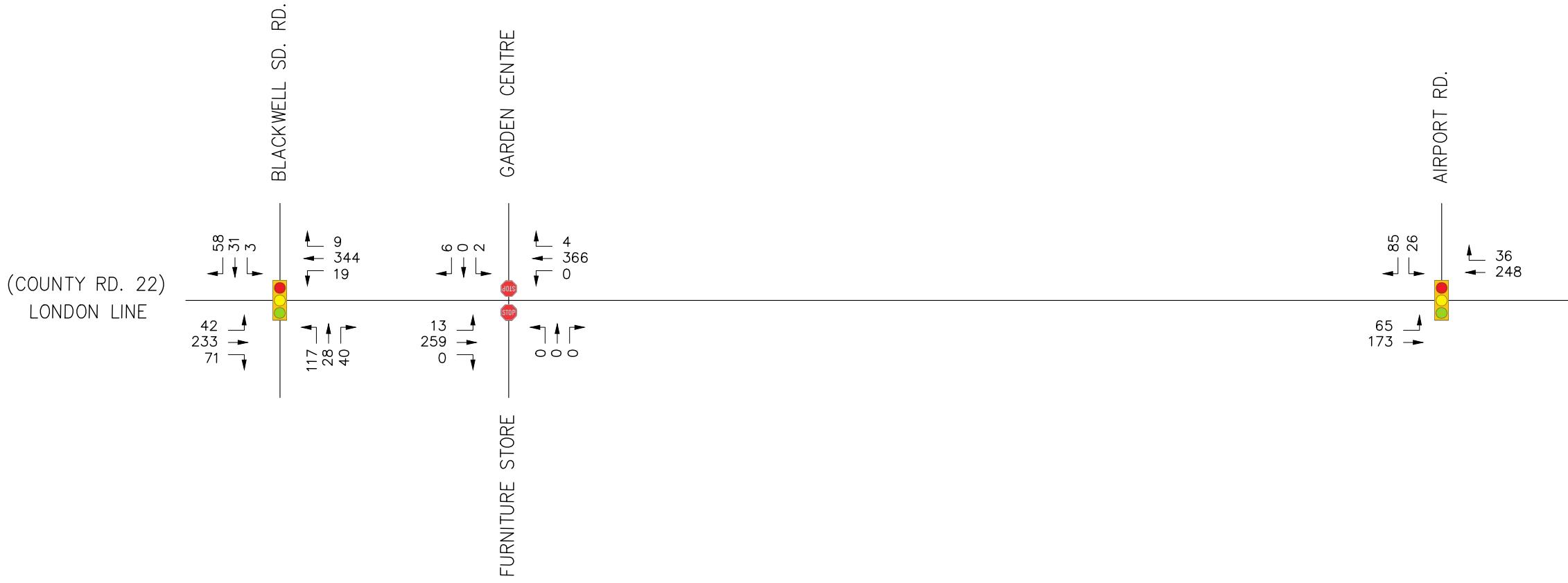
				DESIGN	A.D.B.
				CHECKED	J.T.
				DRAWN	R.LB.
				CHECKED	J.T.
1.	COMPLETED REPORT FIGURES	MAR 7 2019	R.L.B.	A.D.B.	DATE MARCH 2019
NO.	REVISION	DATE	BY	APP	SCALE N.T.S.

LONDON LINE RES. DEVELOPMENT – T.I.S.

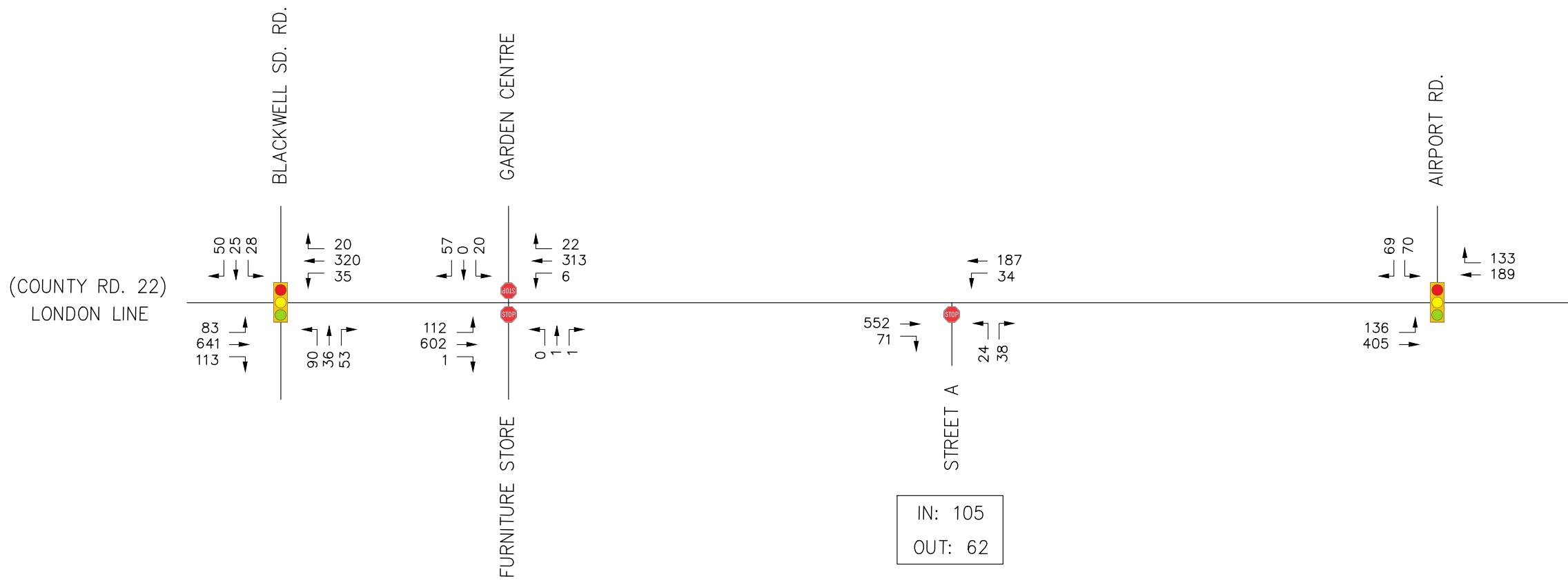
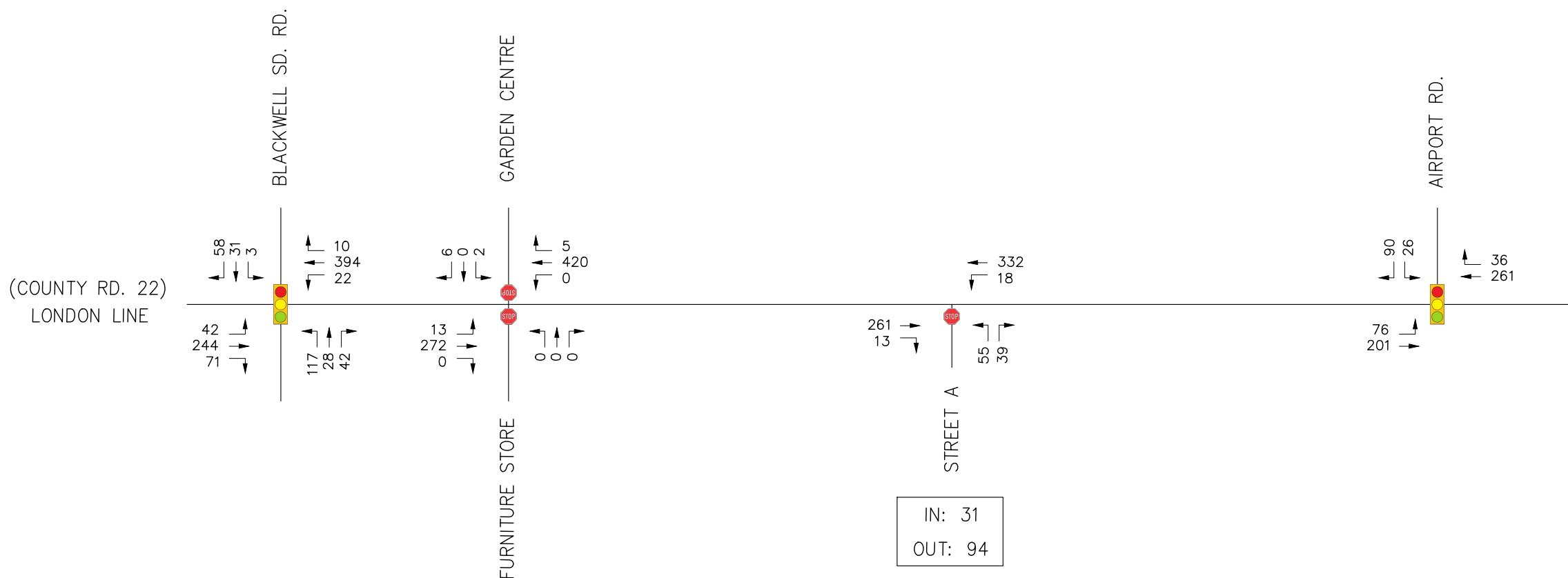
PROJECT NO.

TOTAL TRAFFIC 2025 (AM/PM PEAK HOUR)

FIGURE NO.
6



			 RC SPENCER ASSOCIATES INC. Consulting Engineers Windsor 800 University Ave. W. - Windsor ON N9A 5R9 Leamington 18 Talbot St. W. - Leamington ON N8H 1M4 Chatham-Kent: 138 King St. W. Unit I02 - Chatham ON N7M 1E3	<table border="1"> <thead> <tr> <th></th> <th></th> <th></th> <th>DESIGN A.D.B.</th> </tr> </thead> <tbody> <tr> <td></td> <td></td> <td></td> <td>CHECKED J.T.</td> </tr> <tr> <td></td> <td></td> <td></td> <td>DRAWN R.LB.</td> </tr> <tr> <td></td> <td></td> <td></td> <td>CHECKED J.T.</td> </tr> <tr> <td>1.</td> <td>COMPLETED REPORT FIGURES</td> <td>MAR 7 2019</td> <td>R.L.B. A.D.B.</td> <td>DATE MARCH 2019</td> </tr> <tr> <td>NO.</td> <td>REVISION</td> <td>DATE</td> <td>BY APP</td> <td>SCALE N.T.S.</td> </tr> </tbody> </table>				DESIGN A.D.B.				CHECKED J.T.				DRAWN R.LB.				CHECKED J.T.	1.	COMPLETED REPORT FIGURES	MAR 7 2019	R.L.B. A.D.B.	DATE MARCH 2019	NO.	REVISION	DATE	BY APP	SCALE N.T.S.	LONDON LINE RES. DEVELOPMENT – T.I.S.	PROJECT NO. 18-798
			DESIGN A.D.B.																													
			CHECKED J.T.																													
			DRAWN R.LB.																													
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NO.	REVISION	DATE	BY APP	SCALE N.T.S.																												
					BACKGROUND TRAFFIC 2030 (AM/PM PEAK HOUR)	FIGURE NO. 7 OF 8																										



				DESIGN	A.D.B.
				CHECKED	J.T.
				DRAWN	R.LB.
				CHECKED	J.T.
1.	COMPLETED REPORT FIGURES	MAR 7 2019	R.L.B.	A.D.B.	DATE MARCH 2019
NO.	REVISION	DATE	BY	APP	SCALE N.T.S.

LONDON LINE RES. DEVELOPMENT – T.I.S.

JECT NO.
18-798
URE NO.
8
8

Appendix A

TRAFFIC COUNTS

**London Line (County Road 22) at
Blackwell Side Road**

**London Line (County Road 22) at
Garden Centre / Furniture Store**

**London Line (County Road 22) at
Airport Road**

London Line @ Blackwell Side Rd

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: Sarnia
Site #: 0000000001
Intersection: London Line & Blackwell Side Rd
TFR File #: 1
Count date: 17-Oct-2018

Weather conditions:

Cloudy/Dry

Person(s) who counted:

Cam

**** Signalized Intersection ****

Major Road: London Line runs W/E

North Leg Total: 154

North Entering: 83

North Peds: 0

Peds Cross: ☒

Heavys	0	0	0	0
Trucks	1	2	0	3
Cars	51	26	3	80
Totals	52	28	3	

East Leg Total: 581

East Entering: 333

East Peds: 0

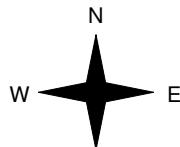
Peds Cross: ☒

Heavys	15	11	439	465
Trucks				
Cars				
Totals				



Blackwell Side Rd

Heavys	0	1	37	38
Trucks	24	8	177	209
Cars	4	3	57	64
Totals	28	12	271	



Blackwell Side Rd

Cars	8	0	0	8
Trucks	285	9	14	308
Heavys	16	0	1	17
Totals	309	9	15	

London Line



Peds Cross:	☒
West Peds:	0
West Entering:	311
West Leg Total:	776

Cars	99
Trucks	5
Heavys	5
Totals	109

Cars	103	23	34	160
Trucks	1	0	0	1
Heavys	1	2	2	5
Totals	105	25	36	

Peds Cross:	☒
South Peds:	0
South Entering:	166
South Leg Total:	275

Comments

London Line @ Blackwell Side Rd

Mid-day Peak Diagram

Specified Period

From: 11:00:00

To: 14:00:00

One Hour Peak

From: 11:30:00

To: 12:30:00

Municipality: Sarnia
Site #: 0000000001
Intersection: London Line & Blackwell Side Rd
TFR File #: 1
Count date: 17-Oct-2018

Weather conditions:

Cloudy/Dry

Person(s) who counted:

Cam

**** Signalized Intersection ****

Major Road: London Line runs W/E

North Leg Total: 216

North Entering: 93

North Peds:

Peds Cross: ☒

Heavys	0	0	0	0
Trucks	0	1	2	3
Cars	54	21	15	90
Totals	54	22	17	

East Leg Total: 808

East Entering: 374

East Peds: 1

Peds Cross: ☒

Heavys	13	7	453	473
Trucks				
Cars				
Totals				

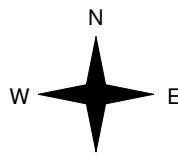


Blackwell Side Rd

Heavys	0	1	80	81
Trucks	30	10	351	391
Cars	1	3	108	112
Totals	31	14	539	



London Line



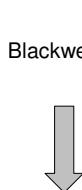
Cars	19	2	0	21
Trucks	301	6	12	319
Heavys	31	1	2	34
Totals	351	9	14	

London Line



Peds Cross:	☒
West Peds:	0
West Entering:	584
West Leg Total:	1057

Cars	160
Trucks	5
Heavys	3
Totals	168



Cars	98	20	21	139
Trucks	1	1	3	5
Heavys	1	0	2	3
Totals	100	21	26	

Peds Cross:	☒
South Peds:	0
South Entering:	147
South Leg Total:	315

Comments

London Line @ Blackwell Side Rd

Afternoon Peak Diagram

Specified Period

From: 15:00:00

To: 18:00:00

One Hour Peak

From: 17:00:00

To: 18:00:00

Municipality: Sarnia
Site #: 0000000001
Intersection: London Line & Blackwell Side Rd
TFR File #: 1
Count date: 17-Oct-2018

Weather conditions:

Cloudy/Dry

Person(s) who counted:

Cam

**** Signalized Intersection ****

Major Road: London Line runs W/E

North Leg Total: 212

North Entering: 89

North Peds: 0

Peds Cross: ☒

Heavys	0	0	2	2
Trucks	0	0	0	0
Cars	45	22	20	87
Totals	45	22	22	

East Leg Total: 902

East Entering: 317

East Peds: 0

Peds Cross: ☒

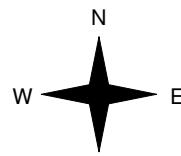
Totals 123

Heavys Trucks Cars Totals
9 0 387 396



Blackwell Side Rd

London Line



Cars	Trucks	Heavys	Totals
17	0	0	17
261	0	9	270
28	2	0	30
306	2	9	

Heavys Trucks Cars Totals
0 1 73 74
13 7 500 520
0 0 101 101
13 8 674



Blackwell Side Rd

London Line



Cars	Trucks	Heavys	Totals
563	7	15	585

Peds Cross: ☒
West Peds: 0
West Entering: 695
West Leg Total: 1091

Cars 151
Trucks 2
Heavys 0
Totals 153

Cars 81 32 43 156
Trucks 0 0 0 0
Heavys 0 0 0 0
Totals 81 32 43

Peds Cross: ☐
South Peds: 0
South Entering: 156
South Leg Total: 309

Comments

London Line @ Blackwell Side Rd

Total Count Diagram

Municipality: Sarnia
Site #: 0000000001
Intersection: London Line & Blackwell Side Rd
TFR File #: 1
Count date: 17-Oct-2018

Weather conditions:

Cloudy/Dry

Person(s) who counted:

Cam

**** Signalized Intersection ****

Major Road: London Line runs W/E

North Leg Total: 1596

North Entering: 707

North Peds: 3

Peds Cross: ☒

Heavys	1	5	5	11
Trucks	7	7	8	22
Cars	362	196	116	674
Totals	370	208	129	

Heavys 11

Trucks 19

Cars 859

Totals 889

East Leg Total: 5541

East Entering: 2184

East Peds: 1

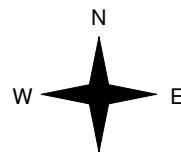
Peds Cross: ☒

Heavys Trucks Cars Totals
89 48 2760 2897



Blackwell Side Rd

London Line



Heavys Trucks Cars Totals
2 6 518 526
206 62 2693 2961
14 12 805 831
222 80 4016



Cars	Trucks	Heavys	Totals
124	8	5	137
1711	38	82	1831
202	7	7	216
2037	53	94	

London Line



Cars	Trucks	Heavys	Totals
3054	81	222	3357

Peds Cross: ☒
West Peds: 1
West Entering: 4318
West Leg Total: 7215

Cars 1203
Trucks 26
Heavys 26
Totals 1255

Cars 687 217 245 1149
Trucks 3 5 11 19
Heavys 6 4 11 21
Totals 696 226 267

Peds Cross: ☐
South Peds: 2
South Entering: 1189
South Leg Total: 2444

Comments

London Line @ Garden Centre

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: Sarnia

Site #: 0000000003

Intersection: London Line & Garden Centre

TFR File #: 3

Count date: 17-Oct-2018

Weather conditions:

Cloudy/Dry

Person(s) who counted:

Cam

** Non-Signalized Intersection **

Major Road: London Line runs W/E

North Leg Total: 23

North Entering: 7

North Peds: 0

Peds Cross: ☒

Heavys	0	0	0	0
Trucks	1	0	0	1
Cars	4	0	2	6
Totals	5	0	2	

East Leg Total: 566

East Entering: 332

East Peds: 0

Peds Cross: ☒

Heavys	15	9	309	333
Trucks				
Cars				
Totals				

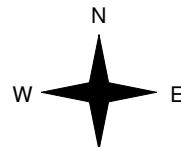


Garden Centre

Heavys	0	1	11	12
Trucks	32	6	194	232
Cars	0	0	0	0
Totals	32	7	205	



London Line



Cars	4	0	0	4
Trucks	305	8	15	328
Heavys	0	0	0	0
Totals	309	8	15	

London Line



Peds Cross:	☒
West Peds:	0
West Entering:	244
West Leg Total:	577

Cars	0
Trucks	0
Heavys	0
Totals	0

Furniture Store



Cars	196	6	32	234
Trucks				
Heavys				
Totals				

Peds Cross:	☒
South Peds:	0
South Entering:	0
South Leg Total:	0

Comments

London Line @ Garden Centre

Mid-day Peak Diagram

Specified Period

From: 11:00:00

To: 14:00:00

One Hour Peak

From: 11:30:00

To: 12:30:00

Municipality: Sarnia

Site #: 0000000003

Intersection: London Line & Garden Centre

TFR File #: 3

Count date: 17-Oct-2018

Weather conditions:

Cloudy/Dry

Person(s) who counted:

Cam

** Non-Signalized Intersection **

Major Road: London Line runs W/E

North Leg Total: 71

North Entering: 27

North Peds: 1

Peds Cross: ☒

Heavys	0	0	0	0
Trucks	1	0	0	1
Cars	23	0	3	26
Totals	24	0	3	

East Leg Total: 748

East Entering: 354

East Peds: 0

Peds Cross: ☒

Heavys Trucks Cars Totals

15	7	346	368
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Garden Centre

Heavys Trucks Cars Totals

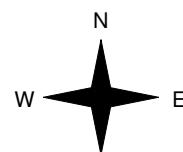
0	0	33	33
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32	14	344	390
----	----	-----	-----

0	0	0	0
---	---	---	---

32	14	377	
----	----	-----	--

Cars	0		
Trucks	0		
Heavy	0		
Totals	0		



London Line

Cars	9	1	0	10
Trucks	323	6	15	344
Heavy	0	0	0	0
Totals	332	7	15	

London Line

Cars	348	14	32	394
------	-----	----	----	-----

Peds Cross: ☒

West Peds: 0

West Entering: 423

West Leg Total: 791

Cars	0		
Trucks	0		
Heavy	0		
Totals	0		

Cars	0	1	1	2
Trucks	0	0	0	0
Heavy	0	0	0	0
Totals	0	1	1	

Peds Cross: ☐

South Peds: 0

South Entering: 2

South Leg Total: 2

Comments

London Line @ Garden Centre

Afternoon Peak Diagram

Specified Period

From: 15:00:00

To: 18:00:00

One Hour Peak

From: 17:00:00

To: 18:00:00

Municipality: Sarnia
Site #: 0000000003
Intersection: London Line & Garden Centre
TFR File #: 3
Count date: 17-Oct-2018

Weather conditions:

Cloudy/Dry

Person(s) who counted:

Cam

** Non-Signalized Intersection **

Major Road: London Line runs W/E

North Leg Total: 186

North Entering: 67

North Peds: 0

Peds Cross: ☒

Heavys	0	0	0	0
Trucks	0	0	0	0
Cars	51	0	16	67
Totals	51	0	16	

Heavys	0		
Trucks	0		
Cars	119		
Totals	119		

East Leg Total: 774

East Entering: 279

East Peds: 0

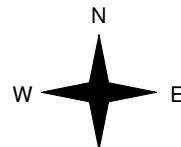
Peds Cross: ☒

Heavys Trucks Cars Totals
9 1 302 312



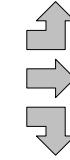
Garden Centre

London Line



Cars	Trucks	Heavys	Totals
18	0	0	18
251	1	9	261
0	0	0	0
269	1	9	

Heavys Trucks Cars Totals
0 0 100 100
17 5 456 478
0 0 1 1
17 5 557



Furniture Store

Cars	Trucks	Heavys	Totals
473	5	17	495

Peds Cross: ☒
West Peds: 0
West Entering: 579
West Leg Total: 891

Cars	1		
Trucks	0		
Heavys	0		
Totals	1		

Cars	0	1	1	2
Trucks	0	0	0	0
Heavys	0	0	0	0
Totals	0	1	1	

Peds Cross: ☐
South Peds: 0
South Entering: 2
South Leg Total: 3

Comments

London Line @ Garden Centre

Total Count Diagram

Municipality: Sarnia
Site #: 0000000003
Intersection: London Line & Garden Centre
TFR File #: 3
Count date: 17-Oct-2018

Weather conditions:

Cloudy/Dry

Person(s) who counted:

Cam

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

Major Road: London Line runs W/E

North Leg Total: 825

North Entering: 299

North Peds:

Peds Cross: ☒

Heavys	1	0	0	1
Trucks	2	0	0	2
Cars	235	0	61	296
Totals	238	0	61	

Heavys	2		
Trucks	9		
Cars	515		
Totals	526		

East Leg Total: 4833

East Entering: 1957

East Peds: 1

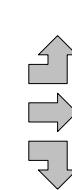
Peds Cross: ☒

Heavys Trucks Cars Totals
89 46 1996 2131

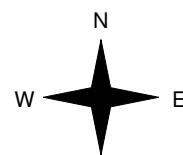


Garden Centre

Heavys Trucks Cars Totals
2 7 443 452
217 78 2515 2810
0 0 2 2
219 85 2960



London Line



Cars	Trucks	Heavys	Totals
70	2	0	72
1753	44	88	1885
0	0	0	0
1823	46	88	

London Line



Cars	Trucks	Heavys	Totals
2581	78	217	2876

Peds Cross: ☒
West Peds: 0
West Entering: 3264
West Leg Total: 5395

Cars 2
Trucks 0
Heavys 0
Totals 2

Cars 8 2 5 15
Trucks 0 0 0 0
Heavys 0 0 0 0
Totals 8 2 5

Peds Cross: ☐
South Peds: 1
South Entering: 15
South Leg Total: 17

Comments

London Line @ Airport Rd

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: Sarnia

Site #: 0000000002

Intersection: London Line & Airport Rd

TFR File #: 2

Count date: 17-Oct-2018

Weather conditions:

Cloudy/Dry

Person(s) who counted:

Cam

**** Signalized Intersection ****

Major Road: London Line runs W/E

North Leg Total: 189

North Entering: 99

North Peds: 0

Peds Cross: ☒

Heavys 7

3 10

Trucks 0

0 0

Cars 69

20 89

Totals 76

23

Heavys 8

East Leg Total: 432

Trucks 2

East Entering: 254

Cars 80

East Peds: 0

Totals 90

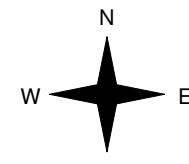
Peds Cross: ☒

Heavys Trucks Cars Totals
15 5 278 298

Airport Rd

London Line

Heavys	Trucks	Cars	Totals
6	0	52	58
22	9	124	155
28	9	176	



Cars	Trucks	Heavys	Totals
28	2	2	32
209	5	8	222
237	7	10	

London Line

Cars	Trucks	Heavys	Totals
144	9	25	178

Peds Cross: ☒

West Peds: 0

West Entering: 213

West Leg Total: 511

Comments

London Line @ Airport Rd

Mid-day Peak Diagram

Specified Period

From: 11:00:00

To: 14:00:00

One Hour Peak

From: 11:30:00

To: 12:30:00

Municipality: Sarnia

Site #: 0000000002

Intersection: London Line & Airport Rd

TFR File #: 2

Count date: 17-Oct-2018

Weather conditions:

Cloudy/Dry

Person(s) who counted:

Cam

**** Signalized Intersection ****

Major Road: London Line runs W/E

North Leg Total: 191

North Entering: 104

North Peds: 0

Peds Cross: ☒

Heavys 5

6

11

Trucks 1

1

2

Cars 60

31

91

Totals 66

38

Heavys 12

Trucks 5

Cars 70

Totals 87

East Leg Total: 591

East Entering: 267

East Peds: 0

Peds Cross: ☒

Heavys Trucks Cars Totals
15 6 298 319

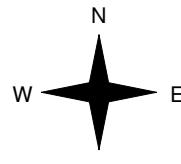


Airport Rd

Cars Trucks Heavys Totals
12 1 1 14
238 5 10 253

250 6 11

Heavys Trucks Cars Totals
11 4 58 73
20 7 259 286
31 11 317



London Line

Cars Trucks Heavys Totals
290 8 26 324

Peds Cross: ☒

West Peds: 0

West Entering: 359

West Leg Total: 678

Comments

London Line @ Airport Rd

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: Sarnia

Site #: 0000000002

Intersection: London Line & Airport Rd

TFR File #: 2

Count date: 17-Oct-2018

Weather conditions:

Cloudy/Dry

Person(s) who counted:

Cam

**** Signalized Intersection ****

Major Road: London Line runs W/E

North Leg Total: 340

North Entering: 108

North Peds: 0

Peds Cross: ☒

Heavys 5

6 11

Trucks 0

0 0

Cars 40

57 97

Totals 45

63

Heavys 7

East Leg Total: 643

Trucks 3

East Entering: 242

Cars 222

East Peds: 0

Totals 232

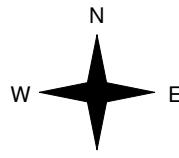
Peds Cross: ☒

Heavys Trucks Cars Totals
9 2 157 168



Airport Rd

London Line



Cars	Trucks	Heavys	Totals
115	2	2	119
117	2	4	123
232	4	6	

Heavys	Trucks	Cars	Totals
5	1	107	113
15	8	315	338
20	9	422	



Cars	Trucks	Heavys	Totals
372	8	21	401

Peds Cross: ☒

West Peds: 0

West Entering: 451

West Leg Total: 619

Comments

London Line @ Airport Rd

Total Count Diagram

Municipality: Sarnia
Site #: 0000000002
Intersection: London Line & Airport Rd
TFR File #: 2
Count date: 17-Oct-2018

Weather conditions:

Cloudy/Dry

Person(s) who counted:
Cam

**** Signalized Intersection ****

Major Road: London Line runs W/E

North Leg Total: 1934

North Entering: 795

North Peds: 2

Peds Cross: ☰

Heavys 34

51

85

Trucks 11

5

16

Cars 392

302

694

Totals 437

358

Heavys 75

Trucks 32

Cars 1032

Totals 1139

East Leg Total: 4239

East Entering: 1856

East Peds: 0

Peds Cross: ☱

Heavys Trucks Cars Totals

84 34 1643 1761



Airport Rd

Heavys Trucks Cars Totals

55 17 535

158 49 1818



London Line



Cars Trucks Heavys Totals

497 15 20 532

1251 23 50 1324

1748 38 70

London Line



Cars Trucks Heavys Totals

2120 54 209 2383

Peds Cross: ☱

West Peds: 10

West Entering: 2632

West Leg Total: 4393

Comments

Appendix B

ITE TRIP GENERATION MANUAL – 10TH EDITION REFERENCES

Proposed Site Development Trip Generation and Distribution

Project: Sarnia Residential Development Traffic Analysis

Site: 1873 London Line, Sarnia, ON

Assumed Land Use: Single Family Detached Housing (ITE No. 210)

Average Vehicle Trip Ends vs.: Dwelling Units

ITE Trip Generation Data collected on a: Weekday

AM Peak Hour: = Average Rate % Entering
 % Exiting

PM Peak Hour: = Average Rate % Entering
 % Exiting

Assumed Land Use: Single Family Detached Housing (ITE No. 210)				
	No. of Units	Trips Generated	Trips Entering	Trips Exiting
AM Peak	169	125	31	94
PM Peak	169	167	105	62

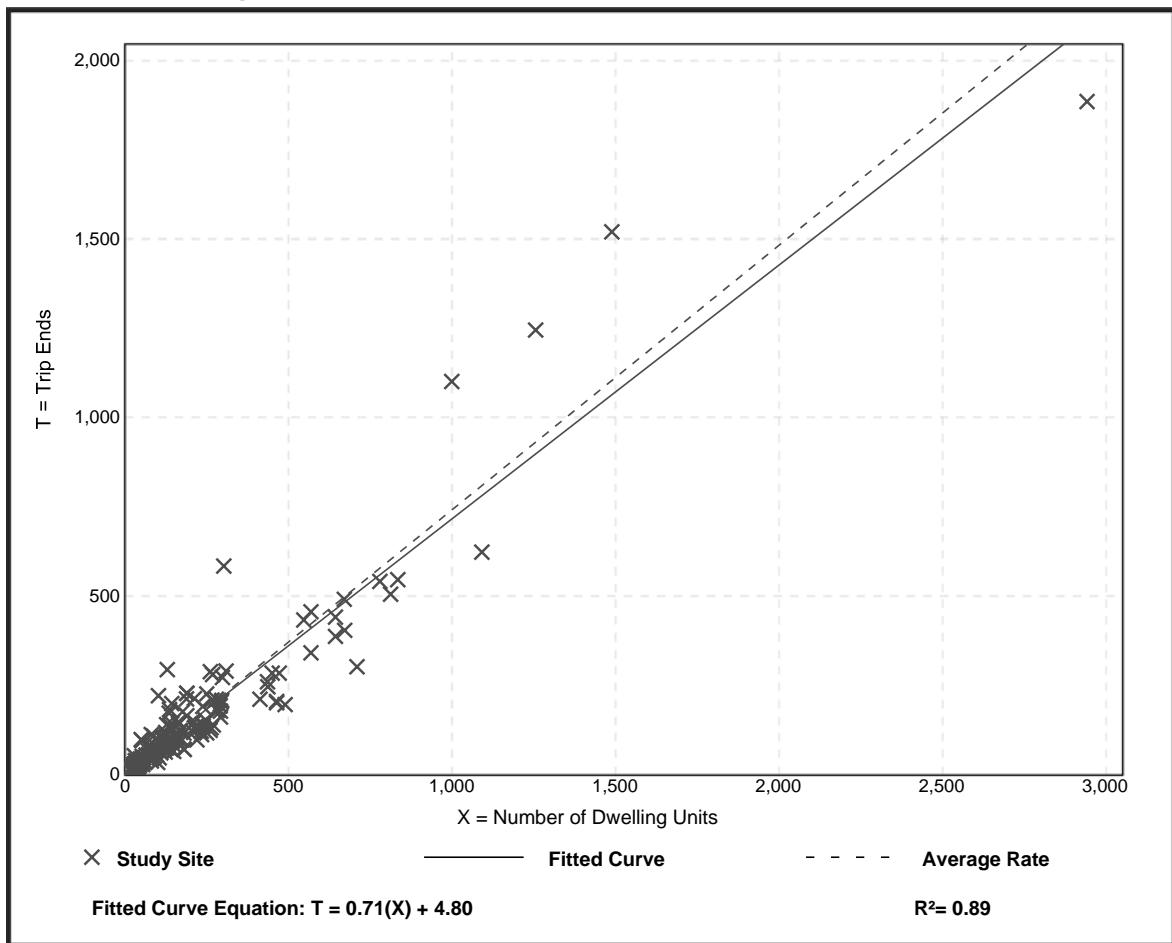
Single-Family Detached Housing (210)

Vehicle Trip Ends vs: Dwelling Units
On a: Weekday,
Peak Hour of Adjacent Street Traffic,
One Hour Between 7 and 9 a.m.
Setting/Location: General Urban/Suburban
Number of Studies: 173
Avg. Num. of Dwelling Units: 219
Directional Distribution: 25% entering, 75% exiting

Vehicle Trip Generation per Dwelling Unit

Average Rate	Range of Rates	Standard Deviation
0.74	0.33 - 2.27	0.27

Data Plot and Equation



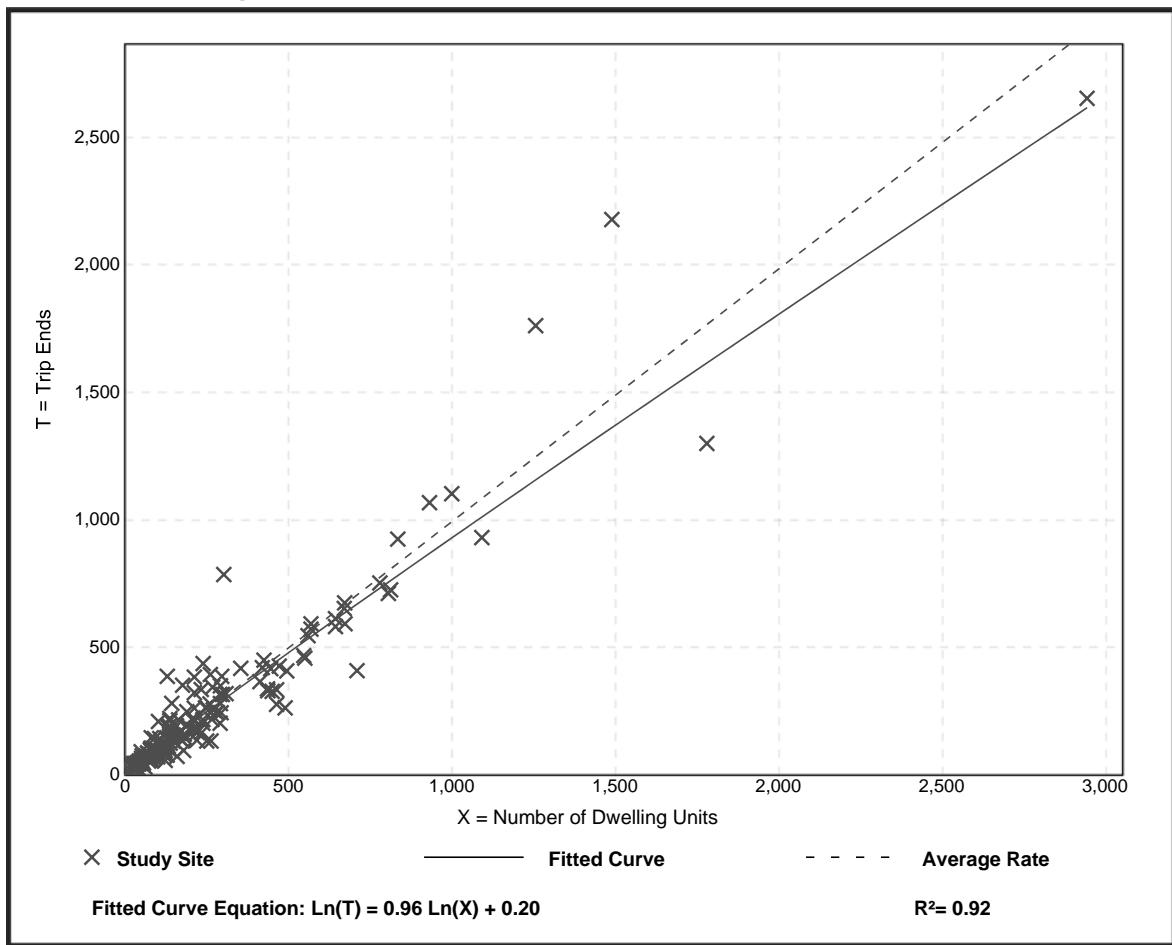
Single-Family Detached Housing (210)

Vehicle Trip Ends vs: Dwelling Units
On a: Weekday,
Peak Hour of Adjacent Street Traffic,
One Hour Between 4 and 6 p.m.
Setting/Location: General Urban/Suburban
Number of Studies: 190
Avg. Num. of Dwelling Units: 242
Directional Distribution: 63% entering, 37% exiting

Vehicle Trip Generation per Dwelling Unit

Average Rate	Range of Rates	Standard Deviation
0.99	0.44 - 2.98	0.31

Data Plot and Equation



Appendix C

TRAFFIC PROJECTION FIGURES

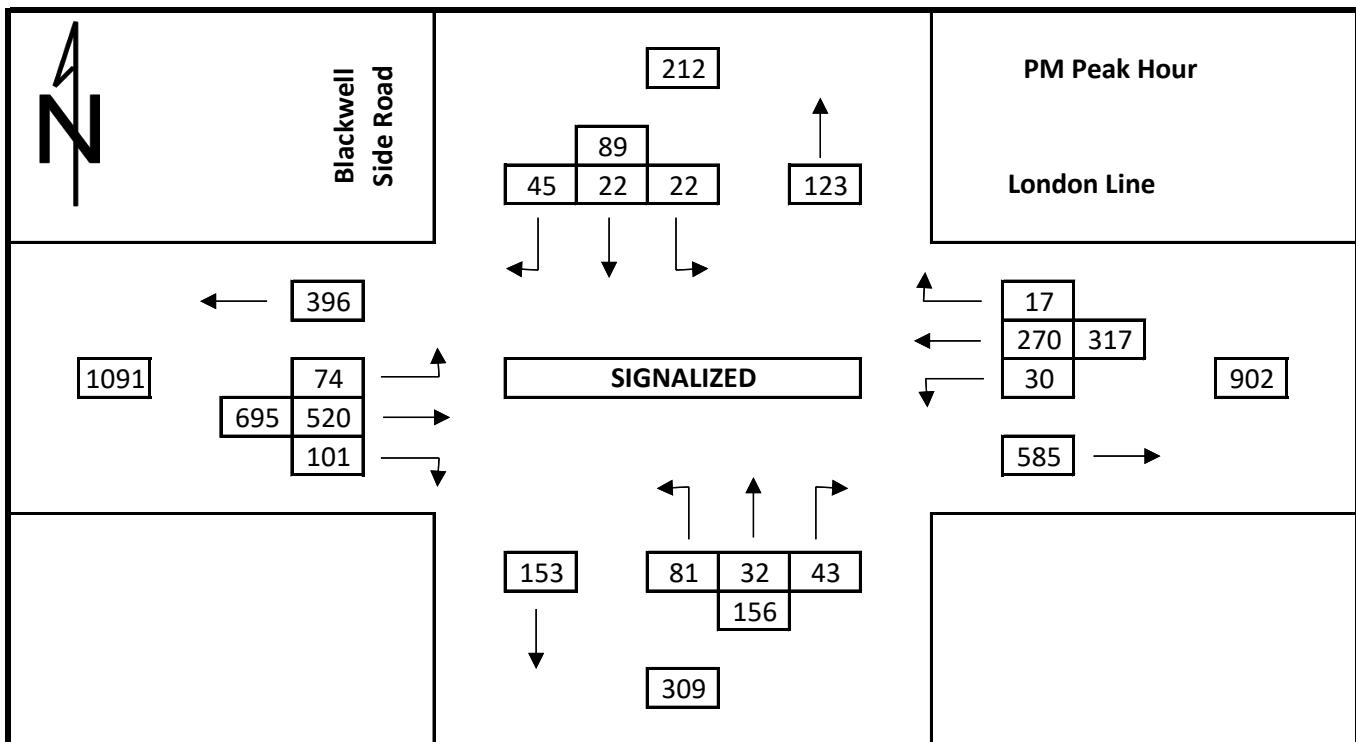
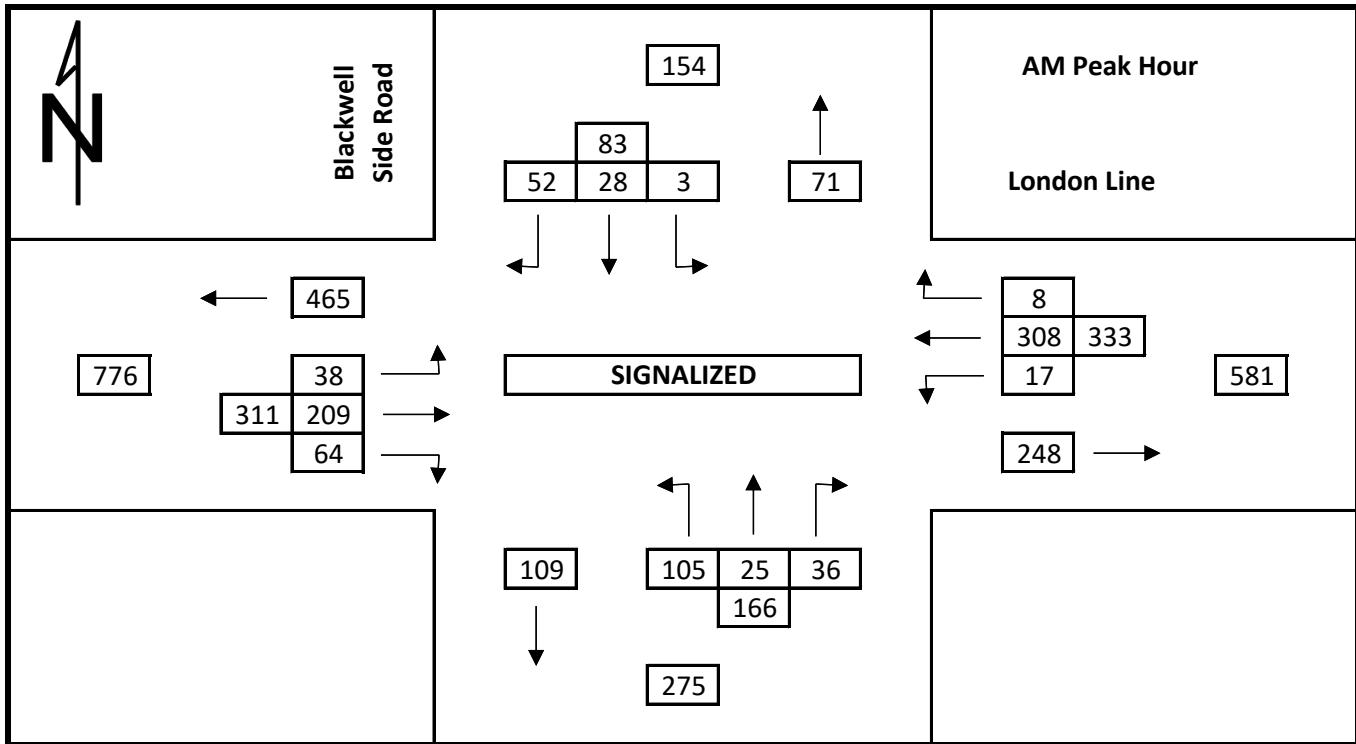
**London Line (County Road 22) at
Blackwell Side Road**

**London Line (County Road 22) at
Garden Centre / Furniture Store**

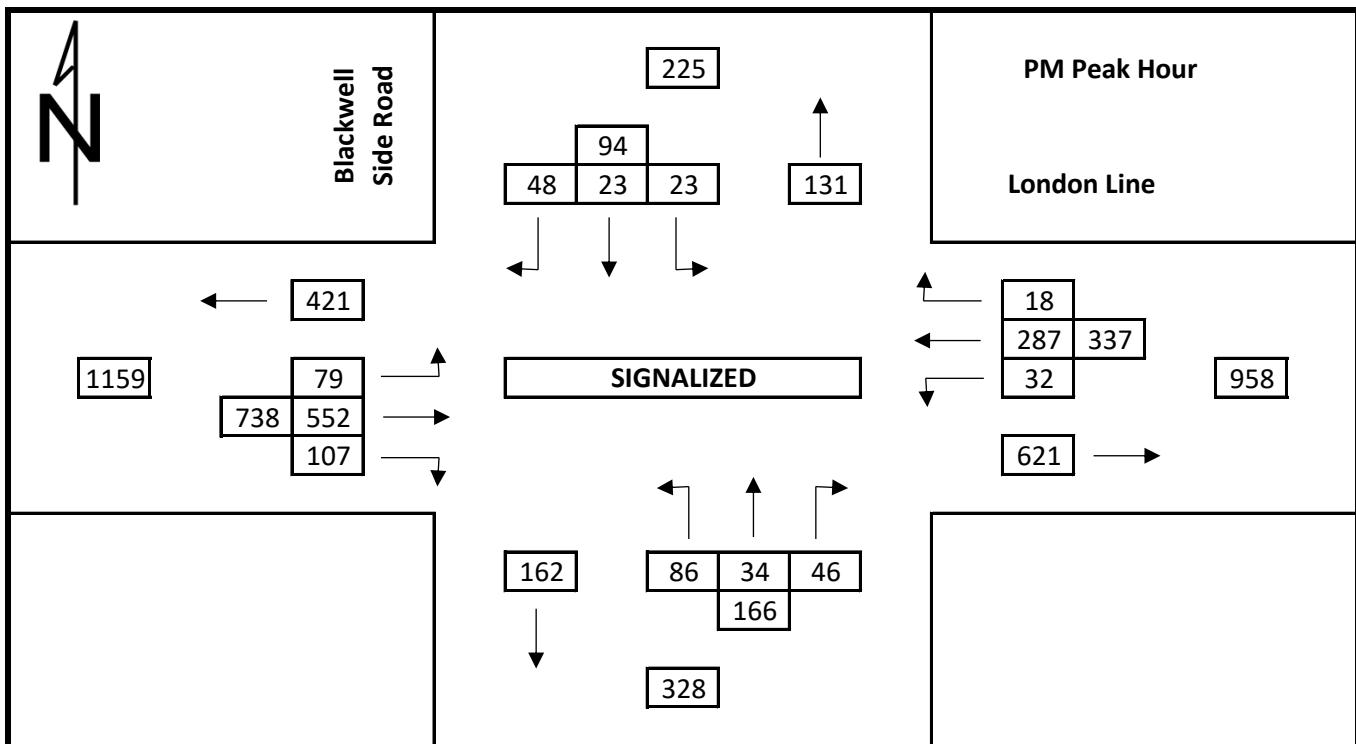
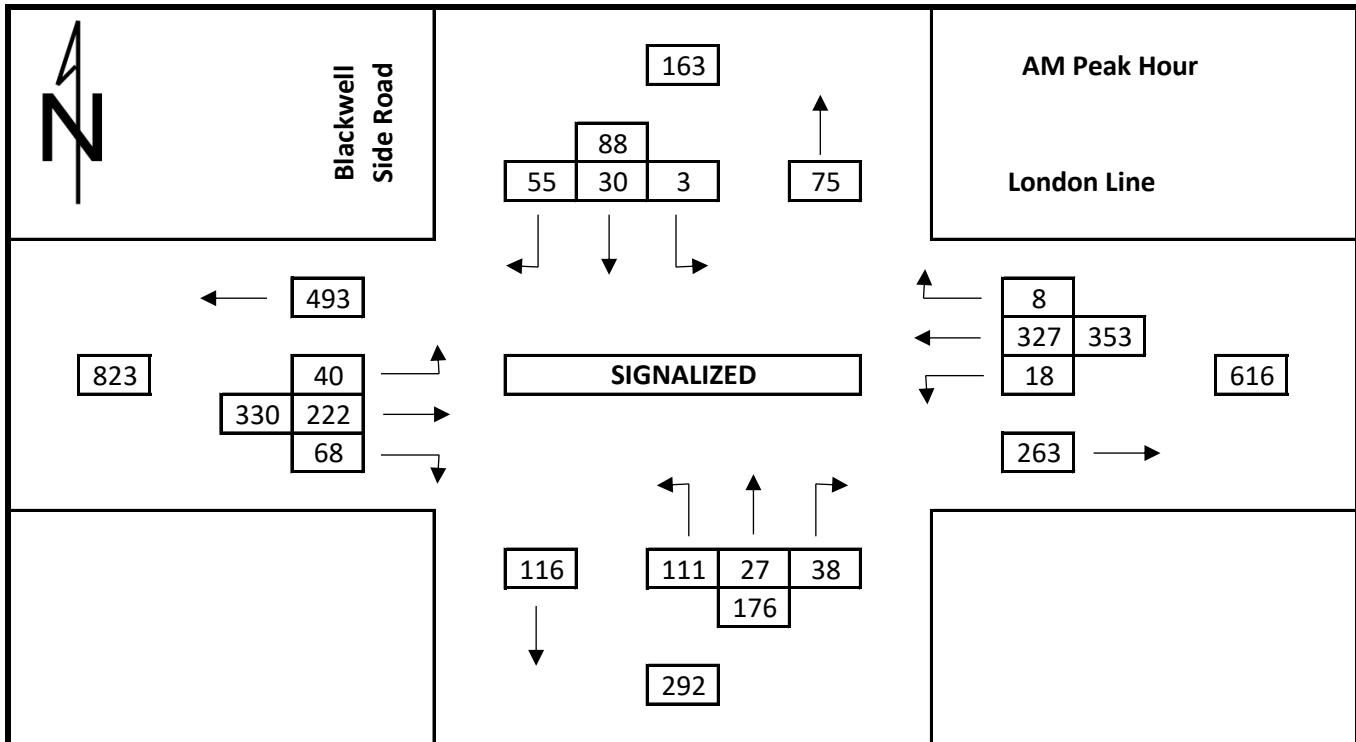
**London Line (County Road 22) at
Site Access (Street A)**

**London Line (County Road 22) at
Airport Road**

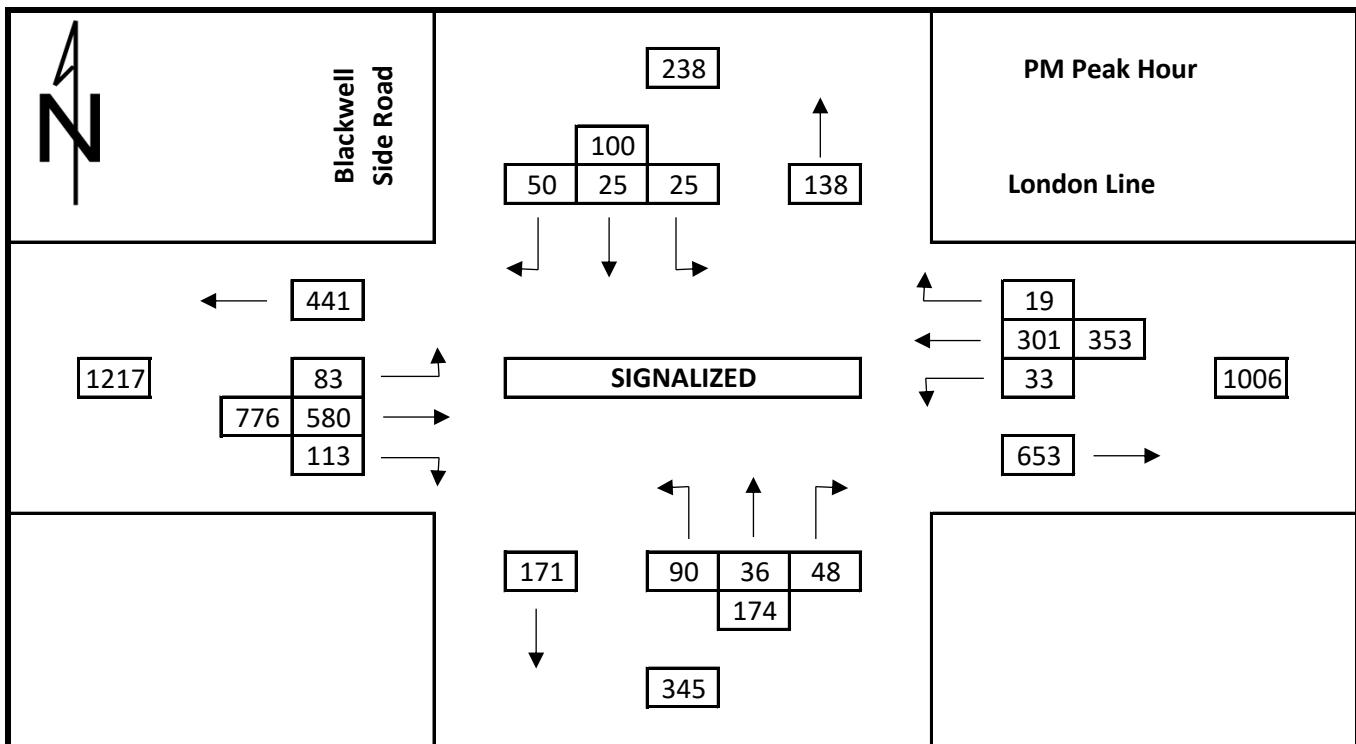
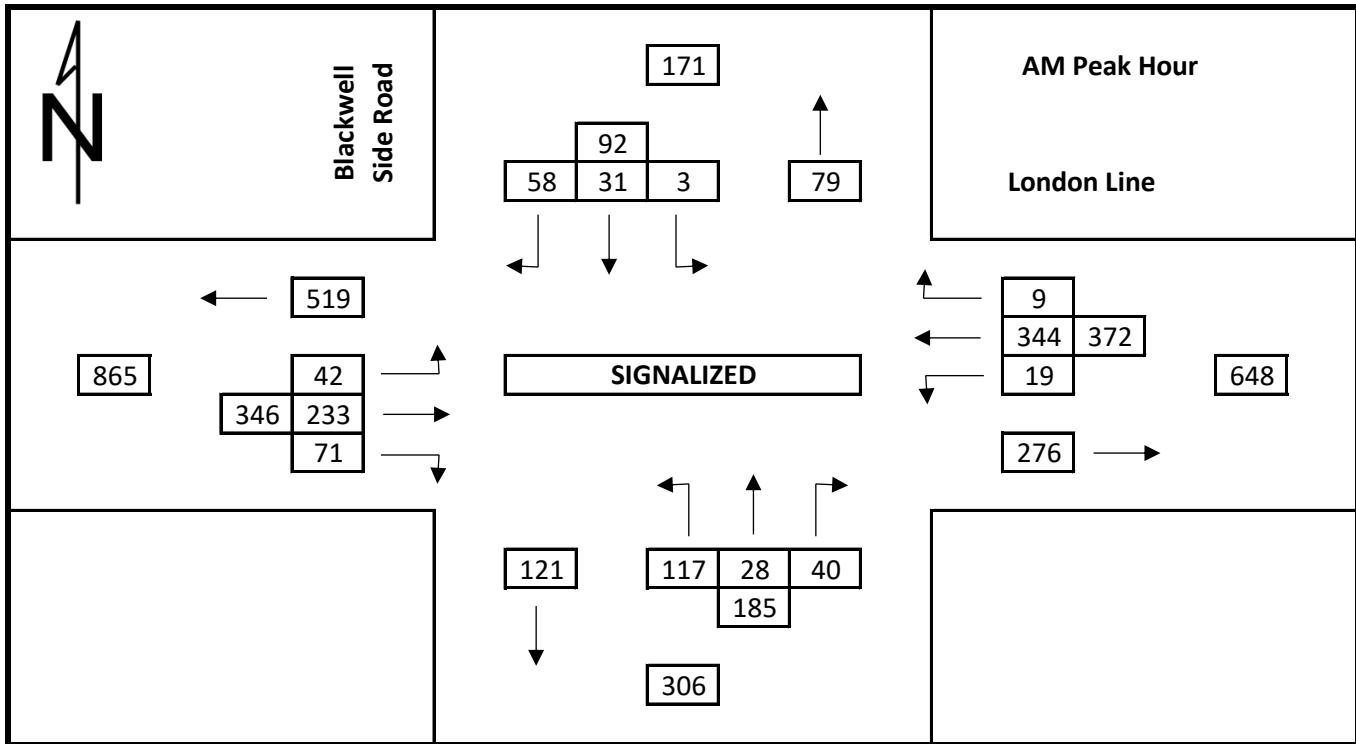
Existing Traffic Counts
 London Line (County Road 22) at Blackwell Side Road



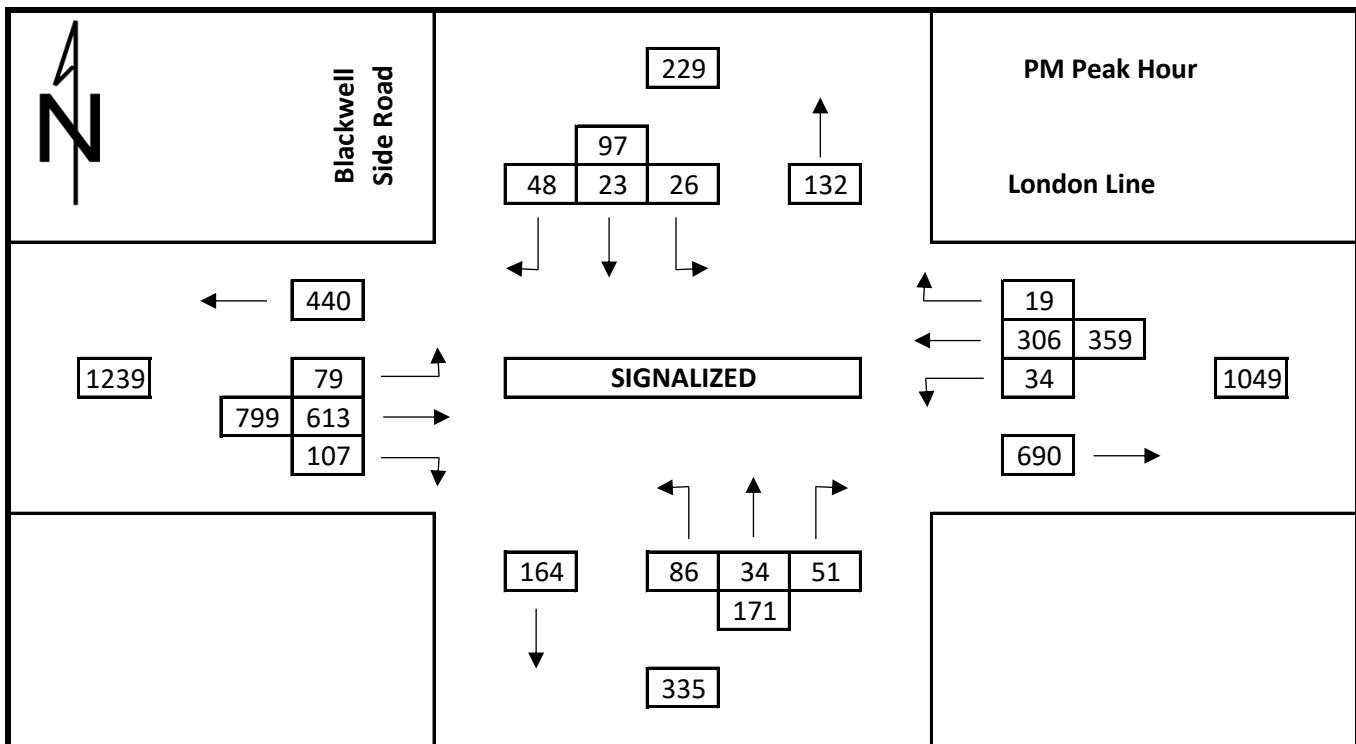
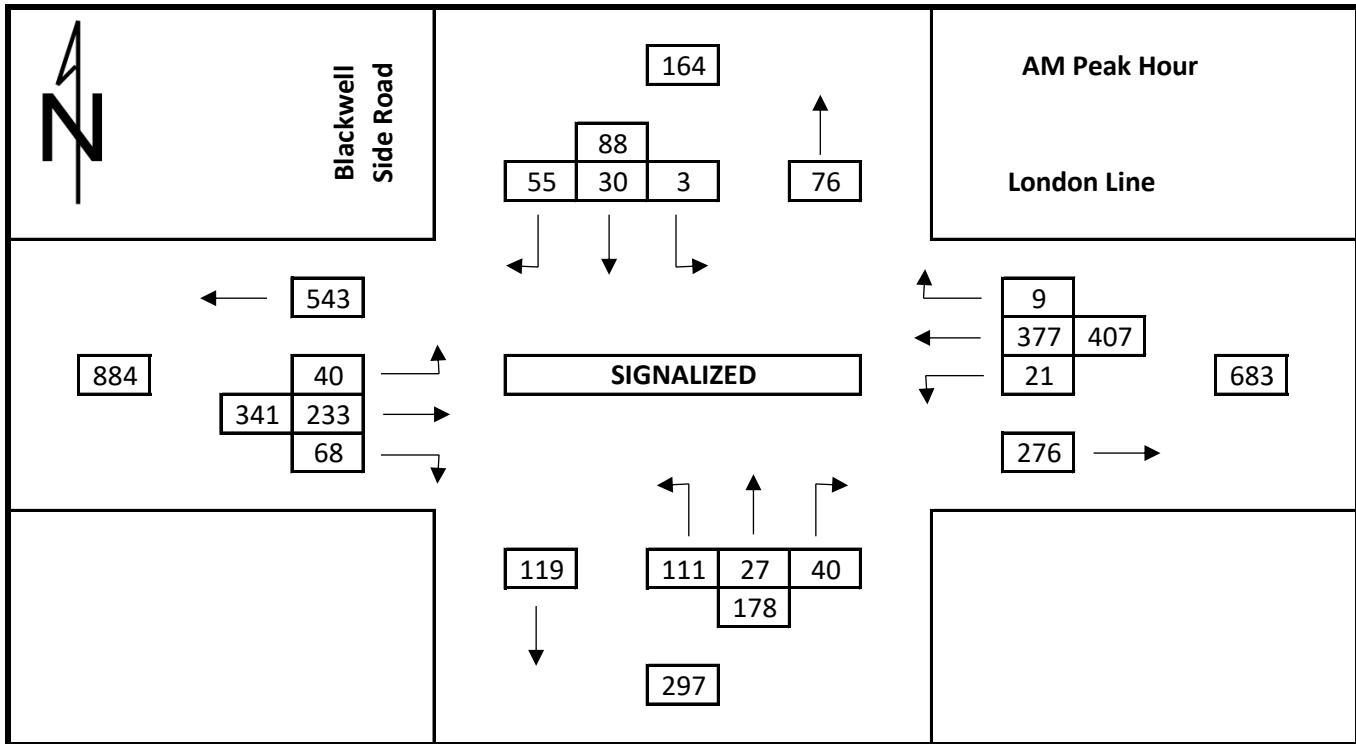
Background Traffic 2025
 London Line (County Road 22) at Blackwell Side Road



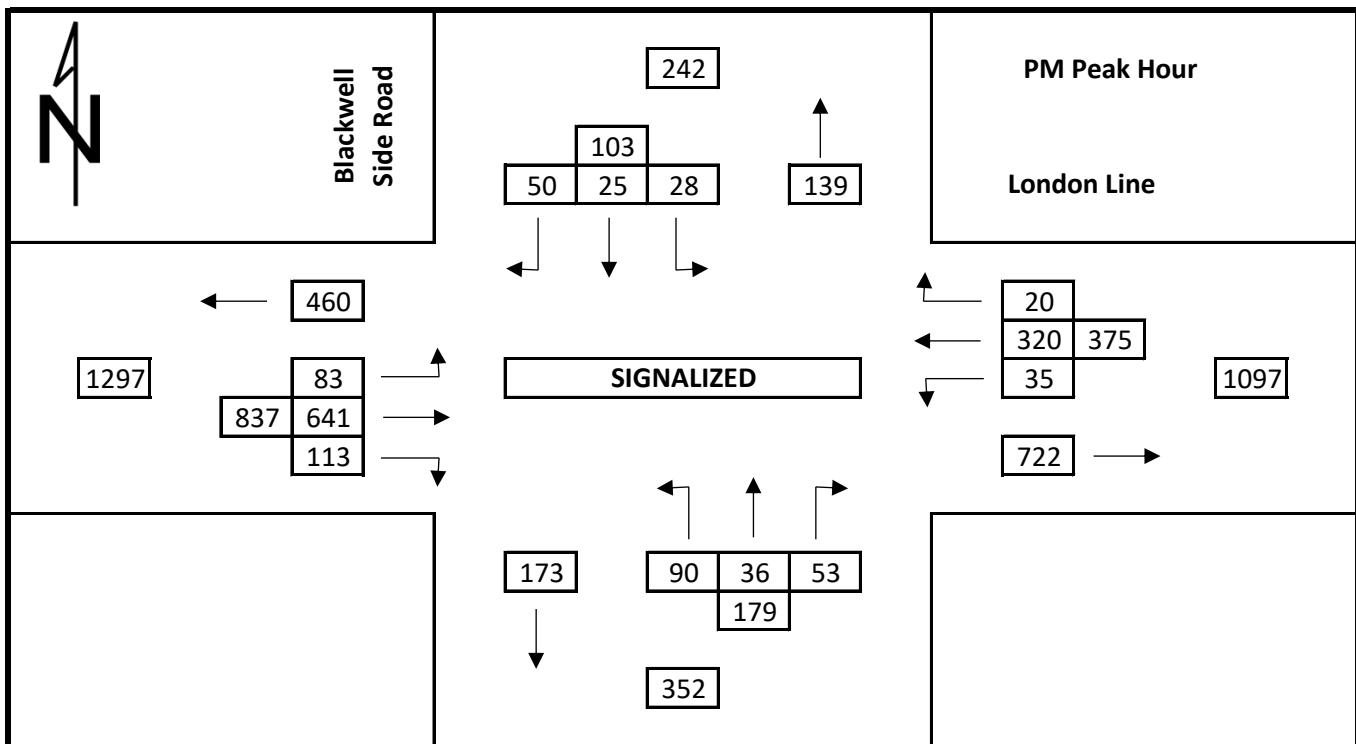
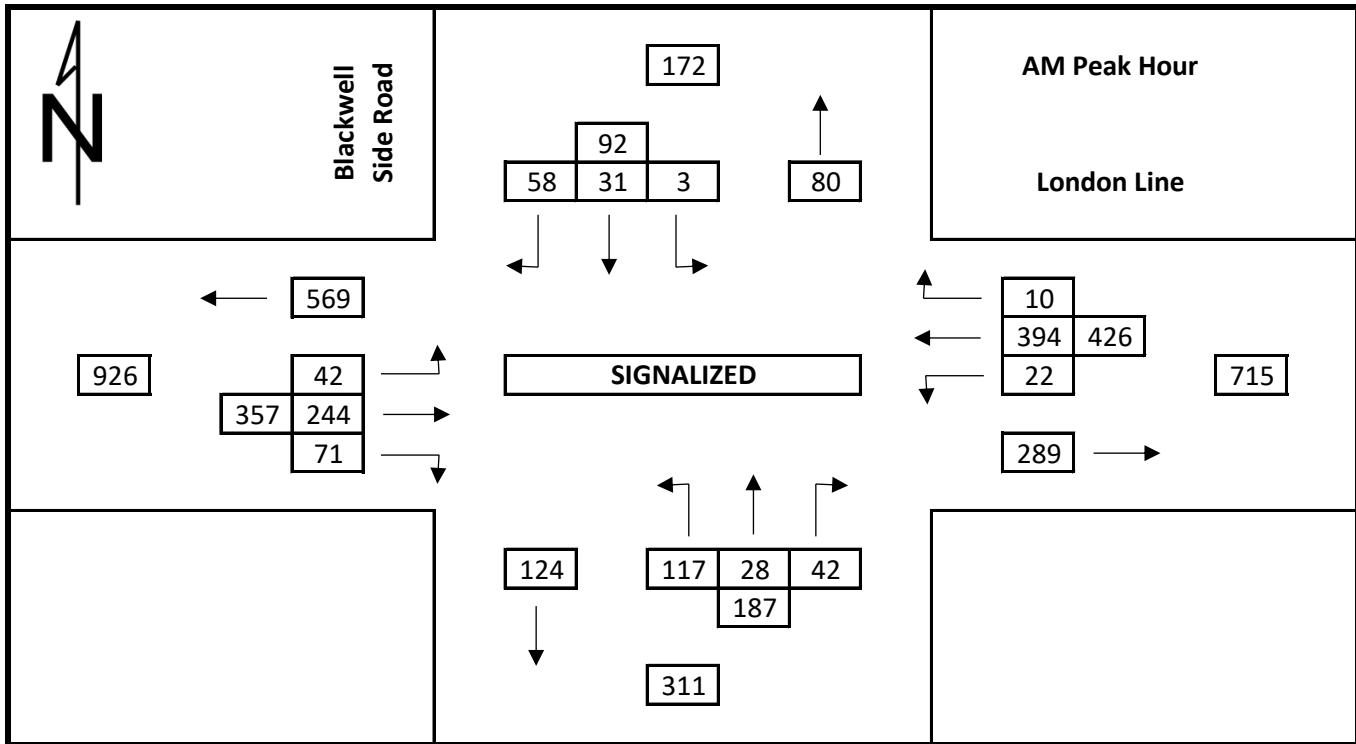
Background Traffic 2030
 London Line (County Road 22) at Blackwell Side Road



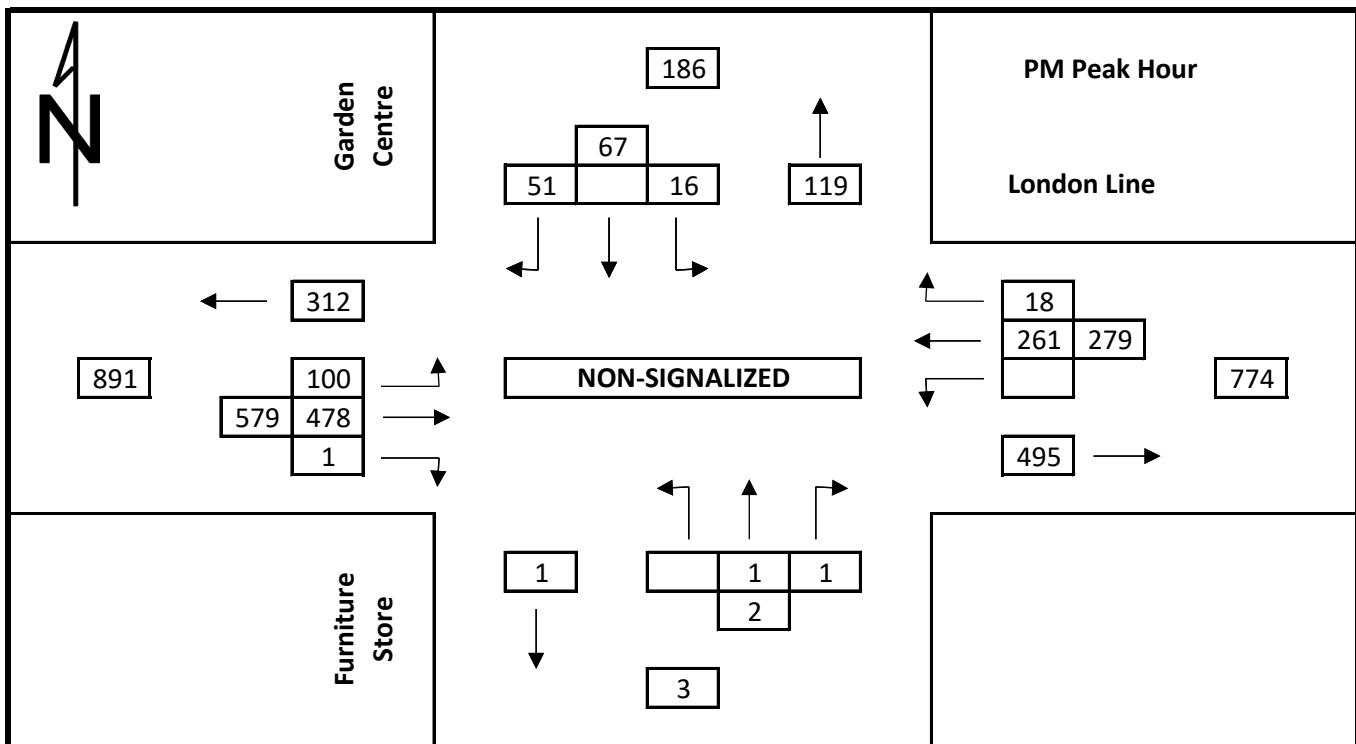
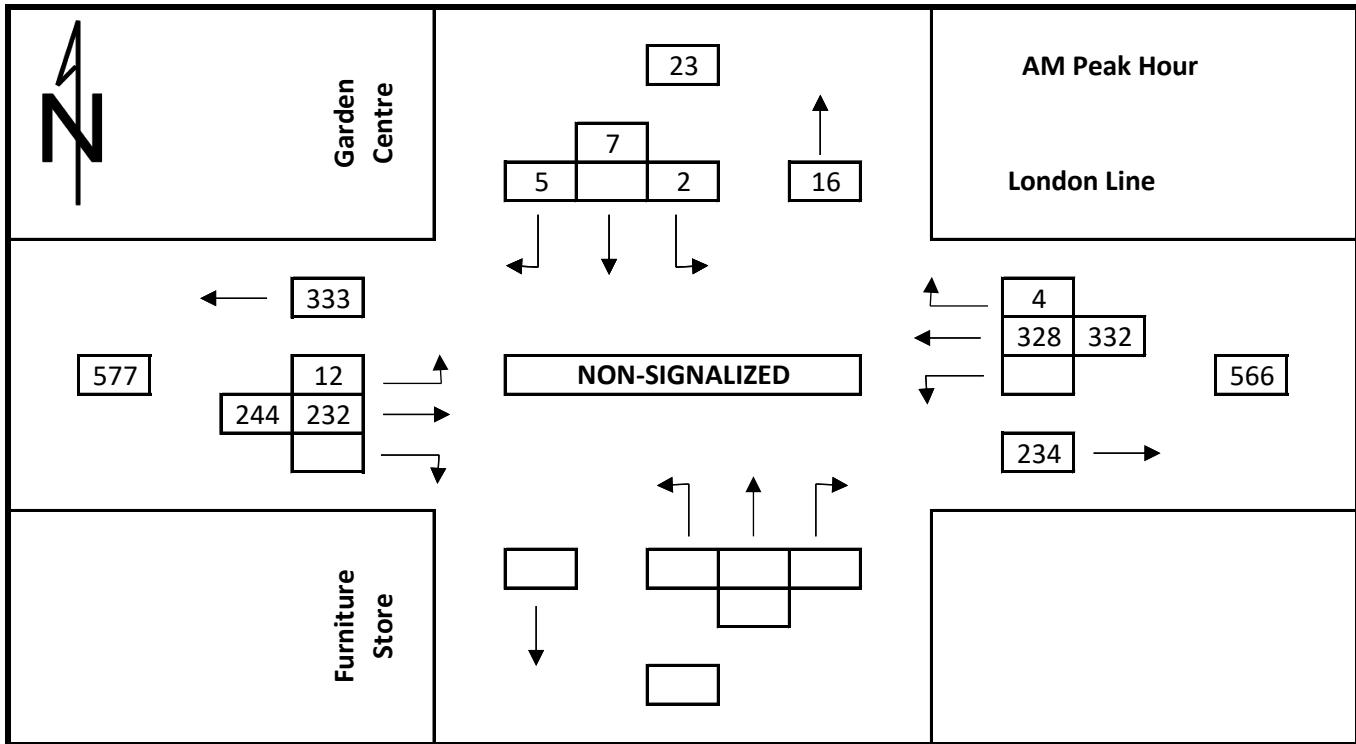
Total Traffic 2025
 London Line (County Road 22) at Blackwell Side Road



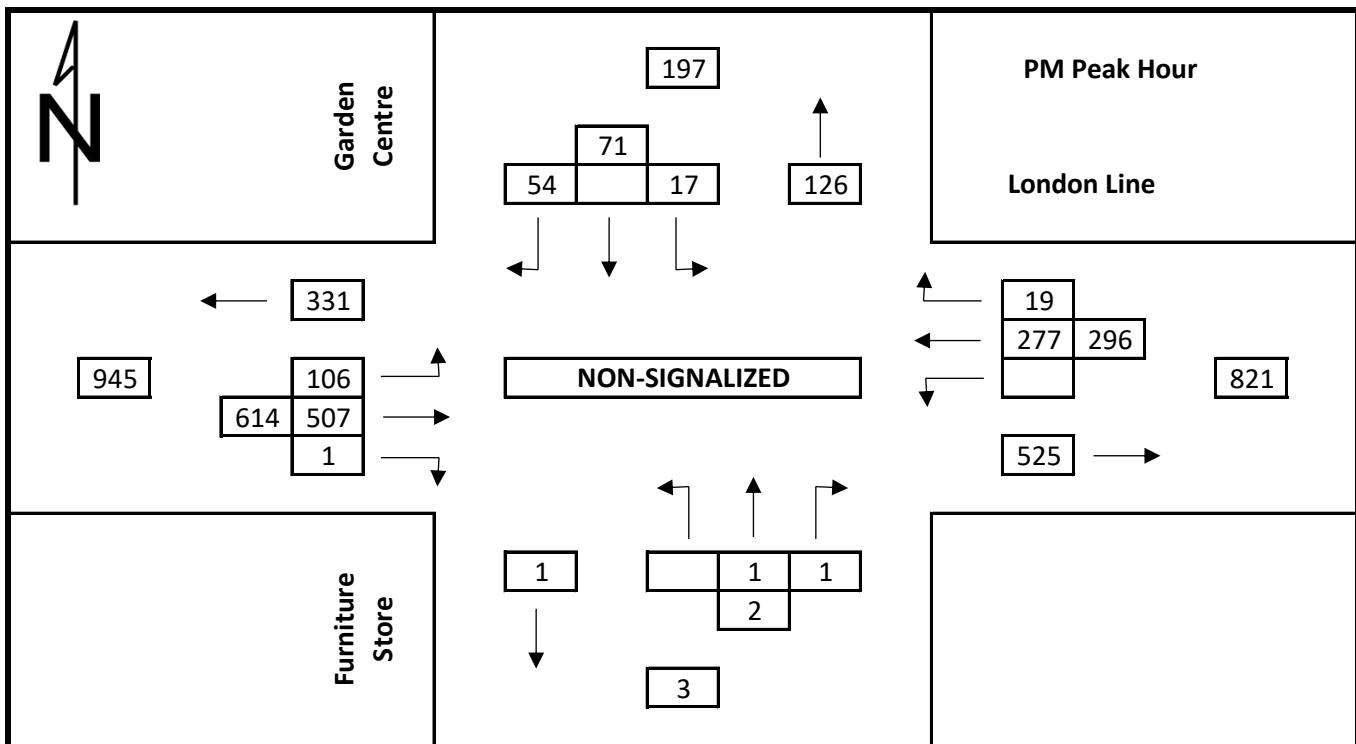
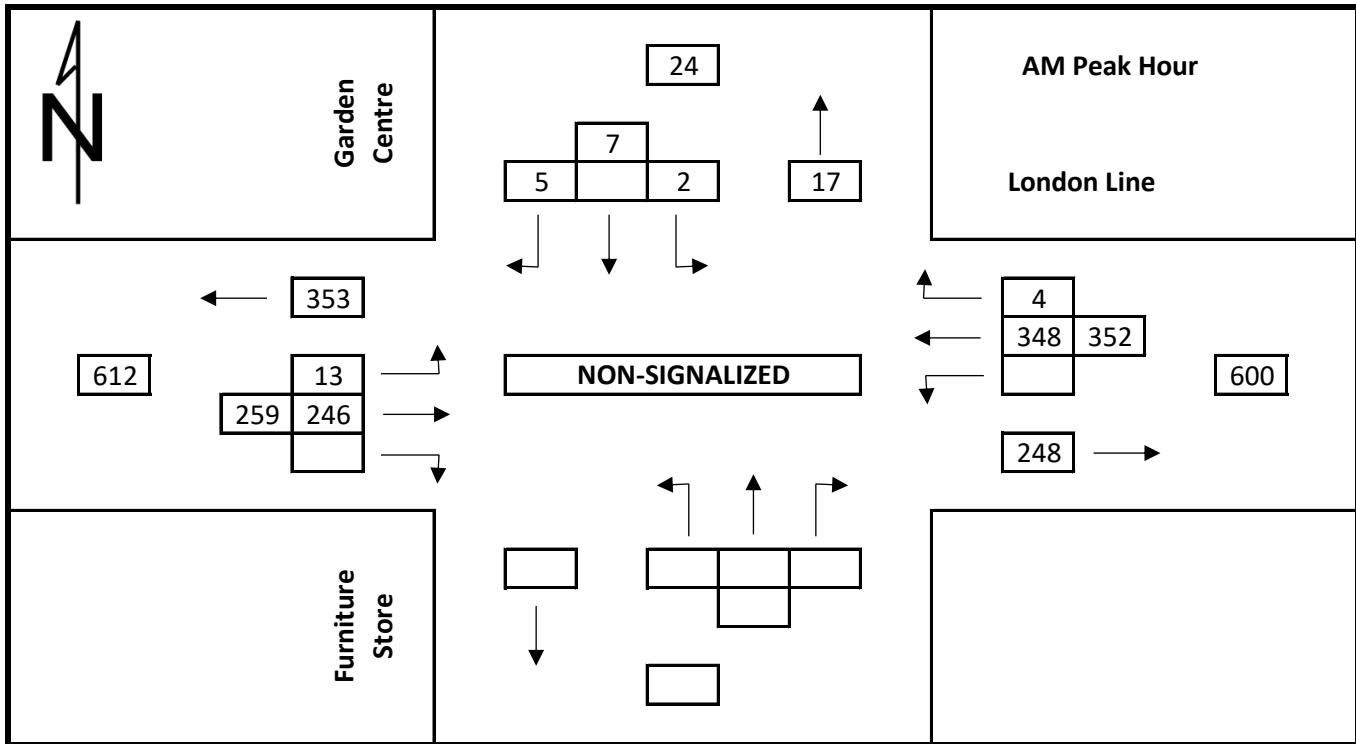
Total Traffic 2030
 London Line (County Road 22) at Blackwell Side Road



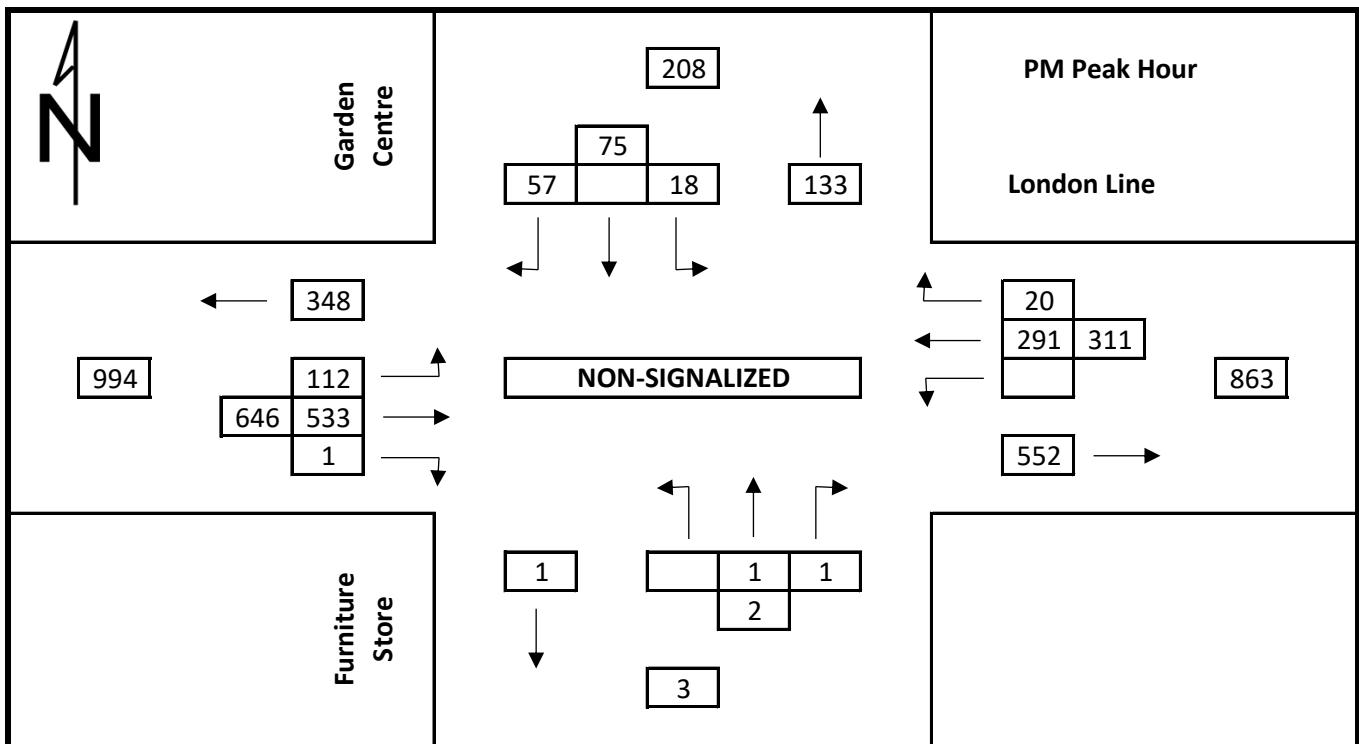
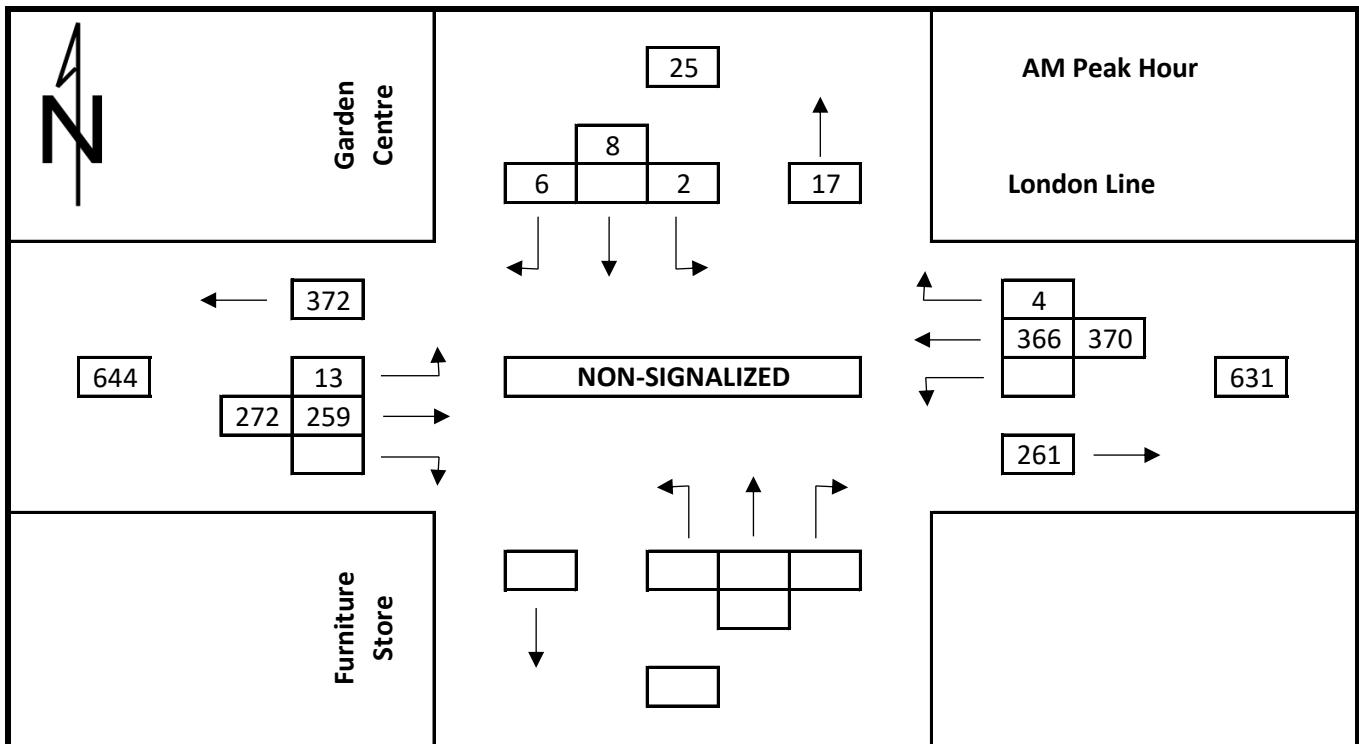
Existing Traffic Counts
 London Line (County Road 22) at Garden Centre / Furniture Store



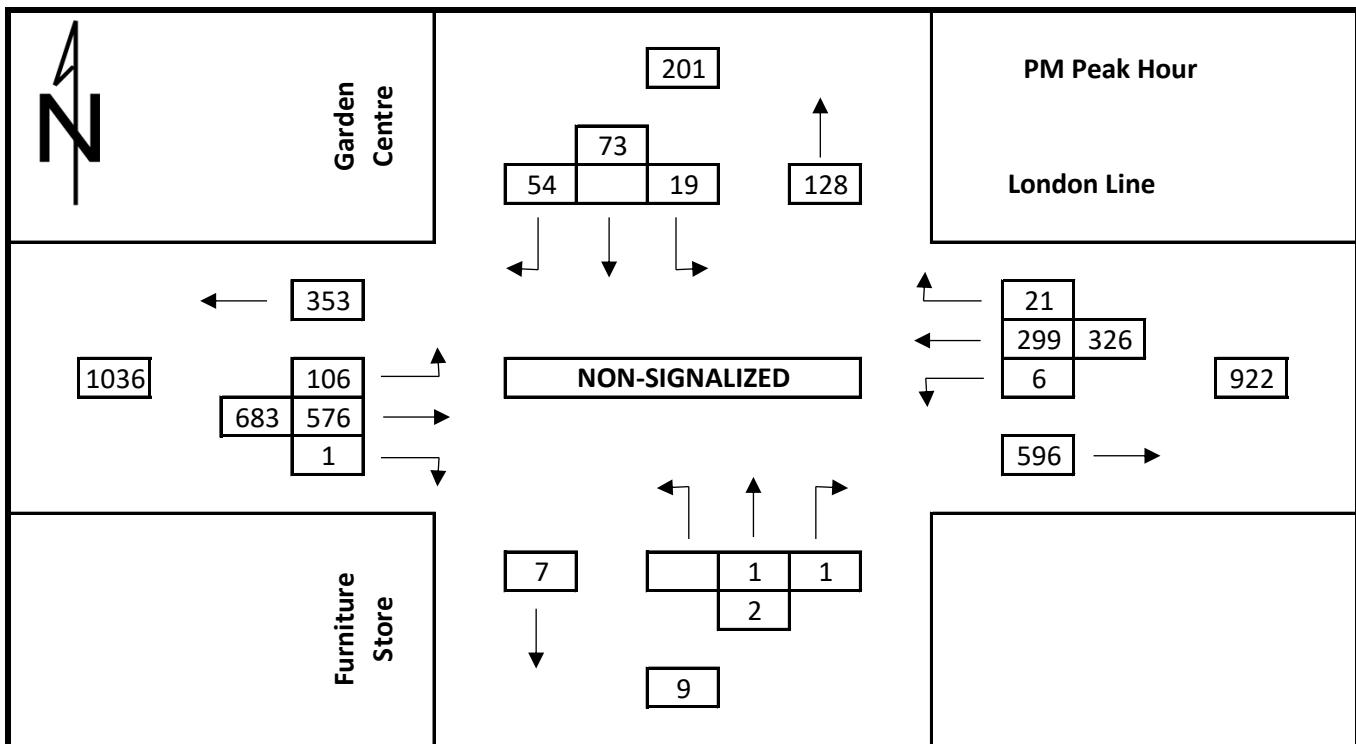
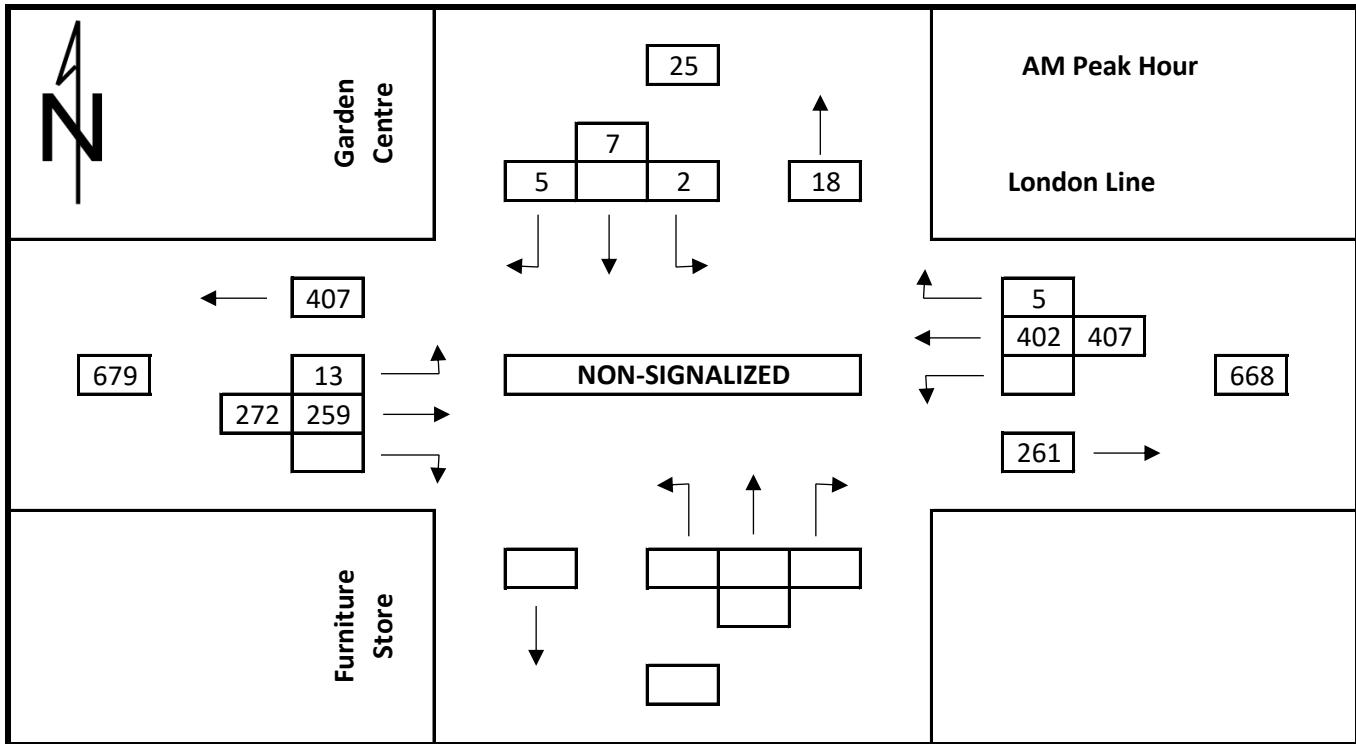
Background Traffic 2025
 London Line (County Road 22) at Garden Centre / Furniture Store



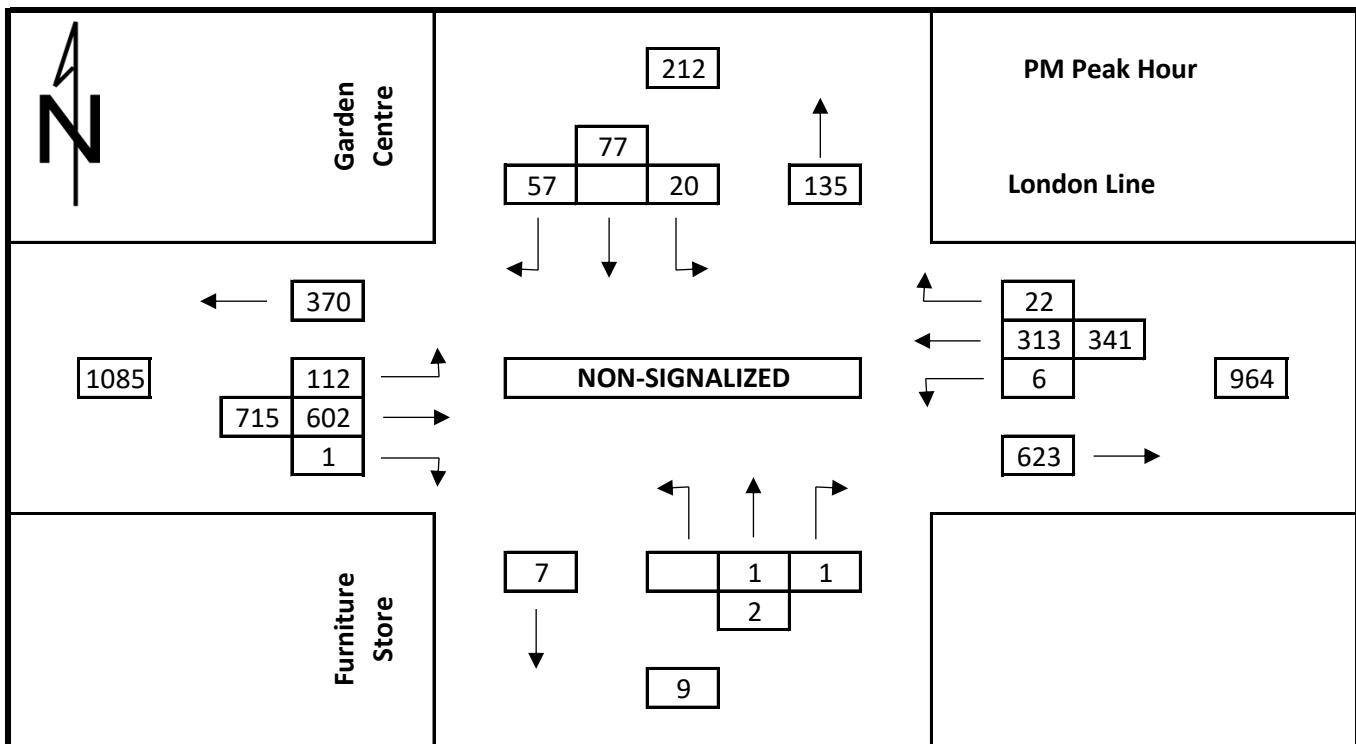
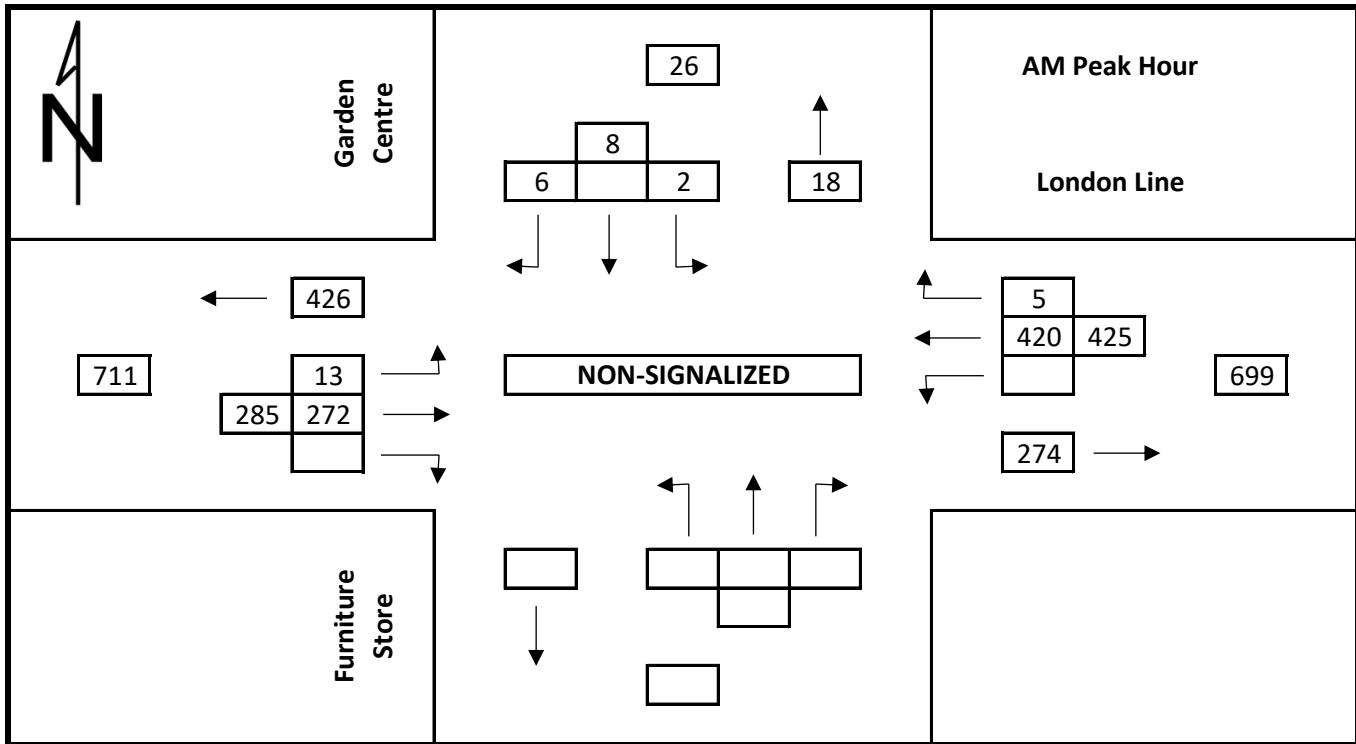
Background Traffic 2030
 London Line (County Road 22) at Garden Centre / Furniture Store



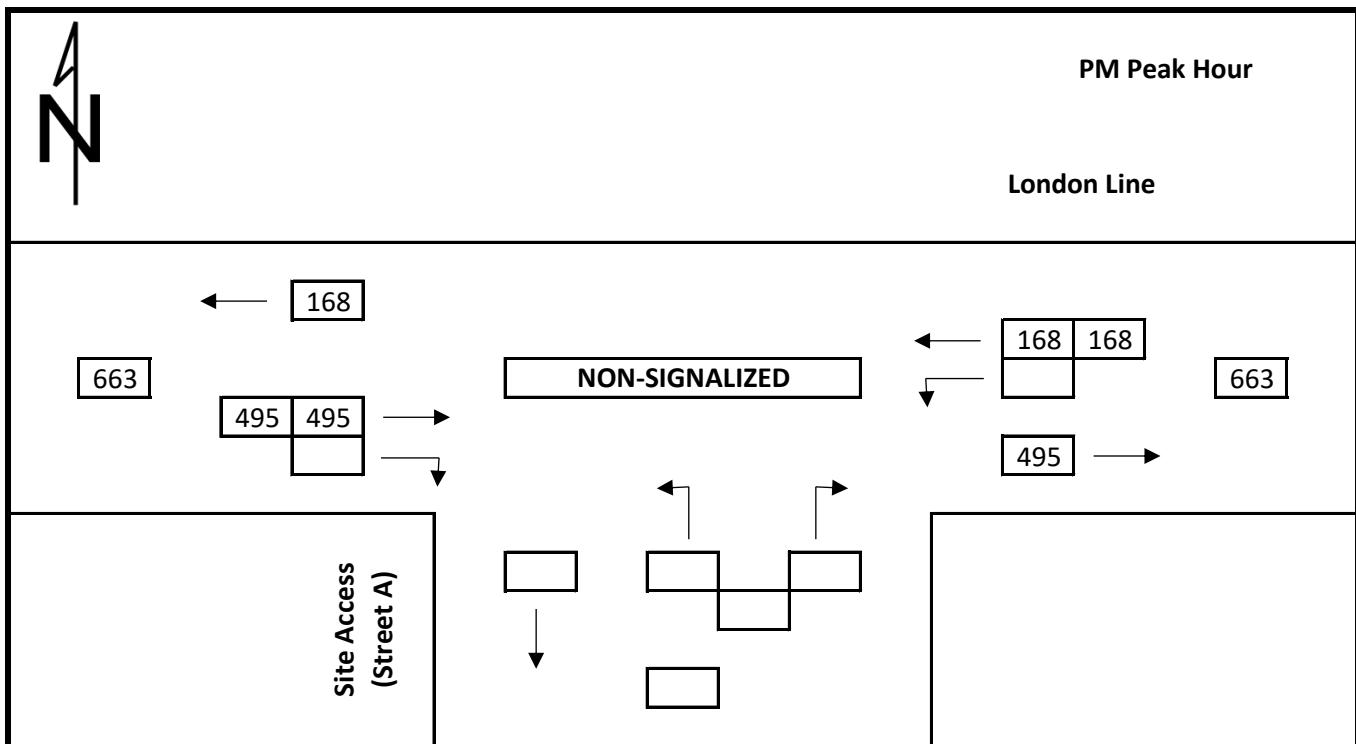
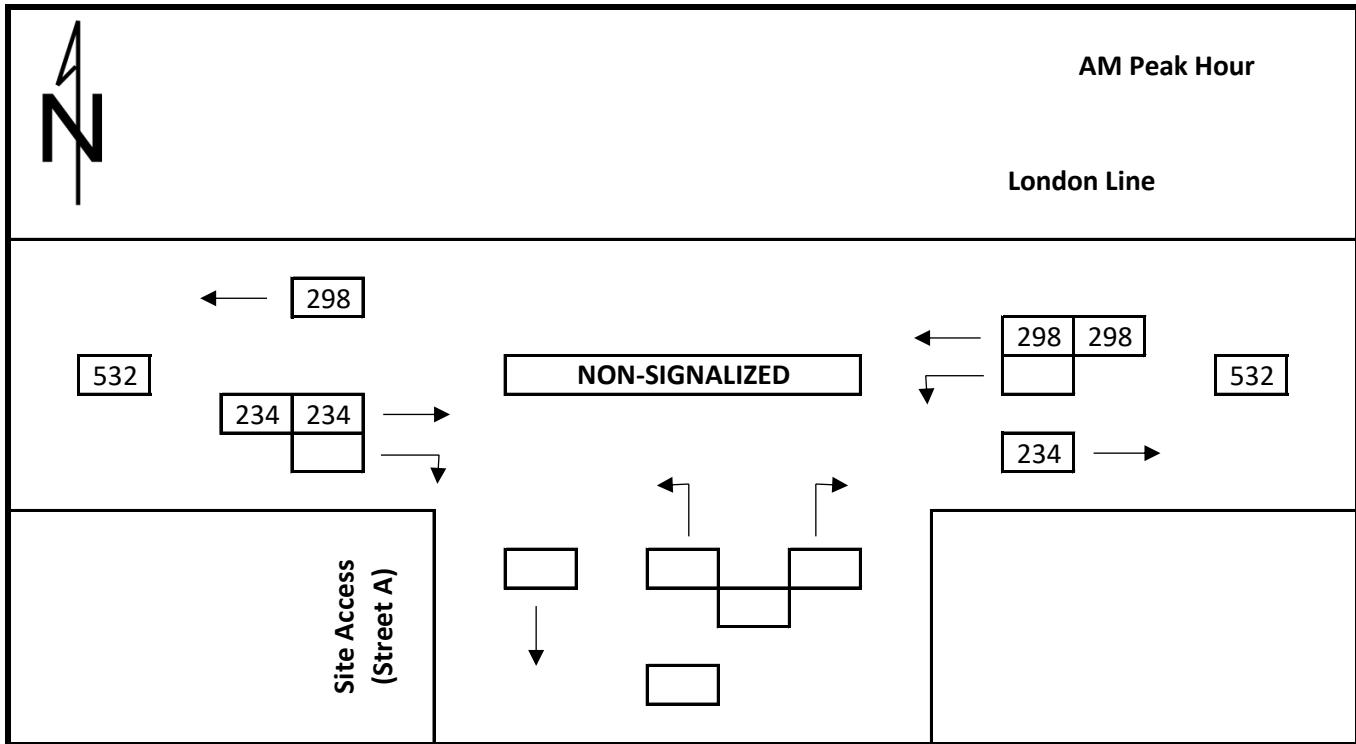
Total Traffic 2025
 London Line (County Road 22) at Garden Centre / Furniture Store



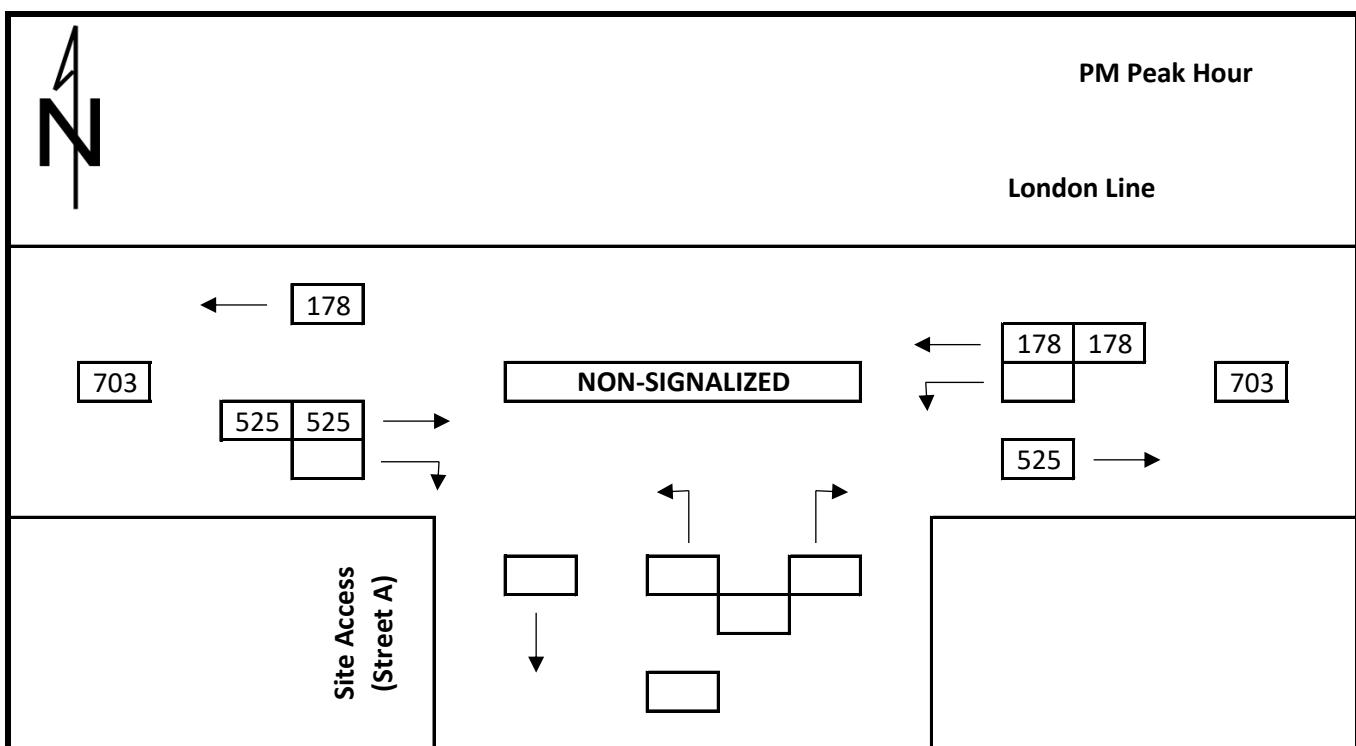
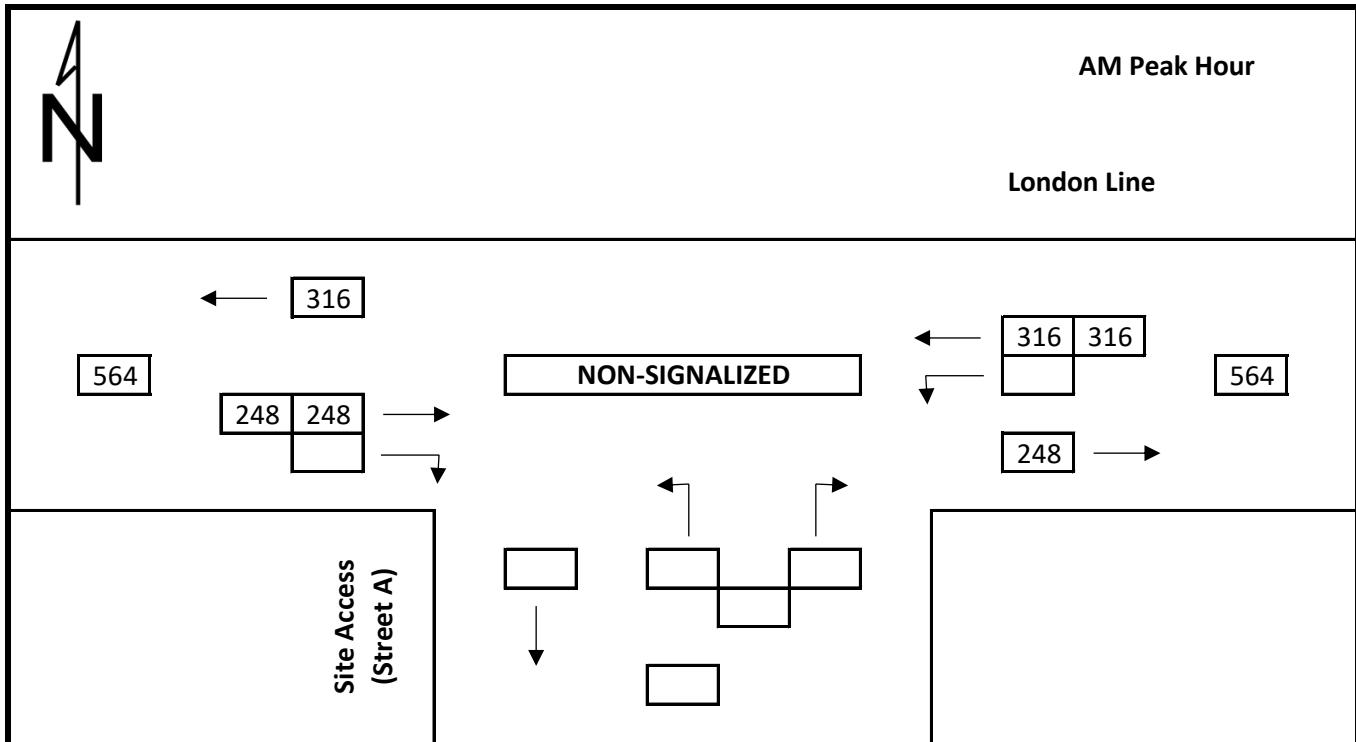
Total Traffic 2030
 London Line (County Road 22) at Garden Centre / Furniture Store



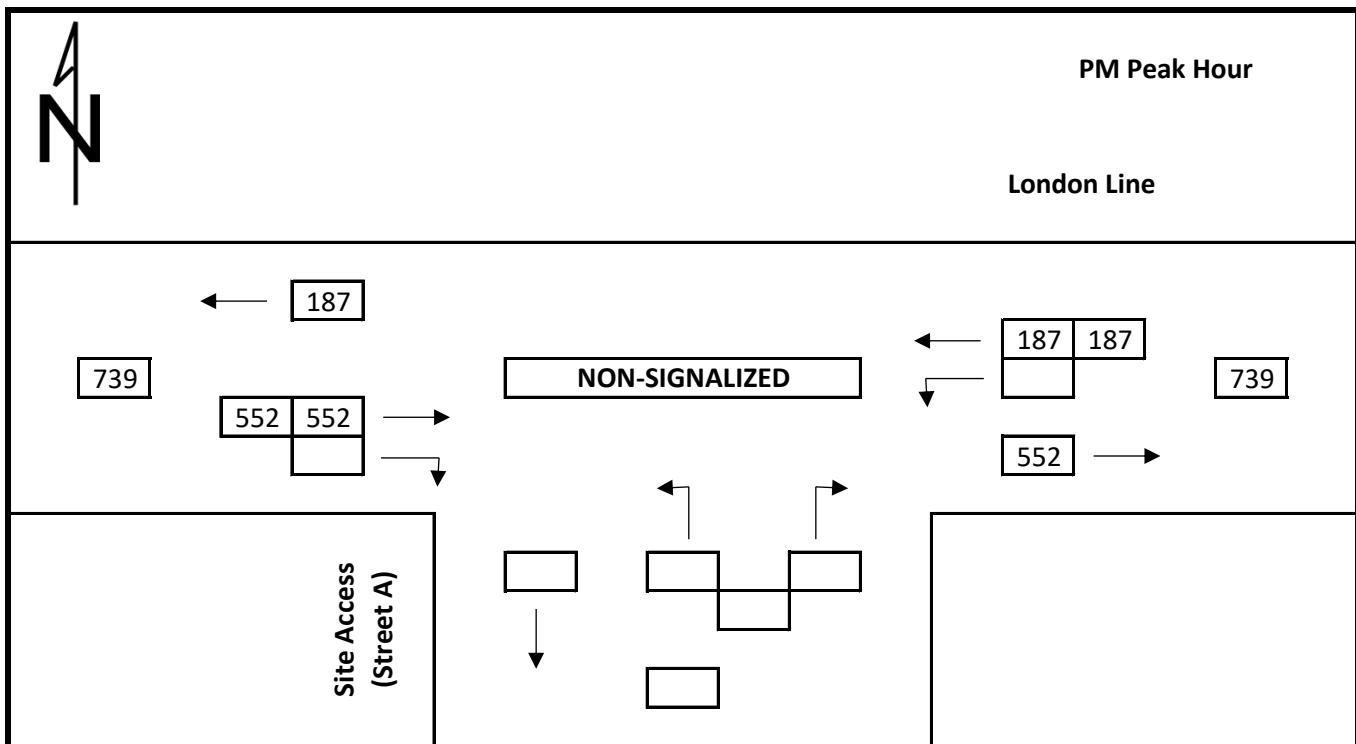
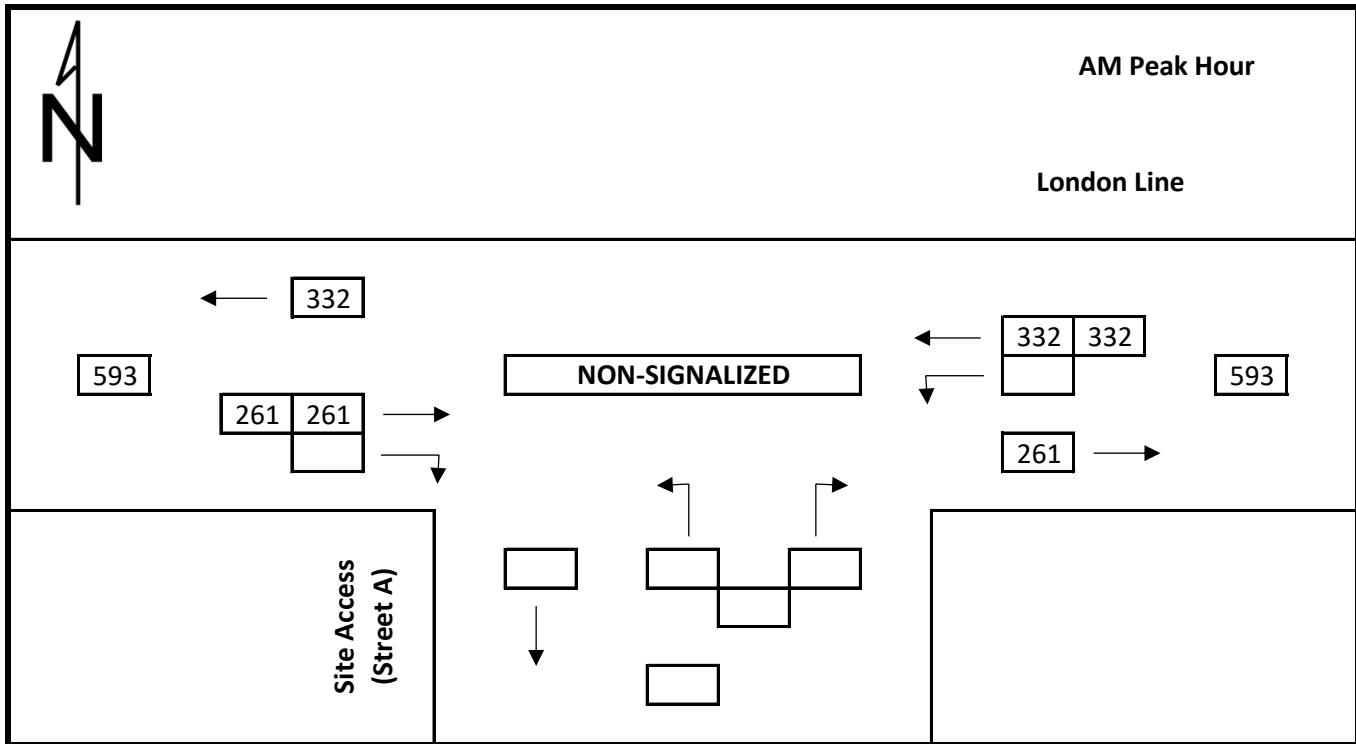
Existing Traffic Counts
London Line (County Road 22) at Site Access



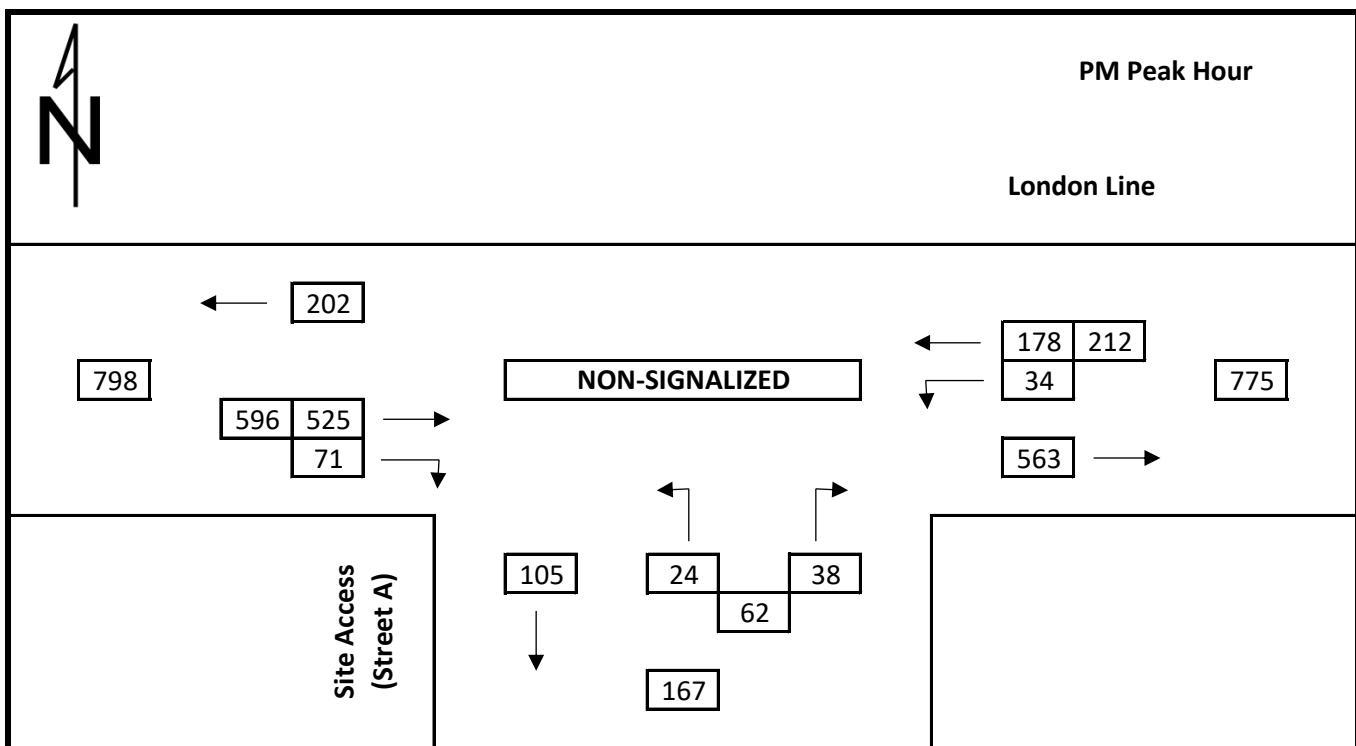
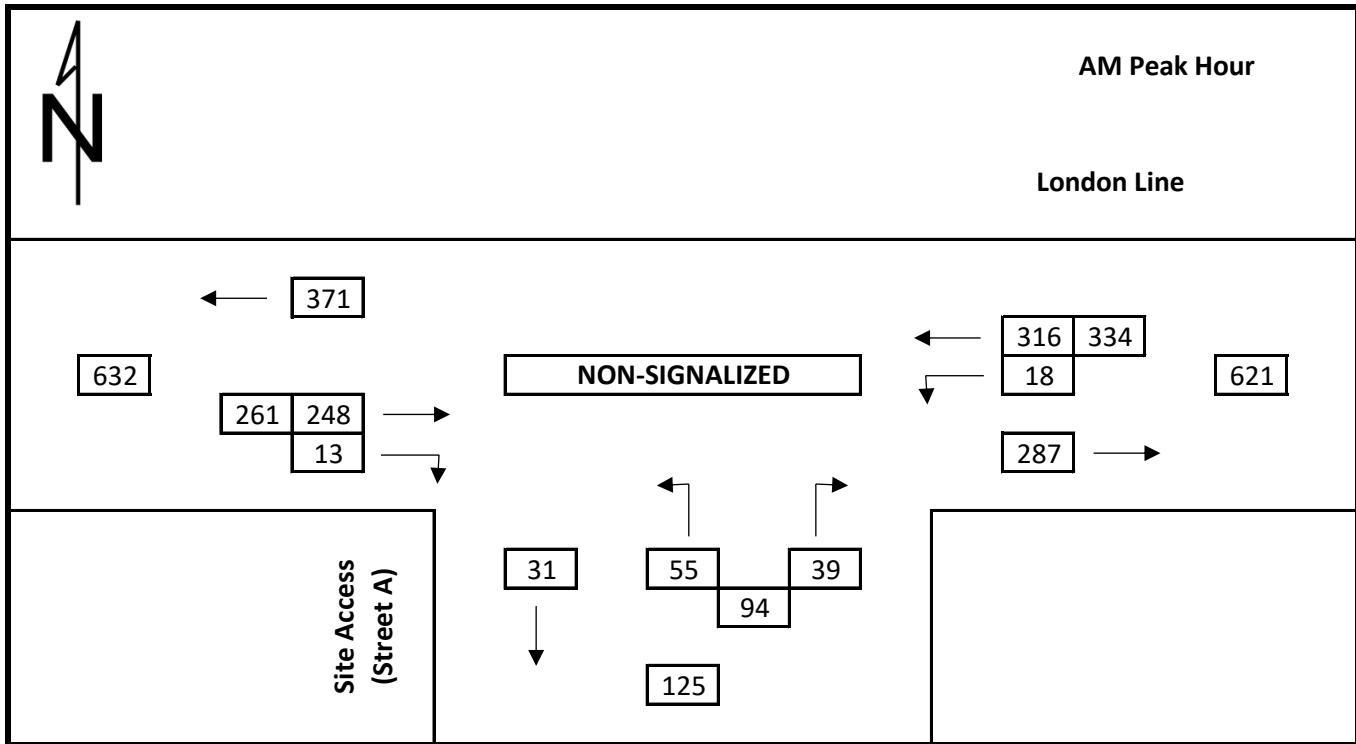
Background Traffic 2025
London Line (County Road 22) at Site Access



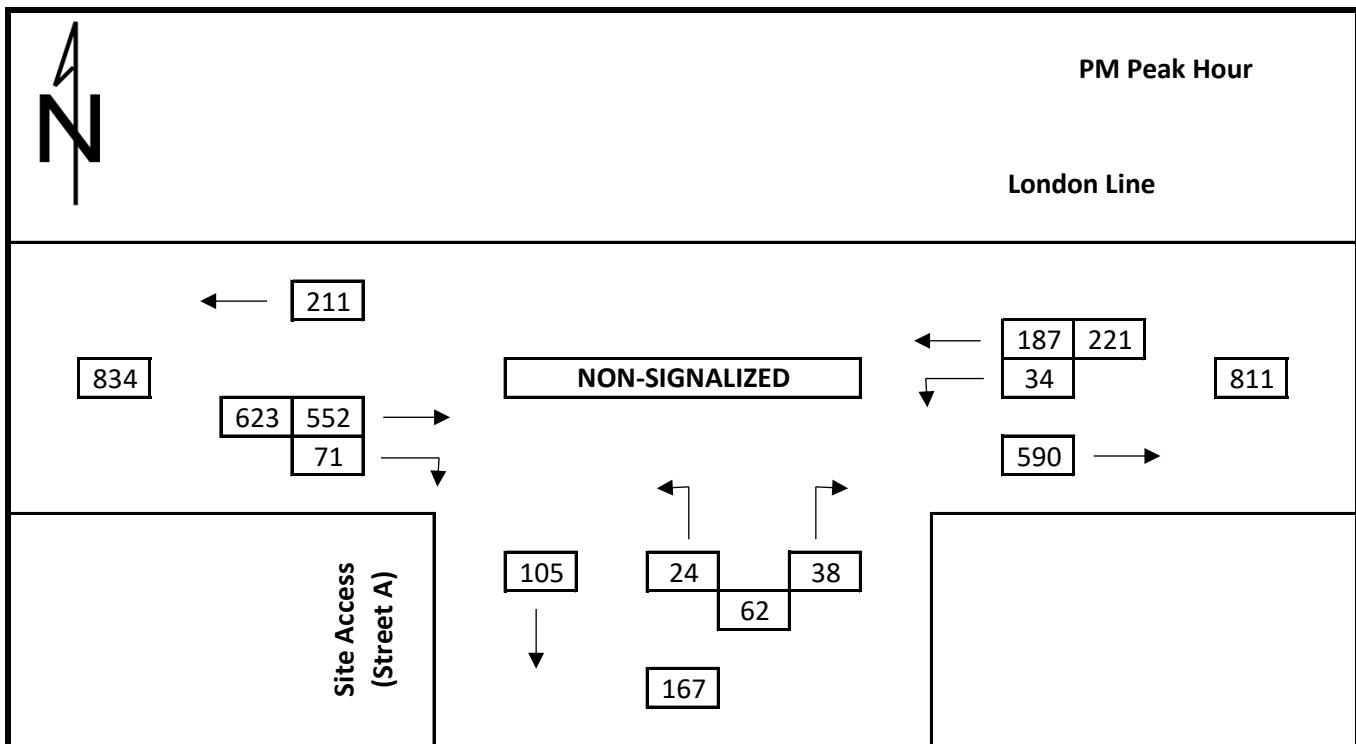
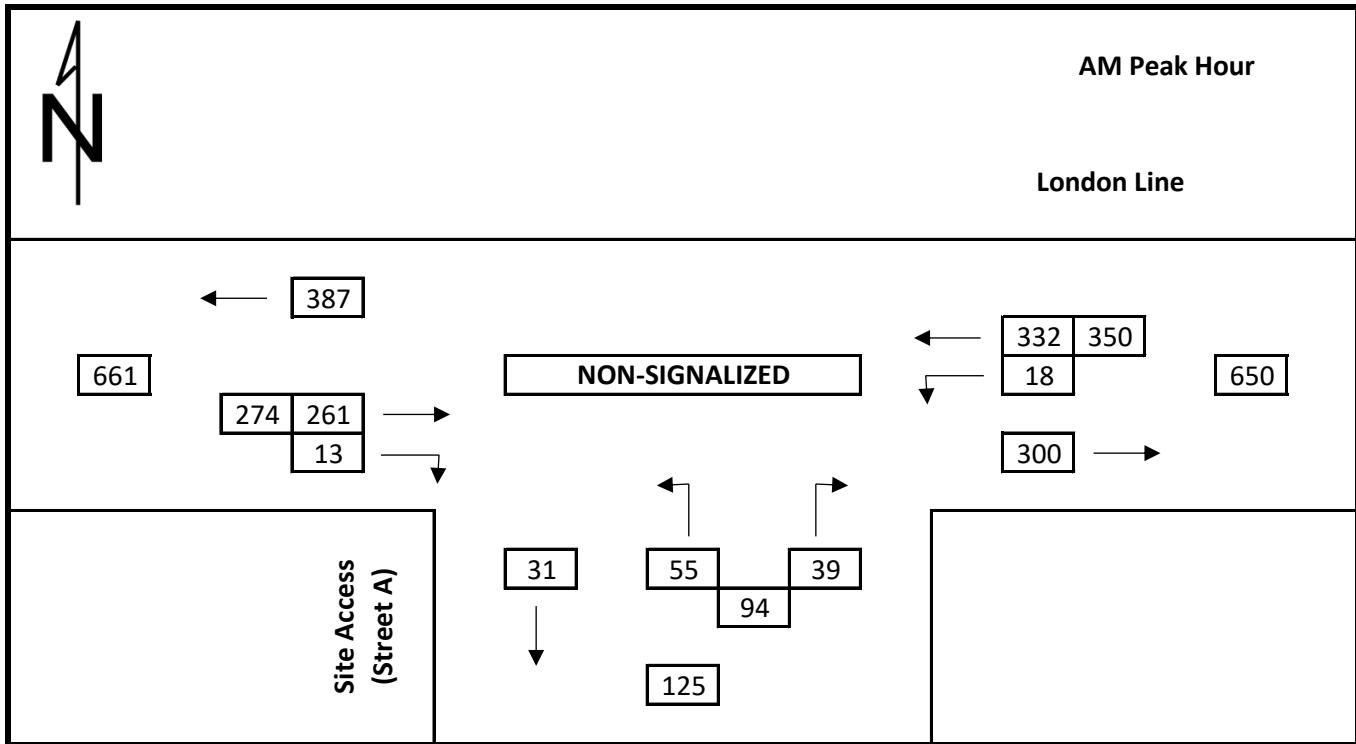
Background Traffic 2030
London Line (County Road 22) at Site Access



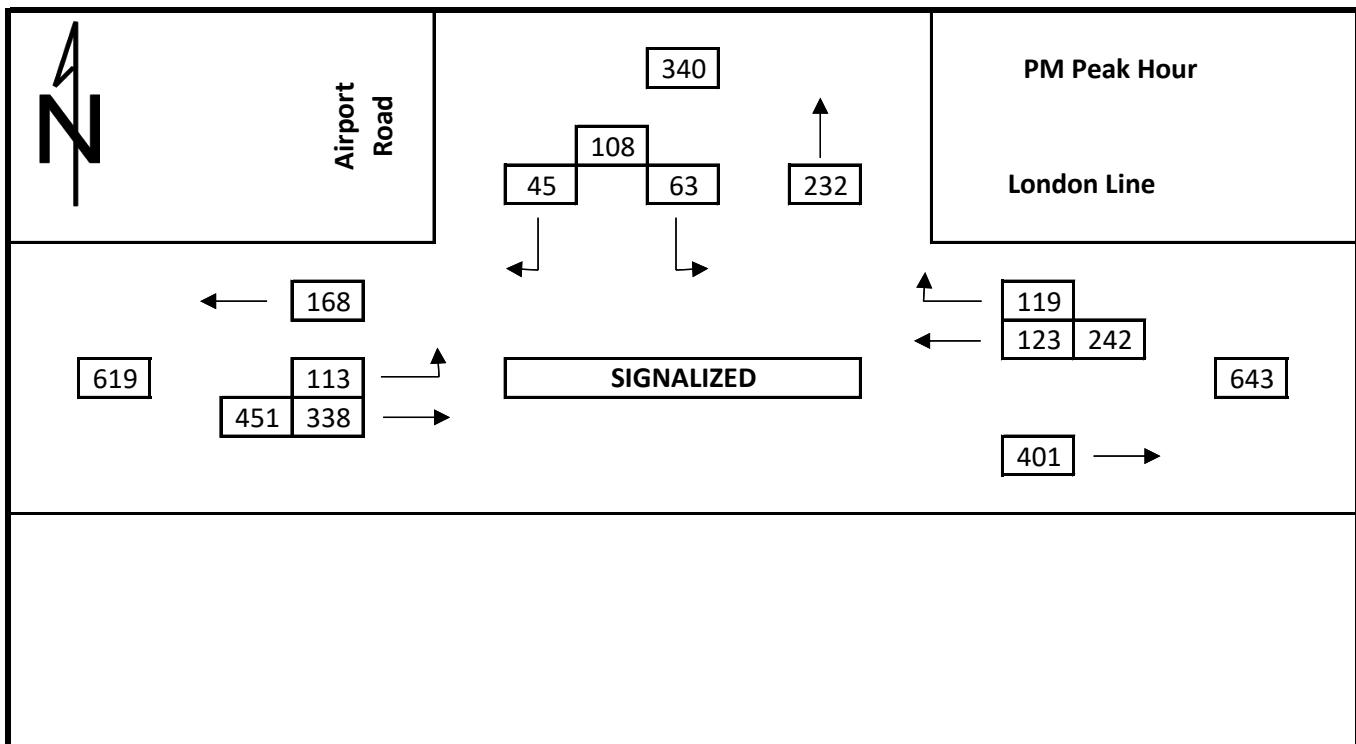
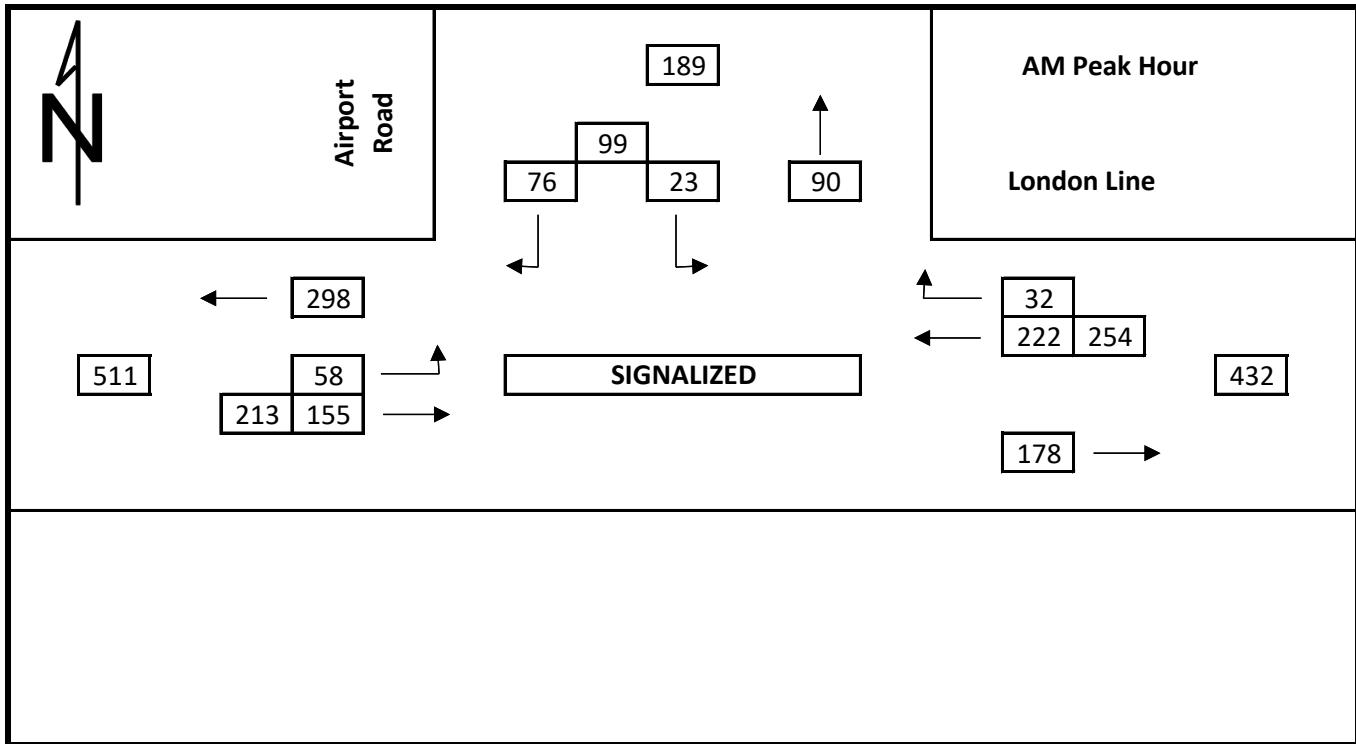
Total Traffic 2025
London Line (County Road 22) at Site Access



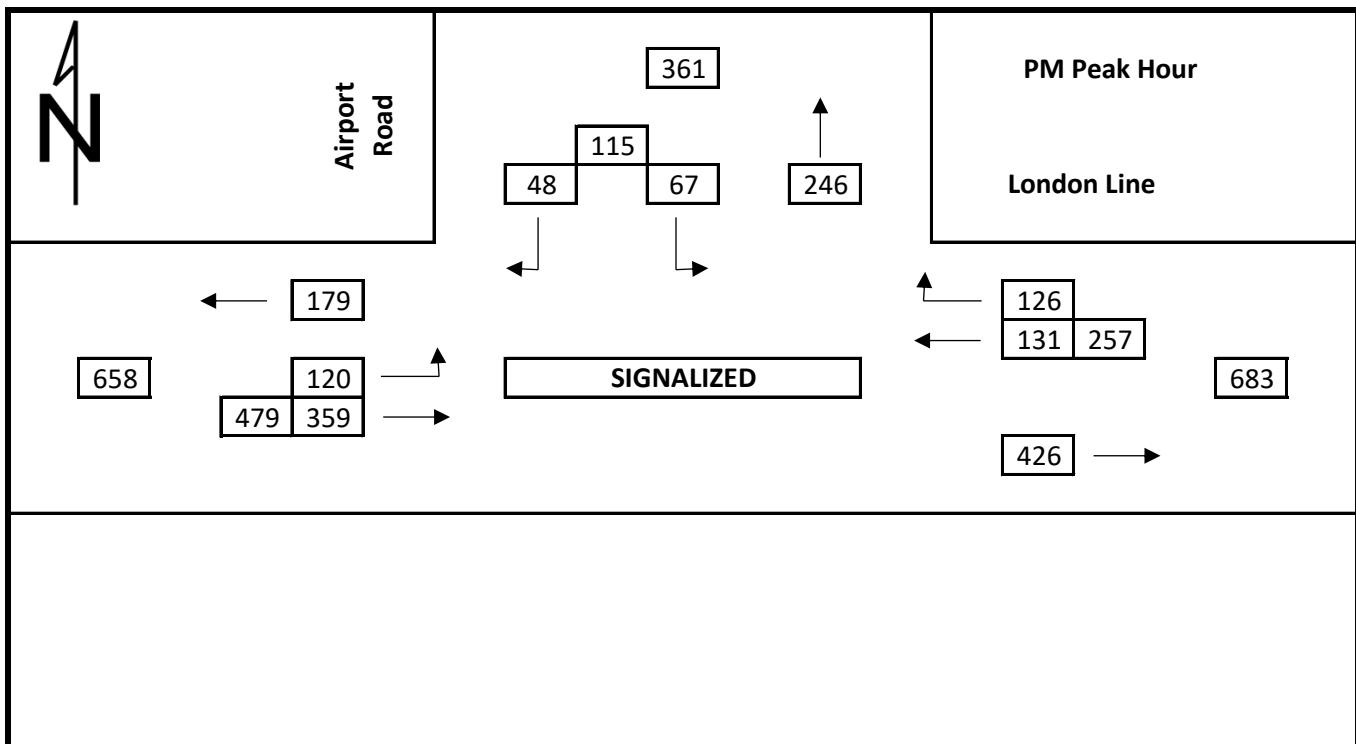
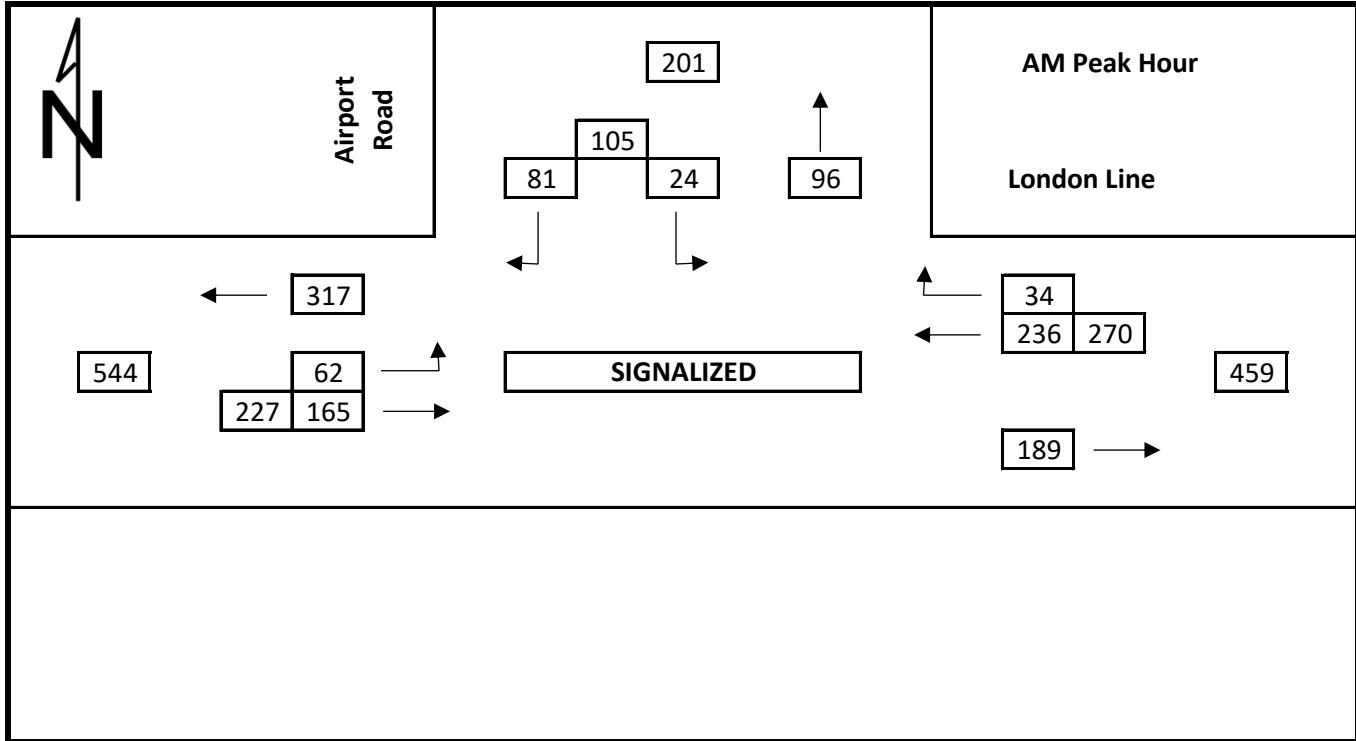
Total Traffic 2030
London Line (County Road 22) at Site Access



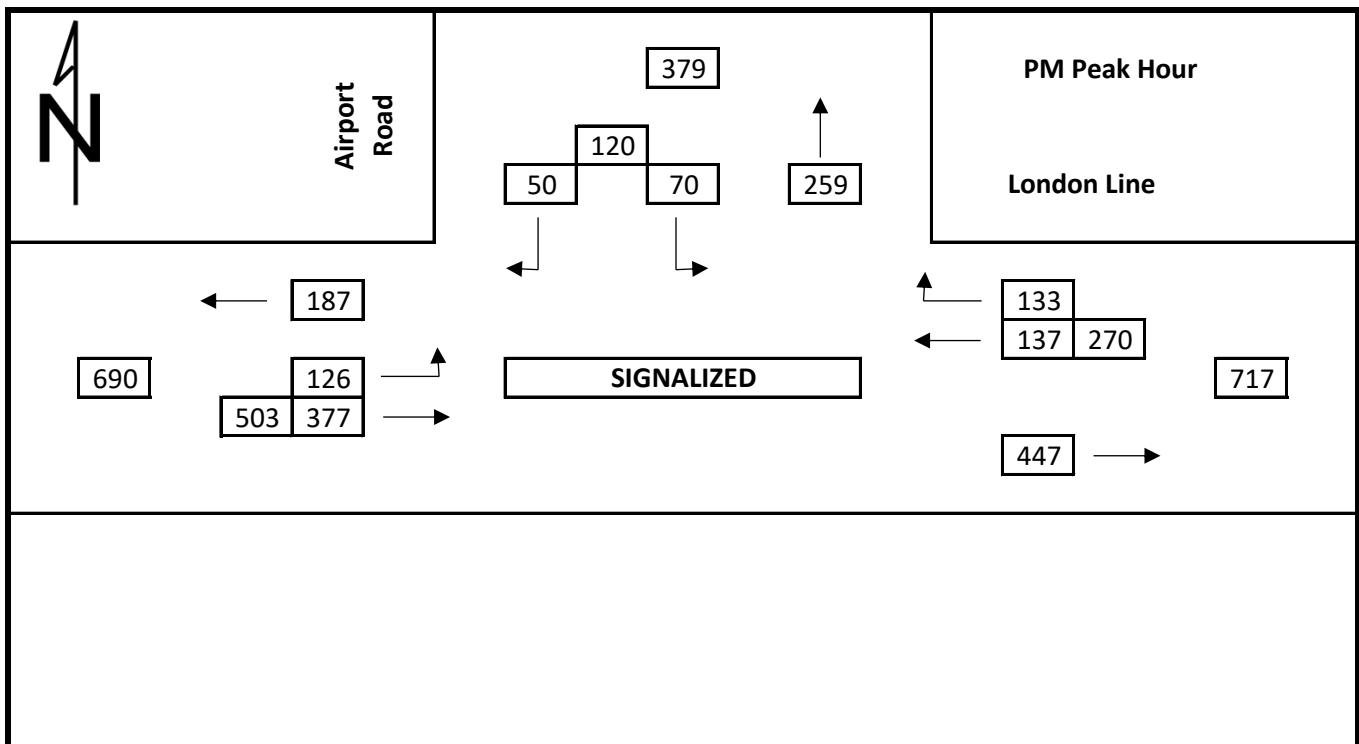
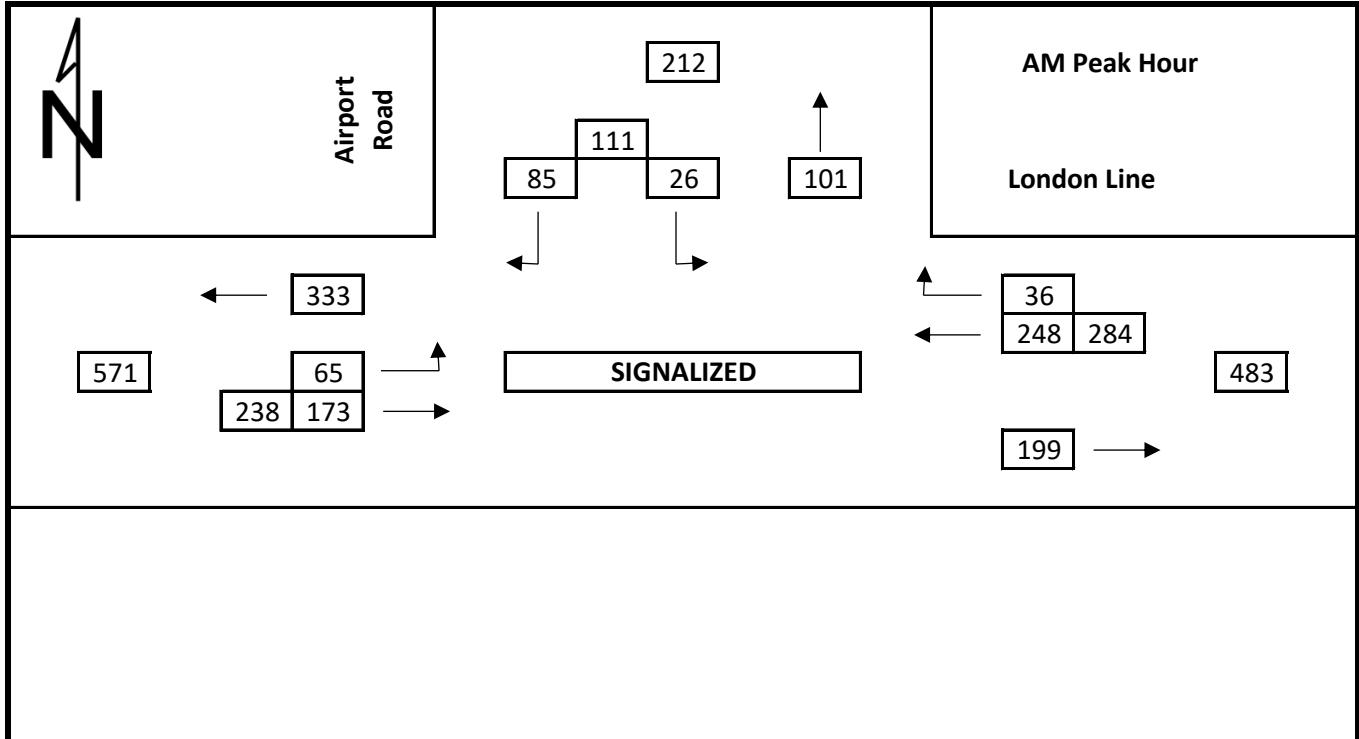
Existing Traffic Counts
London Line (County Road 22) at Airport Road



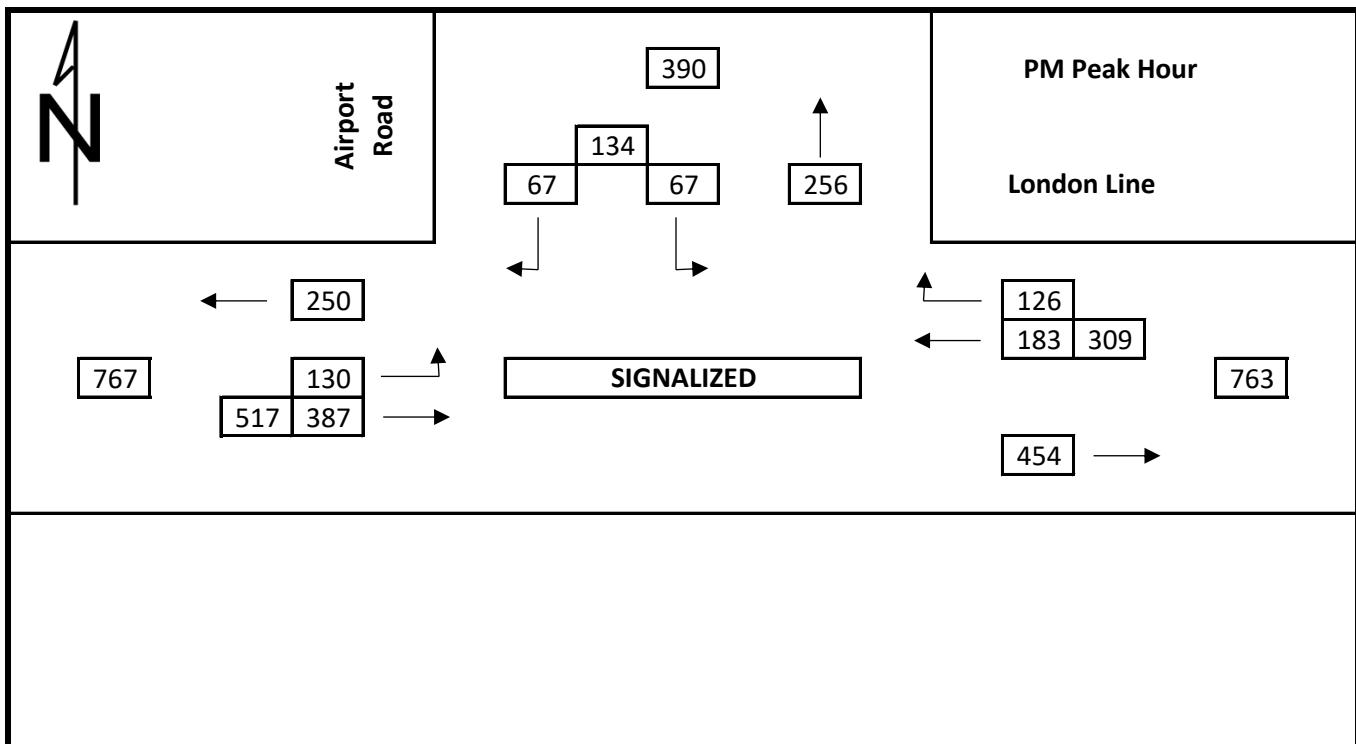
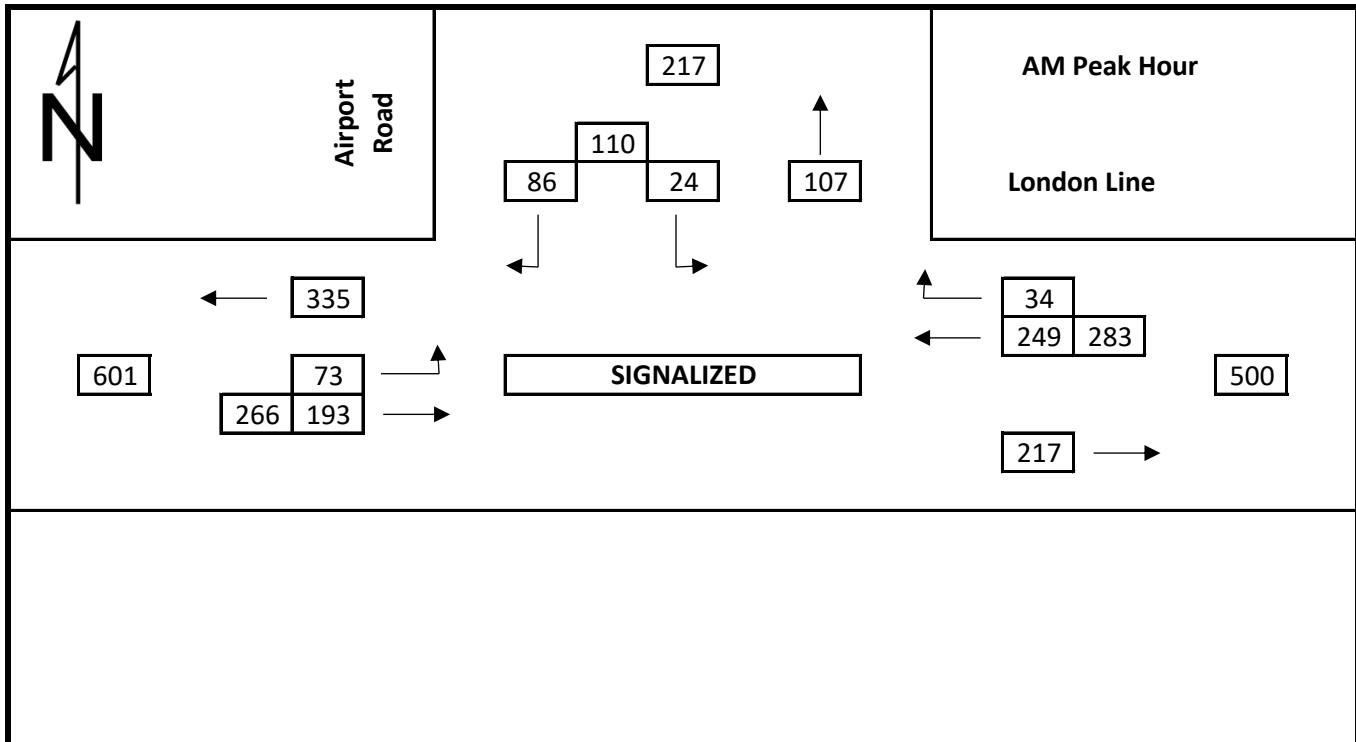
Background Traffic 2025
London Line (County Road 22) at Airport Road



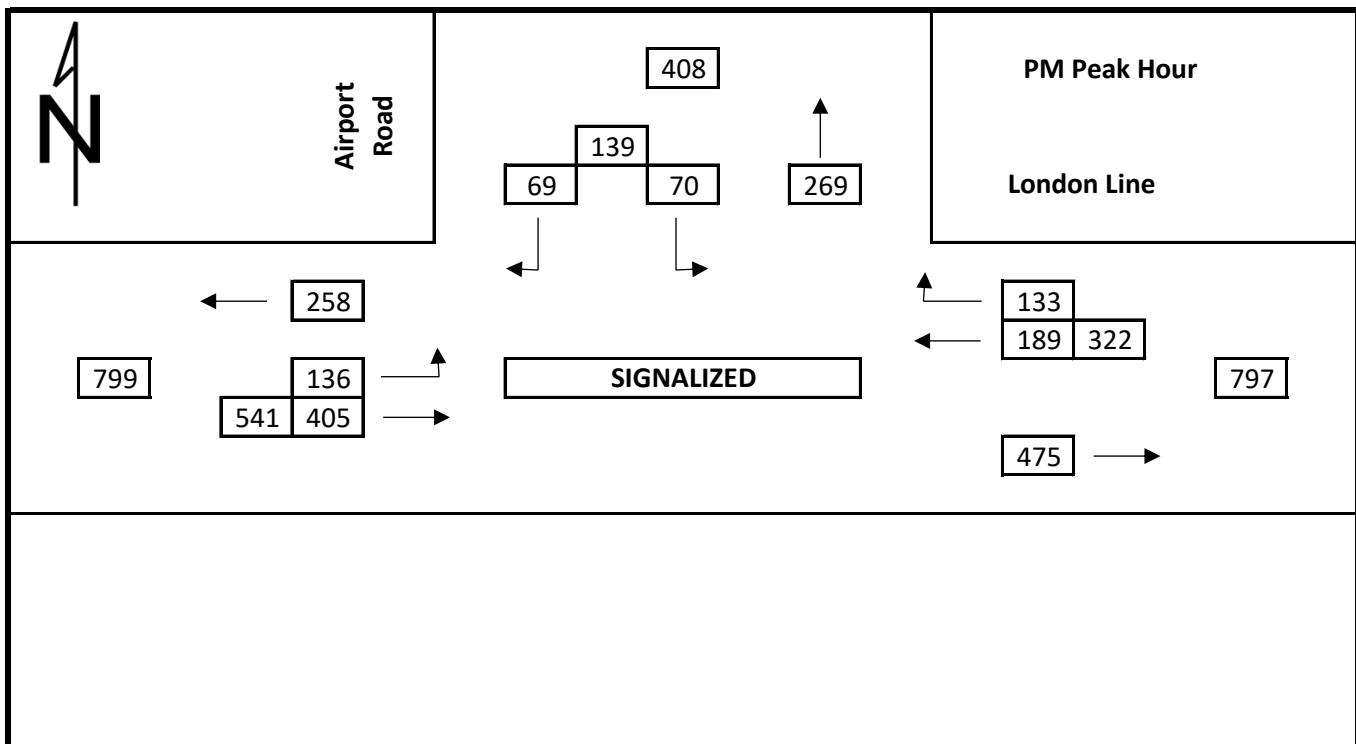
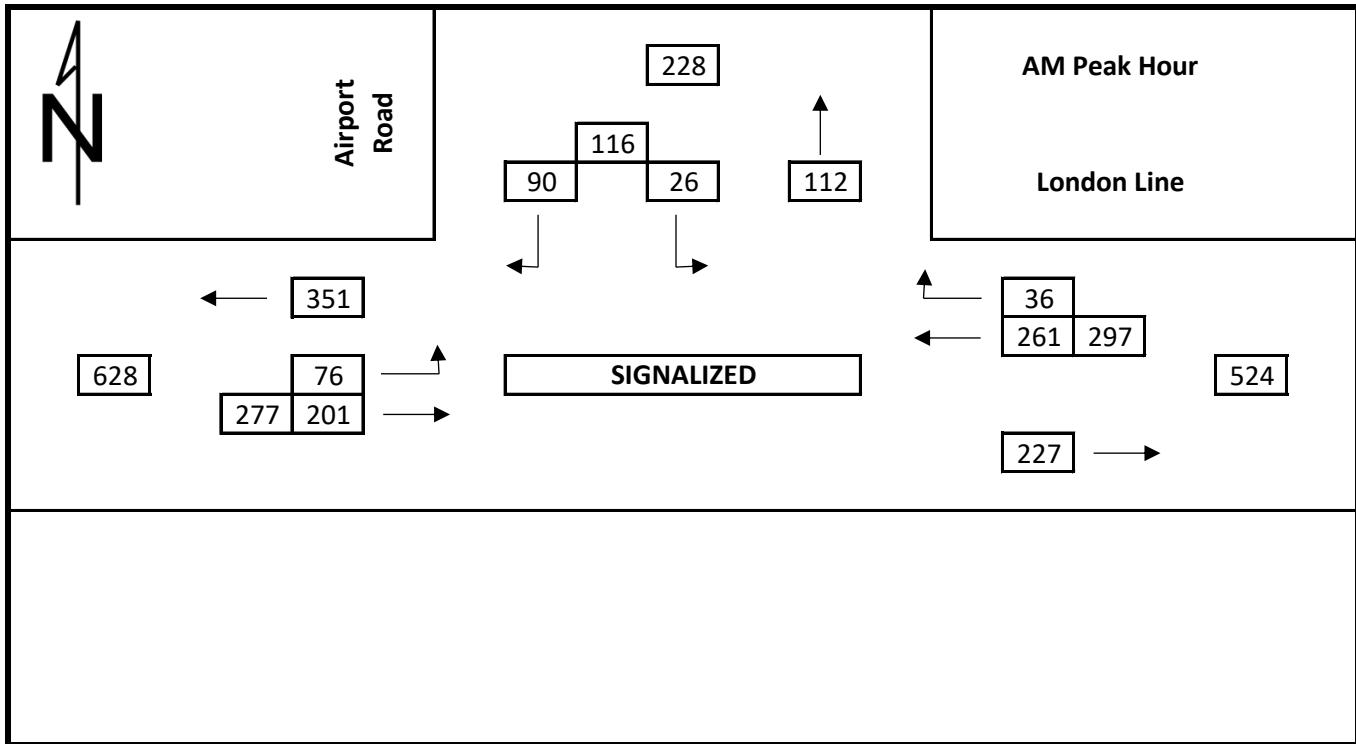
Background Traffic 2030
London Line (County Road 22) at Airport Road



Total Traffic 2025
London Line (County Road 22) at Airport Road



Total Traffic 2030
London Line (County Road 22) at Airport Road



Appendix D

DETAILED SYNCHRO RESULTS

**County Road 22 at
London Line (County Road 22) at
Blackwell Side Road
London Line (County Road 22) at
Garden Centre / Furniture Store
London Line (County Road 22) at
Site Access (Street A)
London Line (County Road 22) at
Airport Road**

London Line at Blackwell Side Road
Sarnia, Ontario

Existing Traffic, AM Peak
Existing Geometric Configuration

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	↑	↑↑		↑	↑↑			↔			↔	
Traffic Volume (vph)	38	209	64	17	308	8	105	25	36	3	28	52
Future Volume (vph)	38	209	64	17	308	8	105	25	36	3	28	52
Ideal Flow (vphpl)	1750	1750	1750	1750	1750	1750	1750	1750	1750	1750	1750	1750
Storage Length (m)	21.0		0.0	21.0		0.0	0.0		0.0	0.0		0.0
Storage Lanes	1		0	1		0	0		0	0		0
Taper Length (m)	27.0			26.0			7.5			7.5		
Lane Util. Factor	1.00	0.95	0.95	1.00	0.95	0.95	1.00	1.00	1.00	1.00	1.00	1.00
Fr _t		0.965			0.996			0.971			0.914	
Flt Protected	0.950			0.950			0.969			0.998		
Satd. Flow (prot)	1614	2813	0	1568	3100	0	0	1587	0	0	1541	0
Flt Permitted	0.545			0.570			0.755			0.986		
Satd. Flow (perm)	926	2813	0	941	3100	0	0	1236	0	0	1522	0
Right Turn on Red		Yes			Yes			Yes			Yes	
Satd. Flow (RTOR)	70			7			37			57		
Link Speed (k/h)	60			60			50			50		
Link Distance (m)	192.3			281.8			92.5			78.1		
Travel Time (s)	11.5			16.9			6.7			5.6		
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Heavy Vehicles (%)	3%	15%	11%	6%	7%	0%	2%	8%	6%	0%	7%	2%
Adj. Flow (vph)	41	227	70	18	335	9	114	27	39	3	30	57
Shared Lane Traffic (%)												
Lane Group Flow (vph)	41	297	0	18	344	0	0	180	0	0	90	0
Turn Type	Perm	NA										
Protected Phases	2			6			4			8		
Permitted Phases	2			6			4			8		
Detector Phase	2	2		6	6		4	4		8	8	
Switch Phase												
Minimum Initial (s)	5.0	5.0		5.0	5.0		5.0	5.0		5.0	5.0	
Minimum Split (s)	22.5	22.5		22.5	22.5		22.5	22.5		22.5	22.5	
Total Split (s)	22.5	22.5		22.5	22.5		22.5	22.5		22.5	22.5	
Total Split (%)	50.0%	50.0%		50.0%	50.0%		50.0%	50.0%		50.0%	50.0%	
Yellow Time (s)	3.5	3.5		3.5	3.5		3.5	3.5		3.5	3.5	
All-Red Time (s)	1.0	1.0		1.0	1.0		1.0	1.0		1.0	1.0	
Lost Time Adjust (s)	0.0	0.0		0.0	0.0		0.0			0.0		
Total Lost Time (s)	4.5	4.5		4.5	4.5		4.5			4.5		
Lead/Lag												
Lead-Lag Optimize?												
Recall Mode	Max	Max		Max	Max		None	None		None	None	
Act Effct Green (s)	22.7	22.7		22.7	22.7		9.7			9.7		
Actuated g/C Ratio	0.59	0.59		0.59	0.59		0.25			0.25		
v/c Ratio	0.07	0.18		0.03	0.19		0.53			0.21		
Control Delay	6.8	5.0		6.5	6.1		15.4			6.5		
Queue Delay	0.0	0.0		0.0	0.0		0.0			0.0		
Total Delay	6.8	5.0		6.5	6.1		15.4			6.5		
LOS	A	A		A	A		B			A		
Approach Delay		5.2			6.1		15.4			6.5		
Approach LOS		A			A		B			A		
Queue Length 50th (m)	1.2	3.5		0.5	5.4		7.6			1.6		

London Line at Blackwell Side Road
Sarnia, Ontario

Existing Traffic, AM Peak
Existing Geometric Configuration



Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Queue Length 95th (m)	5.7	10.6		3.2	14.1			19.5			8.0	
Internal Link Dist (m)			168.3			257.8			68.5			54.1
Turn Bay Length (m)	21.0			21.0								
Base Capacity (vph)	547	1690		556	1833			600			745	
Starvation Cap Reductn	0	0		0	0			0			0	
Spillback Cap Reductn	0	0		0	0			0			0	
Storage Cap Reductn	0	0		0	0			0			0	
Reduced v/c Ratio	0.07	0.18		0.03	0.19			0.30			0.12	

Intersection Summary

Area Type: Other

Cycle Length: 45

Actuated Cycle Length: 38.4

Natural Cycle: 45

Control Type: Actuated-Uncoordinated

Maximum v/c Ratio: 0.53

Intersection Signal Delay: 7.6

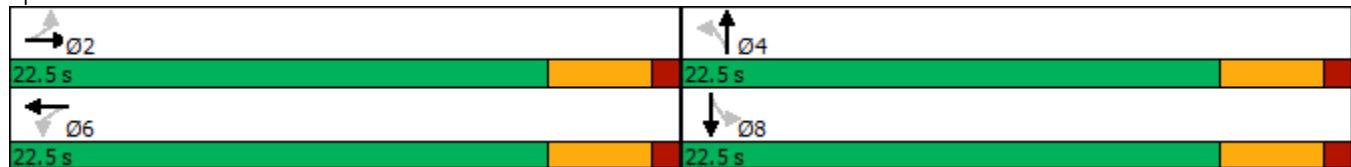
Intersection LOS: A

Intersection Capacity Utilization 41.7%

ICU Level of Service A

Analysis Period (min) 15

Splits and Phases: 3: Blackwell Side Road & London Line



London Line at Blackwell Side Road
Sarnia, Ontario

Existing Traffic, PM Peak
Existing Geometric Configuration

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	↑	↑↑		↑	↑↑			↔			↔	
Traffic Volume (vph)	74	520	101	30	270	17	81	32	43	22	22	45
Future Volume (vph)	74	520	101	30	270	17	81	32	43	22	22	45
Ideal Flow (vphpl)	1750	1750	1750	1750	1750	1750	1750	1750	1750	1750	1750	1750
Storage Length (m)	21.0		0.0	21.0		0.0	0.0		0.0	0.0		0.0
Storage Lanes	1		0	1		0	0		0	0		0
Taper Length (m)	27.0			26.0			7.5			7.5		
Lane Util. Factor	1.00	0.95	0.95	1.00	0.95	0.95	1.00	1.00	1.00	1.00	1.00	1.00
Fr _t		0.976			0.991			0.963			0.932	
Flt Protected	0.950			0.950			0.975			0.988		
Satd. Flow (prot)	1646	3140	0	1554	3205	0	0	1643	0	0	1576	0
Flt Permitted	0.563			0.395			0.786			0.906		
Satd. Flow (perm)	975	3140	0	646	3205	0	0	1325	0	0	1445	0
Right Turn on Red		Yes			Yes			Yes			Yes	
Satd. Flow (RTOR)	60			16			47			49		
Link Speed (k/h)	60			60			50			50		
Link Distance (m)	192.3			281.8			92.5			78.1		
Travel Time (s)	11.5			16.9			6.7			5.6		
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Heavy Vehicles (%)	1%	4%	0%	7%	3%	0%	0%	0%	0%	9%	0%	0%
Adj. Flow (vph)	80	565	110	33	293	18	88	35	47	24	24	49
Shared Lane Traffic (%)												
Lane Group Flow (vph)	80	675	0	33	311	0	0	170	0	0	97	0
Turn Type	Perm	NA										
Protected Phases	2				6			4			8	
Permitted Phases	2			6			4			8		
Detector Phase	2	2		6	6		4	4		8	8	
Switch Phase												
Minimum Initial (s)	5.0	5.0		5.0	5.0		5.0	5.0		5.0	5.0	
Minimum Split (s)	22.5	22.5		22.5	22.5		22.5	22.5		22.5	22.5	
Total Split (s)	22.5	22.5		22.5	22.5		22.5	22.5		22.5	22.5	
Total Split (%)	50.0%	50.0%		50.0%	50.0%		50.0%	50.0%		50.0%	50.0%	
Yellow Time (s)	3.5	3.5		3.5	3.5		3.5	3.5		3.5	3.5	
All-Red Time (s)	1.0	1.0		1.0	1.0		1.0	1.0		1.0	1.0	
Lost Time Adjust (s)	0.0	0.0		0.0	0.0		0.0			0.0		
Total Lost Time (s)	4.5	4.5		4.5	4.5		4.5			4.5		
Lead/Lag												
Lead-Lag Optimize?												
Recall Mode	Max	Max		Max	Max		None	None		None	None	
Act Effct Green (s)	22.6	22.6		22.6	22.6			8.8			8.8	
Actuated g/C Ratio	0.60	0.60		0.60	0.60		0.23			0.23		
v/c Ratio	0.14	0.35		0.08	0.16		0.49			0.26		
Control Delay	6.6	5.9		6.6	5.3		13.8			8.1		
Queue Delay	0.0	0.0		0.0	0.0		0.0			0.0		
Total Delay	6.6	5.9		6.6	5.3		13.8			8.1		
LOS	A	A		A	A		B			A		
Approach Delay		6.0			5.4		13.8			8.1		
Approach LOS		A			A		B			A		
Queue Length 50th (m)	2.2	10.2		0.9	4.3		6.3			2.3		

London Line at Blackwell Side Road
Sarnia, Ontario

Existing Traffic, PM Peak
Existing Geometric Configuration



Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Queue Length 95th (m)	8.9	24.1		4.8	11.3			17.3			9.4	
Internal Link Dist (m)			168.3		257.8			68.5			54.1	
Turn Bay Length (m)	21.0			21.0								
Base Capacity (vph)	587	1915		389	1937			661			720	
Starvation Cap Reductn	0	0		0	0			0			0	
Spillback Cap Reductn	0	0		0	0			0			0	
Storage Cap Reductn	0	0		0	0			0			0	
Reduced v/c Ratio	0.14	0.35		0.08	0.16			0.26			0.13	

Intersection Summary

Area Type: Other

Cycle Length: 45

Actuated Cycle Length: 37.5

Natural Cycle: 45

Control Type: Actuated-Uncoordinated

Maximum v/c Ratio: 0.49

Intersection Signal Delay: 7.0

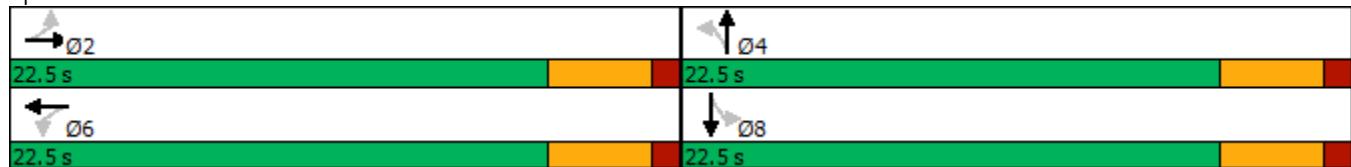
Intersection LOS: A

Intersection Capacity Utilization 50.7%

ICU Level of Service A

Analysis Period (min) 15

Splits and Phases: 3: Blackwell Side Road & London Line



London Line at Blackwell Side Road
Sarnia, Ontario

Background Traffic 2025, AM Peak
Existing Geometric Configuration

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	↑	↑↑		↑	↑↑			↔			↔	
Traffic Volume (vph)	40	222	68	18	327	8	111	27	38	3	30	55
Future Volume (vph)	40	222	68	18	327	8	111	27	38	3	30	55
Ideal Flow (vphpl)	1750	1750	1750	1750	1750	1750	1750	1750	1750	1750	1750	1750
Storage Length (m)	21.0		0.0	21.0		0.0	0.0		0.0	0.0		0.0
Storage Lanes	1		0	1		0	0		0	0		0
Taper Length (m)	27.0			26.0			7.5			7.5		
Lane Util. Factor	1.00	0.95	0.95	1.00	0.95	0.95	1.00	1.00	1.00	1.00	1.00	1.00
Fr _t		0.965			0.996			0.971			0.916	
Flt Protected	0.950			0.950			0.969			0.998		
Satd. Flow (prot)	1614	2813	0	1568	3100	0	0	1587	0	0	1543	0
Flt Permitted	0.535			0.561			0.751			0.987		
Satd. Flow (perm)	909	2813	0	926	3100	0	0	1230	0	0	1526	0
Right Turn on Red		Yes			Yes			Yes			Yes	
Satd. Flow (RTOR)	74			7			36			60		
Link Speed (k/h)	60			60			50			50		
Link Distance (m)	192.3			281.8			92.5			78.1		
Travel Time (s)	11.5			16.9			6.7			5.6		
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Heavy Vehicles (%)	3%	15%	11%	6%	7%	0%	2%	8%	6%	0%	7%	2%
Adj. Flow (vph)	43	241	74	20	355	9	121	29	41	3	33	60
Shared Lane Traffic (%)												
Lane Group Flow (vph)	43	315	0	20	364	0	0	191	0	0	96	0
Turn Type	Perm	NA										
Protected Phases	2			6			4			8		
Permitted Phases	2			6			4			8		
Detector Phase	2	2		6	6		4	4		8	8	
Switch Phase												
Minimum Initial (s)	5.0	5.0		5.0	5.0		5.0	5.0		5.0	5.0	
Minimum Split (s)	22.5	22.5		22.5	22.5		22.5	22.5		22.5	22.5	
Total Split (s)	22.5	22.5		22.5	22.5		22.5	22.5		22.5	22.5	
Total Split (%)	50.0%	50.0%		50.0%	50.0%		50.0%	50.0%		50.0%	50.0%	
Yellow Time (s)	3.5	3.5		3.5	3.5		3.5	3.5		3.5	3.5	
All-Red Time (s)	1.0	1.0		1.0	1.0		1.0	1.0		1.0	1.0	
Lost Time Adjust (s)	0.0	0.0		0.0	0.0		0.0			0.0		
Total Lost Time (s)	4.5	4.5		4.5	4.5		4.5			4.5		
Lead/Lag												
Lead-Lag Optimize?												
Recall Mode	Max	Max		Max	Max		None	None		None	None	
Act Effct Green (s)	22.5	22.5		22.5	22.5		10.0			10.0		
Actuated g/C Ratio	0.58	0.58		0.58	0.58		0.26			0.26		
v/c Ratio	0.08	0.19		0.04	0.20		0.55			0.22		
Control Delay	7.1	5.2		6.8	6.4		15.8			6.4		
Queue Delay	0.0	0.0		0.0	0.0		0.0			0.0		
Total Delay	7.1	5.2		6.8	6.4		15.8			6.4		
LOS	A	A		A	A		B			A		
Approach Delay		5.5			6.4		15.8			6.4		
Approach LOS		A			A		B			A		
Queue Length 50th (m)	1.3	3.9		0.6	6.0		8.3			1.7		

London Line at Blackwell Side Road
Sarnia, Ontario

Background Traffic 2025, AM Peak
Existing Geometric Configuration



Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Queue Length 95th (m)	6.2	11.6		3.6	15.5			20.8			8.4	
Internal Link Dist (m)			168.3			257.8			68.5			54.1
Turn Bay Length (m)	21.0			21.0								
Base Capacity (vph)	530	1671		540	1811			596			747	
Starvation Cap Reductn	0	0		0	0			0			0	
Spillback Cap Reductn	0	0		0	0			0			0	
Storage Cap Reductn	0	0		0	0			0			0	
Reduced v/c Ratio	0.08	0.19		0.04	0.20			0.32			0.13	

Intersection Summary

Area Type: Other

Cycle Length: 45

Actuated Cycle Length: 38.5

Natural Cycle: 45

Control Type: Actuated-Uncoordinated

Maximum v/c Ratio: 0.55

Intersection Signal Delay: 7.8

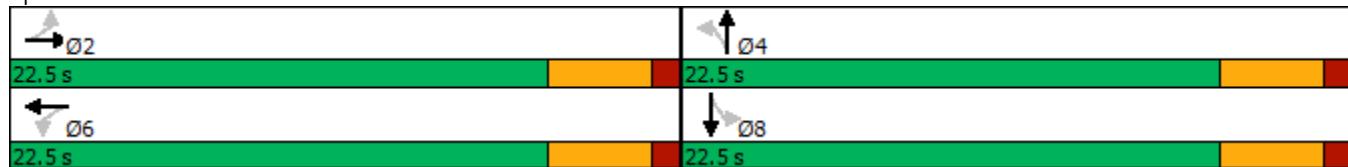
Intersection LOS: A

Intersection Capacity Utilization 42.9%

ICU Level of Service A

Analysis Period (min) 15

Splits and Phases: 3: Blackwell Side Road & London Line



London Line at Blackwell Side Road
Sarnia, Ontario

Background Traffic 2025, PM Peak
Existing Geometric Configuration

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	↑	↑↑		↑	↑↑			↔			↔	
Traffic Volume (vph)	79	552	107	32	287	18	86	34	46	23	23	48
Future Volume (vph)	79	552	107	32	287	18	86	34	46	23	23	48
Ideal Flow (vphpl)	1750	1750	1750	1750	1750	1750	1750	1750	1750	1750	1750	1750
Storage Length (m)	21.0		0.0	21.0		0.0	0.0		0.0	0.0		0.0
Storage Lanes	1		0	1		0	0		0	0		0
Taper Length (m)	27.0			26.0			7.5			7.5		
Lane Util. Factor	1.00	0.95	0.95	1.00	0.95	0.95	1.00	1.00	1.00	1.00	1.00	1.00
Fr _t		0.976			0.991			0.962			0.931	
Flt Protected	0.950			0.950			0.975			0.988		
Satd. Flow (prot)	1646	3140	0	1554	3205	0	0	1641	0	0	1575	0
Flt Permitted	0.551			0.379			0.784			0.908		
Satd. Flow (perm)	955	3140	0	620	3205	0	0	1320	0	0	1447	0
Right Turn on Red		Yes			Yes			Yes			Yes	
Satd. Flow (RTOR)	59			17			50			52		
Link Speed (k/h)	60			60			50			50		
Link Distance (m)	192.3			281.8			92.5			78.1		
Travel Time (s)	11.5			16.9			6.7			5.6		
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Heavy Vehicles (%)	1%	4%	0%	7%	3%	0%	0%	0%	0%	9%	0%	0%
Adj. Flow (vph)	86	600	116	35	312	20	93	37	50	25	25	52
Shared Lane Traffic (%)												
Lane Group Flow (vph)	86	716	0	35	332	0	0	180	0	0	102	0
Turn Type	Perm	NA										
Protected Phases	2				6			4			8	
Permitted Phases	2			6			4			8		
Detector Phase	2	2		6	6		4	4		8	8	
Switch Phase												
Minimum Initial (s)	5.0	5.0		5.0	5.0		5.0	5.0		5.0	5.0	
Minimum Split (s)	22.5	22.5		22.5	22.5		22.5	22.5		22.5	22.5	
Total Split (s)	22.5	22.5		22.5	22.5		22.5	22.5		22.5	22.5	
Total Split (%)	50.0%	50.0%		50.0%	50.0%		50.0%	50.0%		50.0%	50.0%	
Yellow Time (s)	3.5	3.5		3.5	3.5		3.5	3.5		3.5	3.5	
All-Red Time (s)	1.0	1.0		1.0	1.0		1.0	1.0		1.0	1.0	
Lost Time Adjust (s)	0.0	0.0		0.0	0.0			0.0			0.0	
Total Lost Time (s)	4.5	4.5		4.5	4.5		4.5	4.5		4.5	4.5	
Lead/Lag												
Lead-Lag Optimize?												
Recall Mode	Max	Max		Max	Max		None	None		None	None	
Act Effct Green (s)	22.4	22.4		22.4	22.4			9.0			9.0	
Actuated g/C Ratio	0.60	0.60		0.60	0.60			0.24			0.24	
v/c Ratio	0.15	0.38		0.09	0.17			0.51			0.26	
Control Delay	6.9	6.2		6.9	5.5			13.9			8.0	
Queue Delay	0.0	0.0		0.0	0.0			0.0			0.0	
Total Delay	6.9	6.2		6.9	5.5			13.9			8.0	
LOS	A	A		A	A			B			A	
Approach Delay		6.3			5.6			13.9			8.0	
Approach LOS		A			A			B			A	
Queue Length 50th (m)	2.5	11.4		1.0	4.7			6.7			2.4	

London Line at Blackwell Side Road
Sarnia, Ontario

Background Traffic 2025, PM Peak
Existing Geometric Configuration



Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Queue Length 95th (m)	9.7	26.7		5.1	12.4			18.2			9.7	
Internal Link Dist (m)			168.3			257.8			68.5			54.1
Turn Bay Length (m)	21.0			21.0								
Base Capacity (vph)	570	1898		370	1920			660			722	
Starvation Cap Reductn	0	0		0	0			0			0	
Spillback Cap Reductn	0	0		0	0			0			0	
Storage Cap Reductn	0	0		0	0			0			0	
Reduced v/c Ratio	0.15	0.38		0.09	0.17			0.27			0.14	

Intersection Summary

Area Type: Other

Cycle Length: 45

Actuated Cycle Length: 37.5

Natural Cycle: 45

Control Type: Actuated-Uncoordinated

Maximum v/c Ratio: 0.51

Intersection Signal Delay: 7.2

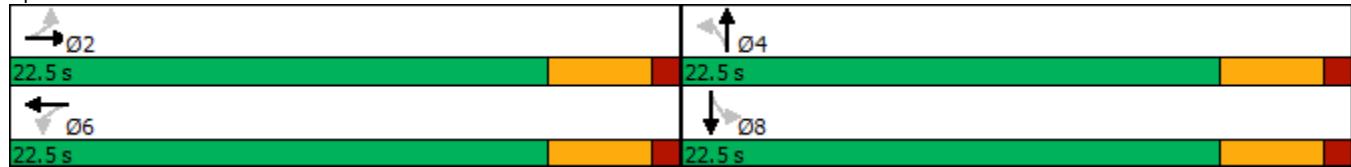
Intersection LOS: A

Intersection Capacity Utilization 52.5%

ICU Level of Service A

Analysis Period (min) 15

Splits and Phases: 3: Blackwell Side Road & London Line



London Line at Blackwell Side Road
Sarnia, Ontario

Total Traffic 2025, AM Peak
Existing Geometric Configuration

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	↑	↑↑		↑	↑↑			↔			↔	
Traffic Volume (vph)	40	233	68	21	377	9	111	27	40	3	30	55
Future Volume (vph)	40	233	68	21	377	9	111	27	40	3	30	55
Ideal Flow (vphpl)	1750	1750	1750	1750	1750	1750	1750	1750	1750	1750	1750	1750
Storage Length (m)	21.0		0.0	21.0		0.0	0.0		0.0	0.0		0.0
Storage Lanes	1		0	1		0	0		0	0		0
Taper Length (m)	27.0			26.0			7.5			7.5		
Lane Util. Factor	1.00	0.95	0.95	1.00	0.95	0.95	1.00	1.00	1.00	1.00	1.00	1.00
Fr _t		0.966			0.996			0.970			0.916	
Flt Protected	0.950			0.950			0.970			0.998		
Satd. Flow (prot)	1614	2815	0	1568	3100	0	0	1586	0	0	1543	0
Flt Permitted	0.506			0.554			0.753			0.987		
Satd. Flow (perm)	860	2815	0	915	3100	0	0	1232	0	0	1526	0
Right Turn on Red		Yes			Yes			Yes			Yes	
Satd. Flow (RTOR)	74			6			38			60		
Link Speed (k/h)	60			60			50			50		
Link Distance (m)	192.3			281.8			92.5			78.1		
Travel Time (s)	11.5			16.9			6.7			5.6		
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Heavy Vehicles (%)	3%	15%	11%	6%	7%	0%	2%	8%	6%	0%	7%	2%
Adj. Flow (vph)	43	253	74	23	410	10	121	29	43	3	33	60
Shared Lane Traffic (%)												
Lane Group Flow (vph)	43	327	0	23	420	0	0	193	0	0	96	0
Turn Type	Perm	NA										
Protected Phases	2				6			4			8	
Permitted Phases	2			6			4			8		
Detector Phase	2	2		6	6		4	4		8	8	
Switch Phase												
Minimum Initial (s)	5.0	5.0		5.0	5.0		5.0	5.0		5.0	5.0	
Minimum Split (s)	22.5	22.5		22.5	22.5		22.5	22.5		22.5	22.5	
Total Split (s)	22.5	22.5		22.5	22.5		22.5	22.5		22.5	22.5	
Total Split (%)	50.0%	50.0%		50.0%	50.0%		50.0%	50.0%		50.0%	50.0%	
Yellow Time (s)	3.5	3.5		3.5	3.5		3.5	3.5		3.5	3.5	
All-Red Time (s)	1.0	1.0		1.0	1.0		1.0	1.0		1.0	1.0	
Lost Time Adjust (s)	0.0	0.0		0.0	0.0			0.0			0.0	
Total Lost Time (s)	4.5	4.5		4.5	4.5		4.5	4.5		4.5	4.5	
Lead/Lag												
Lead-Lag Optimize?												
Recall Mode	Max	Max		Max	Max		None	None		None	None	
Act Effct Green (s)	22.4	22.4		22.4	22.4			10.0			10.0	
Actuated g/C Ratio	0.58	0.58		0.58	0.58			0.26			0.26	
v/c Ratio	0.09	0.20		0.04	0.23			0.55			0.22	
Control Delay	7.2	5.3		6.9	6.5			15.7			6.4	
Queue Delay	0.0	0.0		0.0	0.0			0.0			0.0	
Total Delay	7.2	5.3		6.9	6.5			15.7			6.4	
LOS	A	A		A	A			B			A	
Approach Delay		5.5			6.5			15.7			6.4	
Approach LOS		A			A			B			A	
Queue Length 50th (m)	1.3	4.1		0.7	7.1			8.3			1.7	

London Line at Blackwell Side Road
Sarnia, Ontario

Total Traffic 2025, AM Peak
Existing Geometric Configuration



Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Queue Length 95th (m)	6.3	12.2		3.9	17.9			20.8			8.4	
Internal Link Dist (m)			168.3		257.8			68.5			54.1	
Turn Bay Length (m)	21.0			21.0								
Base Capacity (vph)	501	1671		533	1809			598			748	
Starvation Cap Reductn	0	0		0	0			0			0	
Spillback Cap Reductn	0	0		0	0			0			0	
Storage Cap Reductn	0	0		0	0			0			0	
Reduced v/c Ratio	0.09	0.20		0.04	0.23			0.32			0.13	

Intersection Summary

Area Type: Other

Cycle Length: 45

Actuated Cycle Length: 38.5

Natural Cycle: 45

Control Type: Actuated-Uncoordinated

Maximum v/c Ratio: 0.55

Intersection Signal Delay: 7.8

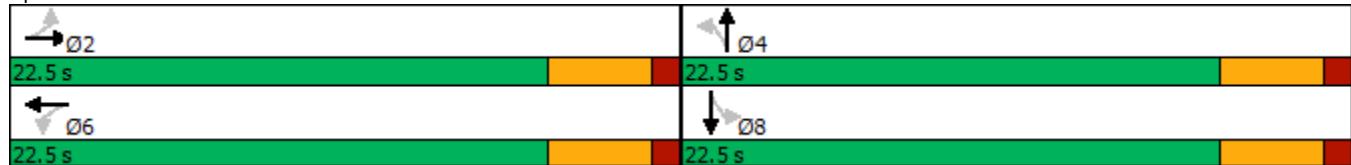
Intersection LOS: A

Intersection Capacity Utilization 44.6%

ICU Level of Service A

Analysis Period (min) 15

Splits and Phases: 3: Blackwell Side Road & London Line



London Line at Blackwell Side Road
Sarnia, Ontario

Total Traffic 2025, PM Peak
Existing Geometric Configuration

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	↑	↑↑		↑	↑↑			↔			↔	
Traffic Volume (vph)	79	613	107	34	306	19	86	34	51	26	23	48
Future Volume (vph)	79	613	107	34	306	19	86	34	51	26	23	48
Ideal Flow (vphpl)	1750	1750	1750	1750	1750	1750	1750	1750	1750	1750	1750	1750
Storage Length (m)	21.0		0.0	21.0		0.0	0.0		0.0	0.0		0.0
Storage Lanes	1		0	1		0	0		0	0		0
Taper Length (m)	27.0			26.0			7.5			7.5		
Lane Util. Factor	1.00	0.95	0.95	1.00	0.95	0.95	1.00	1.00	1.00	1.00	1.00	1.00
Fr _t		0.978			0.991			0.960			0.933	
Flt Protected	0.950			0.950			0.975			0.987		
Satd. Flow (prot)	1646	3145	0	1554	3205	0	0	1638	0	0	1574	0
Flt Permitted	0.540			0.347			0.787			0.900		
Satd. Flow (perm)	936	3145	0	568	3205	0	0	1322	0	0	1435	0
Right Turn on Red		Yes			Yes			Yes			Yes	
Satd. Flow (RTOR)	52			17			55			52		
Link Speed (k/h)	60			60			50			50		
Link Distance (m)	192.3			281.8			92.5			78.1		
Travel Time (s)	11.5			16.9			6.7			5.6		
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Heavy Vehicles (%)	1%	4%	0%	7%	3%	0%	0%	0%	0%	9%	0%	0%
Adj. Flow (vph)	86	666	116	37	333	21	93	37	55	28	25	52
Shared Lane Traffic (%)												
Lane Group Flow (vph)	86	782	0	37	354	0	0	185	0	0	105	0
Turn Type	Perm	NA										
Protected Phases	2				6			4			8	
Permitted Phases	2			6			4			8		
Detector Phase	2	2		6	6		4	4		8	8	
Switch Phase												
Minimum Initial (s)	5.0	5.0		5.0	5.0		5.0	5.0		5.0	5.0	
Minimum Split (s)	22.5	22.5		22.5	22.5		22.5	22.5		22.5	22.5	
Total Split (s)	22.5	22.5		22.5	22.5		22.5	22.5		22.5	22.5	
Total Split (%)	50.0%	50.0%		50.0%	50.0%		50.0%	50.0%		50.0%	50.0%	
Yellow Time (s)	3.5	3.5		3.5	3.5		3.5	3.5		3.5	3.5	
All-Red Time (s)	1.0	1.0		1.0	1.0		1.0	1.0		1.0	1.0	
Lost Time Adjust (s)	0.0	0.0		0.0	0.0			0.0			0.0	
Total Lost Time (s)	4.5	4.5		4.5	4.5		4.5	4.5		4.5	4.5	
Lead/Lag												
Lead-Lag Optimize?												
Recall Mode	Max	Max		Max	Max		None	None		None	None	
Act Effct Green (s)	22.3	22.3		22.3	22.3			9.0			9.0	
Actuated g/C Ratio	0.60	0.60		0.60	0.60			0.24			0.24	
v/c Ratio	0.15	0.41		0.11	0.18			0.52			0.27	
Control Delay	7.0	6.6		7.2	5.5			13.8			8.2	
Queue Delay	0.0	0.0		0.0	0.0			0.0			0.0	
Total Delay	7.0	6.6		7.2	5.5			13.8			8.2	
LOS	A	A		A	A			B			A	
Approach Delay		6.6			5.7			13.8			8.2	
Approach LOS		A			A			B			A	
Queue Length 50th (m)	2.5	13.0		1.0	5.1			6.7			2.6	

London Line at Blackwell Side Road
Sarnia, Ontario

Total Traffic 2025, PM Peak
Existing Geometric Configuration



Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Queue Length 95th (m)	9.8	30.4		5.5	13.3			18.3			10.0	
Internal Link Dist (m)			168.3		257.8			68.5			54.1	
Turn Bay Length (m)	21.0			21.0								
Base Capacity (vph)	557	1894		338	1915			665			718	
Starvation Cap Reductn	0	0		0	0			0			0	
Spillback Cap Reductn	0	0		0	0			0			0	
Storage Cap Reductn	0	0		0	0			0			0	
Reduced v/c Ratio	0.15	0.41		0.11	0.18			0.28			0.15	

Intersection Summary

Area Type: Other

Cycle Length: 45

Actuated Cycle Length: 37.4

Natural Cycle: 45

Control Type: Actuated-Uncoordinated

Maximum v/c Ratio: 0.52

Intersection Signal Delay: 7.4

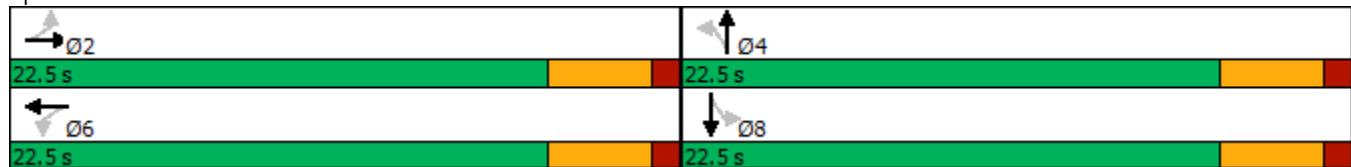
Intersection LOS: A

Intersection Capacity Utilization 54.7%

ICU Level of Service A

Analysis Period (min) 15

Splits and Phases: 3: Blackwell Side Road & London Line



London Line at Blackwell Side Road
Sarnia, Ontario

Background Traffic 2030, AM Peak
Existing Geometric Configuration

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	↑	↑↑		↑	↑↑			↔			↔	
Traffic Volume (vph)	42	233	71	19	344	9	117	28	40	3	31	58
Future Volume (vph)	42	233	71	19	344	9	117	28	40	3	31	58
Ideal Flow (vphpl)	1750	1750	1750	1750	1750	1750	1750	1750	1750	1750	1750	1750
Storage Length (m)	21.0		0.0	21.0		0.0	0.0		0.0	0.0		0.0
Storage Lanes	1		0	1		0	0		0	0		0
Taper Length (m)	27.0			26.0			7.5			7.5		
Lane Util. Factor	1.00	0.95	0.95	1.00	0.95	0.95	1.00	1.00	1.00	1.00	1.00	1.00
Fr _t		0.965			0.996			0.971			0.915	
Flt Protected	0.950			0.950			0.969			0.999		
Satd. Flow (prot)	1614	2813	0	1568	3100	0	0	1587	0	0	1543	0
Flt Permitted	0.524			0.553			0.748			0.988		
Satd. Flow (perm)	890	2813	0	913	3100	0	0	1225	0	0	1526	0
Right Turn on Red		Yes			Yes			Yes			Yes	
Satd. Flow (RTOR)	77			7			37			63		
Link Speed (k/h)	60			60			50			50		
Link Distance (m)	192.3			281.8			92.5			78.1		
Travel Time (s)	11.5			16.9			6.7			5.6		
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Heavy Vehicles (%)	3%	15%	11%	6%	7%	0%	2%	8%	6%	0%	7%	2%
Adj. Flow (vph)	46	253	77	21	374	10	127	30	43	3	34	63
Shared Lane Traffic (%)												
Lane Group Flow (vph)	46	330	0	21	384	0	0	200	0	0	100	0
Turn Type	Perm	NA										
Protected Phases	2				6			4			8	
Permitted Phases	2			6			4			8		
Detector Phase	2	2		6	6		4	4		8	8	
Switch Phase												
Minimum Initial (s)	5.0	5.0		5.0	5.0		5.0	5.0		5.0	5.0	
Minimum Split (s)	22.5	22.5		22.5	22.5		22.5	22.5		22.5	22.5	
Total Split (s)	22.5	22.5		22.5	22.5		22.5	22.5		22.5	22.5	
Total Split (%)	50.0%	50.0%		50.0%	50.0%		50.0%	50.0%		50.0%	50.0%	
Yellow Time (s)	3.5	3.5		3.5	3.5		3.5	3.5		3.5	3.5	
All-Red Time (s)	1.0	1.0		1.0	1.0		1.0	1.0		1.0	1.0	
Lost Time Adjust (s)	0.0	0.0		0.0	0.0		0.0			0.0		
Total Lost Time (s)	4.5	4.5		4.5	4.5		4.5			4.5		
Lead/Lag												
Lead-Lag Optimize?												
Recall Mode	Max	Max		Max	Max		None	None		None	None	
Act Effct Green (s)	22.3	22.3		22.3	22.3			10.3			10.3	
Actuated g/C Ratio	0.58	0.58		0.58	0.58			0.27			0.27	
v/c Ratio	0.09	0.20		0.04	0.21			0.57			0.22	
Control Delay	7.4	5.4		7.1	6.6			16.0			6.3	
Queue Delay	0.0	0.0		0.0	0.0			0.0			0.0	
Total Delay	7.4	5.4		7.1	6.6			16.0			6.3	
LOS	A	A		A	A			B			A	
Approach Delay		5.7			6.6			16.0			6.3	
Approach LOS		A			A			B			A	
Queue Length 50th (m)	1.4	4.2		0.6	6.5			8.8			1.8	

London Line at Blackwell Side Road
Sarnia, Ontario

Background Traffic 2030, AM Peak
Existing Geometric Configuration



Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Queue Length 95th (m)	6.7	12.5		3.8	16.8			21.7			8.5	
Internal Link Dist (m)			168.3			257.8			68.5			54.1
Turn Bay Length (m)	21.0			21.0								
Base Capacity (vph)	513	1657		527	1793			593			747	
Starvation Cap Reductn	0	0		0	0			0			0	
Spillback Cap Reductn	0	0		0	0			0			0	
Storage Cap Reductn	0	0		0	0			0			0	
Reduced v/c Ratio	0.09	0.20		0.04	0.21			0.34			0.13	

Intersection Summary

Area Type: Other

Cycle Length: 45

Actuated Cycle Length: 38.6

Natural Cycle: 45

Control Type: Actuated-Uncoordinated

Maximum v/c Ratio: 0.57

Intersection Signal Delay: 8.0

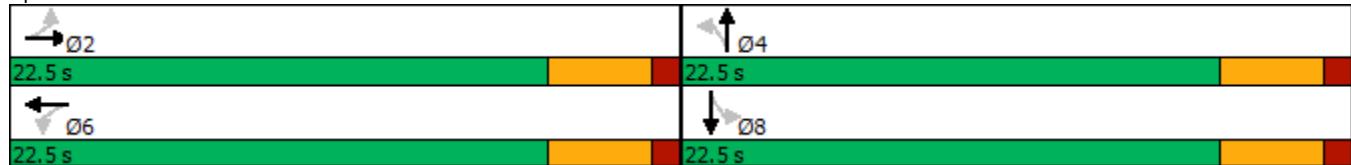
Intersection LOS: A

Intersection Capacity Utilization 44.0%

ICU Level of Service A

Analysis Period (min) 15

Splits and Phases: 3: Blackwell Side Road & London Line



London Line at Blackwell Side Road
Sarnia, Ontario

Background Traffic 2030, PM Peak
Existing Geometric Configuration

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	↑	↑↑		↑	↑↑			↔			↔	
Traffic Volume (vph)	83	580	113	33	301	19	90	36	48	25	25	50
Future Volume (vph)	83	580	113	33	301	19	90	36	48	25	25	50
Ideal Flow (vphpl)	1750	1750	1750	1750	1750	1750	1750	1750	1750	1750	1750	1750
Storage Length (m)	21.0		0.0	21.0		0.0	0.0		0.0	0.0		0.0
Storage Lanes	1		0	1		0	0		0	0		0
Taper Length (m)	27.0			26.0			7.5			7.5		
Lane Util. Factor	1.00	0.95	0.95	1.00	0.95	0.95	1.00	1.00	1.00	1.00	1.00	1.00
Fr _t		0.975			0.991			0.963			0.932	
Flt Protected	0.950			0.950			0.975			0.988		
Satd. Flow (prot)	1646	3137	0	1554	3205	0	0	1643	0	0	1576	0
Flt Permitted	0.543			0.360			0.780			0.905		
Satd. Flow (perm)	941	3137	0	589	3205	0	0	1314	0	0	1444	0
Right Turn on Red		Yes			Yes			Yes			Yes	
Satd. Flow (RTOR)	60			17			51			54		
Link Speed (k/h)	60			60			50			50		
Link Distance (m)	192.3			281.8			92.5			78.1		
Travel Time (s)	11.5			16.9			6.7			5.6		
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Heavy Vehicles (%)	1%	4%	0%	7%	3%	0%	0%	0%	0%	9%	0%	0%
Adj. Flow (vph)	90	630	123	36	327	21	98	39	52	27	27	54
Shared Lane Traffic (%)												
Lane Group Flow (vph)	90	753	0	36	348	0	0	189	0	0	108	0
Turn Type	Perm	NA										
Protected Phases	2				6			4			8	
Permitted Phases	2			6			4			8		
Detector Phase	2	2		6	6		4	4		8	8	
Switch Phase												
Minimum Initial (s)	5.0	5.0		5.0	5.0		5.0	5.0		5.0	5.0	
Minimum Split (s)	22.5	22.5		22.5	22.5		22.5	22.5		22.5	22.5	
Total Split (s)	22.5	22.5		22.5	22.5		22.5	22.5		22.5	22.5	
Total Split (%)	50.0%	50.0%		50.0%	50.0%		50.0%	50.0%		50.0%	50.0%	
Yellow Time (s)	3.5	3.5		3.5	3.5		3.5	3.5		3.5	3.5	
All-Red Time (s)	1.0	1.0		1.0	1.0		1.0	1.0		1.0	1.0	
Lost Time Adjust (s)	0.0	0.0		0.0	0.0			0.0			0.0	
Total Lost Time (s)	4.5	4.5		4.5	4.5		4.5	4.5		4.5	4.5	
Lead/Lag												
Lead-Lag Optimize?												
Recall Mode	Max	Max		Max	Max		None	None		None	None	
Act Effct Green (s)	22.2	22.2		22.2	22.2			9.3			9.3	
Actuated g/C Ratio	0.59	0.59		0.59	0.59			0.25			0.25	
v/c Ratio	0.16	0.40		0.10	0.18			0.52			0.27	
Control Delay	7.2	6.6		7.2	5.7			14.1			8.0	
Queue Delay	0.0	0.0		0.0	0.0			0.0			0.0	
Total Delay	7.2	6.6		7.2	5.7			14.1			8.0	
LOS	A	A		A	A			B			A	
Approach Delay		6.7			5.8			14.1			8.0	
Approach LOS		A			A			B			A	
Queue Length 50th (m)	2.7	12.4		1.0	5.1			7.2			2.6	

London Line at Blackwell Side Road
Sarnia, Ontario

Background Traffic 2030, PM Peak
Existing Geometric Configuration



Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Queue Length 95th (m)	10.4	29.5		5.5	13.4			19.0			10.0	
Internal Link Dist (m)			168.3		257.8			68.5			54.1	
Turn Bay Length (m)	21.0			21.0								
Base Capacity (vph)	556	1879		348	1902			657			721	
Starvation Cap Reductn	0	0		0	0			0			0	
Spillback Cap Reductn	0	0		0	0			0			0	
Storage Cap Reductn	0	0		0	0			0			0	
Reduced v/c Ratio	0.16	0.40		0.10	0.18			0.29			0.15	

Intersection Summary

Area Type: Other

Cycle Length: 45

Actuated Cycle Length: 37.6

Natural Cycle: 45

Control Type: Actuated-Uncoordinated

Maximum v/c Ratio: 0.52

Intersection Signal Delay: 7.5

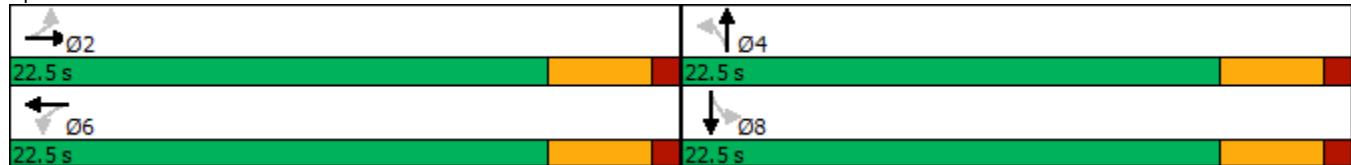
Intersection LOS: A

Intersection Capacity Utilization 54.1%

ICU Level of Service A

Analysis Period (min) 15

Splits and Phases: 3: Blackwell Side Road & London Line



London Line at Blackwell Side Road
Sarnia, Ontario

Total Traffic 2030, AM Peak
Existing Geometric Configuration

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	↑	↑↑		↑	↑↑			↔			↔	
Traffic Volume (vph)	42	244	71	22	394	10	117	28	42	3	31	58
Future Volume (vph)	42	244	71	22	394	10	117	28	42	3	31	58
Ideal Flow (vphpl)	1750	1750	1750	1750	1750	1750	1750	1750	1750	1750	1750	1750
Storage Length (m)	21.0		0.0	21.0		0.0	0.0		0.0	0.0		0.0
Storage Lanes	1		0	1		0	0		0	0		0
Taper Length (m)	27.0			26.0			7.5			7.5		
Lane Util. Factor	1.00	0.95	0.95	1.00	0.95	0.95	1.00	1.00	1.00	1.00	1.00	1.00
Fr _t		0.966			0.996			0.969			0.915	
Flt Protected	0.950			0.950			0.970			0.999		
Satd. Flow (prot)	1614	2815	0	1568	3100	0	0	1585	0	0	1543	0
Flt Permitted	0.497			0.546			0.751			0.988		
Satd. Flow (perm)	844	2815	0	901	3100	0	0	1227	0	0	1526	0
Right Turn on Red		Yes			Yes			Yes			Yes	
Satd. Flow (RTOR)	77			7			39			63		
Link Speed (k/h)	60			60			50			50		
Link Distance (m)	192.3			281.8			92.5			78.1		
Travel Time (s)	11.5			16.9			6.7			5.6		
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Heavy Vehicles (%)	3%	15%	11%	6%	7%	0%	2%	8%	6%	0%	7%	2%
Adj. Flow (vph)	46	265	77	24	428	11	127	30	46	3	34	63
Shared Lane Traffic (%)												
Lane Group Flow (vph)	46	342	0	24	439	0	0	203	0	0	100	0
Turn Type	Perm	NA										
Protected Phases	2			6			4			8		
Permitted Phases	2			6			4			8		
Detector Phase	2	2		6	6		4	4		8	8	
Switch Phase												
Minimum Initial (s)	5.0	5.0		5.0	5.0		5.0	5.0		5.0	5.0	
Minimum Split (s)	22.5	22.5		22.5	22.5		22.5	22.5		22.5	22.5	
Total Split (s)	22.5	22.5		22.5	22.5		22.5	22.5		22.5	22.5	
Total Split (%)	50.0%	50.0%		50.0%	50.0%		50.0%	50.0%		50.0%	50.0%	
Yellow Time (s)	3.5	3.5		3.5	3.5		3.5	3.5		3.5	3.5	
All-Red Time (s)	1.0	1.0		1.0	1.0		1.0	1.0		1.0	1.0	
Lost Time Adjust (s)	0.0	0.0		0.0	0.0		0.0			0.0		
Total Lost Time (s)	4.5	4.5		4.5	4.5		4.5			4.5		
Lead/Lag												
Lead-Lag Optimize?												
Recall Mode	Max	Max		Max	Max		None	None		None	None	
Act Effct Green (s)	22.3	22.3		22.3	22.3		10.3			10.3		
Actuated g/C Ratio	0.58	0.58		0.58	0.58		0.27			0.27		
v/c Ratio	0.09	0.21		0.05	0.25		0.57			0.22		
Control Delay	7.5	5.5		7.2	6.8		16.0			6.3		
Queue Delay	0.0	0.0		0.0	0.0		0.0			0.0		
Total Delay	7.5	5.5		7.2	6.8		16.0			6.3		
LOS	A	A		A	A		B			A		
Approach Delay		5.7			6.8		16.0			6.3		
Approach LOS		A			A		B			A		
Queue Length 50th (m)	1.4	4.4		0.7	7.6		8.8			1.8		

London Line at Blackwell Side Road
Sarnia, Ontario

Total Traffic 2030, AM Peak
Existing Geometric Configuration



Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Queue Length 95th (m)	6.8	13.0		4.2	19.3			21.9			8.5	
Internal Link Dist (m)			168.3			257.8			68.5			54.1
Turn Bay Length (m)	21.0			21.0								
Base Capacity (vph)	486	1656		519	1791			594			747	
Starvation Cap Reductn	0	0		0	0			0			0	
Spillback Cap Reductn	0	0		0	0			0			0	
Storage Cap Reductn	0	0		0	0			0			0	
Reduced v/c Ratio	0.09	0.21		0.05	0.25			0.34			0.13	

Intersection Summary

Area Type: Other

Cycle Length: 45

Actuated Cycle Length: 38.6

Natural Cycle: 45

Control Type: Actuated-Uncoordinated

Maximum v/c Ratio: 0.57

Intersection Signal Delay: 8.0

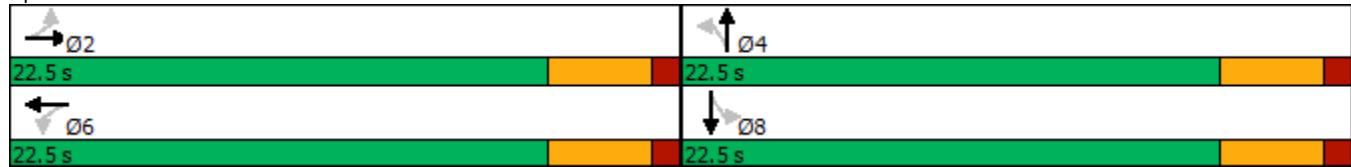
Intersection LOS: A

Intersection Capacity Utilization 45.7%

ICU Level of Service A

Analysis Period (min) 15

Splits and Phases: 3: Blackwell Side Road & London Line



London Line at Blackwell Side Road
Sarnia, Ontario

Total Traffic 2030, PM Peak
Existing Geometric Configuration

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	↑	↑↑		↑	↑↑			↔			↔	
Traffic Volume (vph)	83	641	113	35	320	20	90	36	53	28	25	50
Future Volume (vph)	83	641	113	35	320	20	90	36	53	28	25	50
Ideal Flow (vphpl)	1750	1750	1750	1750	1750	1750	1750	1750	1750	1750	1750	1750
Storage Length (m)	21.0		0.0	21.0		0.0	0.0		0.0	0.0		0.0
Storage Lanes	1		0	1		0	0		0	0		0
Taper Length (m)	27.0			26.0			7.5			7.5		
Lane Util. Factor	1.00	0.95	0.95	1.00	0.95	0.95	1.00	1.00	1.00	1.00	1.00	1.00
Fr _t		0.977			0.991			0.960			0.934	
Flt Protected	0.950			0.950			0.975			0.987		
Satd. Flow (prot)	1646	3142	0	1554	3205	0	0	1638	0	0	1575	0
Flt Permitted	0.532			0.328			0.784			0.898		
Satd. Flow (perm)	922	3142	0	536	3205	0	0	1317	0	0	1433	0
Right Turn on Red		Yes			Yes			Yes			Yes	
Satd. Flow (RTOR)		53			17			56			54	
Link Speed (k/h)		60			60			50			50	
Link Distance (m)		192.3			281.8			92.5			78.1	
Travel Time (s)		11.5			16.9			6.7			5.6	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Heavy Vehicles (%)	1%	4%	0%	7%	3%	0%	0%	0%	0%	9%	0%	0%
Adj. Flow (vph)	90	697	123	38	348	22	98	39	58	30	27	54
Shared Lane Traffic (%)												
Lane Group Flow (vph)	90	820	0	38	370	0	0	195	0	0	111	0
Turn Type	Perm	NA										
Protected Phases		2			6			4			8	
Permitted Phases	2			6			4			8		
Detector Phase	2	2		6	6		4	4		8	8	
Switch Phase												
Minimum Initial (s)	5.0	5.0		5.0	5.0		5.0	5.0		5.0	5.0	
Minimum Split (s)	22.5	22.5		22.5	22.5		22.5	22.5		22.5	22.5	
Total Split (s)	22.5	22.5		22.5	22.5		22.5	22.5		22.5	22.5	
Total Split (%)	50.0%	50.0%		50.0%	50.0%		50.0%	50.0%		50.0%	50.0%	
Yellow Time (s)	3.5	3.5		3.5	3.5		3.5	3.5		3.5	3.5	
All-Red Time (s)	1.0	1.0		1.0	1.0		1.0	1.0		1.0	1.0	
Lost Time Adjust (s)	0.0	0.0		0.0	0.0		0.0			0.0		
Total Lost Time (s)	4.5	4.5		4.5	4.5		4.5			4.5		
Lead/Lag												
Lead-Lag Optimize?												
Recall Mode	Max	Max		Max	Max		None	None		None	None	
Act Effct Green (s)	22.1	22.1		22.1	22.1			9.3			9.3	
Actuated g/C Ratio	0.59	0.59		0.59	0.59			0.25			0.25	
v/c Ratio	0.17	0.44		0.12	0.20			0.53			0.28	
Control Delay	7.3	7.0		7.6	5.8			14.0			8.2	
Queue Delay	0.0	0.0		0.0	0.0			0.0			0.0	
Total Delay	7.3	7.0		7.6	5.8			14.0			8.2	
LOS	A	A		A	A			B			A	
Approach Delay		7.0			5.9			14.0			8.2	
Approach LOS		A			A			B			A	
Queue Length 50th (m)	2.7	14.3		1.1	5.5			7.3			2.8	

London Line at Blackwell Side Road
Sarnia, Ontario

Total Traffic 2030, PM Peak
Existing Geometric Configuration



Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Queue Length 95th (m)	10.5	33.3		5.9	14.3			19.3			10.4	
Internal Link Dist (m)			168.3			257.8			68.5			54.1
Turn Bay Length (m)	21.0			21.0								
Base Capacity (vph)	543	1875		316	1897			662			717	
Starvation Cap Reductn	0	0		0	0			0			0	
Spillback Cap Reductn	0	0		0	0			0			0	
Storage Cap Reductn	0	0		0	0			0			0	
Reduced v/c Ratio	0.17	0.44		0.12	0.20			0.29			0.15	

Intersection Summary

Area Type: Other

Cycle Length: 45

Actuated Cycle Length: 37.5

Natural Cycle: 45

Control Type: Actuated-Uncoordinated

Maximum v/c Ratio: 0.53

Intersection Signal Delay: 7.7

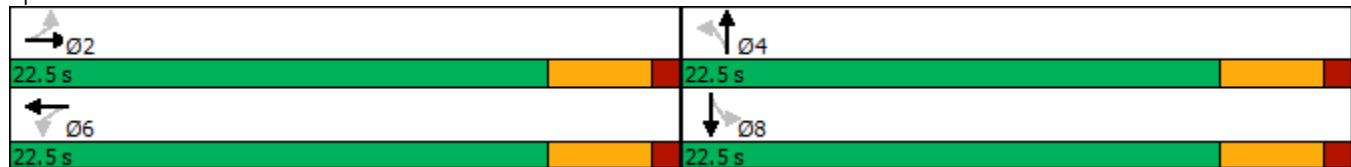
Intersection LOS: A

Intersection Capacity Utilization 56.2%

ICU Level of Service B

Analysis Period (min) 15

Splits and Phases: 3: Blackwell Side Road & London Line



London Line at Garden Centre / Furniture Store
Sarnia, Ontario

Existing Traffic, AM Peak
Existing Geometric Configuration

Intersection

Int Delay, s/veh 0.3

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Vol, veh/h	12	232	0	0	328	4	0	0	0	2	0	5
Future Vol, veh/h	12	232	0	0	328	4	0	0	0	2	0	5
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Free	Free	Stop	Stop	Stop	Stop	Stop	Stop
RT Channelized	-	-	None									
Storage Length	-	-	-	-	-	-	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	92	92	92	92	92	92	92	92	92	92	92	92
Heavy Vehicles, %	8	16	0	0	7	0	0	0	0	0	0	20
Mvmt Flow	13	252	0	0	357	4	0	0	0	2	0	5

Major/Minor	Major1	Major2		Minor1		Minor2						
Conflicting Flow All	361	0	0	252	0	0	457	639	126	511	637	181
Stage 1	-	-	-	-	-	-	278	278	-	359	359	-
Stage 2	-	-	-	-	-	-	179	361	-	152	278	-
Critical Hdwy	4.26	-	-	4.1	-	-	7.5	6.5	6.9	7.5	6.5	7.3
Critical Hdwy Stg 1	-	-	-	-	-	-	6.5	5.5	-	6.5	5.5	-
Critical Hdwy Stg 2	-	-	-	-	-	-	6.5	5.5	-	6.5	5.5	-
Follow-up Hdwy	2.28	-	-	2.2	-	-	3.5	4	3.3	3.5	4	3.5
Pot Cap-1 Maneuver	1152	-	-	1325	-	-	492	397	907	450	398	777
Stage 1	-	-	-	-	-	-	711	684	-	637	631	-
Stage 2	-	-	-	-	-	-	811	629	-	841	684	-
Platoon blocked, %	-	-	-	-	-	-	-	-	-	-	-	-
Mov Cap-1 Maneuver	1152	-	-	1325	-	-	484	392	907	446	393	777
Mov Cap-2 Maneuver	-	-	-	-	-	-	484	392	-	446	393	-
Stage 1	-	-	-	-	-	-	702	675	-	629	631	-
Stage 2	-	-	-	-	-	-	805	629	-	830	675	-

Approach	EB	WB		NB		SB		
HCM Control Delay, s	0.4	0		0		10.7		
HCM LOS				A		B		
<hr/>								
Minor Lane/Major Mvmt	NBLn1	EBL	EBT	EBR	WBL	WBT	WBR	SBLn1
Capacity (veh/h)	-	1152	-	-	1325	-	-	641
HCM Lane V/C Ratio	-	0.011	-	-	-	-	-	0.012
HCM Control Delay (s)	0	8.2	0	-	0	-	-	10.7
HCM Lane LOS	A	A	A	-	A	-	-	B
HCM 95th %tile Q(veh)	-	0	-	-	0	-	-	0

London Line at Garden Centre / Furniture Store
Sarnia, Ontario

Existing Traffic, PM Peak
Existing Geometric Configuration

Intersection

Int Delay, s/veh 1.9

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Vol, veh/h	100	478	1	0	261	18	0	1	1	16	0	51
Future Vol, veh/h	100	478	1	0	261	18	0	1	1	16	0	51
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Free	Free	Stop	Stop	Stop	Stop	Stop	Stop
RT Channelized	-	-	None									
Storage Length	-	-	-	-	-	-	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	92	92	92	92	92	92	92	92	92	92	92	92
Heavy Vehicles, %	0	5	0	0	4	0	0	0	0	0	0	0
Mvmt Flow	109	520	1	0	284	20	0	1	1	17	0	55

Major/Minor	Major1	Major2		Minor1		Minor2						
Conflicting Flow All	304	0	0	521	0	0	881	1043	261	773	1033	152
Stage 1	-	-	-	-	-	-	739	739	-	294	294	-
Stage 2	-	-	-	-	-	-	142	304	-	479	739	-
Critical Hdwy	4.1	-	-	4.1	-	-	7.5	6.5	6.9	7.5	6.5	6.9
Critical Hdwy Stg 1	-	-	-	-	-	-	6.5	5.5	-	6.5	5.5	-
Critical Hdwy Stg 2	-	-	-	-	-	-	6.5	5.5	-	6.5	5.5	-
Follow-up Hdwy	2.2	-	-	2.2	-	-	3.5	4	3.3	3.5	4	3.3
Pot Cap-1 Maneuver	1268	-	-	1056	-	-	244	231	744	292	234	873
Stage 1	-	-	-	-	-	-	380	427	-	695	673	-
Stage 2	-	-	-	-	-	-	852	667	-	542	427	-
Platoon blocked, %	-	-	-	-	-	-	-	-	-	-	-	-
Mov Cap-1 Maneuver	1268	-	-	1056	-	-	207	203	744	263	206	873
Mov Cap-2 Maneuver	-	-	-	-	-	-	207	203	-	263	206	-
Stage 1	-	-	-	-	-	-	334	375	-	611	673	-
Stage 2	-	-	-	-	-	-	798	667	-	474	375	-

Approach	EB	WB		NB		SB		
HCM Control Delay, s	1.6	0		16.4		12.4		
HCM LOS				C		B		
<hr/>								
Minor Lane/Major Mvmt	NBLn1	EBL	EBT	EBR	WBL	WBT	WBR	SBLn1
Capacity (veh/h)	319	1268	-	-	1056	-	-	562
HCM Lane V/C Ratio	0.007	0.086	-	-	-	-	-	0.13
HCM Control Delay (s)	16.4	8.1	0.3	-	0	-	-	12.4
HCM Lane LOS	C	A	A	-	A	-	-	B
HCM 95th %tile Q(veh)	0	0.3	-	-	0	-	-	0.4

Intersection																
Int Delay, s/veh	0.3															
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR				
Lane Configurations																
Traffic Vol, veh/h	13	246	0	0	348	4	0	0	0	2	0	5				
Future Vol, veh/h	13	246	0	0	348	4	0	0	0	2	0	5				
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0				
Sign Control	Free	Free	Free	Free	Free	Free	Stop	Stop	Stop	Stop	Stop	Stop				
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None				
Storage Length	-	-	-	-	-	-	-	-	-	-	-	-				
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-				
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-				
Peak Hour Factor	92	92	92	92	92	92	92	92	92	92	92	92				
Heavy Vehicles, %	8	16	0	0	7	0	0	0	0	0	0	20				
Mvmt Flow	14	267	0	0	378	4	0	0	0	2	0	5				
Major/Minor																
Major1		Major2		Minor1		Minor2										
Conflicting Flow All	382	0	0	267	0	0	484	677	134	542	675	191				
Stage 1	-	-	-	-	-	-	295	295	-	380	380	-				
Stage 2	-	-	-	-	-	-	189	382	-	162	295	-				
Critical Hdwy	4.26	-	-	4.1	-	-	7.5	6.5	6.9	7.5	6.5	7.3				
Critical Hdwy Stg 1	-	-	-	-	-	-	6.5	5.5	-	6.5	5.5	-				
Critical Hdwy Stg 2	-	-	-	-	-	-	6.5	5.5	-	6.5	5.5	-				
Follow-up Hdwy	2.28	-	-	2.2	-	-	3.5	4	3.3	3.5	4	3.5				
Pot Cap-1 Maneuver	1131	-	-	1308	-	-	470	377	897	428	378	765				
Stage 1	-	-	-	-	-	-	695	673	-	619	617	-				
Stage 2	-	-	-	-	-	-	800	616	-	830	673	-				
Platoon blocked, %	-	-	-	-	-	-	-	-	-	-	-	-				
Mov Cap-1 Maneuver	1131	-	-	1308	-	-	462	371	897	423	372	765				
Mov Cap-2 Maneuver	-	-	-	-	-	-	462	371	-	423	372	-				
Stage 1	-	-	-	-	-	-	685	663	-	610	617	-				
Stage 2	-	-	-	-	-	-	794	616	-	818	663	-				
Approach																
EB			WB			NB			SB							
HCM Control Delay, s	0.5		0		0		10.9									
HCM LOS						A		B								
Minor Lane/Major Mvmt																
NBLn1	NBLn1	EBL	EBT	EBR	WBL	WBT	WBR	SBLn1								
Capacity (veh/h)	-	1131	-	-	1308	-	-	621								
HCM Lane V/C Ratio	-	0.012	-	-	-	-	-	0.012								
HCM Control Delay (s)	0	8.2	0.1	-	0	-	-	10.9								
HCM Lane LOS	A	A	A	-	A	-	-	B								
HCM 95th %tile Q(veh)	-	0	-	-	0	-	-	0								

Intersection																
Int Delay, s/veh	2															
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR				
Lane Configurations																
Traffic Vol, veh/h	106	507	1	0	277	19	0	1	1	17	0	54				
Future Vol, veh/h	106	507	1	0	277	19	0	1	1	17	0	54				
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0				
Sign Control	Free	Free	Free	Free	Free	Free	Stop	Stop	Stop	Stop	Stop	Stop				
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None				
Storage Length	-	-	-	-	-	-	-	-	-	-	-	-				
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-				
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-				
Peak Hour Factor	92	92	92	92	92	92	92	92	92	92	92	92				
Heavy Vehicles, %	0	5	0	0	4	0	0	0	0	0	0	0				
Mvmt Flow	115	551	1	0	301	21	0	1	1	18	0	59				
Major/Minor																
Major1		Major2		Minor1		Minor2										
Conflicting Flow All	322	0	0	552	0	0	933	1104	276	818	1094	161				
Stage 1	-	-	-	-	-	-	782	782	-	312	312	-				
Stage 2	-	-	-	-	-	-	151	322	-	506	782	-				
Critical Hdwy	4.1	-	-	4.1	-	-	7.5	6.5	6.9	7.5	6.5	6.9				
Critical Hdwy Stg 1	-	-	-	-	-	-	6.5	5.5	-	6.5	5.5	-				
Critical Hdwy Stg 2	-	-	-	-	-	-	6.5	5.5	-	6.5	5.5	-				
Follow-up Hdwy	2.2	-	-	2.2	-	-	3.5	4	3.3	3.5	4	3.3				
Pot Cap-1 Maneuver	1249	-	-	1028	-	-	224	213	727	271	216	862				
Stage 1	-	-	-	-	-	-	358	408	-	679	661	-				
Stage 2	-	-	-	-	-	-	842	655	-	522	408	-				
Platoon blocked, %	-	-	-	-	-	-	-	-	-	-	-	-				
Mov Cap-1 Maneuver	1249	-	-	1028	-	-	187	185	727	242	187	862				
Mov Cap-2 Maneuver	-	-	-	-	-	-	187	185	-	242	187	-				
Stage 1	-	-	-	-	-	-	310	354	-	589	661	-				
Stage 2	-	-	-	-	-	-	785	655	-	451	354	-				
Approach																
EB			WB			NB			SB							
HCM Control Delay, s	1.7		0		17.3		12.9									
HCM LOS						C		B								
Minor Lane/Major Mvmt																
Capacity (veh/h)	295	1249	-	-	1028	-	-	534								
HCM Lane V/C Ratio	0.007	0.092	-	-	-	-	-	0.145								
HCM Control Delay (s)	17.3	8.2	0.4	-	0	-	-	12.9								
HCM Lane LOS	C	A	A	-	A	-	-	B								
HCM 95th %tile Q(veh)	0	0.3	-	-	0	-	-	0.5								

London Line at Garden Centre / Furniture Store
Sarnia, Ontario

Total Traffic 2025, AM Peak
Existing Geometric Configuration

Intersection

Int Delay, s/veh 0.3

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Vol, veh/h	13	259	0	0	402	5	0	0	0	2	0	5
Future Vol, veh/h	13	259	0	0	402	5	0	0	0	2	0	5
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Free	Free	Stop	Stop	Stop	Stop	Stop	Stop
RT Channelized	-	-	None									
Storage Length	-	-	-	-	-	-	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	92	92	92	92	92	92	92	92	92	92	92	92
Heavy Vehicles, %	8	16	0	0	7	0	0	0	0	0	0	20
Mvmt Flow	14	282	0	0	437	5	0	0	0	2	0	5

Major/Minor	Major1	Major2		Minor1		Minor2						
Conflicting Flow All	442	0	0	282	0	0	529	752	141	609	750	221
Stage 1	-	-	-	-	-	-	310	310	-	440	440	-
Stage 2	-	-	-	-	-	-	219	442	-	169	310	-
Critical Hdwy	4.26	-	-	4.1	-	-	7.5	6.5	6.9	7.5	6.5	7.3
Critical Hdwy Stg 1	-	-	-	-	-	-	6.5	5.5	-	6.5	5.5	-
Critical Hdwy Stg 2	-	-	-	-	-	-	6.5	5.5	-	6.5	5.5	-
Follow-up Hdwy	2.28	-	-	2.2	-	-	3.5	4	3.3	3.5	4	3.5
Pot Cap-1 Maneuver	1073	-	-	1292	-	-	437	342	888	383	342	730
Stage 1	-	-	-	-	-	-	681	663	-	571	581	-
Stage 2	-	-	-	-	-	-	769	580	-	822	663	-
Platoon blocked, %	-	-	-	-	-	-	-	-	-	-	-	-
Mov Cap-1 Maneuver	1073	-	-	1292	-	-	429	337	888	379	337	730
Mov Cap-2 Maneuver	-	-	-	-	-	-	429	337	-	379	337	-
Stage 1	-	-	-	-	-	-	671	653	-	562	581	-
Stage 2	-	-	-	-	-	-	763	580	-	810	653	-

Approach	EB	WB		NB		SB		
HCM Control Delay, s	0.5	0		0		11.3		
HCM LOS				A		B		
<hr/>								
Minor Lane/Major Mvmt	NBLn1	EBL	EBT	EBR	WBL	WBT	WBR	SBLn1
Capacity (veh/h)	-	1073	-	-	1292	-	-	577
HCM Lane V/C Ratio	-	0.013	-	-	-	-	-	0.013
HCM Control Delay (s)	0	8.4	0.1	-	0	-	-	11.3
HCM Lane LOS	A	A	A	-	A	-	-	B
HCM 95th %tile Q(veh)	-	0	-	-	0	-	-	0

London Line at Garden Centre / Furniture Store
Sarnia, Ontario

Total Traffic 2025, PM Peak
Existing Geometric Configuration

Intersection

Int Delay, s/veh 2.1

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Vol, veh/h	106	576	1	6	299	21	0	1	1	19	0	54
Future Vol, veh/h	106	576	1	6	299	21	0	1	1	19	0	54
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Free	Free	Stop	Stop	Stop	Stop	Stop	Stop
RT Channelized	-	-	None									
Storage Length	-	-	-	-	-	-	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	92	92	92	92	92	92	92	92	92	92	92	92
Heavy Vehicles, %	0	5	0	0	4	0	0	0	0	0	0	0
Mvmt Flow	115	626	1	7	325	23	0	1	1	21	0	59

Major/Minor	Major1	Major2		Minor1		Minor2						
Conflicting Flow All	348	0	0	627	0	0	1034	1219	314	895	1208	174
Stage 1	-	-	-	-	-	-	857	857	-	351	351	-
Stage 2	-	-	-	-	-	-	177	362	-	544	857	-
Critical Hdwy	4.1	-	-	4.1	-	-	7.5	6.5	6.9	7.5	6.5	6.9
Critical Hdwy Stg 1	-	-	-	-	-	-	6.5	5.5	-	6.5	5.5	-
Critical Hdwy Stg 2	-	-	-	-	-	-	6.5	5.5	-	6.5	5.5	-
Follow-up Hdwy	2.2	-	-	2.2	-	-	3.5	4	3.3	3.5	4	3.3
Pot Cap-1 Maneuver	1222	-	-	965	-	-	189	182	688	239	185	846
Stage 1	-	-	-	-	-	-	323	377	-	644	636	-
Stage 2	-	-	-	-	-	-	813	629	-	496	377	-
Platoon blocked, %	-	-	-	-	-	-	-	-	-	-	-	-
Mov Cap-1 Maneuver	1222	-	-	965	-	-	155	154	688	210	157	846
Mov Cap-2 Maneuver	-	-	-	-	-	-	155	154	-	210	157	-
Stage 1	-	-	-	-	-	-	276	323	-	551	630	-
Stage 2	-	-	-	-	-	-	750	623	-	422	323	-

Approach	EB	WB		NB		SB		
HCM Control Delay, s	1.6	0.2		19.4		14.1		
HCM LOS				C		B		
<hr/>								
Minor Lane/Major Mvmt	NBLn1	EBL	EBT	EBR	WBL	WBT	WBR	SBLn1
Capacity (veh/h)	252	1222	-	-	965	-	-	473
HCM Lane V/C Ratio	0.009	0.094	-	-	0.007	-	-	0.168
HCM Control Delay (s)	19.4	8.3	0.4	-	8.8	0	-	14.1
HCM Lane LOS	C	A	A	-	A	A	-	B
HCM 95th %tile Q(veh)	0	0.3	-	-	0	-	-	0.6

Intersection																			
Int Delay, s/veh	0.3																		
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR							
Lane Configurations																			
Traffic Vol, veh/h	13	259	0	0	366	4	0	0	0	2	0	6							
Future Vol, veh/h	13	259	0	0	366	4	0	0	0	2	0	6							
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0							
Sign Control	Free	Free	Free	Free	Free	Free	Stop	Stop	Stop	Stop	Stop	Stop							
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None							
Storage Length	-	-	-	-	-	-	-	-	-	-	-	-							
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-							
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-							
Peak Hour Factor	92	92	92	92	92	92	92	92	92	92	92	92							
Heavy Vehicles, %	8	16	0	0	7	0	0	0	0	0	0	20							
Mvmt Flow	14	282	0	0	398	4	0	0	0	2	0	7							
Major/Minor																			
Major1		Major2			Minor1		Minor2												
Conflicting Flow All	402	0	0	282	0	0	509	712	141	569	710	201							
Stage 1	-	-	-	-	-	-	310	310	-	400	400	-							
Stage 2	-	-	-	-	-	-	199	402	-	169	310	-							
Critical Hdwy	4.26	-	-	4.1	-	-	7.5	6.5	6.9	7.5	6.5	7.3							
Critical Hdwy Stg 1	-	-	-	-	-	-	6.5	5.5	-	6.5	5.5	-							
Critical Hdwy Stg 2	-	-	-	-	-	-	6.5	5.5	-	6.5	5.5	-							
Follow-up Hdwy	2.28	-	-	2.2	-	-	3.5	4	3.3	3.5	4	3.5							
Pot Cap-1 Maneuver	1111	-	-	1292	-	-	452	360	888	409	361	753							
Stage 1	-	-	-	-	-	-	681	663	-	603	605	-							
Stage 2	-	-	-	-	-	-	790	604	-	822	663	-							
Platoon blocked, %	-	-	-	-	-	-	-	-	-	-	-	-							
Mov Cap-1 Maneuver	1111	-	-	1292	-	-	443	355	888	405	356	753							
Mov Cap-2 Maneuver	-	-	-	-	-	-	443	355	-	405	356	-							
Stage 1	-	-	-	-	-	-	671	653	-	594	605	-							
Stage 2	-	-	-	-	-	-	783	604	-	810	653	-							
Approach																			
EB			WB			NB			SB										
HCM Control Delay, s	0.5		0			0			10.9										
HCM LOS	A						B												
Minor Lane/Major Mvmt																			
Capacity (veh/h)	-	1111	-	-	1292	-	-	-	620										
HCM Lane V/C Ratio	-	0.013	-	-	-	-	-	-	0.014										
HCM Control Delay (s)	0	8.3	0.1	-	0	-	-	-	10.9										
HCM Lane LOS	A	A	A	-	A	-	-	-	B										
HCM 95th %tile Q(veh)	-	0	-	-	0	-	-	-	0										

Intersection

Int Delay, s/veh 2.1

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Vol, veh/h	112	533	1	0	291	20	0	1	1	18	0	57
Future Vol, veh/h	112	533	1	0	291	20	0	1	1	18	0	57
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Free	Free	Stop	Stop	Stop	Stop	Stop	Stop
RT Channelized	-	-	None									
Storage Length	-	-	-	-	-	-	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	92	92	92	92	92	92	92	92	92	92	92	92
Heavy Vehicles, %	0	5	0	0	4	0	0	0	0	0	0	0
Mvmt Flow	122	579	1	0	316	22	0	1	1	20	0	62

Major/Minor	Major1	Major2		Minor1		Minor2						
Conflicting Flow All	338	0	0	580	0	0	982	1162	290	861	1151	169
Stage 1	-	-	-	-	-	-	824	824	-	327	327	-
Stage 2	-	-	-	-	-	-	158	338	-	534	824	-
Critical Hdwy	4.1	-	-	4.1	-	-	7.5	6.5	6.9	7.5	6.5	6.9
Critical Hdwy Stg 1	-	-	-	-	-	-	6.5	5.5	-	6.5	5.5	-
Critical Hdwy Stg 2	-	-	-	-	-	-	6.5	5.5	-	6.5	5.5	-
Follow-up Hdwy	2.2	-	-	2.2	-	-	3.5	4	3.3	3.5	4	3.3
Pot Cap-1 Maneuver	1232	-	-	1004	-	-	206	197	713	253	200	852
Stage 1	-	-	-	-	-	-	338	390	-	665	651	-
Stage 2	-	-	-	-	-	-	834	644	-	503	390	-
Platoon blocked, %	-	-	-	-	-	-	-	-	-	-	-	-
Mov Cap-1 Maneuver	1232	-	-	1004	-	-	170	168	713	223	171	852
Mov Cap-2 Maneuver	-	-	-	-	-	-	170	168	-	223	171	-
Stage 1	-	-	-	-	-	-	289	333	-	568	651	-
Stage 2	-	-	-	-	-	-	773	644	-	428	333	-

Approach	EB	WB		NB		SB		
HCM Control Delay, s	1.8	0		18.3		13.4		
HCM LOS				C		B		
<hr/>								
Minor Lane/Major Mvmt	NBLn1	EBL	EBT	EBR	WBL	WBT	WBR	SBLn1
Capacity (veh/h)	272	1232	-	-	1004	-	-	508
HCM Lane V/C Ratio	0.008	0.099	-	-	-	-	-	0.16
HCM Control Delay (s)	18.3	8.2	0.4	-	0	-	-	13.4
HCM Lane LOS	C	A	A	-	A	-	-	B
HCM 95th %tile Q(veh)	0	0.3	-	-	0	-	-	0.6

London Line at Garden Centre / Furniture Store
Sarnia, Ontario

Total Traffic 2030, AM Peak
Existing Geometric Configuration

Intersection

Int Delay, s/veh 0.3

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Vol, veh/h	13	272	0	0	420	5	0	0	0	2	0	6
Future Vol, veh/h	13	272	0	0	420	5	0	0	0	2	0	6
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Free	Free	Stop	Stop	Stop	Stop	Stop	Stop
RT Channelized	-	-	None									
Storage Length	-	-	-	-	-	-	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	92	92	92	92	92	92	92	92	92	92	92	92
Heavy Vehicles, %	8	16	0	0	7	0	0	0	0	0	0	20
Mvmt Flow	14	296	0	0	457	5	0	0	0	2	0	7

Major/Minor	Major1	Major2		Minor1		Minor2						
Conflicting Flow All	462	0	0	296	0	0	553	786	148	636	784	231
Stage 1	-	-	-	-	-	-	324	324	-	460	460	-
Stage 2	-	-	-	-	-	-	229	462	-	176	324	-
Critical Hdwy	4.26	-	-	4.1	-	-	7.5	6.5	6.9	7.5	6.5	7.3
Critical Hdwy Stg 1	-	-	-	-	-	-	6.5	5.5	-	6.5	5.5	-
Critical Hdwy Stg 2	-	-	-	-	-	-	6.5	5.5	-	6.5	5.5	-
Follow-up Hdwy	2.28	-	-	2.2	-	-	3.5	4	3.3	3.5	4	3.5
Pot Cap-1 Maneuver	1054	-	-	1277	-	-	420	326	878	367	327	719
Stage 1	-	-	-	-	-	-	668	653	-	556	569	-
Stage 2	-	-	-	-	-	-	759	568	-	814	653	-
Platoon blocked, %	-	-	-	-	-	-	-	-	-	-	-	-
Mov Cap-1 Maneuver	1054	-	-	1277	-	-	411	321	878	363	322	719
Mov Cap-2 Maneuver	-	-	-	-	-	-	411	321	-	363	322	-
Stage 1	-	-	-	-	-	-	657	643	-	547	569	-
Stage 2	-	-	-	-	-	-	752	568	-	801	643	-

Approach	EB	WB		NB		SB		
HCM Control Delay, s	0.5	0		0		11.3		
HCM LOS				A		B		
<hr/>								
Minor Lane/Major Mvmt	NBLn1	EBL	EBT	EBR	WBL	WBT	WBR	SBLn1
Capacity (veh/h)	-	1054	-	-	1277	-	-	577
HCM Lane V/C Ratio	-	0.013	-	-	-	-	-	0.015
HCM Control Delay (s)	0	8.5	0.1	-	0	-	-	11.3
HCM Lane LOS	A	A	A	-	A	-	-	B
HCM 95th %tile Q(veh)	-	0	-	-	0	-	-	0

London Line at Garden Centre / Furniture Store
Sarnia, Ontario

Total Traffic 2030, PM Peak
Existing Geometric Configuration

Intersection

Int Delay, s/veh 2.2

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Vol, veh/h	112	602	1	6	313	22	0	1	1	20	0	57
Future Vol, veh/h	112	602	1	6	313	22	0	1	1	20	0	57
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Free	Free	Stop	Stop	Stop	Stop	Stop	Stop
RT Channelized	-	-	None									
Storage Length	-	-	-	-	-	-	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	92	92	92	92	92	92	92	92	92	92	92	92
Heavy Vehicles, %	0	5	0	0	4	0	0	0	0	0	0	0
Mvmt Flow	122	654	1	7	340	24	0	1	1	22	0	62

Major/Minor	Major1	Major2		Minor1		Minor2						
Conflicting Flow All	364	0	0	655	0	0	1083	1277	328	938	1265	182
Stage 1	-	-	-	-	-	-	899	899	-	366	366	-
Stage 2	-	-	-	-	-	-	184	378	-	572	899	-
Critical Hdwy	4.1	-	-	4.1	-	-	7.5	6.5	6.9	7.5	6.5	6.9
Critical Hdwy Stg 1	-	-	-	-	-	-	6.5	5.5	-	6.5	5.5	-
Critical Hdwy Stg 2	-	-	-	-	-	-	6.5	5.5	-	6.5	5.5	-
Follow-up Hdwy	2.2	-	-	2.2	-	-	3.5	4	3.3	3.5	4	3.3
Pot Cap-1 Maneuver	1206	-	-	942	-	-	174	168	674	222	171	836
Stage 1	-	-	-	-	-	-	304	360	-	631	626	-
Stage 2	-	-	-	-	-	-	806	619	-	477	360	-
Platoon blocked, %	-	-	-	-	-	-	-	-	-	-	-	-
Mov Cap-1 Maneuver	1206	-	-	942	-	-	140	140	674	192	142	836
Mov Cap-2 Maneuver	-	-	-	-	-	-	140	140	-	192	142	-
Stage 1	-	-	-	-	-	-	256	303	-	531	620	-
Stage 2	-	-	-	-	-	-	740	613	-	399	303	-

Approach	EB	WB		NB		SB		
HCM Control Delay, s	1.7	0.2		20.7		14.9		
HCM LOS				C		B		
<hr/>								
Minor Lane/Major Mvmt	NBLn1	EBL	EBT	EBR	WBL	WBT	WBR	SBLn1
Capacity (veh/h)	232	1206	-	-	942	-	-	447
HCM Lane V/C Ratio	0.009	0.101	-	-	0.007	-	-	0.187
HCM Control Delay (s)	20.7	8.3	0.5	-	8.8	0	-	14.9
HCM Lane LOS	C	A	A	-	A	A	-	B
HCM 95th %tile Q(veh)	0	0.3	-	-	0	-	-	0.7

London Line at Street A
Sarnia, Ontario

Total Traffic 2025, AM Peak
Existing Geometric Configuration

Intersection						
Int Delay, s/veh	1.8					
Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations	↑↑		↑↑	↑	↑	↑
Traffic Vol, veh/h	248	13	18	316	55	39
Future Vol, veh/h	248	13	18	316	55	39
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	-	-	0	0
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	92	92	92	92	92	92
Heavy Vehicles, %	16	0	0	7	0	0
Mvmt Flow	270	14	20	343	60	42
Major/Minor	Major1	Major2	Minor1			
Conflicting Flow All	0	0	284	0	489	142
Stage 1	-	-	-	-	277	-
Stage 2	-	-	-	-	212	-
Critical Hdwy	-	-	4.1	-	6.8	6.9
Critical Hdwy Stg 1	-	-	-	-	5.8	-
Critical Hdwy Stg 2	-	-	-	-	5.8	-
Follow-up Hdwy	-	-	2.2	-	3.5	3.3
Pot Cap-1 Maneuver	-	-	1290	-	513	886
Stage 1	-	-	-	-	751	-
Stage 2	-	-	-	-	809	-
Platoon blocked, %	-	-	-	-	-	-
Mov Cap-1 Maneuver	-	-	1290	-	503	886
Mov Cap-2 Maneuver	-	-	-	-	503	-
Stage 1	-	-	-	-	737	-
Stage 2	-	-	-	-	809	-
Approach	EB	WB	NB			
HCM Control Delay, s	0	0.5	11.5			
HCM LOS			B			
Minor Lane/Major Mvmt	NBLn1	NBLn2	EBT	EBR	WBL	WBT
Capacity (veh/h)	503	886	-	-	1290	-
HCM Lane V/C Ratio	0.119	0.048	-	-	0.015	-
HCM Control Delay (s)	13.1	9.3	-	-	7.8	0.1
HCM Lane LOS	B	A	-	-	A	A
HCM 95th %tile Q(veh)	0.4	0.2	-	-	0	-

London Line at Street A
Sarnia, Ontario

Total Traffic 2025, PM Peak
Existing Geometric Configuration

Intersection

Int Delay, s/veh 1.3

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations	↑↑		↑↑	↑	↑	↑
Traffic Vol, veh/h	525	71	34	178	24	38
Future Vol, veh/h	525	71	34	178	24	38
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	-	-	0	0
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	92	92	92	92	92	92
Heavy Vehicles, %	5	0	0	4	0	0
Mvmt Flow	571	77	37	193	26	41

Major/Minor	Major1	Major2	Minor1		
Conflicting Flow All	0	0	648	0	781
Stage 1	-	-	-	-	610
Stage 2	-	-	-	-	171
Critical Hdwy	-	-	4.1	-	6.8
Critical Hdwy Stg 1	-	-	-	-	5.8
Critical Hdwy Stg 2	-	-	-	-	5.8
Follow-up Hdwy	-	-	2.2	-	3.5
Pot Cap-1 Maneuver	-	-	947	-	336
Stage 1	-	-	-	-	510
Stage 2	-	-	-	-	848
Platoon blocked, %	-	-	-	-	-
Mov Cap-1 Maneuver	-	-	947	-	321
Mov Cap-2 Maneuver	-	-	-	-	321
Stage 1	-	-	-	-	488
Stage 2	-	-	-	-	848

Approach	EB	WB	NB
HCM Control Delay, s	0	1.5	13.2
HCM LOS		B	

Minor Lane/Major Mvmt	NBLn1	NBLn2	EBT	EBR	WBL	WBT
Capacity (veh/h)	321	678	-	-	947	-
HCM Lane V/C Ratio	0.081	0.061	-	-	0.039	-
HCM Control Delay (s)	17.2	10.7	-	-	9	0.1
HCM Lane LOS	C	B	-	-	A	A
HCM 95th %tile Q(veh)	0.3	0.2	-	-	0.1	-

London Line at Street A
Sarnia, Ontario

Total Traffic 2030, AM Peak
Existing Geometric Configuration

Intersection						
Int Delay, s/veh	1.8					
Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations	↑↑			↑↑	↑	↑
Traffic Vol, veh/h	261	13	18	332	55	39
Future Vol, veh/h	261	13	18	332	55	39
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	-	-	0	0
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	92	92	92	92	92	92
Heavy Vehicles, %	16	0	0	7	0	0
Mvmt Flow	284	14	20	361	60	42
Major/Minor	Major1	Major2	Minor1			
Conflicting Flow All	0	0	298	0	512	149
Stage 1	-	-	-	-	291	-
Stage 2	-	-	-	-	221	-
Critical Hdwy	-	-	4.1	-	6.8	6.9
Critical Hdwy Stg 1	-	-	-	-	5.8	-
Critical Hdwy Stg 2	-	-	-	-	5.8	-
Follow-up Hdwy	-	-	2.2	-	3.5	3.3
Pot Cap-1 Maneuver	-	-	1275	-	496	877
Stage 1	-	-	-	-	739	-
Stage 2	-	-	-	-	801	-
Platoon blocked, %	-	-	-	-	-	-
Mov Cap-1 Maneuver	-	-	1275	-	486	877
Mov Cap-2 Maneuver	-	-	-	-	486	-
Stage 1	-	-	-	-	724	-
Stage 2	-	-	-	-	801	-
Approach	EB	WB	NB			
HCM Control Delay, s	0	0.5	11.7			
HCM LOS			B			
Minor Lane/Major Mvmt	NBLn1	NBLn2	EBT	EBR	WBL	WBT
Capacity (veh/h)	486	877	-	-	1275	-
HCM Lane V/C Ratio	0.123	0.048	-	-	0.015	-
HCM Control Delay (s)	13.4	9.3	-	-	7.9	0.1
HCM Lane LOS	B	A	-	-	A	A
HCM 95th %tile Q(veh)	0.4	0.2	-	-	0	-

London Line at Street A
Sarnia, Ontario

Total Traffic 2030, PM Peak
Existing Geometric Configuration

Intersection

Int Delay, s/veh 1.3

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations	↑↑		↑↑	↑	↑	↑
Traffic Vol, veh/h	552	71	34	187	24	38
Future Vol, veh/h	552	71	34	187	24	38
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	-	-	0	0
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	92	92	92	92	92	92
Heavy Vehicles, %	5	0	0	4	0	0
Mvmt Flow	600	77	37	203	26	41

Major/Minor	Major1	Major2	Minor1		
Conflicting Flow All	0	0	677	0	815 339
Stage 1	-	-	-	-	639 -
Stage 2	-	-	-	-	176 -
Critical Hdwy	-	-	4.1	-	6.8 6.9
Critical Hdwy Stg 1	-	-	-	-	5.8 -
Critical Hdwy Stg 2	-	-	-	-	5.8 -
Follow-up Hdwy	-	-	2.2	-	3.5 3.3
Pot Cap-1 Maneuver	-	-	924	-	319 663
Stage 1	-	-	-	-	493 -
Stage 2	-	-	-	-	843 -
Platoon blocked, %	-	-	-	-	-
Mov Cap-1 Maneuver	-	-	924	-	305 663
Mov Cap-2 Maneuver	-	-	-	-	305 -
Stage 1	-	-	-	-	471 -
Stage 2	-	-	-	-	843 -

Approach	EB	WB	NB
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HCM Control Delay, s 0 1.5 13.5

HCM LOS B

Minor Lane/Major Mvmt	NBLn1	NBLn2	EBT	EBR	WBL	WBT
Capacity (veh/h)	305	663	-	-	924	-
HCM Lane V/C Ratio	0.086	0.062	-	-	0.04	-
HCM Control Delay (s)	17.9	10.8	-	-	9.1	0.1
HCM Lane LOS	C	B	-	-	A	A
HCM 95th %tile Q(veh)	0.3	0.2	-	-	0.1	-

London Line at Airport Road
Sarnia, Ontario

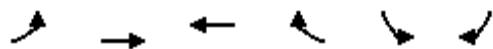
Existing Traffic, AM Peak
Existing Geometric Configuration



Lane Group	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations	↑	↑↑	↑↑	↑	↑	↑
Traffic Volume (vph)	58	155	222	32	23	76
Future Volume (vph)	58	155	222	32	23	76
Ideal Flow (vphpl)	1750	1750	1750	1750	1750	1750
Storage Length (m)	67.0			65.0	82.0	0.0
Storage Lanes	1			1	1	1
Taper Length (m)	100.0				70.0	
Lane Util. Factor	1.00	0.95	0.95	1.00	1.00	1.00
Frt				0.850		0.850
Flt Protected	0.950				0.950	
Satd. Flow (prot)	1511	2771	3137	1316	1471	1365
Flt Permitted	0.602				0.950	
Satd. Flow (perm)	958	2771	3137	1316	1471	1365
Right Turn on Red				Yes		Yes
Satd. Flow (RTOR)				35		83
Link Speed (k/h)	60	60		60		
Link Distance (m)	497.3	249.3		209.6		
Travel Time (s)	29.8	15.0		12.6		
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Heavy Vehicles (%)	10%	20%	6%	13%	13%	9%
Adj. Flow (vph)	63	168	241	35	25	83
Shared Lane Traffic (%)						
Lane Group Flow (vph)	63	168	241	35	25	83
Turn Type	Perm	NA	NA	Perm	Perm	Perm
Protected Phases	2	6				
Permitted Phases	2			6	4	4
Detector Phase	2	2	6	6	4	4
Switch Phase						
Minimum Initial (s)	5.0	5.0	5.0	5.0	5.0	5.0
Minimum Split (s)	22.5	22.5	22.5	22.5	22.5	22.5
Total Split (s)	22.5	22.5	22.5	22.5	22.5	22.5
Total Split (%)	50.0%	50.0%	50.0%	50.0%	50.0%	50.0%
Yellow Time (s)	3.5	3.5	3.5	3.5	3.5	3.5
All-Red Time (s)	1.0	1.0	1.0	1.0	1.0	1.0
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	0.0
Total Lost Time (s)	4.5	4.5	4.5	4.5	4.5	4.5
Lead/Lag						
Lead-Lag Optimize?						
Recall Mode	Max	Max	Max	Max	None	None
Act Effct Green (s)	28.6	28.6	28.6	28.6	6.5	6.5
Actuated g/C Ratio	0.75	0.75	0.75	0.75	0.17	0.17
v/c Ratio	0.09	0.08	0.10	0.04	0.10	0.28
Control Delay	4.1	3.5	3.4	2.0	13.2	6.4
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	4.1	3.5	3.4	2.0	13.2	6.4
LOS	A	A	A	A	B	A
Approach Delay		3.6	3.2		8.0	
Approach LOS		A	A		A	
Queue Length 50th (m)	1.4	1.9	2.7	0.0	1.8	0.0

London Line at Airport Road
Sarnia, Ontario

Existing Traffic, AM Peak
Existing Geometric Configuration



Lane Group	EBL	EBT	WBT	WBR	SBL	SBR
Queue Length 95th (m)	5.0	4.9	6.5	2.1	4.6	6.2
Internal Link Dist (m)		473.3	225.3		185.6	
Turn Bay Length (m)	67.0			65.0	82.0	
Base Capacity (vph)	717	2073	2347	993	698	691
Starvation Cap Reductn	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0
Reduced v/c Ratio	0.09	0.08	0.10	0.04	0.04	0.12

Intersection Summary

Area Type: Other

Cycle Length: 45

Actuated Cycle Length: 38.2

Natural Cycle: 45

Control Type: Actuated-Uncoordinated

Maximum v/c Ratio: 0.28

Intersection Signal Delay: 4.2

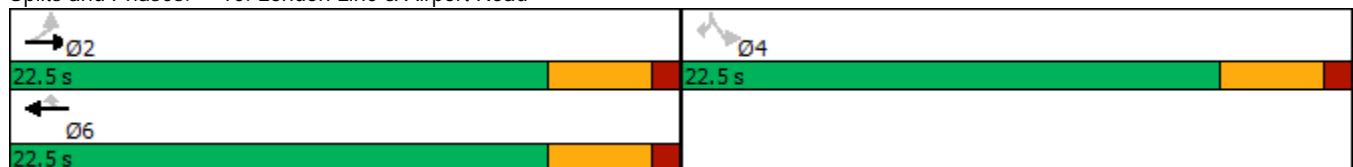
Intersection LOS: A

Intersection Capacity Utilization 26.2%

ICU Level of Service A

Analysis Period (min) 15

Splits and Phases: 10: London Line & Airport Road



London Line at Airport Road
Sarnia, Ontario

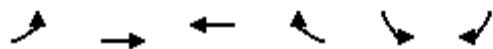
Existing Traffic, PM Peak
Existing Geometric Configuration



Lane Group	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations	↑	↑↑	↑↑	↑	↑	↑
Traffic Volume (vph)	113	338	123	119	63	45
Future Volume (vph)	113	338	123	119	63	45
Ideal Flow (vphpl)	1750	1750	1750	1750	1750	1750
Storage Length (m)	67.0			65.0	82.0	0.0
Storage Lanes	1			1	1	1
Taper Length (m)	100.0				70.0	
Lane Util. Factor	1.00	0.95	0.95	1.00	1.00	1.00
Fr _t				0.850		0.850
Flt Protected	0.950				0.950	
Satd. Flow (prot)	1583	3107	3167	1444	1511	1340
Flt Permitted	0.667				0.950	
Satd. Flow (perm)	1112	3107	3167	1444	1511	1340
Right Turn on Red				Yes		Yes
Satd. Flow (RTOR)				129		49
Link Speed (k/h)	60	60		60		
Link Distance (m)	497.3	249.3		209.6		
Travel Time (s)	29.8	15.0		12.6		
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Heavy Vehicles (%)	5%	7%	5%	3%	10%	11%
Adj. Flow (vph)	123	367	134	129	68	49
Shared Lane Traffic (%)						
Lane Group Flow (vph)	123	367	134	129	68	49
Turn Type	Perm	NA	NA	Perm	Perm	Perm
Protected Phases	2		6			
Permitted Phases	2			6	4	4
Detector Phase	2	2	6	6	4	4
Switch Phase						
Minimum Initial (s)	5.0	5.0	5.0	5.0	5.0	5.0
Minimum Split (s)	22.5	22.5	22.5	22.5	22.5	22.5
Total Split (s)	22.5	22.5	22.5	22.5	22.5	22.5
Total Split (%)	50.0%	50.0%	50.0%	50.0%	50.0%	50.0%
Yellow Time (s)	3.5	3.5	3.5	3.5	3.5	3.5
All-Red Time (s)	1.0	1.0	1.0	1.0	1.0	1.0
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	0.0
Total Lost Time (s)	4.5	4.5	4.5	4.5	4.5	4.5
Lead/Lag						
Lead-Lag Optimize?						
Recall Mode	Max	Max	Max	Max	None	None
Act Effct Green (s)	28.0	28.0	28.0	28.0	7.2	7.2
Actuated g/C Ratio	0.73	0.73	0.73	0.73	0.19	0.19
v/c Ratio	0.15	0.16	0.06	0.12	0.24	0.17
Control Delay	4.8	3.8	3.8	1.6	14.5	6.0
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	4.8	3.8	3.8	1.6	14.5	6.0
LOS	A	A	A	A	B	A
Approach Delay		4.0	2.8		10.9	
Approach LOS		A	A		B	
Queue Length 50th (m)	3.2	5.0	1.6	0.0	4.9	0.0

London Line at Airport Road
Sarnia, Ontario

Existing Traffic, PM Peak
Existing Geometric Configuration



Lane Group	EBL	EBT	WBT	WBR	SBL	SBR
Queue Length 95th (m)	9.4	10.4	4.3	4.3	9.4	4.7
Internal Link Dist (m)		473.3	225.3		185.6	
Turn Bay Length (m)	67.0			65.0	82.0	
Base Capacity (vph)	815	2278	2322	1093	715	659
Starvation Cap Reductn	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0
Reduced v/c Ratio	0.15	0.16	0.06	0.12	0.10	0.07

Intersection Summary

Area Type: Other

Cycle Length: 45

Actuated Cycle Length: 38.2

Natural Cycle: 45

Control Type: Actuated-Uncoordinated

Maximum v/c Ratio: 0.24

Intersection Signal Delay: 4.6

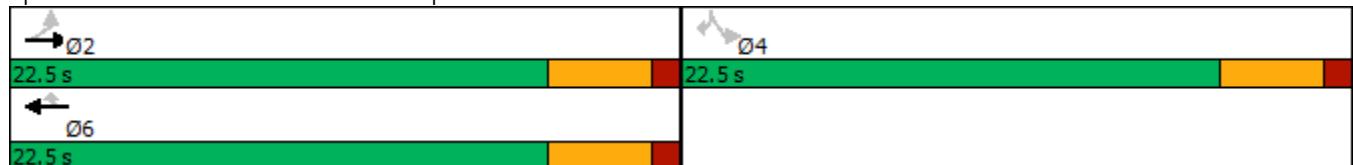
Intersection LOS: A

Intersection Capacity Utilization 26.4%

ICU Level of Service A

Analysis Period (min) 15

Splits and Phases: 10: London Line & Airport Road



London Line at Airport Road
Sarnia, Ontario

Background Traffic 2025, AM Peak
Existing Geometric Configuration



Lane Group	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations	1	2	2	1	1	1
Traffic Volume (vph)	62	165	236	34	24	81
Future Volume (vph)	62	165	236	34	24	81
Ideal Flow (vphpl)	1750	1750	1750	1750	1750	1750
Storage Length (m)	67.0			65.0	82.0	0.0
Storage Lanes	1			1	1	1
Taper Length (m)	100.0				70.0	
Lane Util. Factor	1.00	0.95	0.95	1.00	1.00	1.00
Frt				0.850		0.850
Flt Protected	0.950				0.950	
Satd. Flow (prot)	1511	2771	3137	1316	1471	1365
Flt Permitted	0.593				0.950	
Satd. Flow (perm)	943	2771	3137	1316	1471	1365
Right Turn on Red				Yes		Yes
Satd. Flow (RTOR)				37		88
Link Speed (k/h)	60	60		60		
Link Distance (m)	497.3	249.3		209.6		
Travel Time (s)	29.8	15.0		12.6		
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Heavy Vehicles (%)	10%	20%	6%	13%	13%	9%
Adj. Flow (vph)	67	179	257	37	26	88
Shared Lane Traffic (%)						
Lane Group Flow (vph)	67	179	257	37	26	88
Turn Type	Perm	NA	NA	Perm	Perm	Perm
Protected Phases	2		6			
Permitted Phases	2			6	4	4
Detector Phase	2	2	6	6	4	4
Switch Phase						
Minimum Initial (s)	5.0	5.0	5.0	5.0	5.0	5.0
Minimum Split (s)	22.5	22.5	22.5	22.5	22.5	22.5
Total Split (s)	22.5	22.5	22.5	22.5	22.5	22.5
Total Split (%)	50.0%	50.0%	50.0%	50.0%	50.0%	50.0%
Yellow Time (s)	3.5	3.5	3.5	3.5	3.5	3.5
All-Red Time (s)	1.0	1.0	1.0	1.0	1.0	1.0
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	0.0
Total Lost Time (s)	4.5	4.5	4.5	4.5	4.5	4.5
Lead/Lag						
Lead-Lag Optimize?						
Recall Mode	Max	Max	Max	Max	None	None
Act Effct Green (s)	28.1	28.1	28.1	28.1	6.5	6.5
Actuated g/C Ratio	0.74	0.74	0.74	0.74	0.17	0.17
v/c Ratio	0.10	0.09	0.11	0.04	0.10	0.29
Control Delay	4.2	3.5	3.4	2.0	13.0	6.4
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	4.2	3.5	3.4	2.0	13.0	6.4
LOS	A	A	A	A	B	A
Approach Delay		3.7	3.2		7.9	
Approach LOS		A	A		A	
Queue Length 50th (m)	1.5	2.0	3.0	0.0	1.8	0.0



Lane Group	EBL	EBT	WBT	WBR	SBL	SBR
Queue Length 95th (m)	5.4	5.2	7.0	2.2	4.7	6.3
Internal Link Dist (m)		473.3	225.3		185.6	
Turn Bay Length (m)	67.0			65.0	82.0	
Base Capacity (vph)	702	2062	2335	989	704	698
Starvation Cap Reductn	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0
Reduced v/c Ratio	0.10	0.09	0.11	0.04	0.04	0.13

Intersection Summary

Area Type: Other

Cycle Length: 45

Actuated Cycle Length: 37.8

Natural Cycle: 45

Control Type: Actuated-Uncoordinated

Maximum v/c Ratio: 0.29

Intersection Signal Delay: 4.2

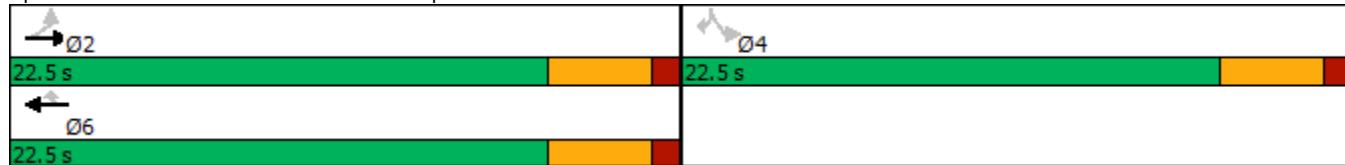
Intersection LOS: A

Intersection Capacity Utilization 26.7%

ICU Level of Service A

Analysis Period (min) 15

Splits and Phases: 10: London Line & Airport Road



London Line at Airport Road
Sarnia, Ontario

Total Traffic 2025, AM Peak
Existing Geometric Configuration



Lane Group	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations	1	2	2	1	1	1
Traffic Volume (vph)	73	193	249	34	24	86
Future Volume (vph)	73	193	249	34	24	86
Ideal Flow (vphpl)	1750	1750	1750	1750	1750	1750
Storage Length (m)	67.0			65.0	82.0	0.0
Storage Lanes	1			1	1	1
Taper Length (m)	100.0				70.0	
Lane Util. Factor	1.00	0.95	0.95	1.00	1.00	1.00
Frt				0.850		0.850
Flt Protected	0.950				0.950	
Satd. Flow (prot)	1511	2771	3137	1316	1471	1365
Flt Permitted	0.585				0.950	
Satd. Flow (perm)	931	2771	3137	1316	1471	1365
Right Turn on Red				Yes		Yes
Satd. Flow (RTOR)				37		93
Link Speed (k/h)	60	60		60		
Link Distance (m)	497.3	249.3		209.6		
Travel Time (s)	29.8	15.0		12.6		
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Heavy Vehicles (%)	10%	20%	6%	13%	13%	9%
Adj. Flow (vph)	79	210	271	37	26	93
Shared Lane Traffic (%)						
Lane Group Flow (vph)	79	210	271	37	26	93
Turn Type	Perm	NA	NA	Perm	Perm	Perm
Protected Phases	2		6			
Permitted Phases	2			6	4	4
Detector Phase	2	2	6	6	4	4
Switch Phase						
Minimum Initial (s)	5.0	5.0	5.0	5.0	5.0	5.0
Minimum Split (s)	22.5	22.5	22.5	22.5	22.5	22.5
Total Split (s)	22.5	22.5	22.5	22.5	22.5	22.5
Total Split (%)	50.0%	50.0%	50.0%	50.0%	50.0%	50.0%
Yellow Time (s)	3.5	3.5	3.5	3.5	3.5	3.5
All-Red Time (s)	1.0	1.0	1.0	1.0	1.0	1.0
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	0.0
Total Lost Time (s)	4.5	4.5	4.5	4.5	4.5	4.5
Lead/Lag						
Lead-Lag Optimize?						
Recall Mode	Max	Max	Max	Max	None	None
Act Effct Green (s)	27.9	27.9	27.9	27.9	6.5	6.5
Actuated g/C Ratio	0.74	0.74	0.74	0.74	0.17	0.17
v/c Ratio	0.11	0.10	0.12	0.04	0.10	0.30
Control Delay	4.4	3.5	3.4	2.1	12.9	6.3
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	4.4	3.5	3.4	2.1	12.9	6.3
LOS	A	A	A	A	B	A
Approach Delay		3.7	3.3		7.8	
Approach LOS		A	A		A	
Queue Length 50th (m)	1.8	2.4	3.2	0.0	1.8	0.0

London Line at Airport Road
Sarnia, Ontario

Total Traffic 2025, AM Peak
Existing Geometric Configuration



Lane Group	EBL	EBT	WBT	WBR	SBL	SBR
Queue Length 95th (m)	6.3	6.0	7.4	2.2	4.7	6.5
Internal Link Dist (m)		473.3	225.3		185.6	
Turn Bay Length (m)	67.0			65.0	82.0	
Base Capacity (vph)	690	2055	2327	986	708	705
Starvation Cap Reductn	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0
Reduced v/c Ratio	0.11	0.10	0.12	0.04	0.04	0.13

Intersection Summary

Area Type: Other

Cycle Length: 45

Actuated Cycle Length: 37.6

Natural Cycle: 45

Control Type: Actuated-Uncoordinated

Maximum v/c Ratio: 0.30

Intersection Signal Delay: 4.2

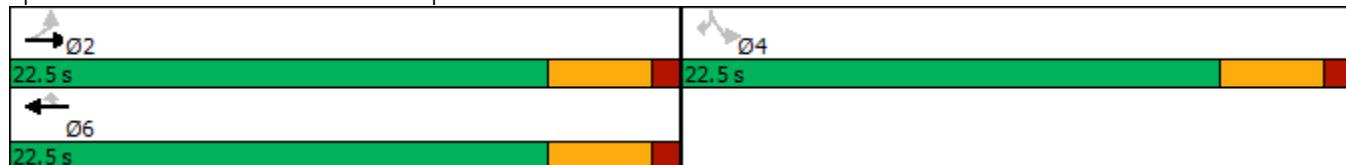
Intersection LOS: A

Intersection Capacity Utilization 27.3%

ICU Level of Service A

Analysis Period (min) 15

Splits and Phases: 10: London Line & Airport Road



London Line at Airport Road
Sarnia, Ontario

Background Traffic 2025, PM Peak
Existing Geometric Configuration



Lane Group	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations	↑	↑↑	↑↑	↑	↑	↑
Traffic Volume (vph)	120	359	131	126	67	48
Future Volume (vph)	120	359	131	126	67	48
Ideal Flow (vphpl)	1750	1750	1750	1750	1750	1750
Storage Length (m)	67.0			65.0	82.0	0.0
Storage Lanes	1			1	1	1
Taper Length (m)	100.0				70.0	
Lane Util. Factor	1.00	0.95	0.95	1.00	1.00	1.00
Fr _t				0.850		0.850
Flt Protected	0.950				0.950	
Satd. Flow (prot)	1583	3107	3167	1444	1511	1340
Flt Permitted	0.662				0.950	
Satd. Flow (perm)	1103	3107	3167	1444	1511	1340
Right Turn on Red				Yes		Yes
Satd. Flow (RTOR)				137		52
Link Speed (k/h)	60	60		60		
Link Distance (m)	497.3	249.3		209.6		
Travel Time (s)	29.8	15.0		12.6		
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Heavy Vehicles (%)	5%	7%	5%	3%	10%	11%
Adj. Flow (vph)	130	390	142	137	73	52
Shared Lane Traffic (%)						
Lane Group Flow (vph)	130	390	142	137	73	52
Turn Type	Perm	NA	NA	Perm	Perm	Perm
Protected Phases	2		6			
Permitted Phases	2			6	4	4
Detector Phase	2	2	6	6	4	4
Switch Phase						
Minimum Initial (s)	5.0	5.0	5.0	5.0	5.0	5.0
Minimum Split (s)	22.5	22.5	22.5	22.5	22.5	22.5
Total Split (s)	22.5	22.5	22.5	22.5	22.5	22.5
Total Split (%)	50.0%	50.0%	50.0%	50.0%	50.0%	50.0%
Yellow Time (s)	3.5	3.5	3.5	3.5	3.5	3.5
All-Red Time (s)	1.0	1.0	1.0	1.0	1.0	1.0
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	0.0
Total Lost Time (s)	4.5	4.5	4.5	4.5	4.5	4.5
Lead/Lag						
Lead-Lag Optimize?						
Recall Mode	Max	Max	Max	Max	None	None
Act Effct Green (s)	27.6	27.6	27.6	27.6	7.3	7.3
Actuated g/C Ratio	0.73	0.73	0.73	0.73	0.19	0.19
v/c Ratio	0.16	0.17	0.06	0.13	0.25	0.17
Control Delay	5.0	3.9	3.9	1.6	14.4	5.8
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	5.0	3.9	3.9	1.6	14.4	5.8
LOS	A	A	A	A	B	A
Approach Delay		4.2	2.8		10.8	
Approach LOS		A	A		B	
Queue Length 50th (m)	3.4	5.4	1.7	0.0	5.0	0.0



Lane Group	EBL	EBT	WBT	WBR	SBL	SBR
Queue Length 95th (m)	10.1	11.2	4.6	4.6	9.9	4.9
Internal Link Dist (m)		473.3	225.3		185.6	
Turn Bay Length (m)	67.0			65.0	82.0	
Base Capacity (vph)	802	2261	2304	1088	720	666
Starvation Cap Reductn	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0
Reduced v/c Ratio	0.16	0.17	0.06	0.13	0.10	0.08

Intersection Summary

Area Type: Other

Cycle Length: 45

Actuated Cycle Length: 37.9

Natural Cycle: 45

Control Type: Actuated-Uncoordinated

Maximum v/c Ratio: 0.25

Intersection Signal Delay: 4.7

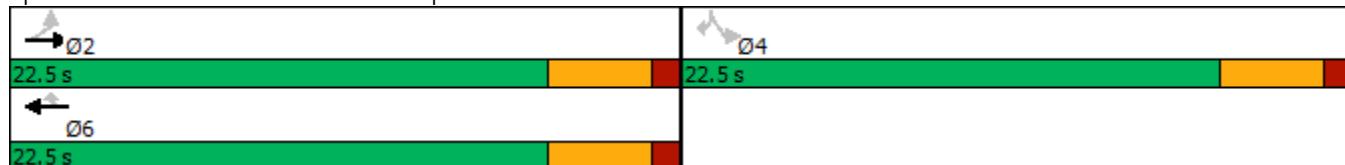
Intersection LOS: A

Intersection Capacity Utilization 26.8%

ICU Level of Service A

Analysis Period (min) 15

Splits and Phases: 10: London Line & Airport Road



London Line at Airport Road
Sarnia, Ontario

Total Traffic 2025, PM Peak
Existing Geometric Configuration



Lane Group	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations	1	2	2	1	1	1
Traffic Volume (vph)	130	387	183	126	67	67
Future Volume (vph)	130	387	183	126	67	67
Ideal Flow (vphpl)	1750	1750	1750	1750	1750	1750
Storage Length (m)	67.0			65.0	82.0	0.0
Storage Lanes	1			1	1	1
Taper Length (m)	100.0				70.0	
Lane Util. Factor	1.00	0.95	0.95	1.00	1.00	1.00
Fr _t				0.850		0.850
Flt Protected	0.950				0.950	
Satd. Flow (prot)	1583	3107	3167	1444	1511	1340
Flt Permitted	0.627				0.950	
Satd. Flow (perm)	1045	3107	3167	1444	1511	1340
Right Turn on Red				Yes		Yes
Satd. Flow (RTOR)				137		73
Link Speed (k/h)	60	60		60		
Link Distance (m)	497.3	249.3		209.6		
Travel Time (s)	29.8	15.0		12.6		
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Heavy Vehicles (%)	5%	7%	5%	3%	10%	11%
Adj. Flow (vph)	141	421	199	137	73	73
Shared Lane Traffic (%)						
Lane Group Flow (vph)	141	421	199	137	73	73
Turn Type	Perm	NA	NA	Perm	Perm	Perm
Protected Phases	2		6			
Permitted Phases	2			6	4	4
Detector Phase	2	2	6	6	4	4
Switch Phase						
Minimum Initial (s)	5.0	5.0	5.0	5.0	5.0	5.0
Minimum Split (s)	22.5	22.5	22.5	22.5	22.5	22.5
Total Split (s)	22.5	22.5	22.5	22.5	22.5	22.5
Total Split (%)	50.0%	50.0%	50.0%	50.0%	50.0%	50.0%
Yellow Time (s)	3.5	3.5	3.5	3.5	3.5	3.5
All-Red Time (s)	1.0	1.0	1.0	1.0	1.0	1.0
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	0.0
Total Lost Time (s)	4.5	4.5	4.5	4.5	4.5	4.5
Lead/Lag						
Lead-Lag Optimize?						
Recall Mode	Max	Max	Max	Max	None	None
Act Effct Green (s)	26.8	26.8	26.8	26.8	7.2	7.2
Actuated g/C Ratio	0.72	0.72	0.72	0.72	0.19	0.19
v/c Ratio	0.19	0.19	0.09	0.13	0.25	0.23
Control Delay	5.3	4.0	3.9	1.7	14.0	5.7
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	5.3	4.0	3.9	1.7	14.0	5.7
LOS	A	A	A	A	B	A
Approach Delay		4.3	3.0		9.9	
Approach LOS		A	A		A	
Queue Length 50th (m)	3.7	5.8	2.5	0.0	4.5	0.0

London Line at Airport Road
Sarnia, Ontario

Total Traffic 2025, PM Peak
Existing Geometric Configuration



Lane Group	EBL	EBT	WBT	WBR	SBL	SBR
Queue Length 95th (m)	11.1	12.1	6.1	4.6	9.9	5.7
Internal Link Dist (m)		473.3	225.3		185.6	
Turn Bay Length (m)	67.0			65.0	82.0	
Base Capacity (vph)	753	2240	2283	1079	734	688
Starvation Cap Reductn	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0
Reduced v/c Ratio	0.19	0.19	0.09	0.13	0.10	0.11

Intersection Summary

Area Type: Other

Cycle Length: 45

Actuated Cycle Length: 37.1

Natural Cycle: 45

Control Type: Actuated-Uncoordinated

Maximum v/c Ratio: 0.25

Intersection Signal Delay: 4.7

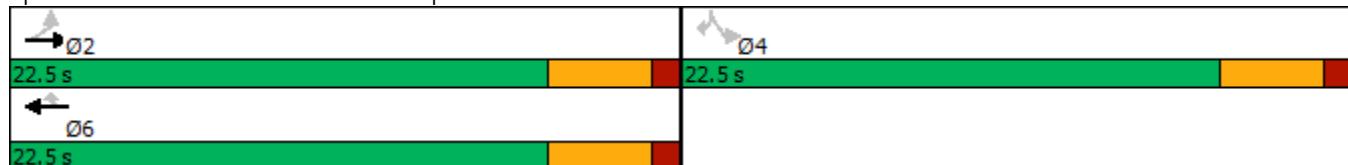
Intersection LOS: A

Intersection Capacity Utilization 28.7%

ICU Level of Service A

Analysis Period (min) 15

Splits and Phases: 10: London Line & Airport Road



London Line at Airport Road
Sarnia, Ontario

Background Traffic 2030, AM Peak
Existing Geometric Configuration



Lane Group	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations	↑	↑↑	↑↑	↑	↑	↑
Traffic Volume (vph)	65	173	248	36	26	85
Future Volume (vph)	65	173	248	36	26	85
Ideal Flow (vphpl)	1750	1750	1750	1750	1750	1750
Storage Length (m)	67.0			65.0	82.0	0.0
Storage Lanes	1			1	1	1
Taper Length (m)	100.0				70.0	
Lane Util. Factor	1.00	0.95	0.95	1.00	1.00	1.00
Frt				0.850		0.850
Flt Protected	0.950				0.950	
Satd. Flow (prot)	1511	2771	3137	1316	1471	1365
Flt Permitted	0.585				0.950	
Satd. Flow (perm)	931	2771	3137	1316	1471	1365
Right Turn on Red				Yes		Yes
Satd. Flow (RTOR)				39		92
Link Speed (k/h)	60	60		60		
Link Distance (m)	497.3	249.3		209.6		
Travel Time (s)	29.8	15.0		12.6		
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Heavy Vehicles (%)	10%	20%	6%	13%	13%	9%
Adj. Flow (vph)	71	188	270	39	28	92
Shared Lane Traffic (%)						
Lane Group Flow (vph)	71	188	270	39	28	92
Turn Type	Perm	NA	NA	Perm	Perm	Perm
Protected Phases	2		6			
Permitted Phases	2			6	4	4
Detector Phase	2	2	6	6	4	4
Switch Phase						
Minimum Initial (s)	5.0	5.0	5.0	5.0	5.0	5.0
Minimum Split (s)	22.5	22.5	22.5	22.5	22.5	22.5
Total Split (s)	22.5	22.5	22.5	22.5	22.5	22.5
Total Split (%)	50.0%	50.0%	50.0%	50.0%	50.0%	50.0%
Yellow Time (s)	3.5	3.5	3.5	3.5	3.5	3.5
All-Red Time (s)	1.0	1.0	1.0	1.0	1.0	1.0
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	0.0
Total Lost Time (s)	4.5	4.5	4.5	4.5	4.5	4.5
Lead/Lag						
Lead-Lag Optimize?						
Recall Mode	Max	Max	Max	Max	None	None
Act Effct Green (s)	27.8	27.8	27.8	27.8	6.5	6.5
Actuated g/C Ratio	0.74	0.74	0.74	0.74	0.17	0.17
v/c Ratio	0.10	0.09	0.12	0.04	0.11	0.30
Control Delay	4.3	3.5	3.4	2.0	13.0	6.4
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	4.3	3.5	3.4	2.0	13.0	6.4
LOS	A	A	A	A	B	A
Approach Delay		3.7	3.3		7.9	
Approach LOS		A	A		A	
Queue Length 50th (m)	1.6	2.2	3.2	0.0	1.9	0.0



Lane Group	EBL	EBT	WBT	WBR	SBL	SBR
Queue Length 95th (m)	5.7	5.4	7.3	2.2	5.0	6.5
Internal Link Dist (m)		473.3	225.3		185.6	
Turn Bay Length (m)	67.0			65.0	82.0	
Base Capacity (vph)	690	2054	2325	985	709	705
Starvation Cap Reductn	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0
Reduced v/c Ratio	0.10	0.09	0.12	0.04	0.04	0.13

Intersection Summary

Area Type: Other

Cycle Length: 45

Actuated Cycle Length: 37.5

Natural Cycle: 45

Control Type: Actuated-Uncoordinated

Maximum v/c Ratio: 0.30

Intersection Signal Delay: 4.2

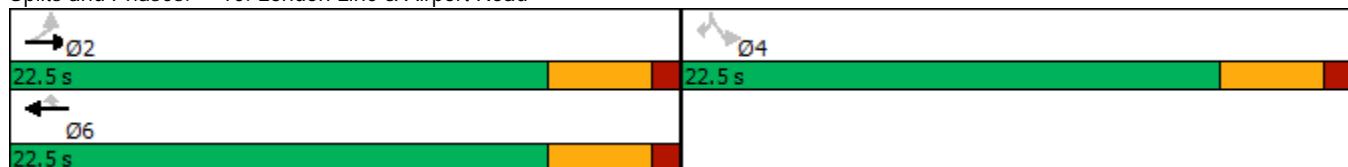
Intersection LOS: A

Intersection Capacity Utilization 27.0%

ICU Level of Service A

Analysis Period (min) 15

Splits and Phases: 10: London Line & Airport Road



London Line at Airport Road
Sarnia, Ontario

Background Traffic 2030, PM Peak
Existing Geometric Configuration



Lane Group	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations	1	2	2	1	1	1
Traffic Volume (vph)	126	377	137	133	70	50
Future Volume (vph)	126	377	137	133	70	50
Ideal Flow (vphpl)	1750	1750	1750	1750	1750	1750
Storage Length (m)	67.0			65.0	82.0	0.0
Storage Lanes	1			1	1	1
Taper Length (m)	100.0				70.0	
Lane Util. Factor	1.00	0.95	0.95	1.00	1.00	1.00
Fr _t				0.850		0.850
Flt Protected	0.950				0.950	
Satd. Flow (prot)	1583	3107	3167	1444	1511	1340
Flt Permitted	0.658				0.950	
Satd. Flow (perm)	1097	3107	3167	1444	1511	1340
Right Turn on Red				Yes		Yes
Satd. Flow (RTOR)				145		54
Link Speed (k/h)		60	60		60	
Link Distance (m)		497.3	249.3		209.6	
Travel Time (s)		29.8	15.0		12.6	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Heavy Vehicles (%)	5%	7%	5%	3%	10%	11%
Adj. Flow (vph)	137	410	149	145	76	54
Shared Lane Traffic (%)						
Lane Group Flow (vph)	137	410	149	145	76	54
Turn Type	Perm	NA	NA	Perm	Perm	Perm
Protected Phases		2	6			
Permitted Phases	2			6	4	4
Detector Phase	2	2	6	6	4	4
Switch Phase						
Minimum Initial (s)	5.0	5.0	5.0	5.0	5.0	5.0
Minimum Split (s)	22.5	22.5	22.5	22.5	22.5	22.5
Total Split (s)	22.5	22.5	22.5	22.5	22.5	22.5
Total Split (%)	50.0%	50.0%	50.0%	50.0%	50.0%	50.0%
Yellow Time (s)	3.5	3.5	3.5	3.5	3.5	3.5
All-Red Time (s)	1.0	1.0	1.0	1.0	1.0	1.0
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	0.0
Total Lost Time (s)	4.5	4.5	4.5	4.5	4.5	4.5
Lead/Lag						
Lead-Lag Optimize?						
Recall Mode	Max	Max	Max	Max	None	None
Act Effct Green (s)	27.3	27.3	27.3	27.3	7.3	7.3
Actuated g/C Ratio	0.72	0.72	0.72	0.72	0.19	0.19
v/c Ratio	0.17	0.18	0.06	0.13	0.26	0.18
Control Delay	5.1	4.0	4.0	1.7	14.4	5.7
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	5.1	4.0	4.0	1.7	14.4	5.7
LOS	A	A	A	A	B	A
Approach Delay		4.3	2.8		10.8	
Approach LOS		A	A		B	
Queue Length 50th (m)	3.6	5.7	1.8	0.0	5.1	0.0



Lane Group	EBL	EBT	WBT	WBR	SBL	SBR
Queue Length 95th (m)	10.7	11.8	4.8	4.7	10.2	4.9
Internal Link Dist (m)		473.3	225.3		185.6	
Turn Bay Length (m)	67.0			65.0	82.0	
Base Capacity (vph)	795	2252	2295	1086	723	669
Starvation Cap Reductn	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0
Reduced v/c Ratio	0.17	0.18	0.06	0.13	0.11	0.08

Intersection Summary

Area Type: Other

Cycle Length: 45

Actuated Cycle Length: 37.7

Natural Cycle: 45

Control Type: Actuated-Uncoordinated

Maximum v/c Ratio: 0.26

Intersection Signal Delay: 4.7

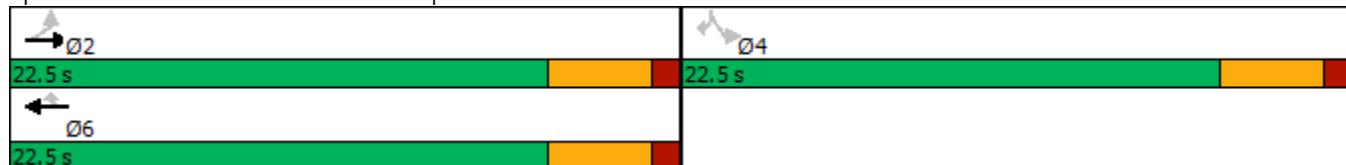
Intersection LOS: A

Intersection Capacity Utilization 27.2%

ICU Level of Service A

Analysis Period (min) 15

Splits and Phases: 10: London Line & Airport Road



London Line at Airport Road
Sarnia, Ontario

Total Traffic 2030, AM Peak
Existing Geometric Configuration



Lane Group	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations	1	2	2	1	1	1
Traffic Volume (vph)	76	201	261	36	26	90
Future Volume (vph)	76	201	261	36	26	90
Ideal Flow (vphpl)	1750	1750	1750	1750	1750	1750
Storage Length (m)	67.0			65.0	82.0	0.0
Storage Lanes	1			1	1	1
Taper Length (m)	100.0				70.0	
Lane Util. Factor	1.00	0.95	0.95	1.00	1.00	1.00
Fr _t				0.850		0.850
Flt Protected	0.950				0.950	
Satd. Flow (prot)	1511	2771	3137	1316	1471	1365
Flt Permitted	0.578				0.950	
Satd. Flow (perm)	920	2771	3137	1316	1471	1365
Right Turn on Red				Yes		Yes
Satd. Flow (RTOR)				39		98
Link Speed (k/h)	60	60		60		
Link Distance (m)	497.3	249.3		209.6		
Travel Time (s)	29.8	15.0		12.6		
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Heavy Vehicles (%)	10%	20%	6%	13%	13%	9%
Adj. Flow (vph)	83	218	284	39	28	98
Shared Lane Traffic (%)						
Lane Group Flow (vph)	83	218	284	39	28	98
Turn Type	Perm	NA	NA	Perm	Perm	Perm
Protected Phases	2	6				
Permitted Phases	2			6	4	4
Detector Phase	2	2	6	6	4	4
Switch Phase						
Minimum Initial (s)	5.0	5.0	5.0	5.0	5.0	5.0
Minimum Split (s)	22.5	22.5	22.5	22.5	22.5	22.5
Total Split (s)	22.5	22.5	22.5	22.5	22.5	22.5
Total Split (%)	50.0%	50.0%	50.0%	50.0%	50.0%	50.0%
Yellow Time (s)	3.5	3.5	3.5	3.5	3.5	3.5
All-Red Time (s)	1.0	1.0	1.0	1.0	1.0	1.0
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	0.0
Total Lost Time (s)	4.5	4.5	4.5	4.5	4.5	4.5
Lead/Lag						
Lead-Lag Optimize?						
Recall Mode	Max	Max	Max	Max	None	None
Act Effct Green (s)	27.5	27.5	27.5	27.5	6.5	6.5
Actuated g/C Ratio	0.74	0.74	0.74	0.74	0.17	0.17
v/c Ratio	0.12	0.11	0.12	0.04	0.11	0.31
Control Delay	4.5	3.6	3.5	2.1	12.8	6.3
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	4.5	3.6	3.5	2.1	12.8	6.3
LOS	A	A	A	A	B	A
Approach Delay		3.8	3.3		7.7	
Approach LOS		A	A		A	
Queue Length 50th (m)	1.9	2.5	3.3	0.0	1.9	0.0

London Line at Airport Road
Sarnia, Ontario

Total Traffic 2030, AM Peak
Existing Geometric Configuration



Lane Group	EBL	EBT	WBT	WBR	SBL	SBR
Queue Length 95th (m)	6.6	6.3	7.7	2.3	5.0	6.7
Internal Link Dist (m)		473.3	225.3		185.6	
Turn Bay Length (m)	67.0			65.0	82.0	
Base Capacity (vph)	679	2044	2315	981	713	712
Starvation Cap Reductn	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0
Reduced v/c Ratio	0.12	0.11	0.12	0.04	0.04	0.14

Intersection Summary

Area Type: Other

Cycle Length: 45

Actuated Cycle Length: 37.3

Natural Cycle: 45

Control Type: Actuated-Uncoordinated

Maximum v/c Ratio: 0.31

Intersection Signal Delay: 4.3

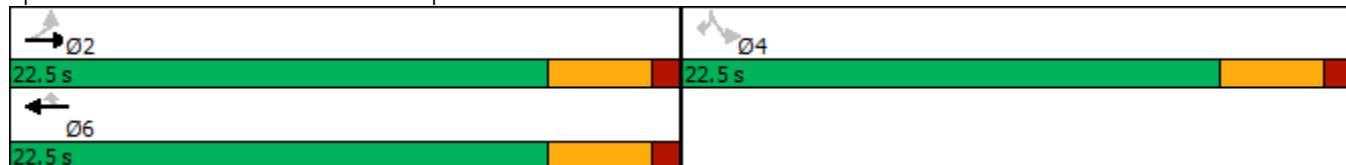
Intersection LOS: A

Intersection Capacity Utilization 27.8%

ICU Level of Service A

Analysis Period (min) 15

Splits and Phases: 10: London Line & Airport Road



London Line at Airport Road
Sarnia, Ontario

Total Traffic 2030, PM Peak
Existing Geometric Configuration



Lane Group	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations	↑	↑↑	↑↑	↑	↑	↑
Traffic Volume (vph)	136	405	189	133	70	69
Future Volume (vph)	136	405	189	133	70	69
Ideal Flow (vphpl)	1750	1750	1750	1750	1750	1750
Storage Length (m)	67.0			65.0	82.0	0.0
Storage Lanes	1			1	1	1
Taper Length (m)	100.0				70.0	
Lane Util. Factor	1.00	0.95	0.95	1.00	1.00	1.00
Frt				0.850		0.850
Flt Protected	0.950				0.950	
Satd. Flow (prot)	1583	3107	3167	1444	1511	1340
Flt Permitted	0.623				0.950	
Satd. Flow (perm)	1038	3107	3167	1444	1511	1340
Right Turn on Red				Yes		Yes
Satd. Flow (RTOR)				145		75
Link Speed (k/h)	60	60		60		
Link Distance (m)	497.3	249.3		209.6		
Travel Time (s)	29.8	15.0		12.6		
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Heavy Vehicles (%)	5%	7%	5%	3%	10%	11%
Adj. Flow (vph)	148	440	205	145	76	75
Shared Lane Traffic (%)						
Lane Group Flow (vph)	148	440	205	145	76	75
Turn Type	Perm	NA	NA	Perm	Perm	Perm
Protected Phases	2		6			
Permitted Phases	2			6	4	4
Detector Phase	2	2	6	6	4	4
Switch Phase						
Minimum Initial (s)	5.0	5.0	5.0	5.0	5.0	5.0
Minimum Split (s)	22.5	22.5	22.5	22.5	22.5	22.5
Total Split (s)	22.5	22.5	22.5	22.5	22.5	22.5
Total Split (%)	50.0%	50.0%	50.0%	50.0%	50.0%	50.0%
Yellow Time (s)	3.5	3.5	3.5	3.5	3.5	3.5
All-Red Time (s)	1.0	1.0	1.0	1.0	1.0	1.0
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	0.0
Total Lost Time (s)	4.5	4.5	4.5	4.5	4.5	4.5
Lead/Lag						
Lead-Lag Optimize?						
Recall Mode	Max	Max	Max	Max	None	None
Act Effct Green (s)	26.7	26.7	26.7	26.7	7.3	7.3
Actuated g/C Ratio	0.72	0.72	0.72	0.72	0.20	0.20
v/c Ratio	0.20	0.20	0.09	0.13	0.26	0.23
Control Delay	5.4	4.1	3.9	1.7	14.0	5.7
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	5.4	4.1	3.9	1.7	14.0	5.7
LOS	A	A	A	A	B	A
Approach Delay		4.4	3.0		9.9	
Approach LOS		A	A		A	
Queue Length 50th (m)	4.0	6.1	2.6	0.0	4.6	0.0

London Line at Airport Road
Sarnia, Ontario

Total Traffic 2030, PM Peak
Existing Geometric Configuration



Lane Group	EBL	EBT	WBT	WBR	SBL	SBR
Queue Length 95th (m)	11.8	12.7	6.3	4.7	10.2	5.8
Internal Link Dist (m)		473.3	225.3		185.6	
Turn Bay Length (m)	67.0			65.0	82.0	
Base Capacity (vph)	746	2233	2277	1079	735	690
Starvation Cap Reductn	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0
Reduced v/c Ratio	0.20	0.20	0.09	0.13	0.10	0.11

Intersection Summary

Area Type: Other

Cycle Length: 45

Actuated Cycle Length: 37.1

Natural Cycle: 45

Control Type: Actuated-Uncoordinated

Maximum v/c Ratio: 0.26

Intersection Signal Delay: 4.7

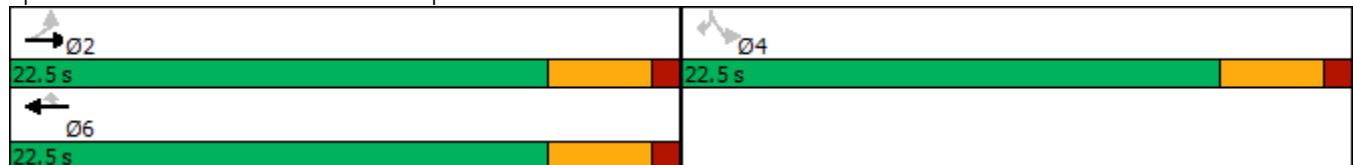
Intersection LOS: A

Intersection Capacity Utilization 29.3%

ICU Level of Service A

Analysis Period (min) 15

Splits and Phases: 10: London Line & Airport Road



Appendix E

TRAFFIC SIGNAL WARRANTS

**London Line (County Road 22) at
Garden Centre / Furniture Store
London Line (County Road 22) at
Site Access (Street A)**

Traffic Signal Warrants – Summary of Justifications (OTM Book 12)

Projected Total Traffic (Horizon Year 2025)

London Line (County Road 22) at Garden Centre / Furniture Store

JUSTIFICATION	DESCRIPTION	MINIMUM REQUIREMENTS FOR TWO-LANE ROADWAYS		COMPLIANCE	
		FREE FLOW	RESTRICTED FLOW		
		OPERATING SPEED GREATER THAN OR EQUAL TO 70 km/h	OPERATING SPEED LESS THAN 70 km/h	SECTIONAL %	ENTIRE %**
1. MINIMUM VEHICULAR VOLUME	A*. Vehicle Volume, All Approaches for Each of the Heaviest 8 Hours of an Average Day, and B***. Vehicle Volume, Along Minor Streets for Each of the Same 8 Hours	480 120	720 170	100 ⁽¹⁾ 12 ⁽²⁾	12
2. DELAY TO CROSS TRAFFIC	A*. Vehicle Volume, Major Street for Each of the Heaviest 8 Hours of an Average Day, and B*. Combined Vehicle and Pedestrian Volume Crossing the Major Street for Each of the Same 8 Hours.	480 50	720 75	59 ⁽³⁾ 8 ⁽⁴⁾	8
3. VOLUME/DELAY COMBINATIONS	The Above Justifications (1 and 2) Both Satisfied to the Extent of 80% or more	YES <input type="checkbox"/>	<input checked="" type="checkbox"/>		8
4. MIN. FOUR HOUR VEHICLE VOLUME	At Plotted Point Representing Hourly Volume for Minor Approach vs. Major Approach for Four Highest Hours of an Average Day Fall above the Applicable Curve	YES <input type="checkbox"/>	NO <input type="checkbox"/>		N/A
5. COLLISION EXPERIENCE	A. Total Reported Accidents of Types Susceptible to Correction by a Traffic Signal, per 12 Month Period Averaged over a 36 Month Period, and B. Adequate Trial of Less Restrictive Remedies. Where Satisfactory Observance and Enforcement Have Failed to Reduce the Number of Collisions		5	N/A	N/A
6. PEDESTRIAN VOLUME AND DELAY	A. Plotted Point Representing 8 Hour Pedestrian Volume vs. 8 Hour Vehicular Volume Fall in Justified Zone, and B. Plotted Point Representing 8 Hour Volume of Pedestrian Experiencing Delays of 10 s or more vs. 8 Hour Pedestrian Volume Fall in Justified Zone	YES <input type="checkbox"/> YES <input type="checkbox"/>	NO <input type="checkbox"/> NO <input type="checkbox"/>		N/A

Notes

* Vehicle Volume Warrants 1A and 2A for Roadways Having Two or More Moving Lanes in One Direction Should be 25% Higher than Values Given Above.

** The Lowest Sectional Percentage Governs the Entire Warrant.

*** For "T" Intersections, the Values for Warrant (1B) should be increased by 50%.

Justification 7 - Future Traffic Volumes

$$(1) = (686 + 1084) / 4 / 720 = 100\%$$

$$(2) = (7 + 75) / 4 / 170 = 12\%$$

$$(3) = (679 + 1009) / 4 / 720 = 59\%$$

$$(4) = (2 + 21) / 4 / 75 = 8\%$$

Traffic Signal Warrants – Summary of Justifications (OTM Book 12)

Projected Total Traffic (Horizon Year 2030)

London Line (County Road 22) at Garden Centre / Furniture Store

JUSTIFICATION	DESCRIPTION	MINIMUM REQUIREMENTS FOR TWO-LANE ROADWAYS		COMPLIANCE	
		FREE FLOW	RESTRICTED FLOW		
		OPERATING SPEED GREATER THAN OR EQUAL TO 70 km/h	OPERATING SPEED LESS THAN 70 km/h	SECTIONAL %	ENTIRE %**
1. MINIMUM VEHICULAR VOLUME	A*. Vehicle Volume, All Approaches for Each of the Heaviest 8 Hours of an Average Day, and	480	720	100 ⁽¹⁾	13
	B***. Vehicle Volume, Along Minor Streets for Each of the Same 8 Hours	120	170	13 ⁽²⁾	
2. DELAY TO CROSS TRAFFIC	A*. Vehicle Volume, Major Street for Each of the Heaviest 8 Hours of an Average Day, and	480	720	100 ⁽³⁾	8
	B*. Combined Vehicle and Pedestrian Volume Crossing the Major Street for Each of the Same 8 Hours.	50	75	8 ⁽⁴⁾	
3. VOLUME/DELAY COMBINATIONS	The Above Justifications (1 and 2) Both Satisfied to the Extent of 80% or more	YES <input type="checkbox"/>	NO <input checked="" type="checkbox"/>		8
4. MIN. FOUR HOUR VEHICLE VOLUME	At Plotted Point Representing Hourly Volume for Minor Approach vs. Major Approach for Four Highest Hours of an Average Day Fall above the Applicable Curve	YES <input type="checkbox"/>	NO <input type="checkbox"/>		N/A
5. COLLISION EXPERIENCE	A. Total Reported Accidents of Types Susceptible to Correction by a Traffic Signal, per 12 Month Period Averaged over a 36 Month Period, and	5		N/A	N/A
	B. Adequate Trial of Less Restrictive Remedies. Where Satisfactory Observance and Enforcement Have Failed to Reduce the Number of Collisions	YES <input type="checkbox"/>	NO <input type="checkbox"/>		
6. PEDESTRIAN VOLUME AND DELAY	A. Plotted Point Representing 8 Hour Pedestrian Volume vs. 8 Hour Vehicular Volume Fall in Justified Zone, and	YES <input type="checkbox"/>	NO <input type="checkbox"/>		N/A
	B. Plotted Point Representing 8 Hour Volume of Pedestrian Experiencing Delays of 10 s or more vs. 8 Hour Pedestrian Volume Fall in Justified Zone	YES <input type="checkbox"/>	NO <input type="checkbox"/>		

Notes

* Vehicle Volume Warrants 1A and 2A for Roadways Having Two or More Moving Lanes in One Direction Should be 25% Higher than Values Given Above.

** The Lowest Sectional Percentage Governs the Entire Warrant.

*** For "T" Intersections, the Values for Warrant (1B) should be increased by 50%.

Justification 7 - Future Traffic Volumes

$$(1) = (718 + 1135) / 4 / 720 = 100\%$$

$$(2) = (8 + 79) / 4 / 170 = 13\%$$

$$(3) = (710 + 1056) / 4 / 720 = 100\%$$

$$(4) = (2 + 21) / 4 / 75 = 8\%$$

Traffic Signal Warrants – Summary of Justifications (OTM Book 12)

Projected Total Traffic (Horizon Year 2025)

London Line (County Road 22) at Site Access

JUSTIFICATION	DESCRIPTION	MINIMUM REQUIREMENTS FOR TWO-LANE ROADWAYS		COMPLIANCE	
		FREE FLOW	RESTRICTED FLOW		
		OPERATING SPEED GREATER THAN OR EQUAL TO 70 km/h	OPERATING SPEED LESS THAN 70 km/h	SECTIONAL %	ENTIRE %**
1. MINIMUM VEHICULAR VOLUME	A*. Vehicle Volume, All Approaches for Each of the Heaviest 8 Hours of an Average Day, and	480	720	54 ⁽¹⁾	15
	B***. Vehicle Volume, Along Minor Streets for Each of the Same 8 Hours	120	170	15 ⁽²⁾	
2. DELAY TO CROSS TRAFFIC	A*. Vehicle Volume, Major Street for Each of the Heaviest 8 Hours of an Average Day, and	480	720	49 ⁽³⁾	3
	B*. Combined Vehicle and Pedestrian Volume Crossing the Major Street for Each of the Same 8 Hours.	50	720	3 ⁽⁴⁾	
3. VOLUME/DELAY COMBINATIONS	The Above Justifications (1 and 2) Both Satisfied to the Extent of 80% or more	YES <input type="checkbox"/>	NO <input checked="" type="checkbox"/>		3
4. MIN. FOUR HOUR VEHICLE VOLUME	At Plotted Point Representing Hourly Volume for Minor Approach vs. Major Approach for Four Highest Hours of an Average Day Fall above the Applicable Curve	YES <input type="checkbox"/>	NO <input type="checkbox"/>		N/A
5. COLLISION EXPERIENCE	A. Total Reported Accidents of Types Susceptible to Correction by a Traffic Signal, per 12 Month Period Averaged over a 36 Month Period, and	5		N/A	N/A
	B. Adequate Trial of Less Restrictive Remedies. Where Satisfactory Observance and Enforcement Have Failed to Reduce the Number of Collisions	YES <input type="checkbox"/>	NO <input type="checkbox"/>		
6. PEDESTRIAN VOLUME AND DELAY	A. Plotted Point Representing 8 Hour Pedestrian Volume vs. 8 Hour Vehicular Volume Fall in Justified Zone, and	YES <input type="checkbox"/>	NO <input type="checkbox"/>		N/A
	B. Plotted Point Representing 8 Hour Volume of Pedestrian Experiencing Delays of 10 s or more vs. 8 Hour Pedestrian Volume Fall in Justified Zone	YES <input type="checkbox"/>	NO <input type="checkbox"/>		

Notes

* Vehicle Volume Warrants 1A and 2A for Roadways Having Two or More Moving Lanes in One Direction Should be 25% Higher than Values Given Above.

** The Lowest Sectional Percentage Governs the Entire Warrant.

*** For "T" Intersections, the Values for Warrant (1B) should be increased by 50%.

Justification 7 - Future Traffic Volumes

$$(1) = (689 + 870) / 4 / 720 = 54\%$$

$$(2) = (94 + 62) / 4 / (170 * 1.5) = 15\%$$

$$(3) = (595 + 808) / 4 / 720 = 49\%$$

$$(4) = (55 + 24) / 4 / 720 = 3\%$$

Traffic Signal Warrants – Summary of Justifications (OTM Book 12)

Projected Total Traffic (Horizon Year 2030)

London Line (County Road 22) at Site Access

JUSTIFICATION	DESCRIPTION	MINIMUM REQUIREMENTS FOR TWO-LANE ROADWAYS		COMPLIANCE	
		FREE FLOW	RESTRICTED FLOW		
		OPERATING SPEED GREATER THAN OR EQUAL TO 70 km/h	OPERATING SPEED LESS THAN 70 km/h	SECTIONAL %	ENTIRE %**
1. MINIMUM VEHICULAR VOLUME	A*. Vehicle Volume, All Approaches for Each of the Heaviest 8 Hours of an Average Day, and B***. Vehicle Volume, Along Minor Streets for Each of the Same 8 Hours	480 120	720 170	56 ⁽¹⁾ 15 ⁽²⁾	15
2. DELAY TO CROSS TRAFFIC	A*. Vehicle Volume, Major Street for Each of the Heaviest 8 Hours of an Average Day, and B*. Combined Vehicle and Pedestrian Volume Crossing the Major Street for Each of the Same 8 Hours.	480 50	720 720	51 ⁽³⁾ 3 ⁽⁴⁾	3
3. VOLUME/DELAY COMBINATIONS	The Above Justifications (1 and 2) Both Satisfied to the Extent of 80% or more	YES <input type="checkbox"/>	NO <input checked="" type="checkbox"/>		3
4. MIN. FOUR HOUR VEHICLE VOLUME	At Plotted Point Representing Hourly Volume for Minor Approach vs. Major Approach for Four Highest Hours of an Average Day Fall above the Applicable Curve	YES <input type="checkbox"/>	NO <input type="checkbox"/>		N/A
5. COLLISION EXPERIENCE	A. Total Reported Accidents of Types Susceptible to Correction by a Traffic Signal, per 12 Month Period Averaged over a 36 Month Period, and B. Adequate Trial of Less Restrictive Remedies. Where Satisfactory Observance and Enforcement Have Failed to Reduce the Number of Collisions		5	N/A	N/A
6. PEDESTRIAN VOLUME AND DELAY	A. Plotted Point Representing 8 Hour Pedestrian Volume vs. 8 Hour Vehicular Volume Fall in Justified Zone, and B. Plotted Point Representing 8 Hour Volume of Pedestrian Experiencing Delays of 10 s or more vs. 8 Hour Pedestrian Volume Fall in Justified Zone	YES <input type="checkbox"/> YES <input type="checkbox"/>	NO <input type="checkbox"/> NO <input type="checkbox"/>		N/A

Notes

* Vehicle Volume Warrants 1A and 2A for Roadways Having Two or More Moving Lanes in One Direction Should be 25% Higher than Values Given Above.

** The Lowest Sectional Percentage Governs the Entire Warrant.

*** For "T" Intersections, the Values for Warrant (1B) should be increased by 50%.

Justification 7 - Future Traffic Volumes

$$(1) = (718 + 906) / 4 / 720 = 56\%$$

$$(2) = (94 + 62) / 4 / (170 * 1.5) = 15\%$$

$$(3) = (624 + 844) / 4 / 720 = 51\%$$

$$(4) = (55 + 24) / 4 / 720 = 3\%$$

Appendix F

SIGHT LINE ANALYSIS

**London Line (County Road 22) at
Site Access (Street A)**

18-798: London Line Residential Development - Sight Line Analysis

Design Intersection Sight Distance (TAC Geometric Design Guide for Canadian Roads)

Design Speed: 70km/h (Posted 60km/h)

Table 9.9.3: Time Gap for Case B1, Left Turn from Stop

Design Vehicle	Time Gap (t_g)(s) at Design Speed of Major Road
Passenger car	7.5
Single-unit truck	9.5
Combination truck (WB 19 and WB 20)	11.5
Longer truck	To be established by road authority

$$\text{Intersection Stopping Distance (ISD)} = 0.278 V_{\text{major}} t_g$$

Where:

ISD = intersection sight distance (m)
(length of the leg of sight triangle along the major road)

V_{major} = design speed of the major road (km/h)

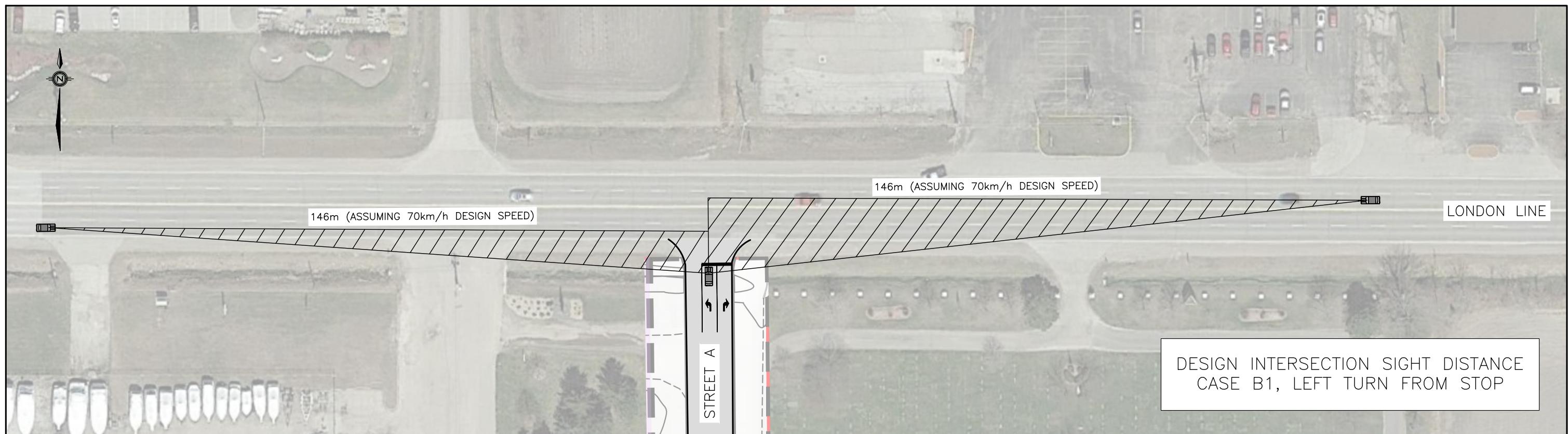
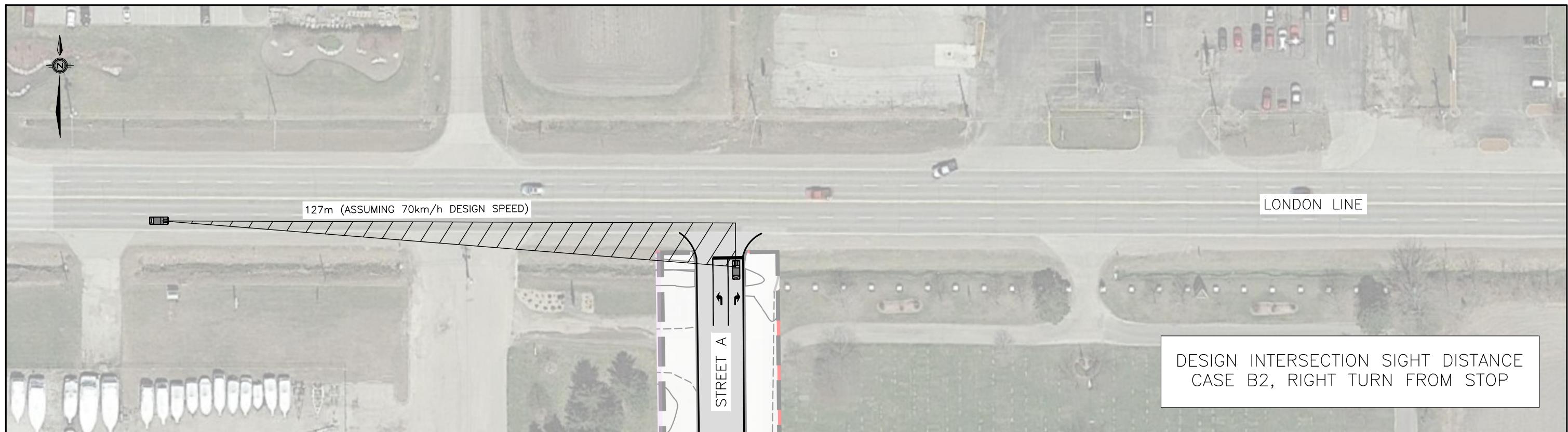
t_g = time gap for minor road vehicle to enter the major road (s)

$$\text{ISD}_{\text{passenger car}} \text{ (left turn from stop)} = 0.278 \times 70 \times 7.5 = \mathbf{146 \text{ m}}$$

Table 9.9.5: Time Gap for Case B2—Right Turn from Stop and Case B3—Crossing Maneuver

Design Vehicle	Time Gap (t_g)(s) at Design Speed of Major Road
Passenger car	6.5
Single-unit truck	8.5
Combination truck (WB 19 and WB 20)	10.5

$$\text{ISD}_{\text{passenger car}} \text{ (right turn from stop)} = 0.278 \times 70 \times 6.5 = \mathbf{127 \text{ m}}$$



			<p>RC SPENCER ASSOCIATES INC. Consulting Engineers Windsor 800 University Ave. W. - Windsor ON N9A 5R9 Leamington 18 Talbot St. W. - Leamington ON N8H 1M4 Chatham-Kent: 138 King St. W. Unit I02 - Chatham ON N7M 1E3</p> <p>Professional Engineers Ontario</p>	<table border="1"> <thead> <tr> <th></th> <th></th> <th></th> <th>DESIGN A.D.B.</th> </tr> </thead> <tbody> <tr> <td></td> <td></td> <td></td> <td>CHECKED J.T.</td> </tr> <tr> <td></td> <td></td> <td></td> <td>DRAWN R.LB.</td> </tr> <tr> <td></td> <td></td> <td></td> <td>CHECKED J.T.</td> </tr> <tr> <td>1. COMPLETED REPORT FIGURES</td> <td>MAR 7 2019</td> <td>R.L.B. A.D.B.</td> <td>DATE MARCH 2019</td> </tr> <tr> <td>NO.</td> <td>REVISION</td> <td>DATE BY APP</td> <td>SCALE N.T.S.</td> </tr> </tbody> </table>				DESIGN A.D.B.				CHECKED J.T.				DRAWN R.LB.				CHECKED J.T.	1. COMPLETED REPORT FIGURES	MAR 7 2019	R.L.B. A.D.B.	DATE MARCH 2019	NO.	REVISION	DATE BY APP	SCALE N.T.S.	<p>PROJECT NO. 18-798</p> <p>FIGURE NO. F1</p> <p>OF F1</p> <p>LONDON LINE RES. DEVELOPMENT – T.I.S.</p> <p>SIGHT LINE ANALYSIS INTERSECTION SIGHT DISTANCE</p>
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