WOLLONDILLY TRANSPORTATION MODEL

Traffic Impact

Abbotsford Planning Proposal Report

Prepared by

GABITES PORTER

October 2012

Wollondilly Transportation Model
Traffic Impact
Abbotsford Planning Proposal Report

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EXECUTIVE SUMMARY

This report provides an overview of the work completed by Gabites Porter for the networkwide assessment of the Picton residential development at Abbotsford Road. This process involved amending the future Wollondilly TRACKS Transportation Models to include the proposed the Picton housing development and to assess the impact of the proposed development on the surrounding traffic network.

The Wollondilly TRACKS Transportation Model has previously been updated to a base year of 2006, successfully meeting published validation requirements, and as such is fit for strategic modelling such as that required for this part of the traffic impact assessment. Traffic models for 2016, 2021, 2026, 2031 and 2036 have been developed to forecast traffic volumes, congestion and roading requirements in the Shire for the next 25 years.

The future land use assumptions are based on the "Wollondilly Shire Council Draft Growth Management Strategy 2010" report, with specific details of the location, likelihood and timing of the land release areas in the report confirmed by Council staff.

The results of the analysis appear to indicate that there is little difference in LOS conditions with or without the development when it is fully implemented by 2021. The critical intersection of Barkers Lodge Road and Argyle Street continues to operate satisfactorily at better than LOS D with or without the development.

It also appears that there is no significant change in LOS in the near vicinity of the development on Abbotsford Road although minor changes in traffic flows further afield result in some slight deterioration in LOS. There is no deterioration in LOS resulting in LOS worse than D until 2031 although there is a deterioration in LOS from C to D along part of Menangle Road west of Wilton Park Road in the morning peak period at 2021 (due to an increase of 22 vph taking the total to just 9 vph over the threshold for LOS D) and the intersection of Menangle Road and Prince Street deteriorates from LOS C to D in the morning peak period at 2026 (due to an increased delay at the Prince Street approach of just one tenth of a second).

No new intersection or link improvements appear to be required over and above those already highlighted for Section 94 contribution in the "Wollondilly 2006 Transportation Model: Traffic Impact Study, Future Modelling Report" report.

1. INTRODUCTION

This is document should be read in conjunction with "Wollondilly 2006 Transportation Model: Traffic Impact Study, Future Modelling Report" which is a report published by Gabites Porter in December 2010.

This document reports the development of land included in the Picton proposed residential development and model outputs for 2016, 2021, 2026, 2031 and 2036, and includes analysis of predicted traffic congestion levels and locations.

Section 2 contains an explanation of the model form and how the road network, zone system and data availability is obtained.

Section 3 describes changes made to the 2010 network for each of the future years.

Section 4 gives the details of the land use used for the future year models.

Section 5 gives Level of Service (LOS) plots for AM Peak and PM Peak periods for all future years and highlights the LOS issues arising in these future year models.

2. BASE MODEL

2.1 2010 model

See section 2 of the *Wollondilly 2006 Transportation Model: Traffic Impact Study, Future Modelling Report* for details of the model form, road network and zone system of the overall Wollondilly Transportation Model. The base year model is 2006. As part of previous assessments a 2010 model was created using the 2006 road network with the following amendments:

- The intersection of Argyle Street and Thirlmere Way was modelled as a Give way at 2006 but is converted to a dual circulating lane roundabout at 2010
- Right turns at the intersection of Remembrance Drive and Larkin are banned at 2010

2.2 Summary of Local Area Model Validation

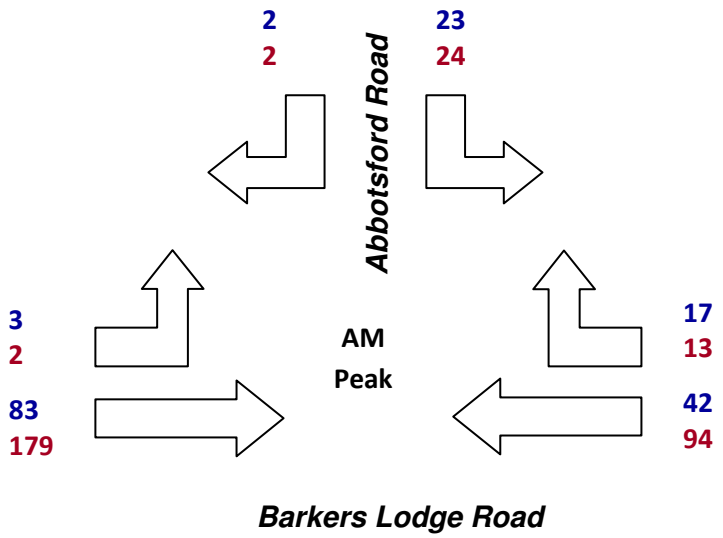
Validation of the model requires that the output traffic volumes from the model approximate what occurs in reality.

Comprehensive validation reporting is included in "Wollondilly 2006 Transportation Model: Building the Transport Model" for the entire model. Whilst there are no clear guidelines dictating validation requirements in Roads and Traffic Authority (RTA) publications, it has been successfully validated to the levels required by the New Zealand Transport Agency (NZTA) Economic Evaluation Manual guidelines for overall link traffic validation and is fully capable of any demand on it of strategic nature.

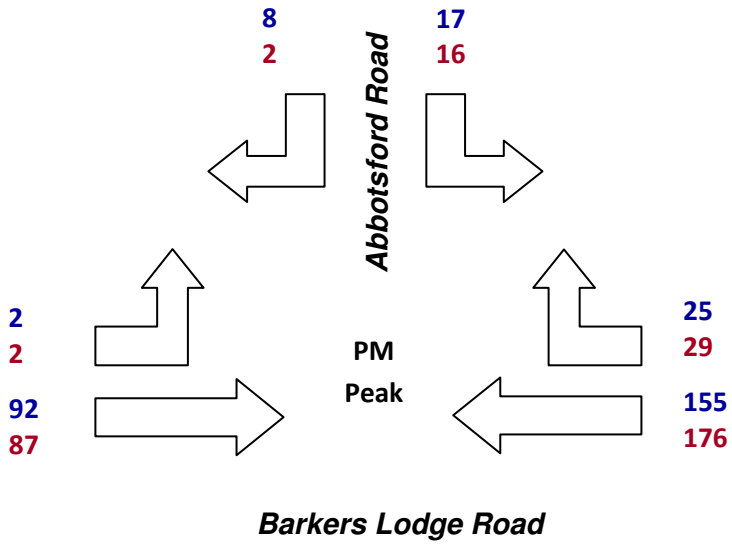
As with any model, local validation checks were recommended for the application of the model to a local infrastructure project. Accordingly validation checks were carried out in the vicinity of the proposed Picton development.

Modelled intersection flows for the Barkers Lodge Road / Abbotsford Road intersection are displayed in **Figure 1** along with traffic counts provided by Thompson Stanbury Associates. The AM and PM Peak intersection counts provided by Thompson Stanbury were used to assess local validation. These counts were taken on Monday 15 October 2012. Monday does not represent a typical weekday therefore flows on that day are not entirely representative of typical weekday traffic flows particularly during the morning peak period.

As the surveyed AM peak counts are not representative of typical morning peak traffic flows the model flows in the morning peak period do not closely approximate all surveyed counts. However, the more typical evening peak traffic counts are reflected well in the corresponding evening peak flows modelled.



Traffic Counts (Oct 2012)
Modelled flows (2010 Base)



Wollondilly Transportation Model	**Peak Hour Intersection flows** **Barkers Lodge Road / Abbotsford Road**	**Figure 1**
Gabites Porter		

3. FUTURE NETWORKS

The base road networks for 2016, 2021, 2026, 2031 and 2036 are all based on the validated 2006 road network with upgrade as requested by the Wollondilly Shire Council. The changes made to the 2006 network for each of the future years are described in Table 2 of *Wollondilly 2006 Transportation Model: Traffic Impact Study, Future Modelling Report*. The one exception is the roundabout at the intersection of Thirlmere Way and Castlereagh Street which was scheduled to be implemented by 2010 but will now not be implemented until much later (it has not been included in modelling until 2021 base model). The locations of upgrades are shown in Figure 3 of that report. The changes apply to all future years and form a do minimum network.

Model options were created for each of the future years 2021, 2026, 2031 and 2036 (the option is not modelled at 2016 as the housing development is not expected to be implemented until after 2016). Option networks were built from the base year network with an additional zone (zone 174) included in the Abbotsford Road development area.

4. LAND USE

Section 4 of *Wollondilly 2006 Transportation Model: Traffic Impact Study, Future Modelling Report* details land use included in the 2006, 2010 and future year base models. These future land uses included preliminary estimates of the proposed development in the area.

For this analysis the Abbotsford land use was added to zone 174 future year option networks. The addition of households to the Abbotsford development zone was based on information provided by the developer as to the number of allotments and the development uptake over time. Based on the information provided it was assumed the development would comprise a total of 50 lots with implementation commencing after 2016 and completed by 2021. Accordingly the full 50 additional households were modelled at 2021 and beyond with land use variables:

Persons per household = 3.2
Cars per household = 2.4

The two way generation of trips to and from the full development produced by the TRACKS model in 2021 was found to be 43 vehicles in the AM Peak and 53 vehicles in the PM Peak.

5. NETWORK DEFICIENCY ANALYSIS

5.1 Levels of Service Criteria

Level of Service is a subjective measure of the way in which a network is operating, given the traffic demands that are placed on it. It is a concept developed by American engineers, and has been generally internationally adopted.

Because it is subjective, individual regions have a local perception of how individual roads and intersections are operating and that affects the local interpretation of the LOS values. In this study the boundaries were adopted from those used in the Highway Capacity Manual.

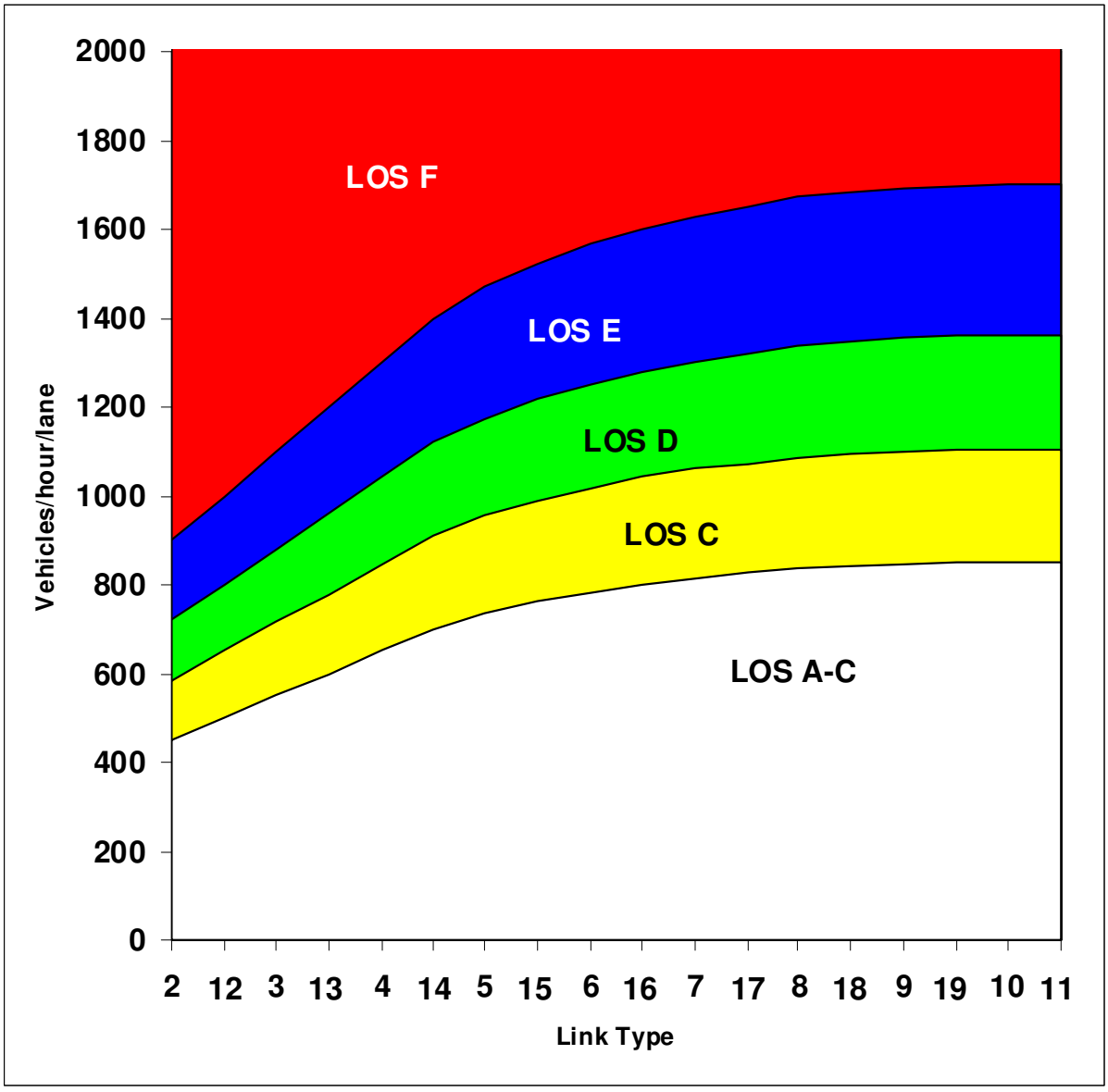
This study focuses on LOS F, E, and D with particular attention paid to LOS F and E. The LOS boundaries are described in **Table 1**, which provides a description of:

- LOS definitions describing the type of conditions a driver faces under each level
- Link LOS boundaries that describe the performance of traffic moving along a section of road and a function of traffic volume and link free flow speed.
- Intersection LOS boundaries are based on two different criteria: Worst Approach based delay for non-signalised intersections; and weighted average delay for signalised intersections and roundabouts.

Figure 2 shows how Link LOS varies depending on the link free flow speed. It shows that the higher the vehicle volume and the lower the free speed the worse the LOS becomes.

This present day level of service provides a measure by which future network performance and deficiencies can be assessed given knowledge and experience of current conditions.

Definitions Of LOS				Table 1
LOS	**AustRoads Description**	**Wollondilly Transportation Study LOS criteria**		
		Link (vehicles per hour)	**Intersection (average delay/veh)**	
			Priority	**Signal/Rotary**
LOS F	Forced flow. The amount of traffic approaching a point exceeds that which can pass it. Flow break-downs occur, and queuing and delays occur.	In excess of **900-1700** depending on link type	50 sec	80 sec
LOS E	Traffic volumes are at or close to *capacity and there is virtually no freedom* to select desired speed and to manoeuvre within the traffic stream. Flow is unstable and *minor disturbances within the traffic stream will cause break-downs in operation*.	Between **720-1360** depending on link type	35 sec	55 sec
LOS D	Approaching unstable flow where *all drivers are severely restricted* in their freedom to select desired speed and to manoeuvre within the traffic stream. The general level of *comfort and convenience is poor* and small increases in traffic flow will cause operational problems.	Between **585-1105** depending on link type	25 sec	35 sec
LOS C	Stable flow but most drivers *are restricted to some extent* in their freedom to select their desired speed and to manoeuvre within the traffic stream. The general level of *comfort and convenience has declined noticeably*.	Between **450-850** depending on link type	15 sec	20 sec
LOS B	Stable flow where drivers still *have reasonable freedom* to select their desired speed and to manoeuvre within the traffic stream. The general level of comfort and convenience is less than LOS A.	Not Applicable	Not Applicable	
LOS A	Free flow in which drivers are *virtually unaffected* by the presence of others in the traffic stream. Freedom to select desired speeds and to manoeuvre within the traffic stream is extremely high and the general level of *comfort and convenience is excellent*.			



	LOS BAND (VEH/HR)																	
LINK TYPE	**2**	**12**	**3**	**13**	**4**	**14**	**5**	**15**	**6**	**16**	**7**	**17**	**8**	**18**	**9**	**19**	**10**	**11**
FREE SPEED (km/hr)	**20**	**25**	**30**	**35**	**40**	**45**	**50**	**55**	**60**	**65**	**70**	**75**	**80**	**85**	**90**	**95**	**100**	**110**
LOS C	450	500	550	600	650	650	734	760	782	800	814	825	835	841	846	849	850	850
LOS D	585	650	715	780	845	910	954	988	1016	1040	1058	1073	1085	1093	1100	1104	1105	1105
LOS E	720	800	880	960	1040	1120	1174	1216	1250	1280	1302	1320	1335	1346	1354	1358	1360	1360
LOS F	900	1000	1100	1200	1300	1400	1467	1520	1563	1600	1627	1650	1669	1682	1692	1698	1700	1700

Wollondilly Transportation Model	**Wollondilly Transportation Model Link LOS Criteria**	**Figure 2**
Gabites Porter		

5.2 Level of Service Results

Plots of the study area Level of Service (LOS) for 2021 though to 2036 are included in **Figure 3** through to **Figure 22** for the AM Peak and PM Peak, respectively. The LOS plots show the surrounding Picton/Tahmoor/Thirmere area.

It appears that there is very little difference in LOS conditions with or without the development when it reaches full operation in 2021. The critical intersection of Barkers Lodge Road and Argyle Street continues to operate satisfactorily at better than LOS D with or without the development.

It also appears that the only instances of LOS deteriorating beyond LOS D, as a result of the introduction of the development, occur after 2026 when general background growth increases. The additional flow generated by the development results in several instances where small additional flows result in changes in LOS conditions at locations where traffic flows and/or delays are already just below the threshold for a LOS change. These reductions in LOS occur at the following locations:

1. 2021 AM Peak – Menangle Road West of Wilton Park Road deteriorates from LOS C to D due to an increase of 22 vph taking the flow to just 9 vph beyond the threshold for LOS D.

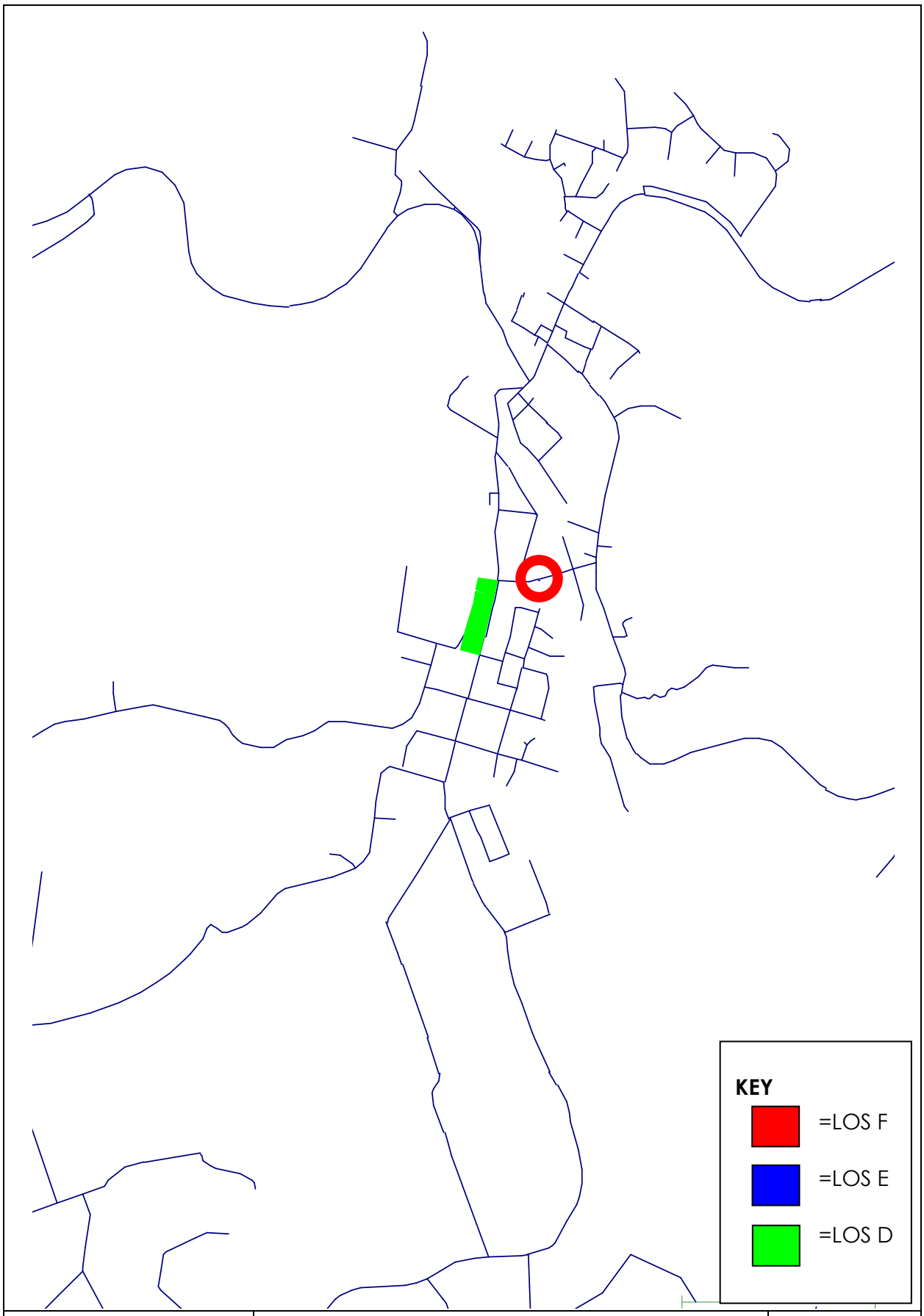
2. 2026 AM Peak – Prince St approach to the Prince / Manangle intersection moves from LOS C to D with an increased delay of just 0.1 of a second taking it just over the 25 second threshold.

3. 2031 PM Peak – Menangle Road West of Wilton Park Road deteriorates from LOS D to E due to an increase of just 12 vph taking the flow to just 4 vph over the threshold for LOS E.

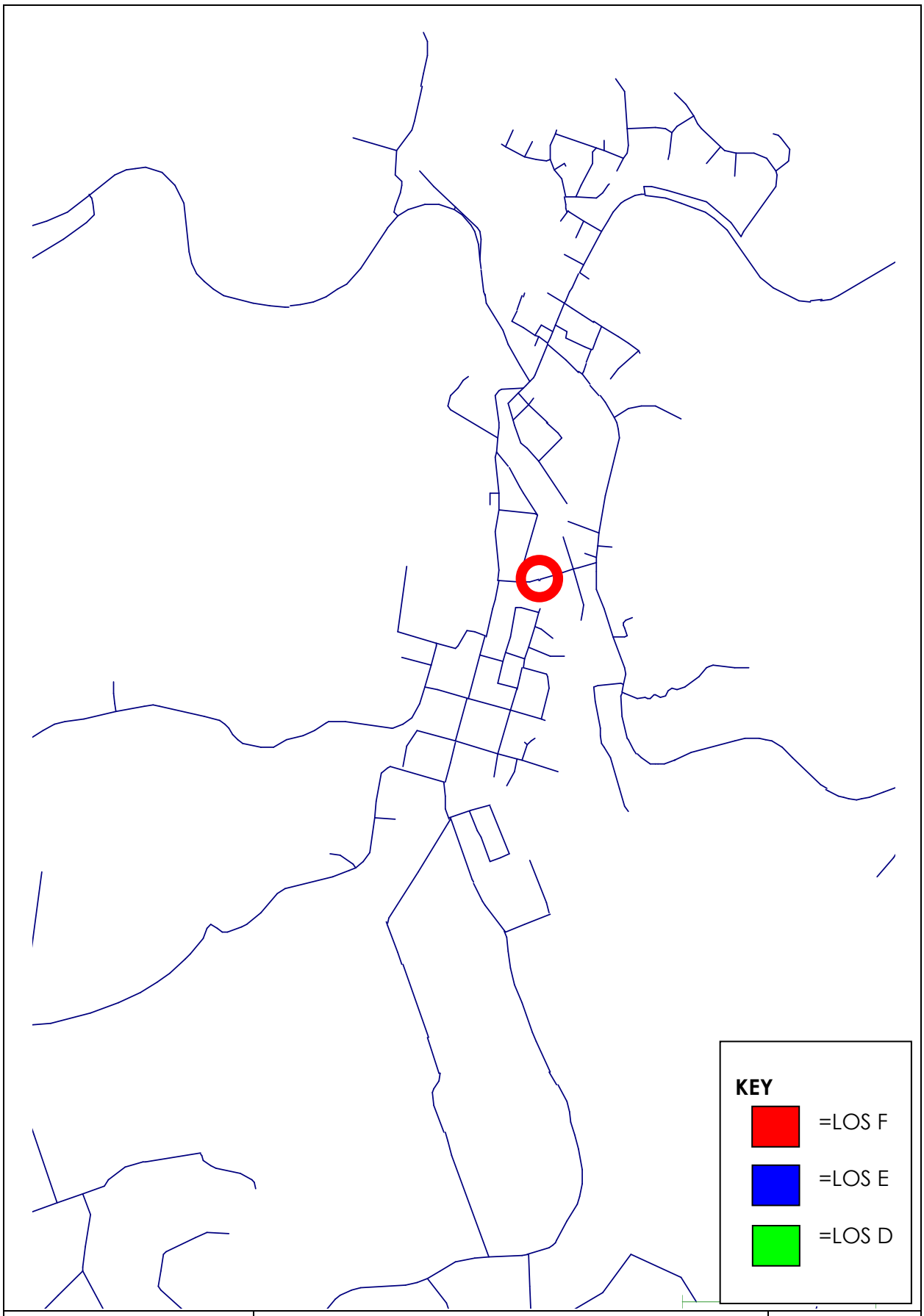
   The intersection of Menangle Road and Remembrance Dr improves from LOS E to D with a reduction in worst approach (Menangle Road East) delay decreasing from 36.6 seconds to 34.3 seconds which is just below the 35 second threshhold.

4. 2036 AM Peak –A short section of Remembrance Drive between Barkers Lodge Road and Menangle Rd deteriorates from LOS E to F due to an increase in of 13 vph. The base volume (without Abbotsford development) is just 8 vph below LOS F.

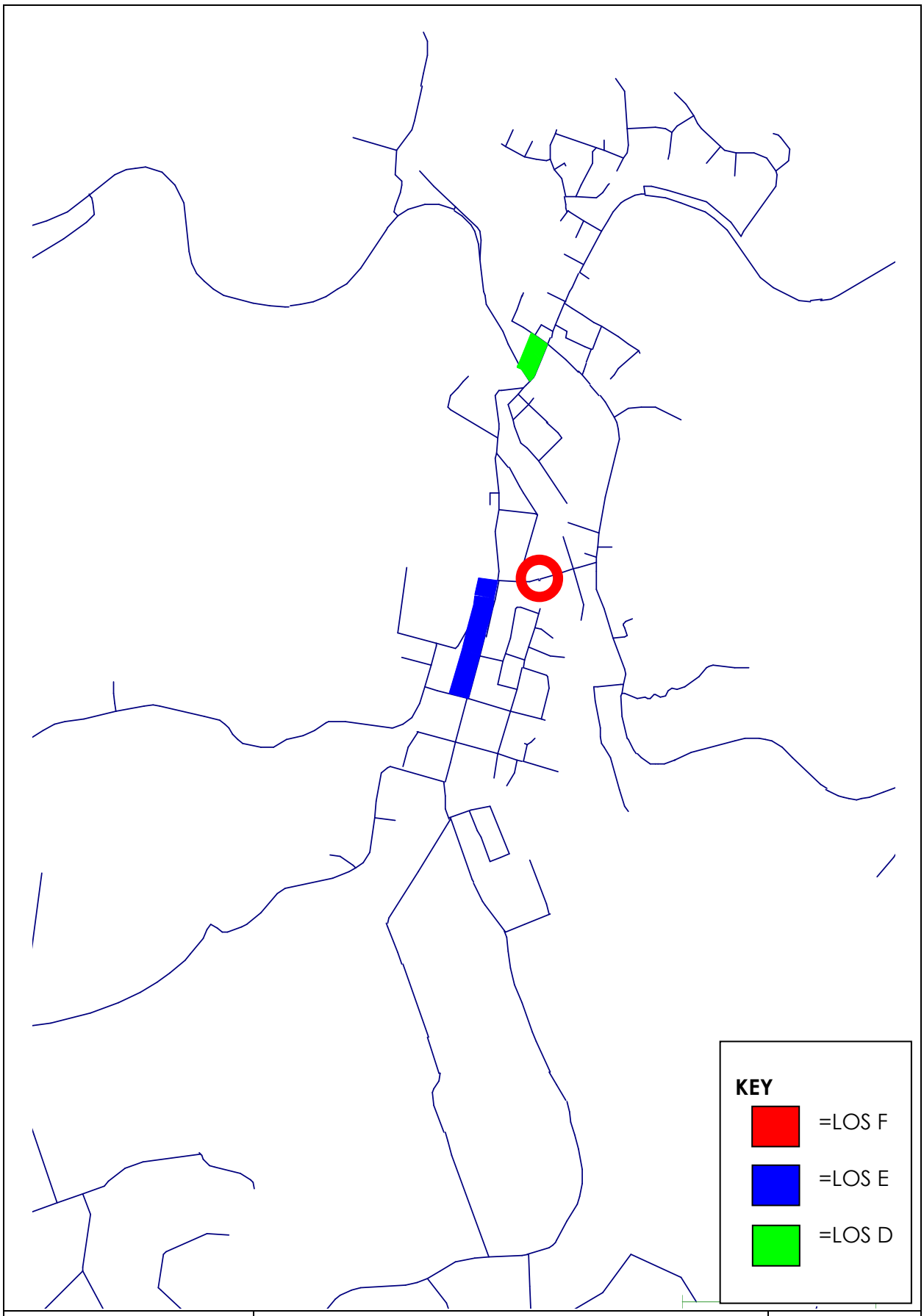
No new intersection or link improvements appear to be required over and above those already highlighted for Section 94 contribution in the "Wollondilly 2006 Transportation Model: Traffic Impact Study, Future Modelling Report" report.



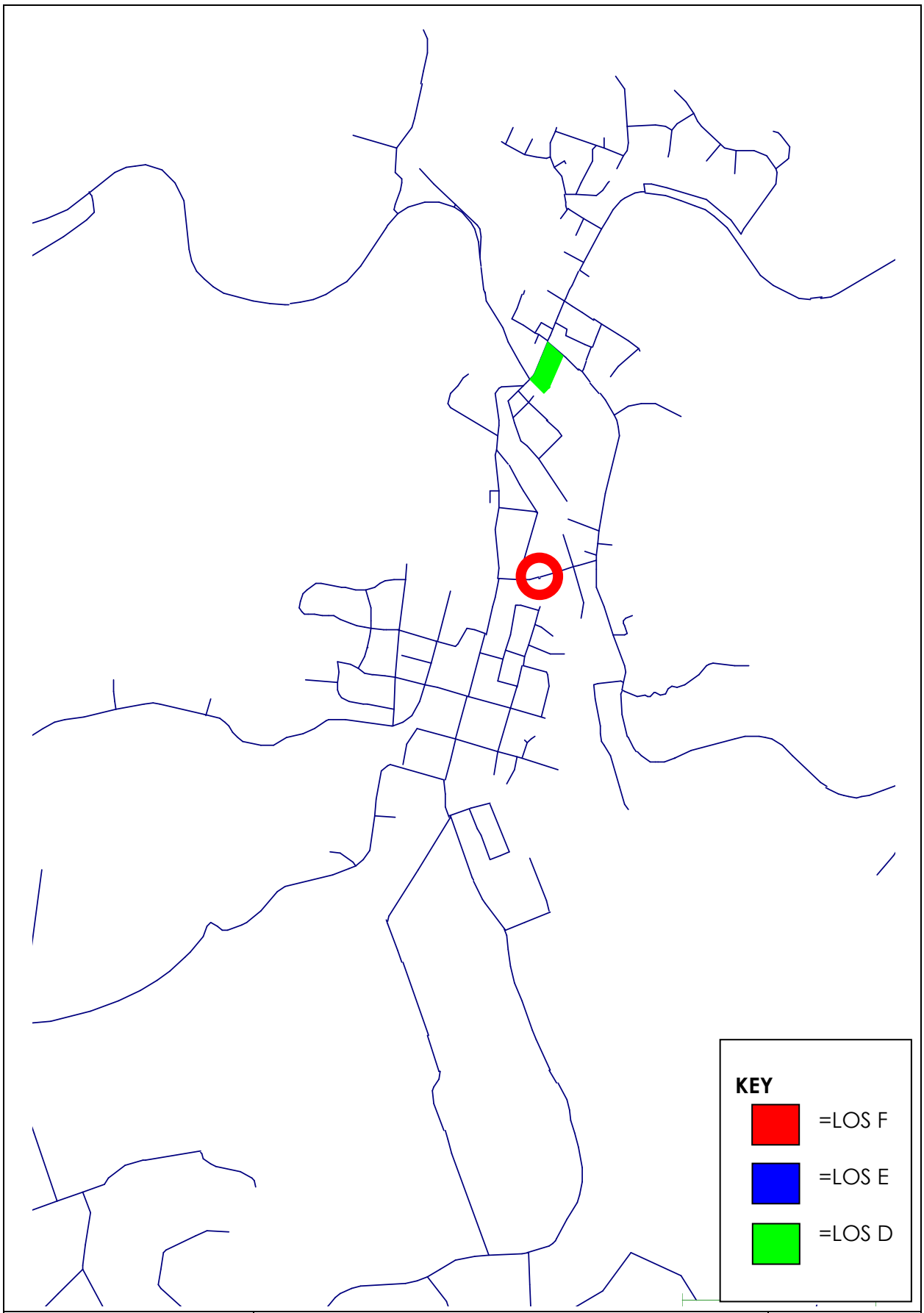
Wollondilly Transportation Model	**2010 Base AM Peak LOS**	**Figure 3**
Gabites Porter		



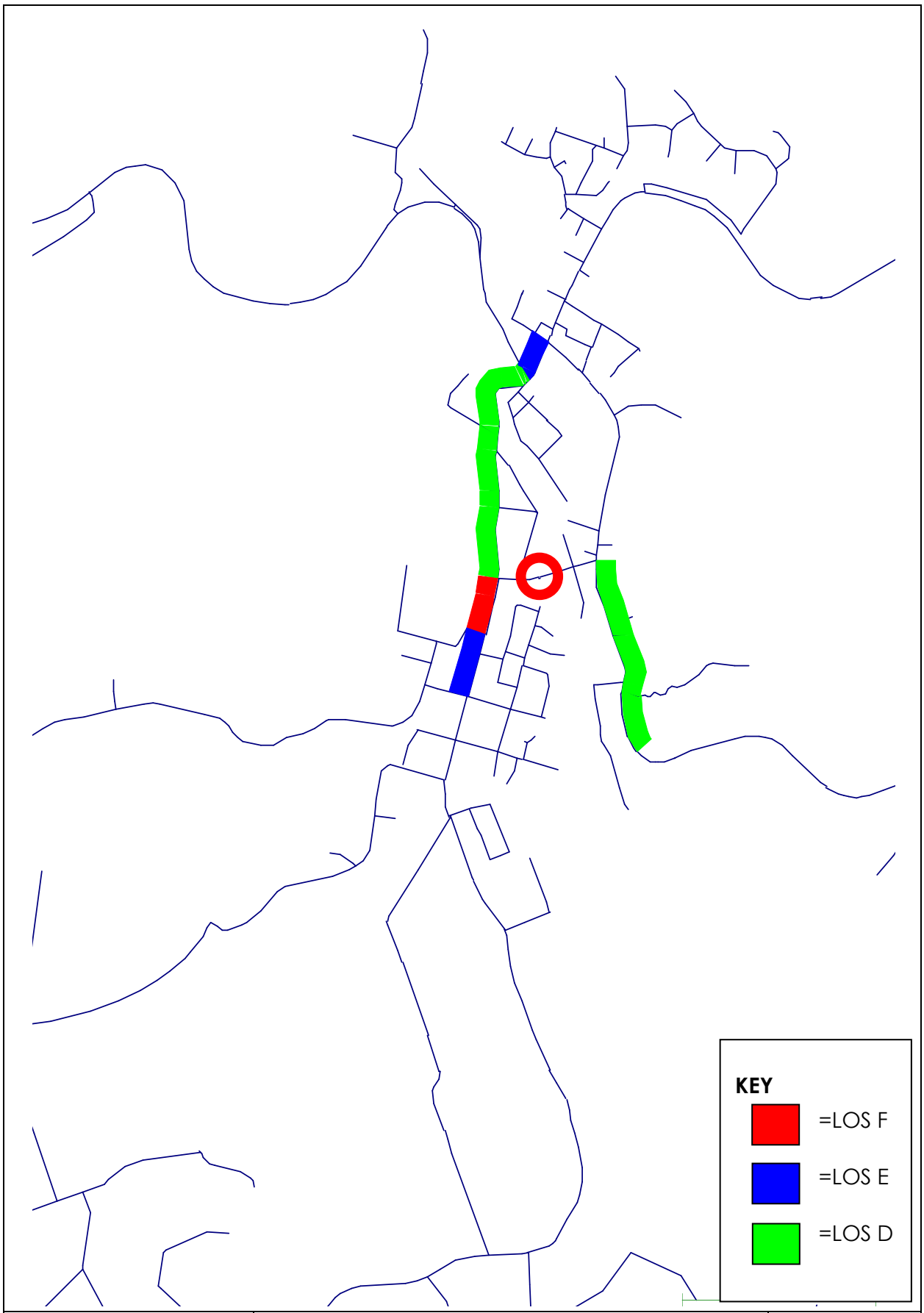
Wollondilly Transportation Model	**2010 Base PM Peak LOS**	**Figure 4**
Gabites Porter		



Wollondilly Transportation Model	**2016 Base AM Peak LOS**	**Figure 5**
Gabites Porter		



Wollondilly Transportation Model	**2016 Base PM Peak LOS**	**Figure 6**
Gabites Porter		



Wollondilly Transportation Model	**2021 Base AM Peak LOS**	**Figure 7**
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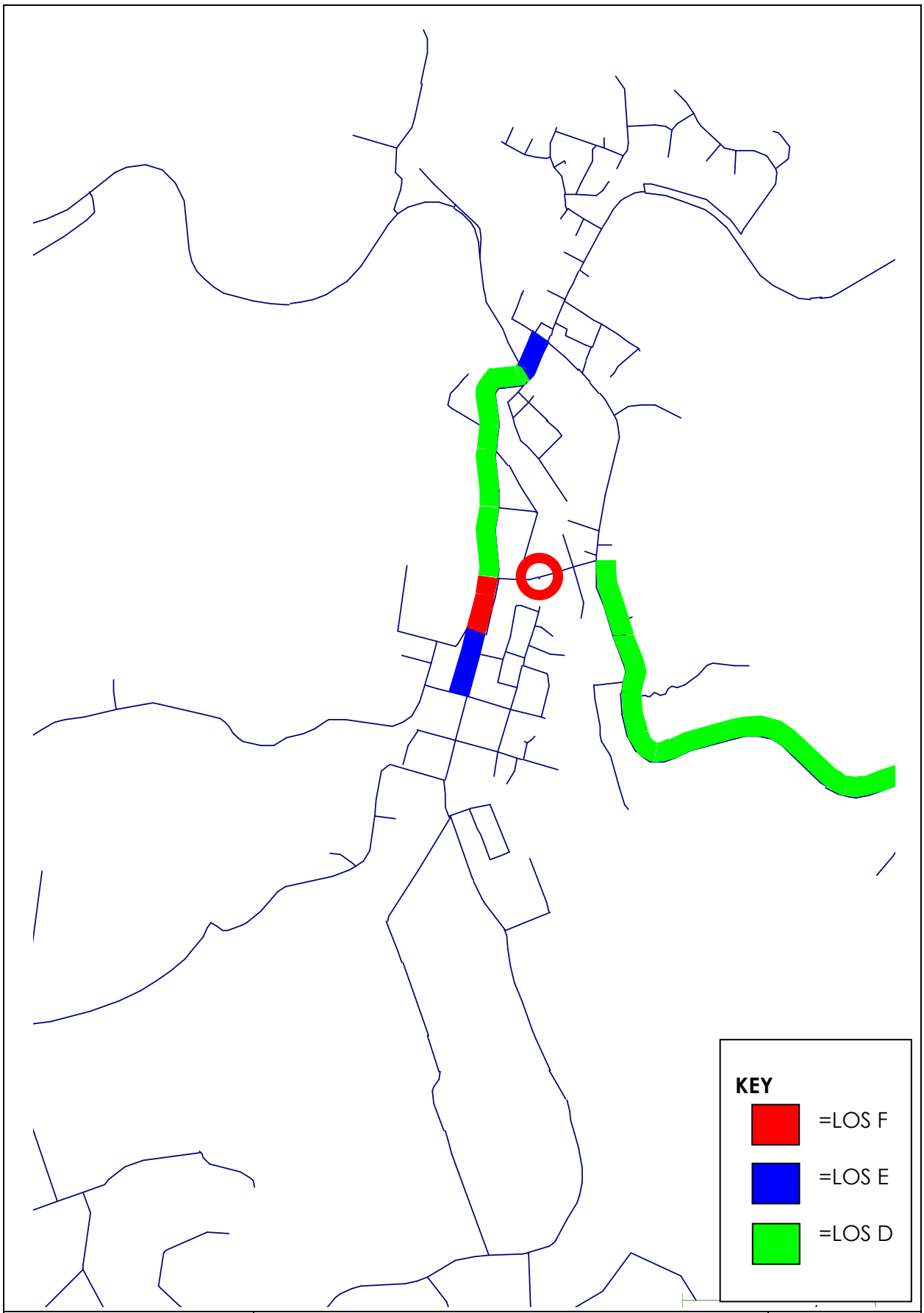

Wollondilly Transportation Model	**2021 Option** **AM Peak LOS**	**Figure 8**
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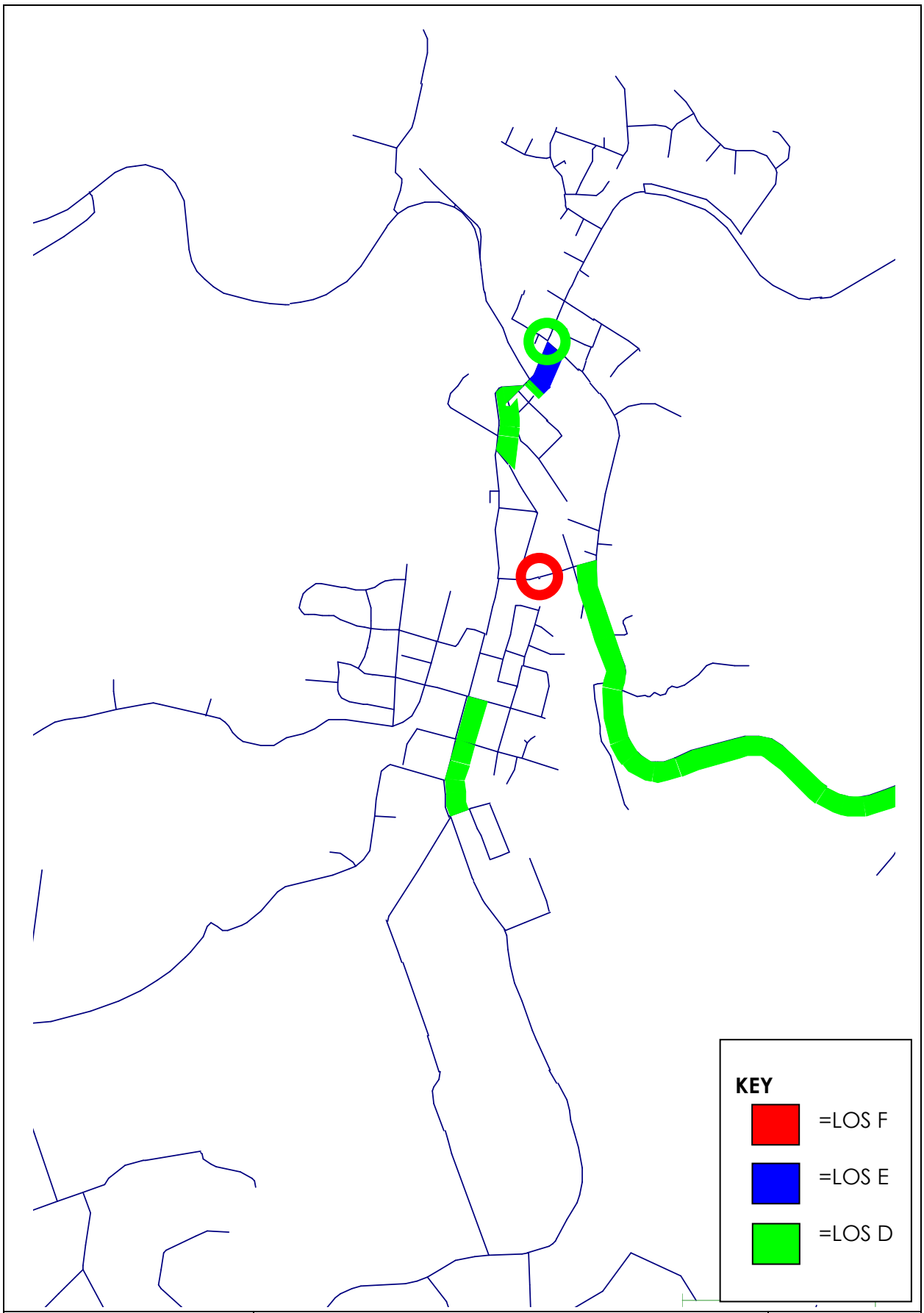
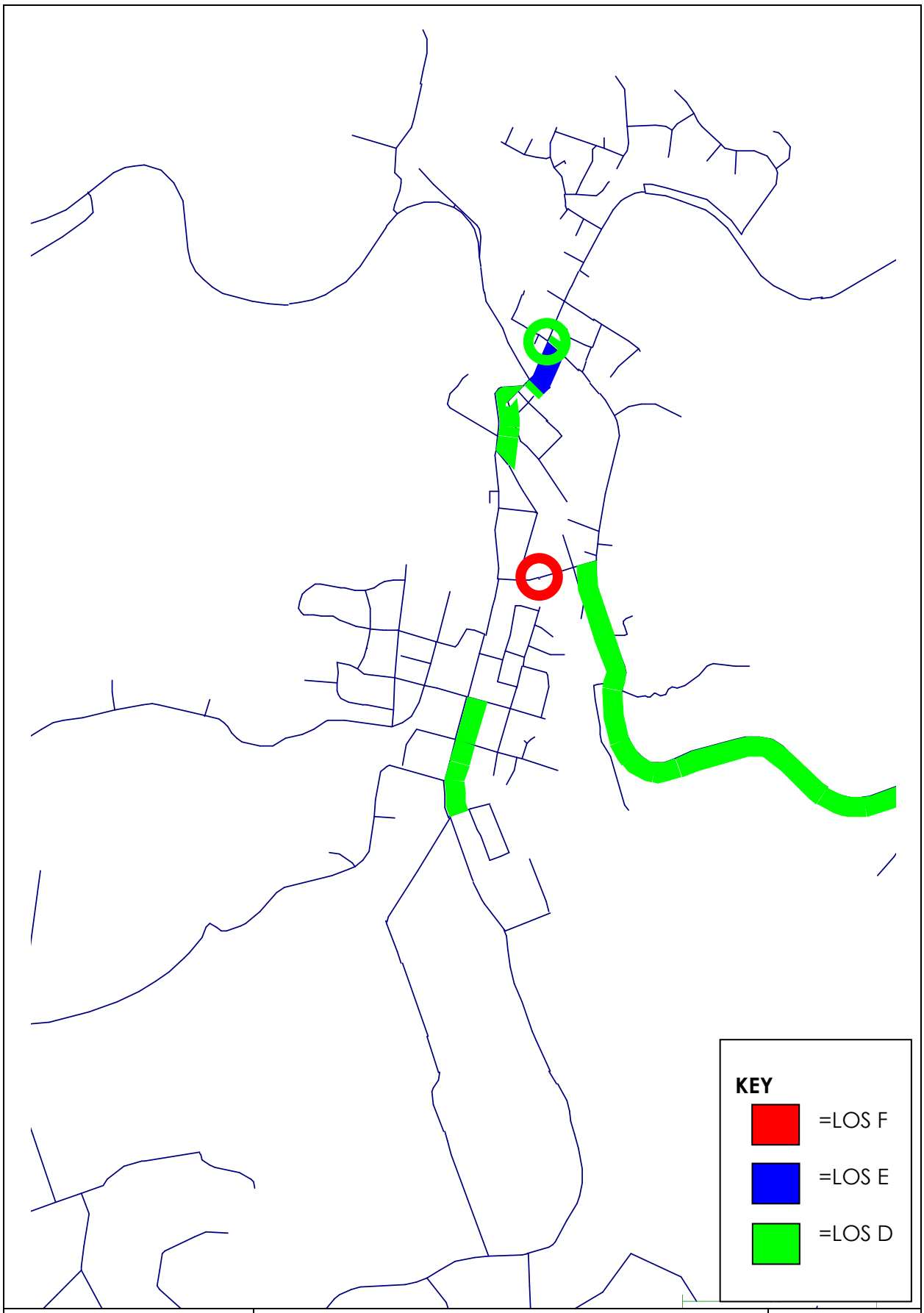
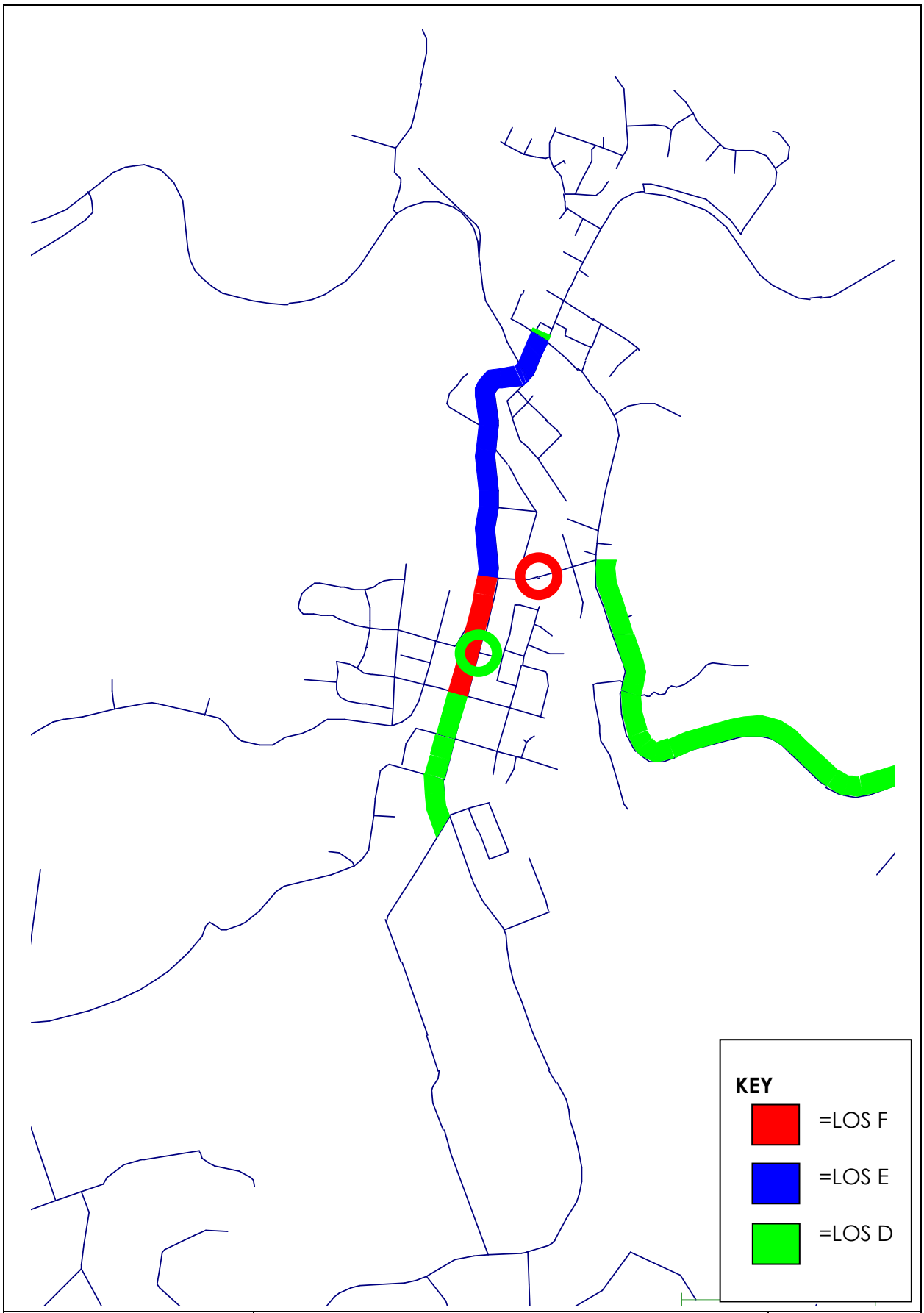


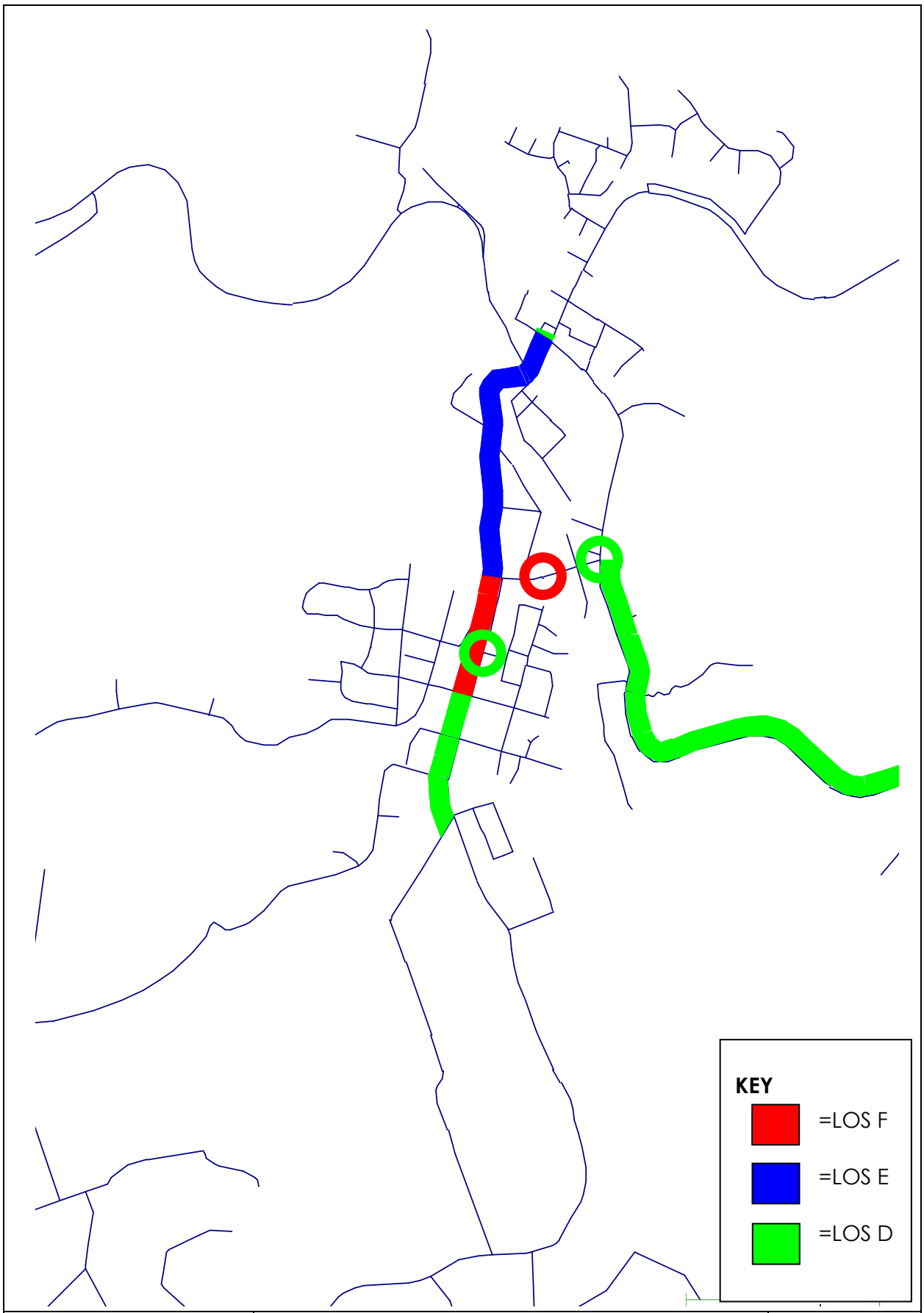
Wollondilly Transportation Model	**2021 Base PM Peak LOS**	**Figure 9**
Gabites Porter		



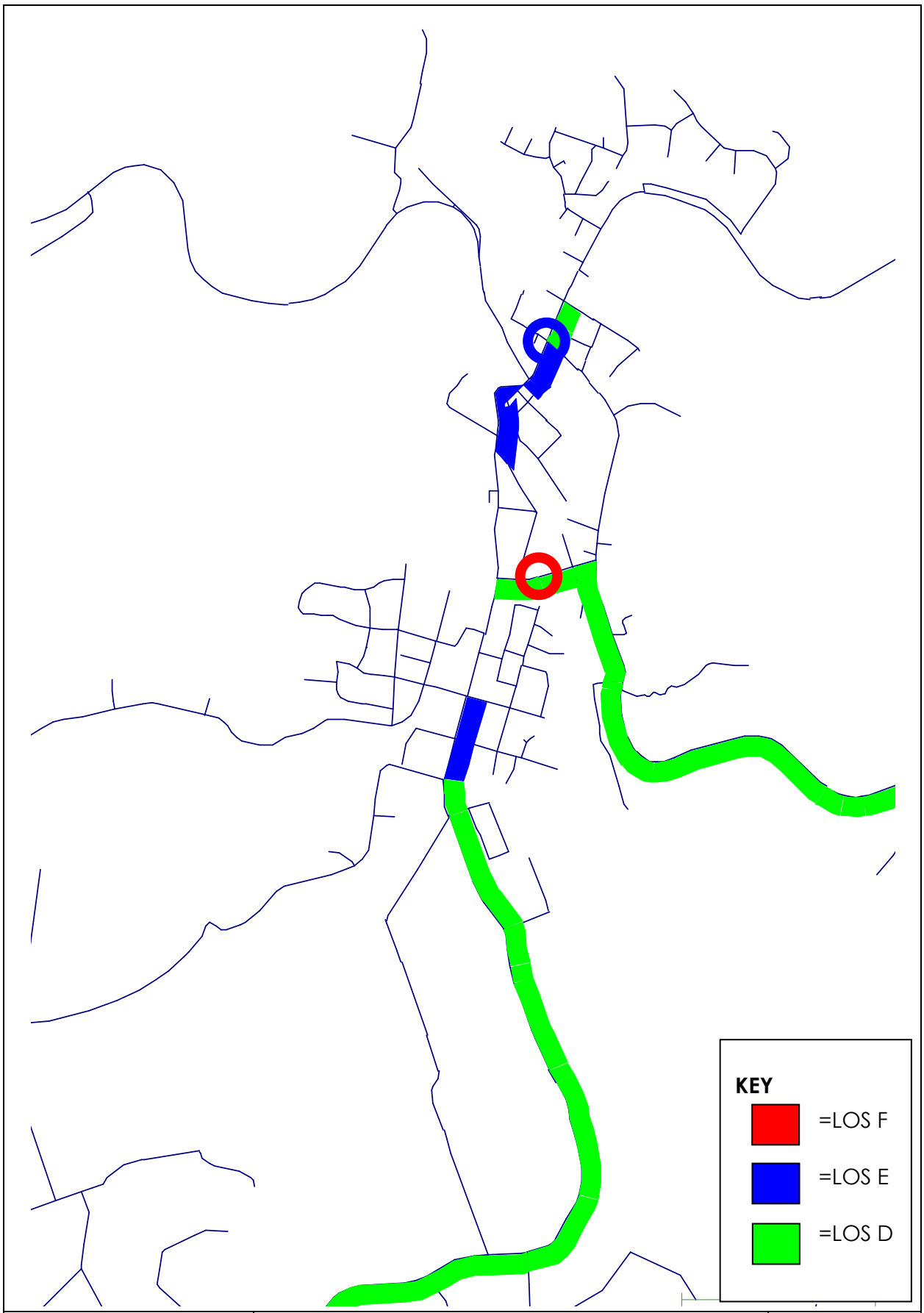
Wollondilly Transportation Model	**2021 Option** **PM Peak LOS**	**Figure 10**
Gabites Porter		



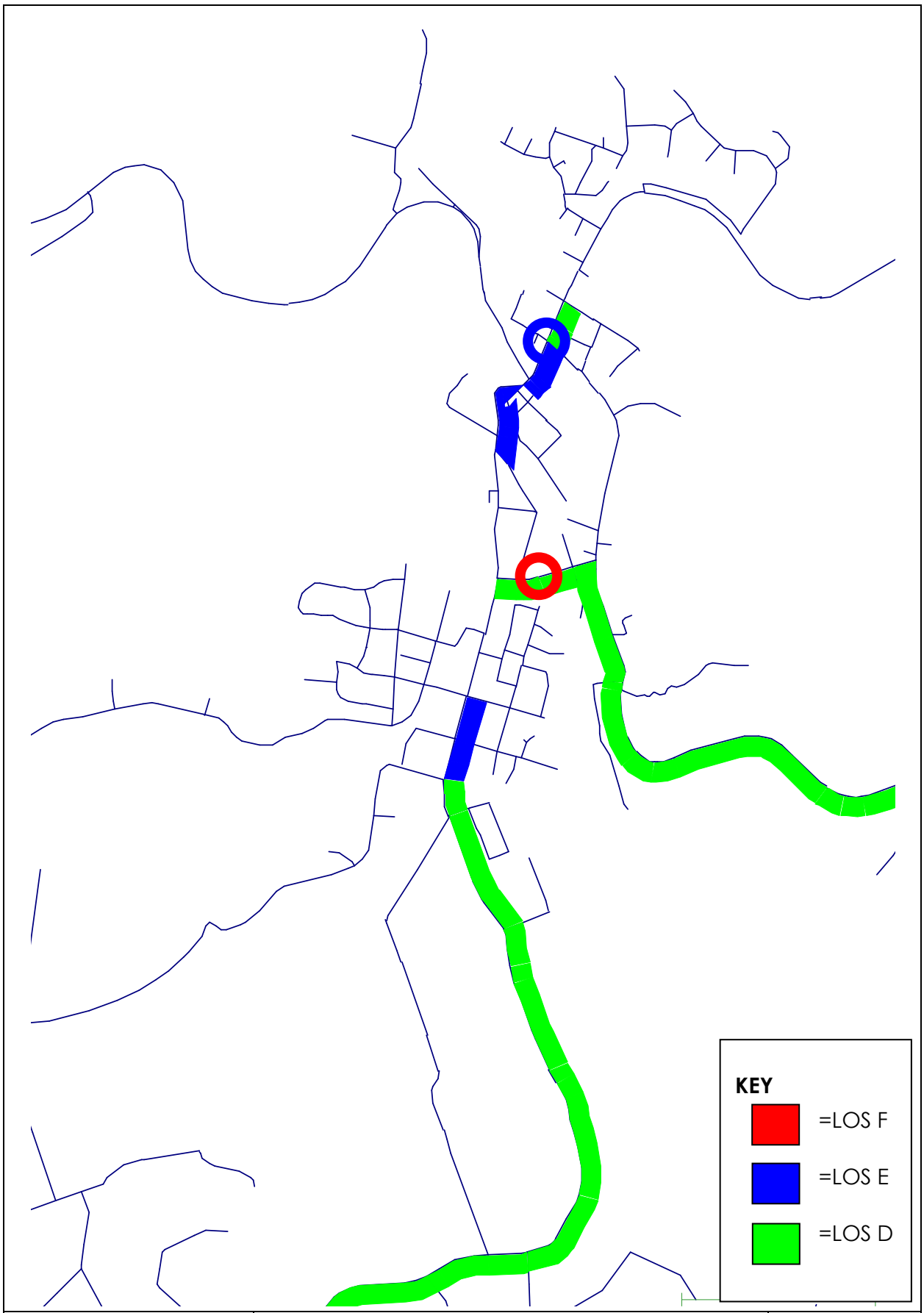
Wollondilly Transportation Model	**2026 Base AM Peak LOS**	**Figure 11**
Gabites Porter		



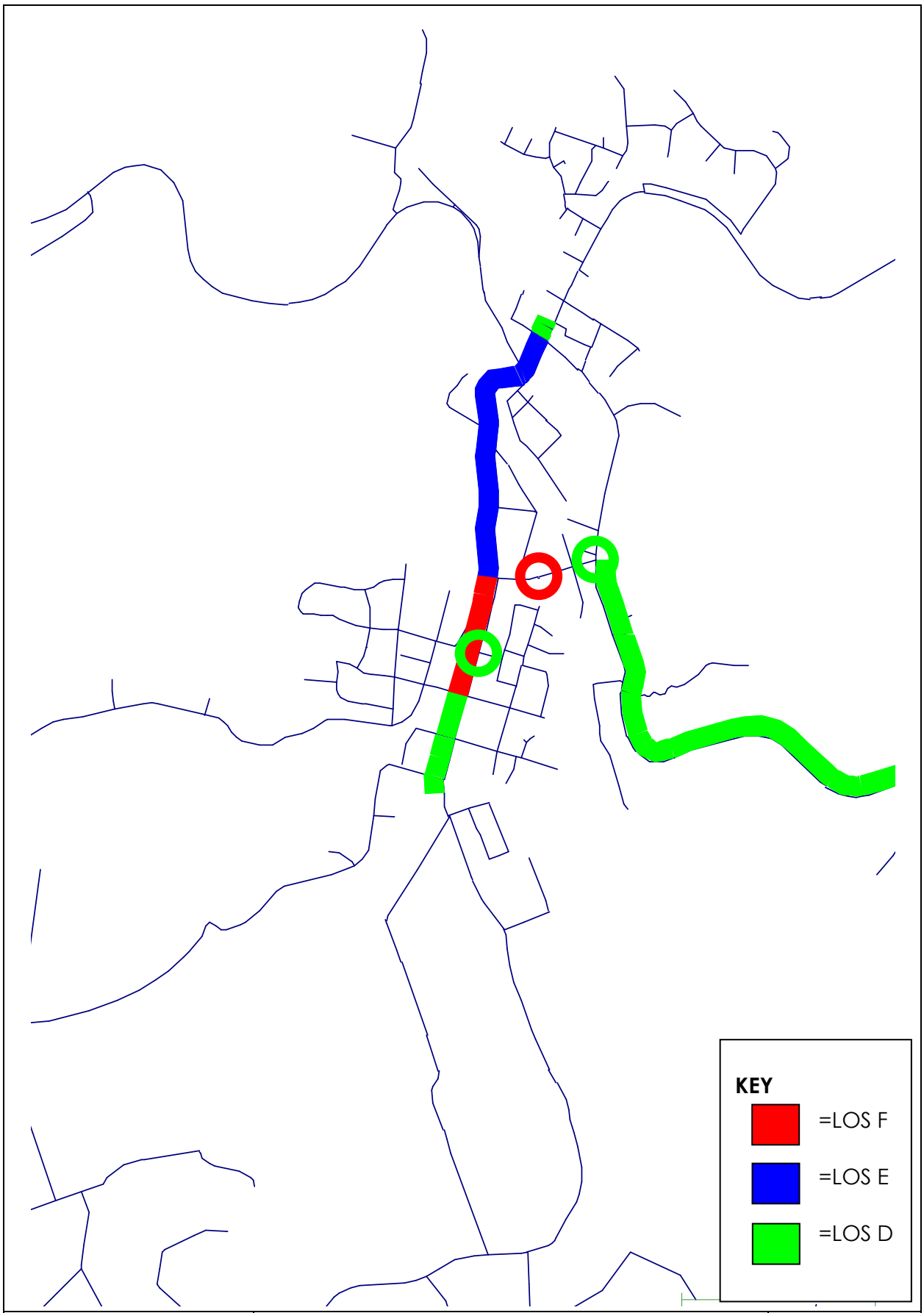
Wollondilly Transportation Model	**2026 Option** **AM Peak LOS**	**Figure 12**
Gabites Porter		



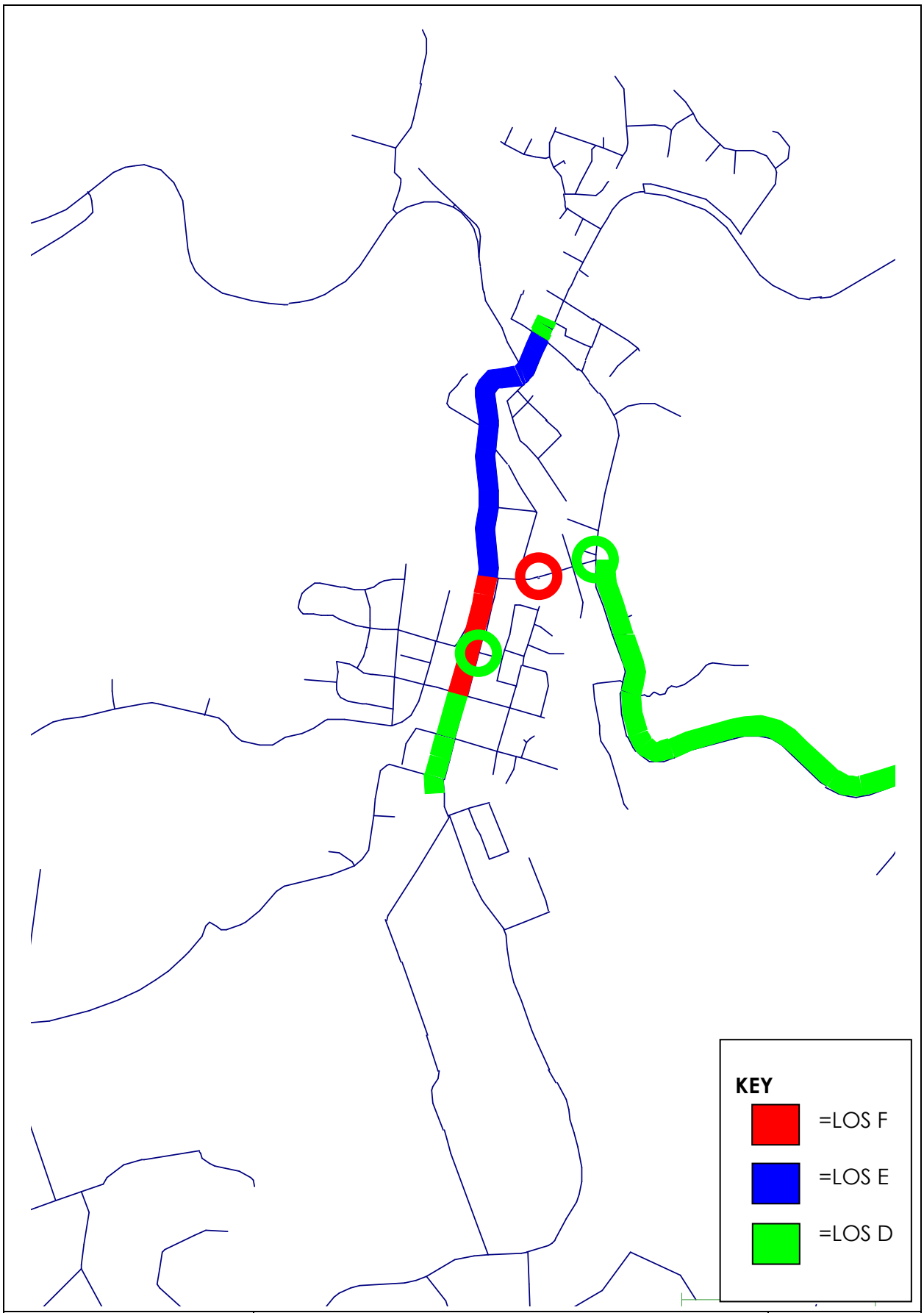
Wollondilly Transportation Model	**2026 Base PM Peak LOS**	**Figure 13**
Gabites Porter		



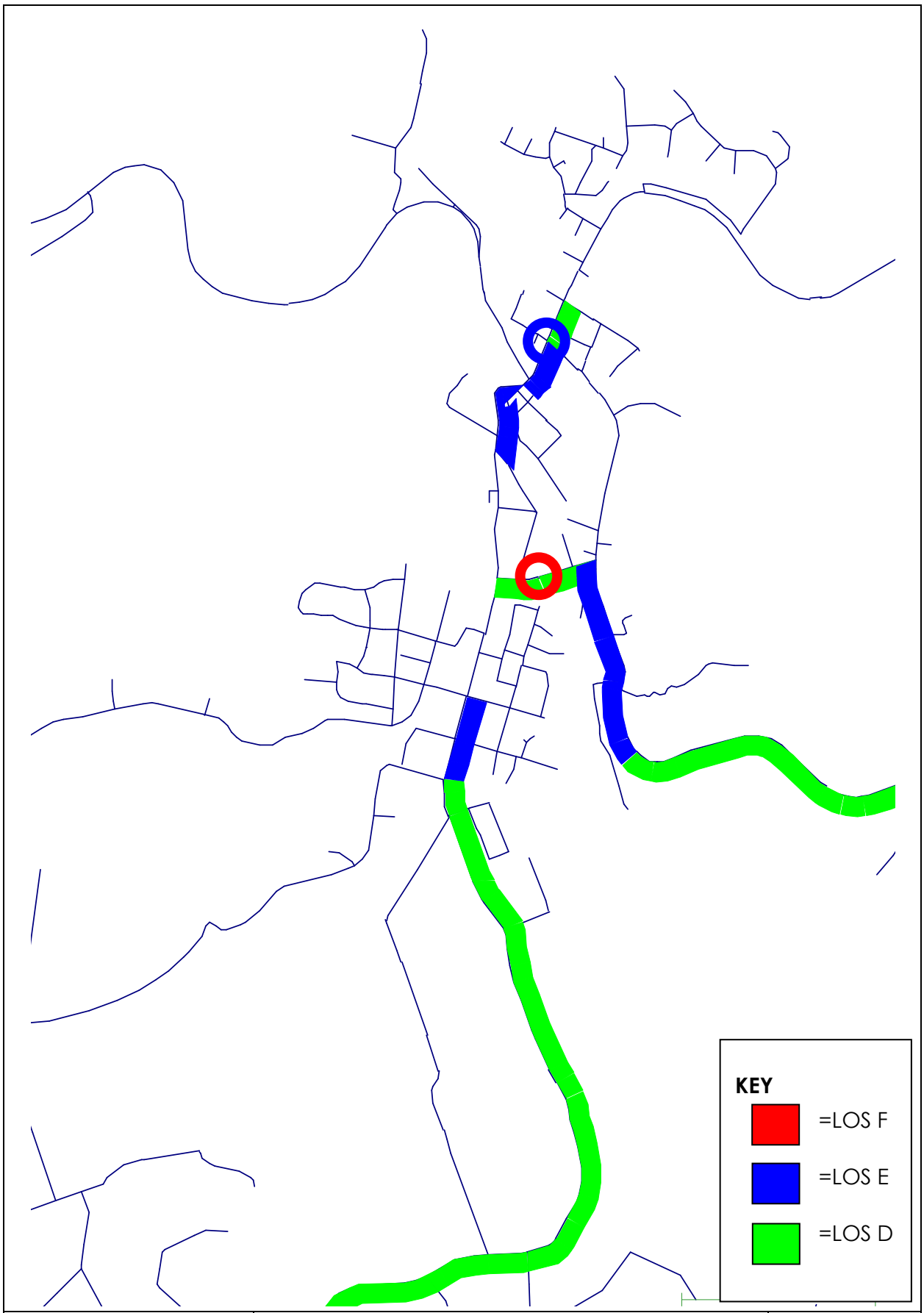
Wollondilly Transportation Model	**2026 Option** **PM Peak LOS**	**Figure 14**
Gabites Porter		



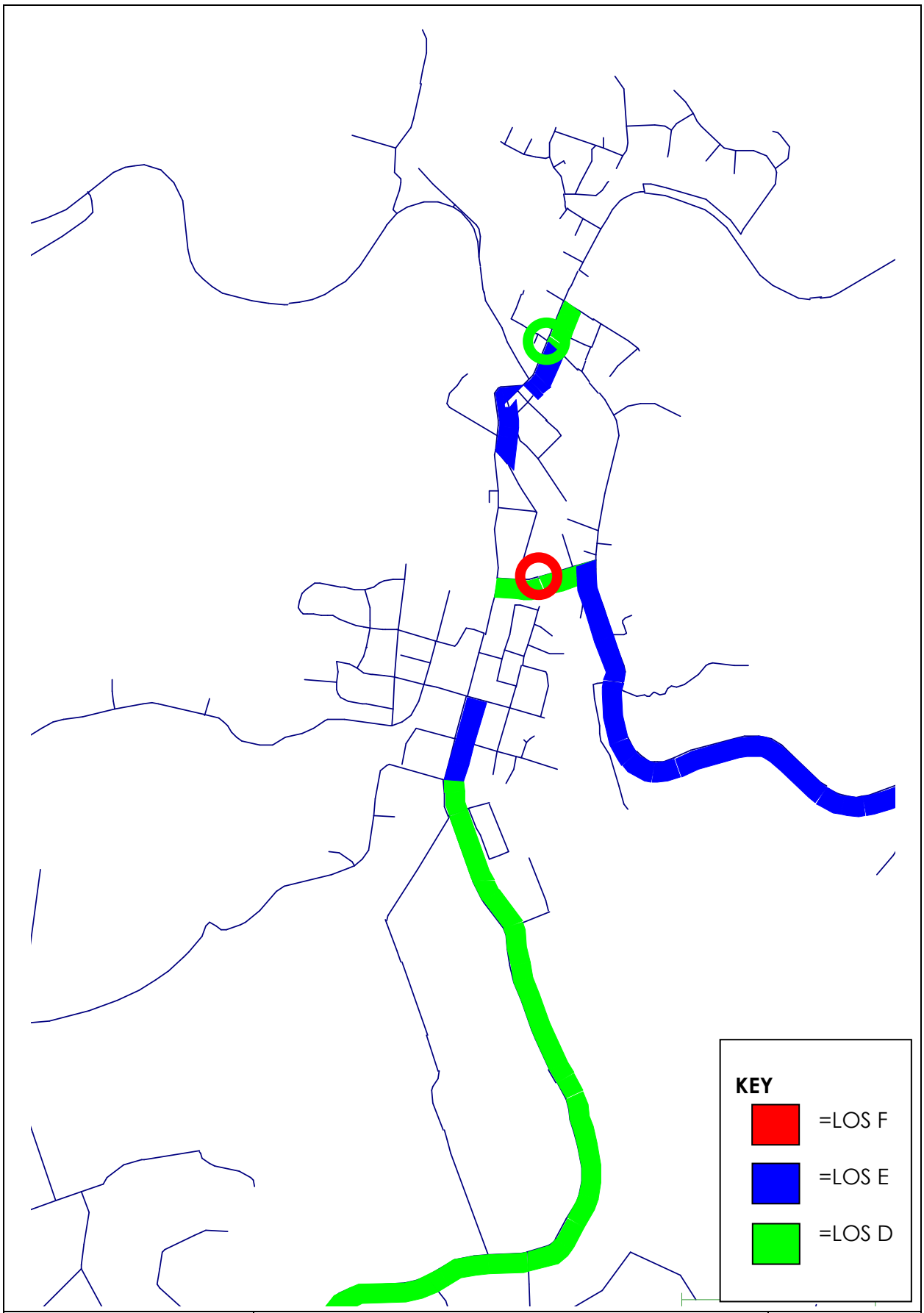
Wollondilly Transportation Model	**2031 Base AM Peak LOS**	**Figure 15**
Gabites Porter		



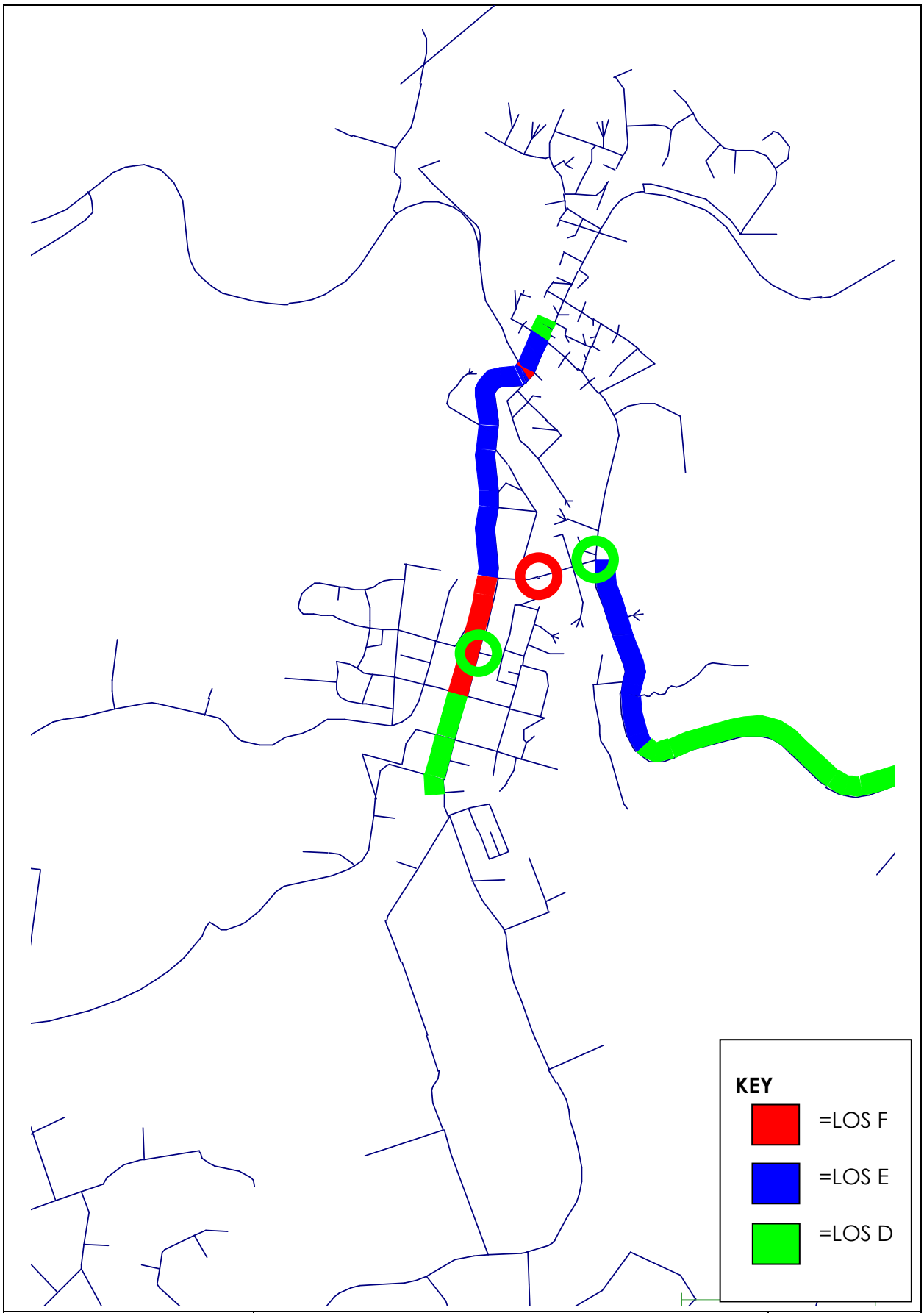
Wollondilly Transportation Model	**2031 Option** **AM Peak LOS**	**Figure 16**
Gabites Porter		



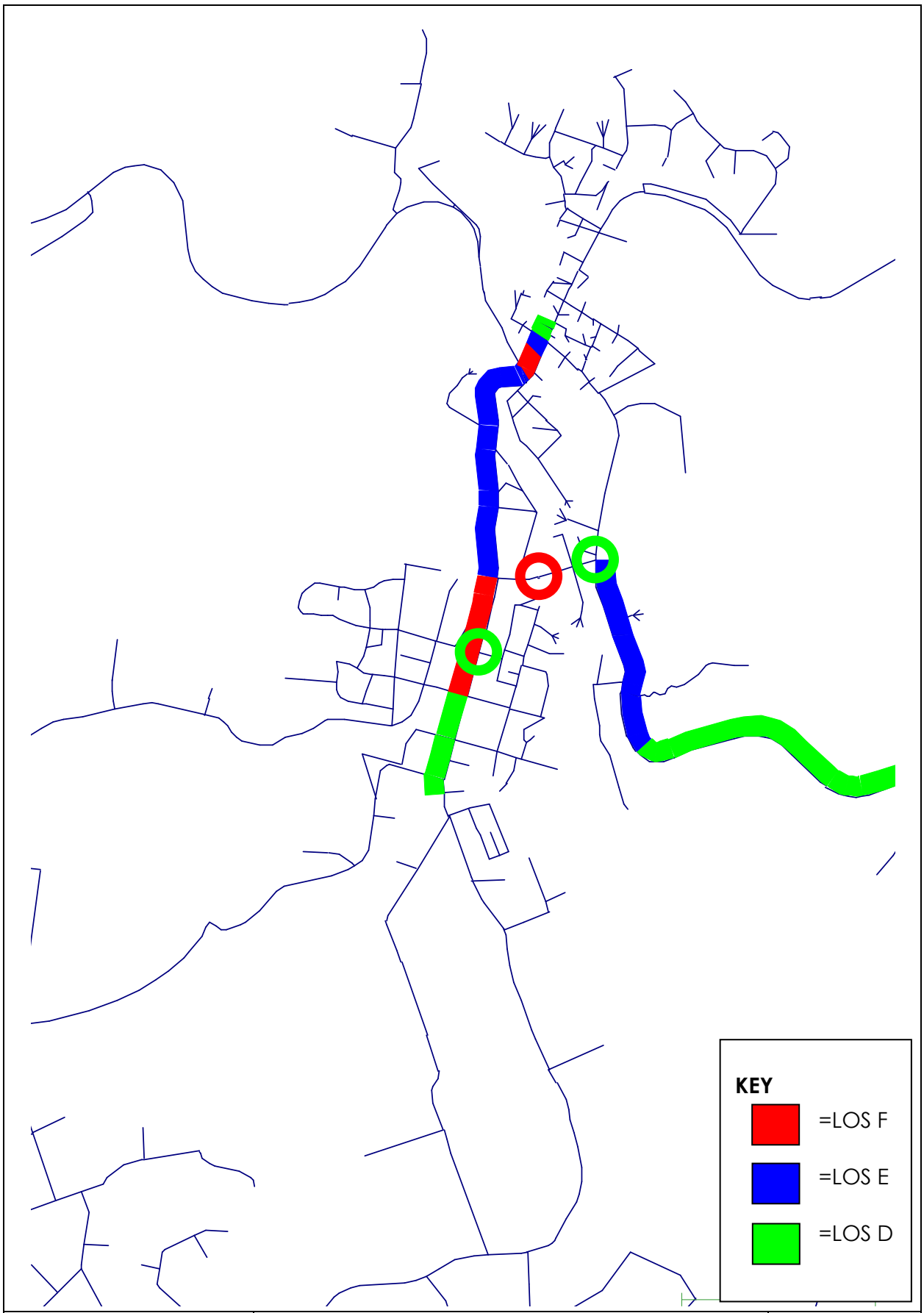
Wollondilly Transportation Model	**2031 Base PM Peak LOS**	**Figure 17**
Gabites Porter		



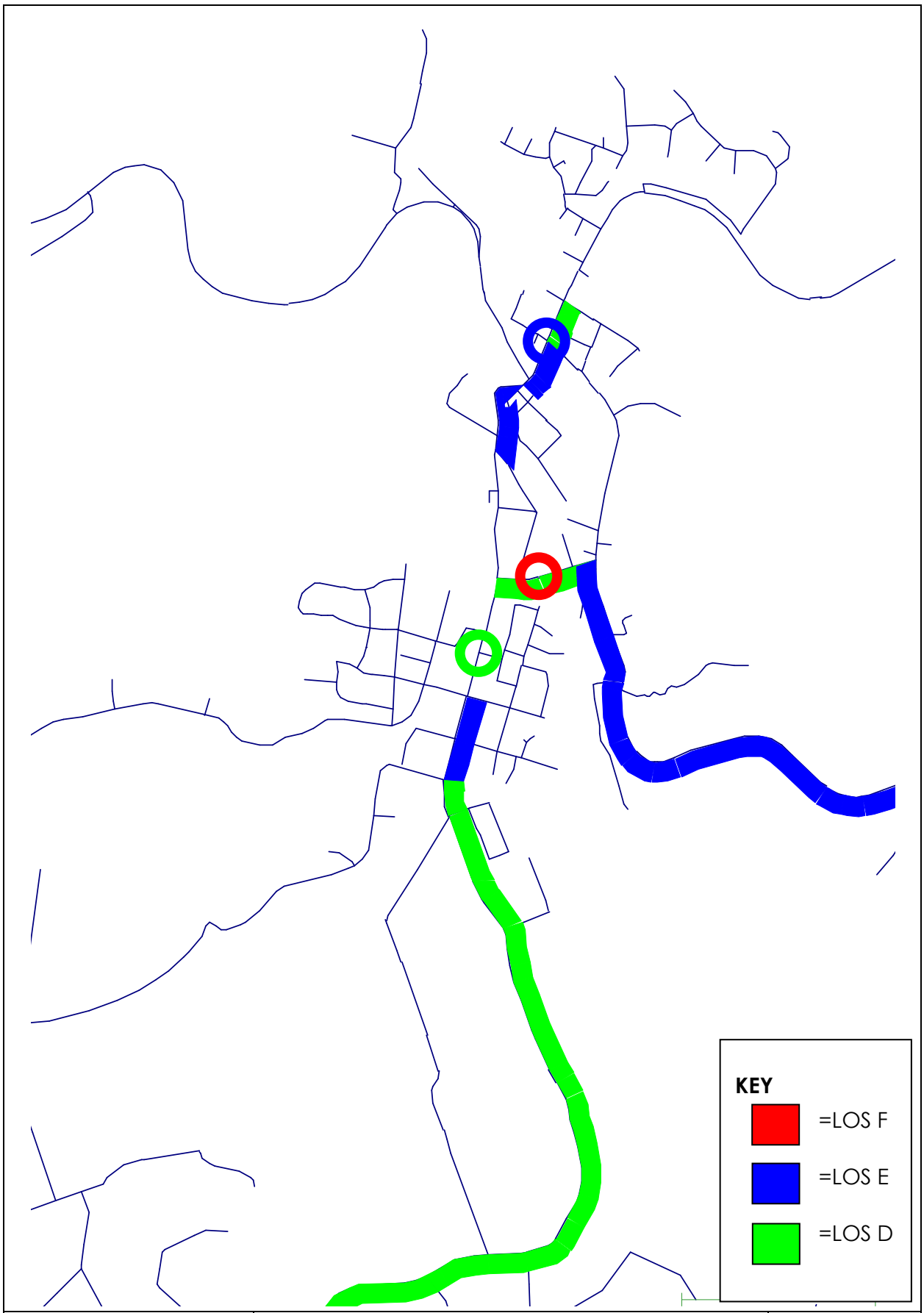
Wollondilly Transportation Model	**2031 Option** **PM Peak LOS**	**Figure 18**
Gabites Porter		



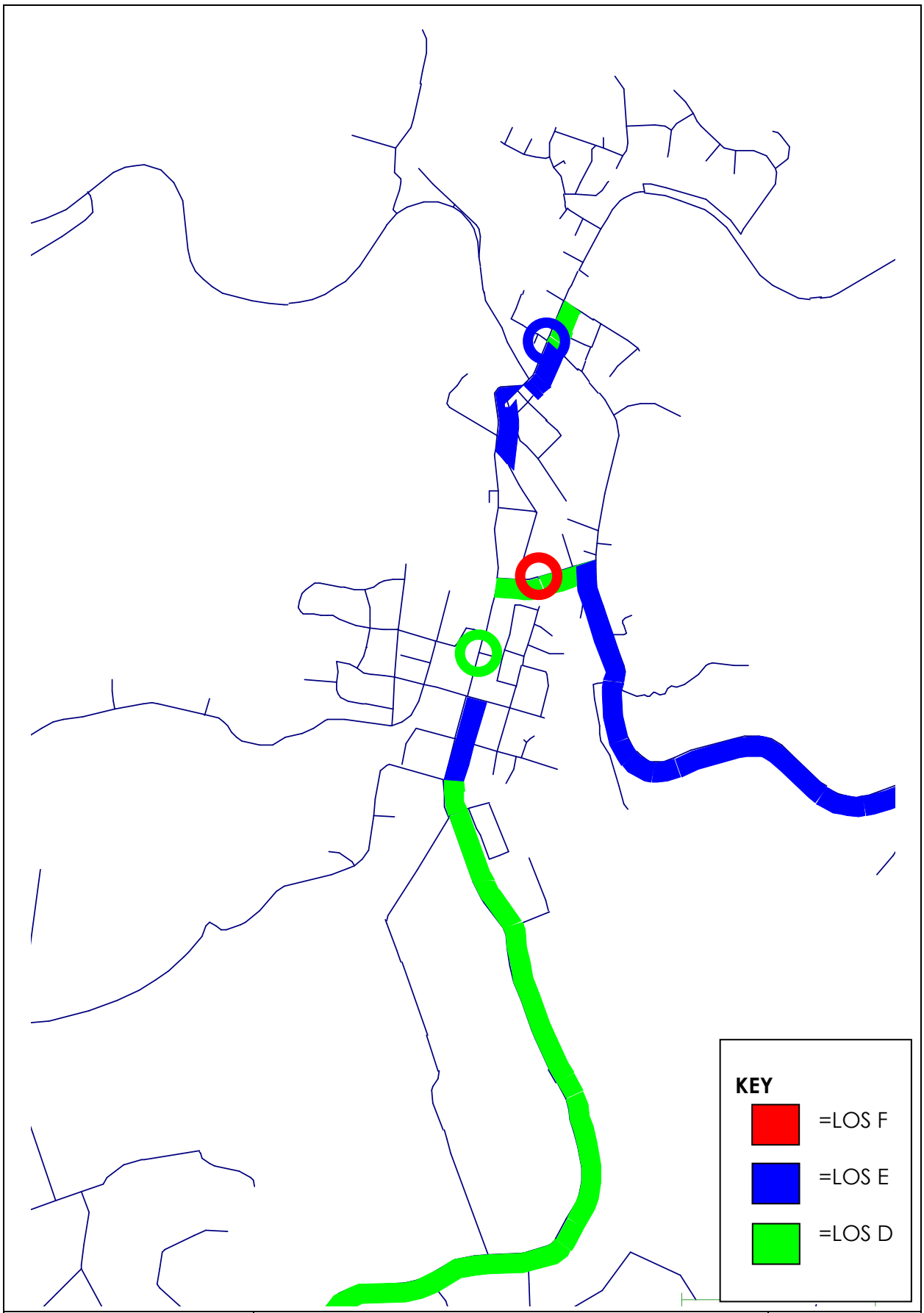
Wollondilly Transportation Model	**2036 Base AM Peak LOS**	**Figure 19**
Gabites Porter		



Wollondilly Transportation Model	**2036 Option** **AM Peak LOS**	**Figure 20**
Gabites Porter		



Wollondilly Transportation Model	**2036 Base PM Peak LOS**	**Figure 21**
Gabites Porter		



Wollondilly Transportation Model	**2036 Option** **PM Peak LOS**	**Figure 22**
Gabites Porter		

6. MODEL SUMMARY VOLUMES

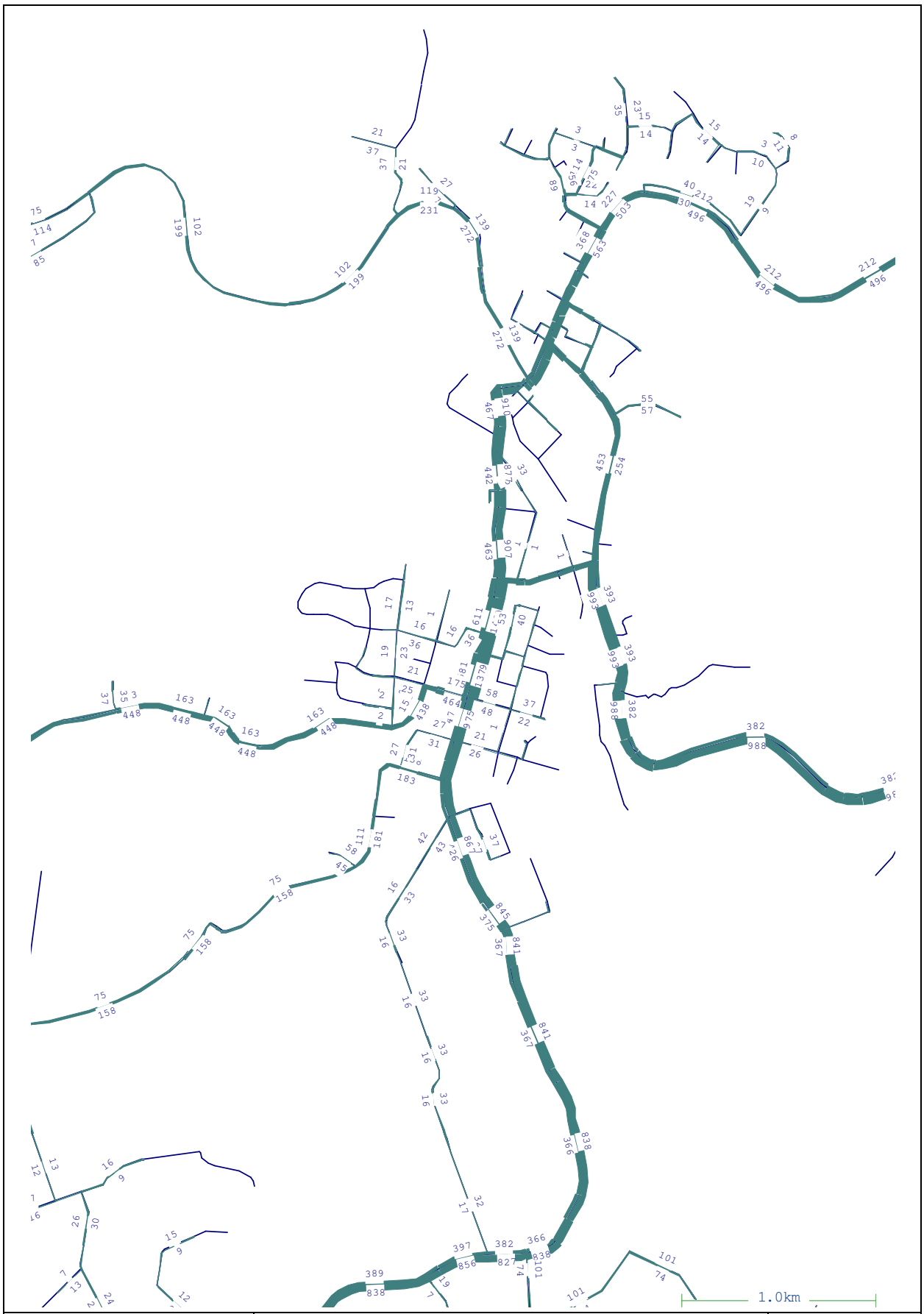
Directional volumes plots and volume change plots reporting the change in traffic flows between the base model and the option are included in **Figure 23** to **Figure 50,** with an overview of the study area for both the Base and option in the AM Peak and PM Peak periods for each of the years 2021, 2026, 2031 and 2036.

Intersection turning movement diagrams for 2010 (base only), 2021, 2026, 2031 and 2036 have been extracted for both AM and PM Peak models at the intersection of Barkers Lodge Road and Abbotsford Road (see **Figure 51** through **Figure 59**) and the intersection of Barkers Lodge Road and Argyle Street (see **Figure 60** through **Figure 68**).

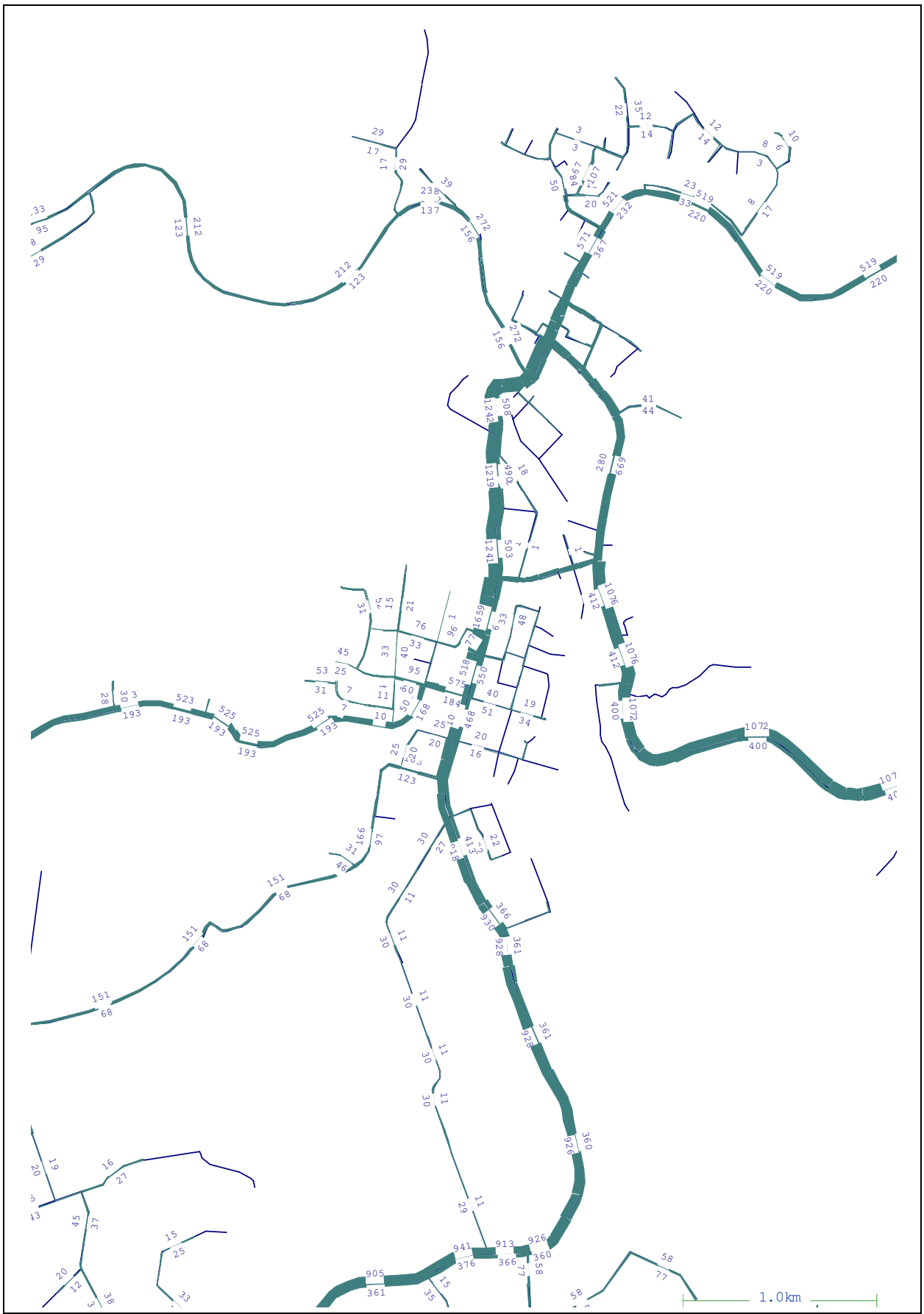
Wollondilly Transportation Model	**2010 Base** **AM Peak** **Modelled Traffic Volume**	**Figure 23**
Gabites Porter		

Wollondilly Transportation Model	**2010 Base** **PM Peak** **Modelled Traffic Volume**	**Figure 24**
Gabites Porter		

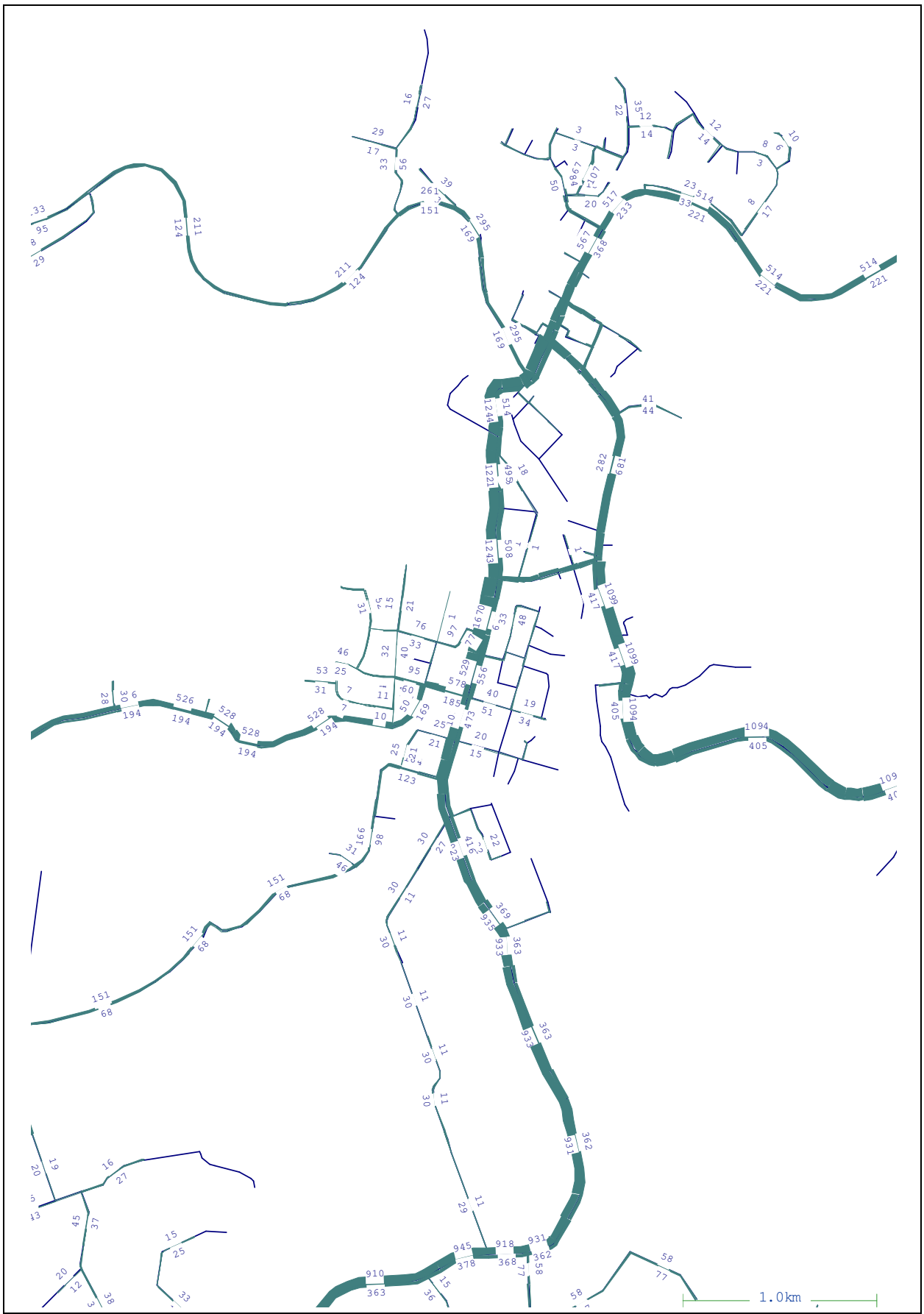
Wollondilly Transportation Model	**2016 Base** **AM Peak** **Modelled Traffic Volume**	**Figure 25**
Gabites Porter		



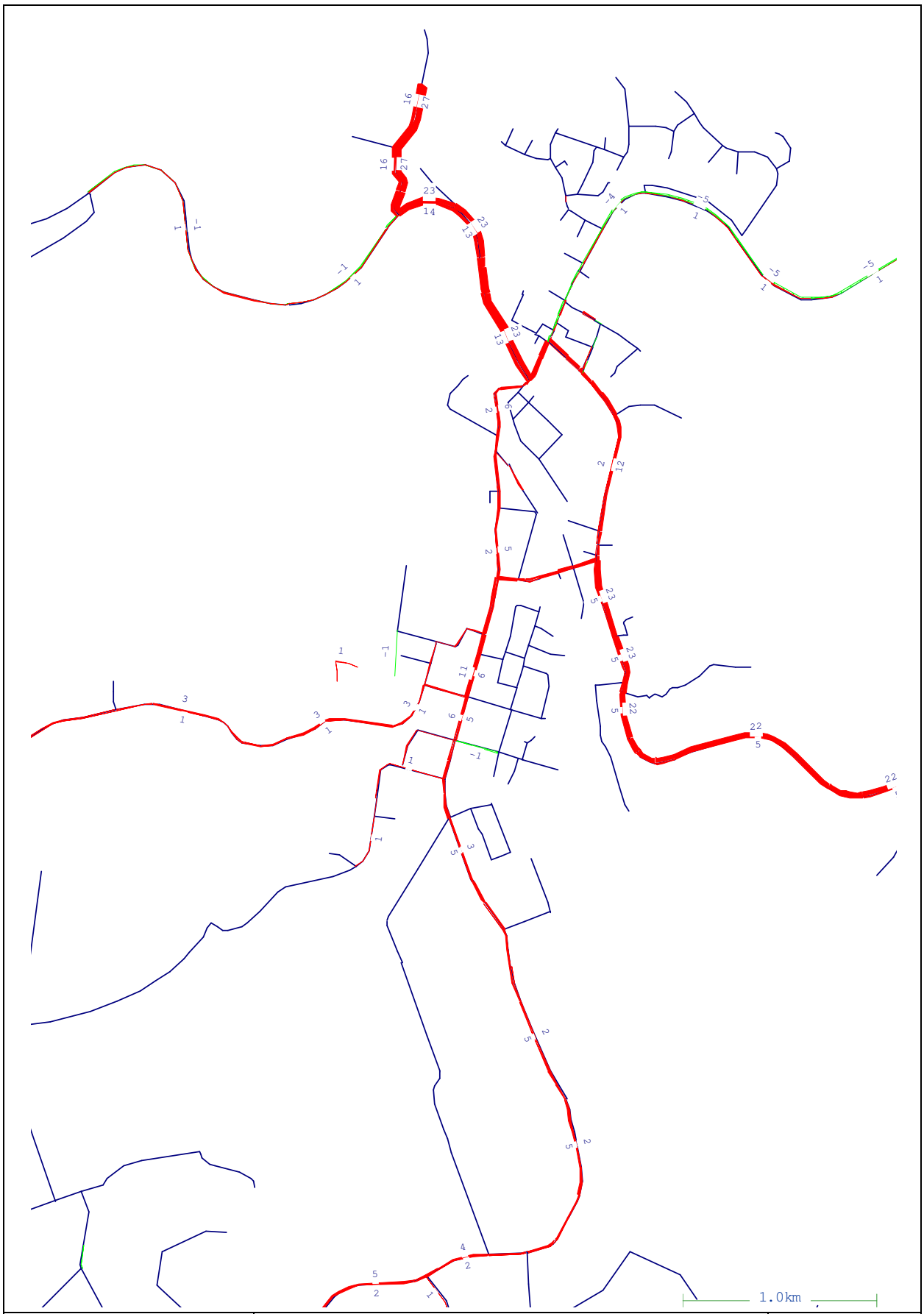
Wollondilly Transportation Model	**2016 Base** **PM Peak** **Modelled Traffic Volume**	**Figure 26**
Gabites Porter		



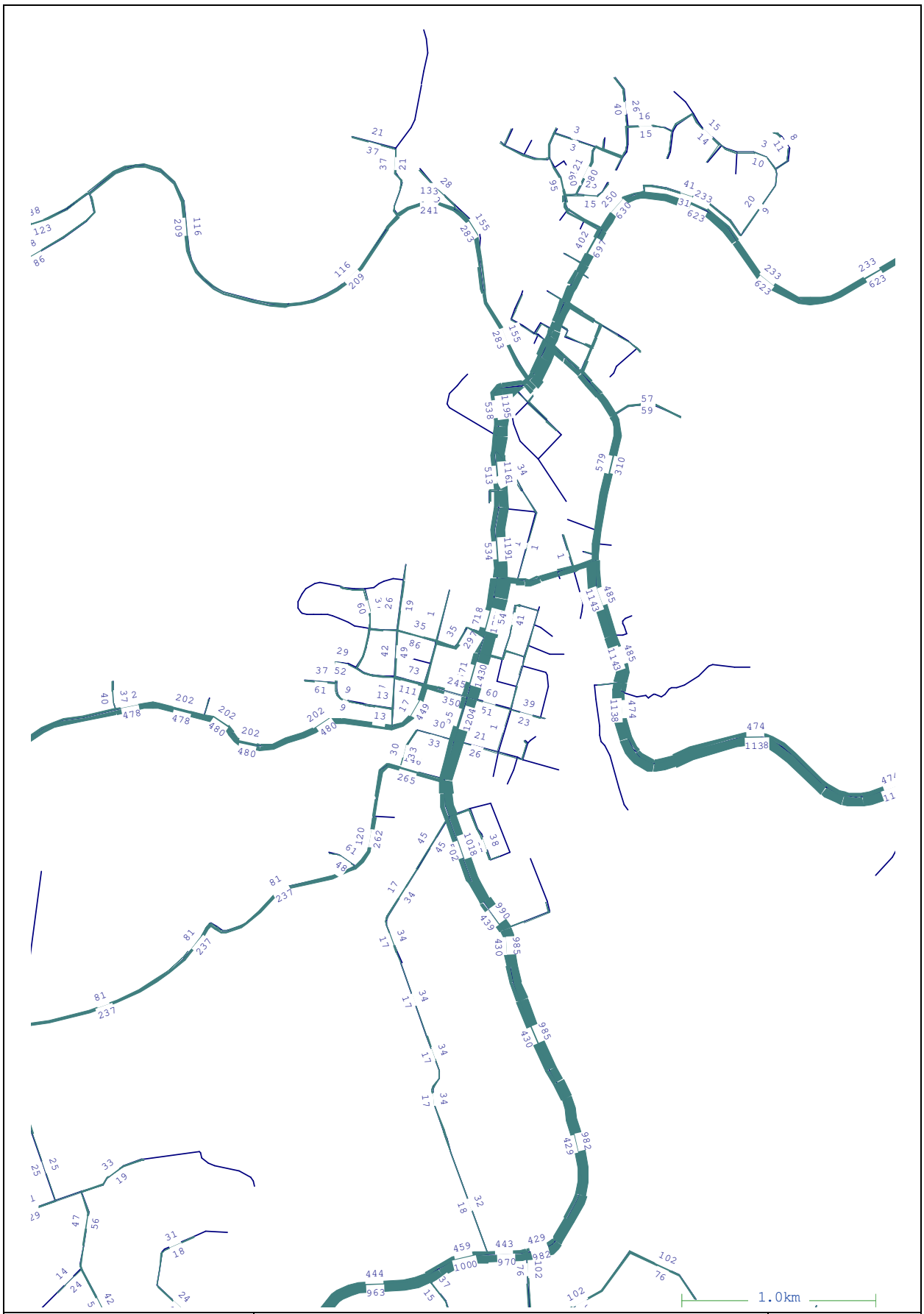
Wollondilly Transportation Model	**2021 Base** **AM Peak** **Modelled Traffic Volume**	**Figure 27**
Gabites Porter		



Wollondilly Transportation Model	**2021 Option** **AM Peak** **Modelled Traffic Volume**	**Figure 28**
Gabites Porter		

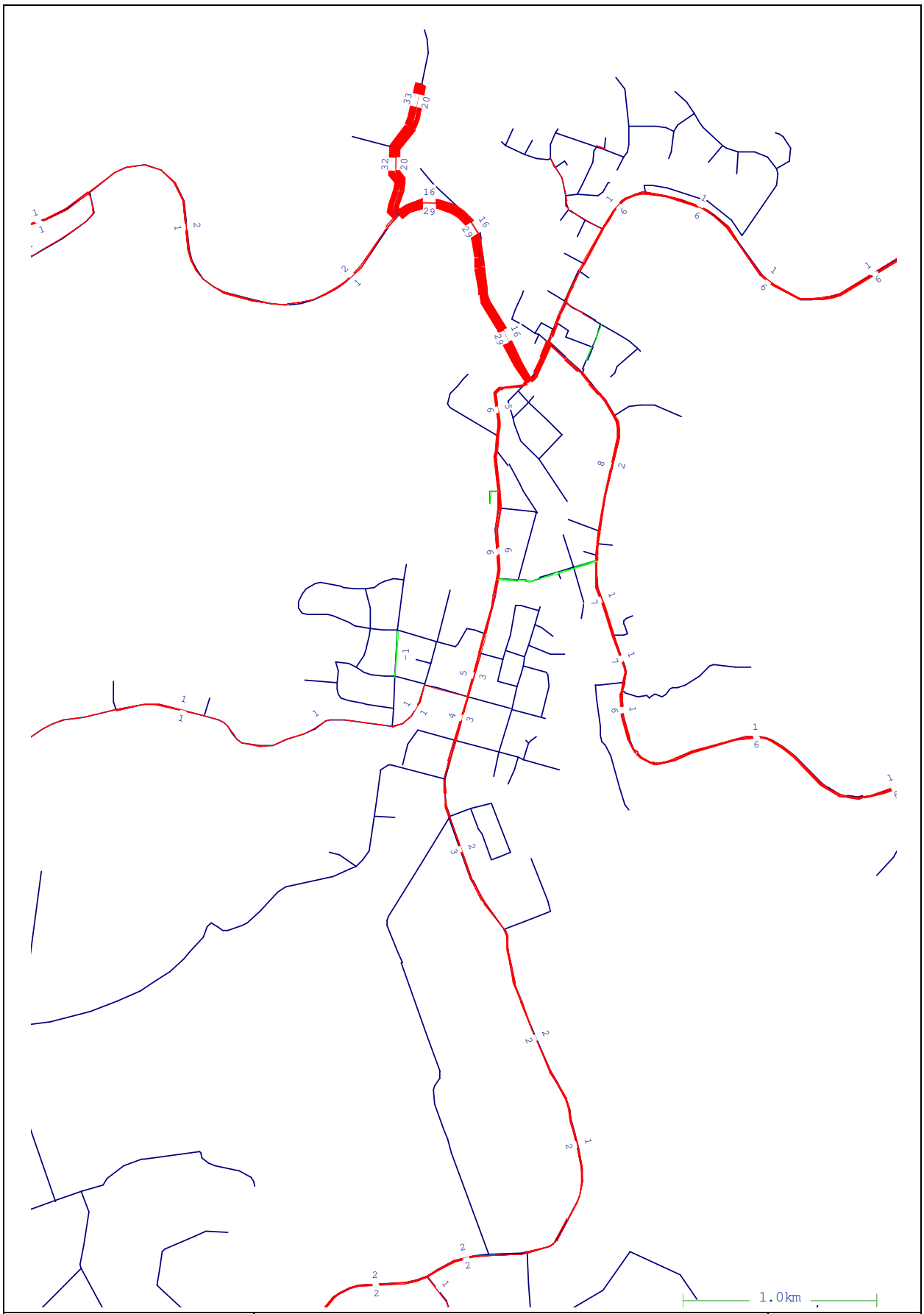


Wollondilly Transportation Model	**Volume Change Plot** **2021 AM Peak** **Base v Option**	**Figure 29**
Gabites Porter		

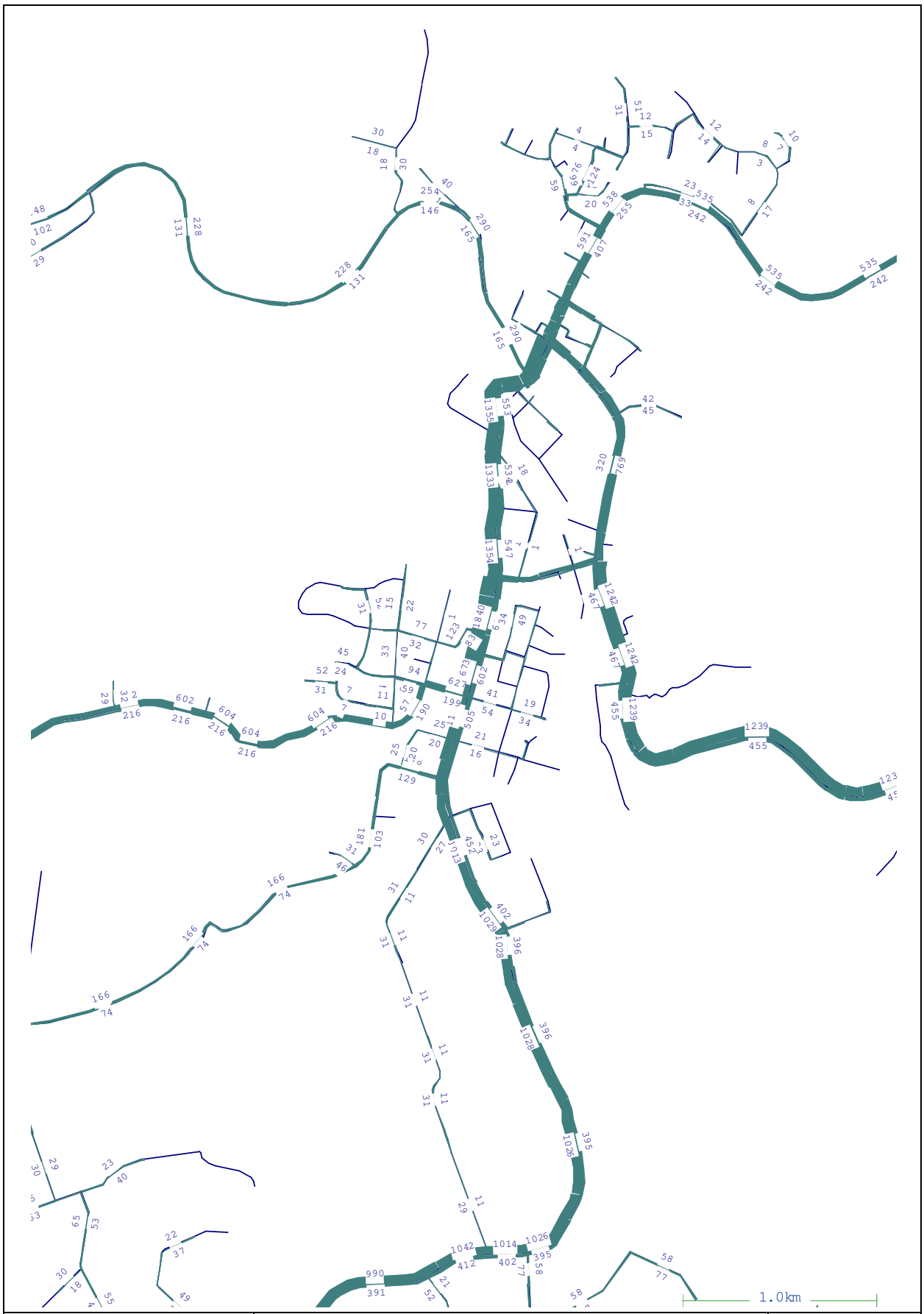


Wollondilly Transportation Model	**2021 Base** **PM Peak** **Modelled Traffic Volume**	**Figure 30**
Gabites Porter		

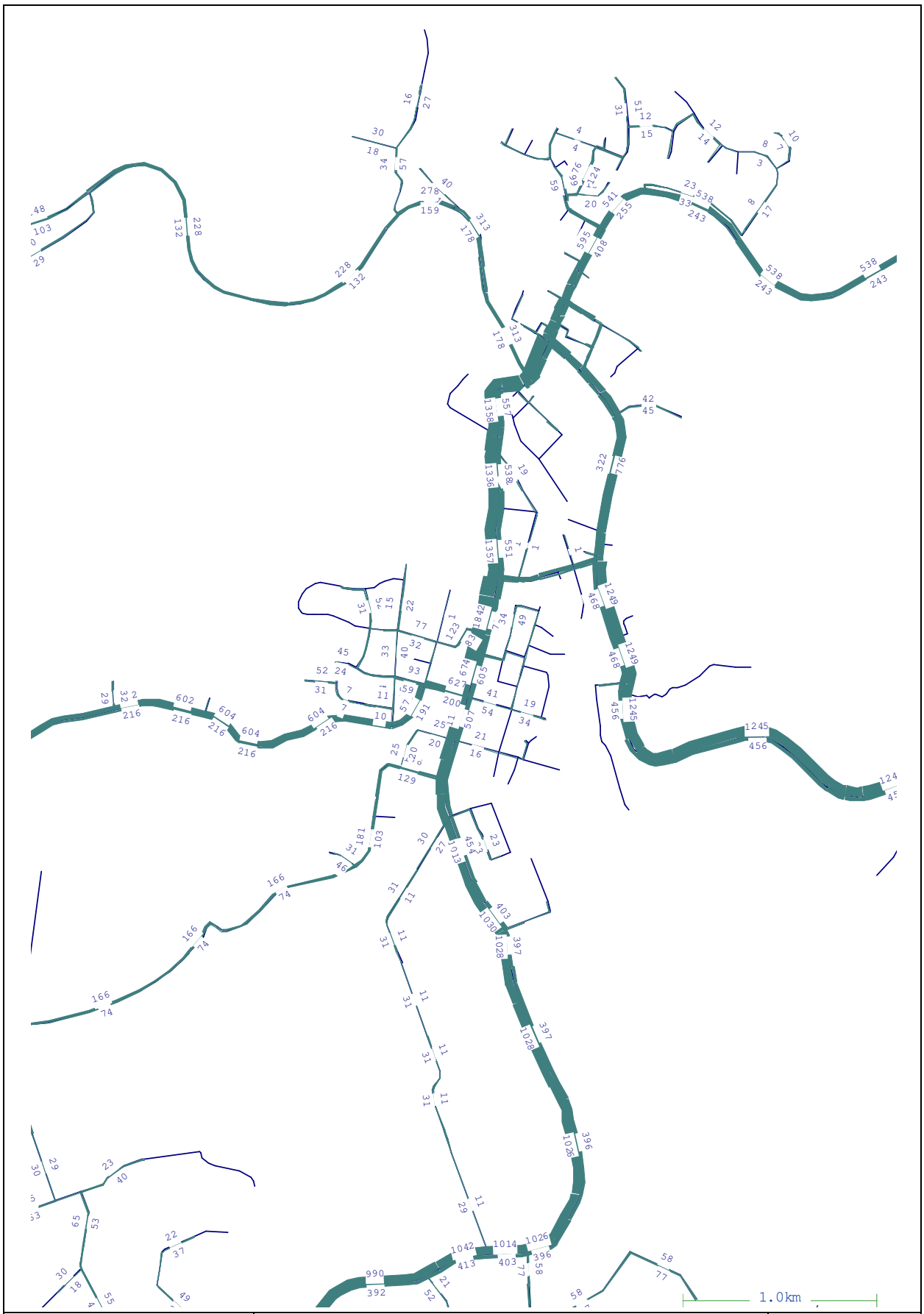
Wollondilly Transportation Model	**2021 Option** **PM Peak** **Modelled Traffic Volume**	**Figure 31**
Gabites Porter		



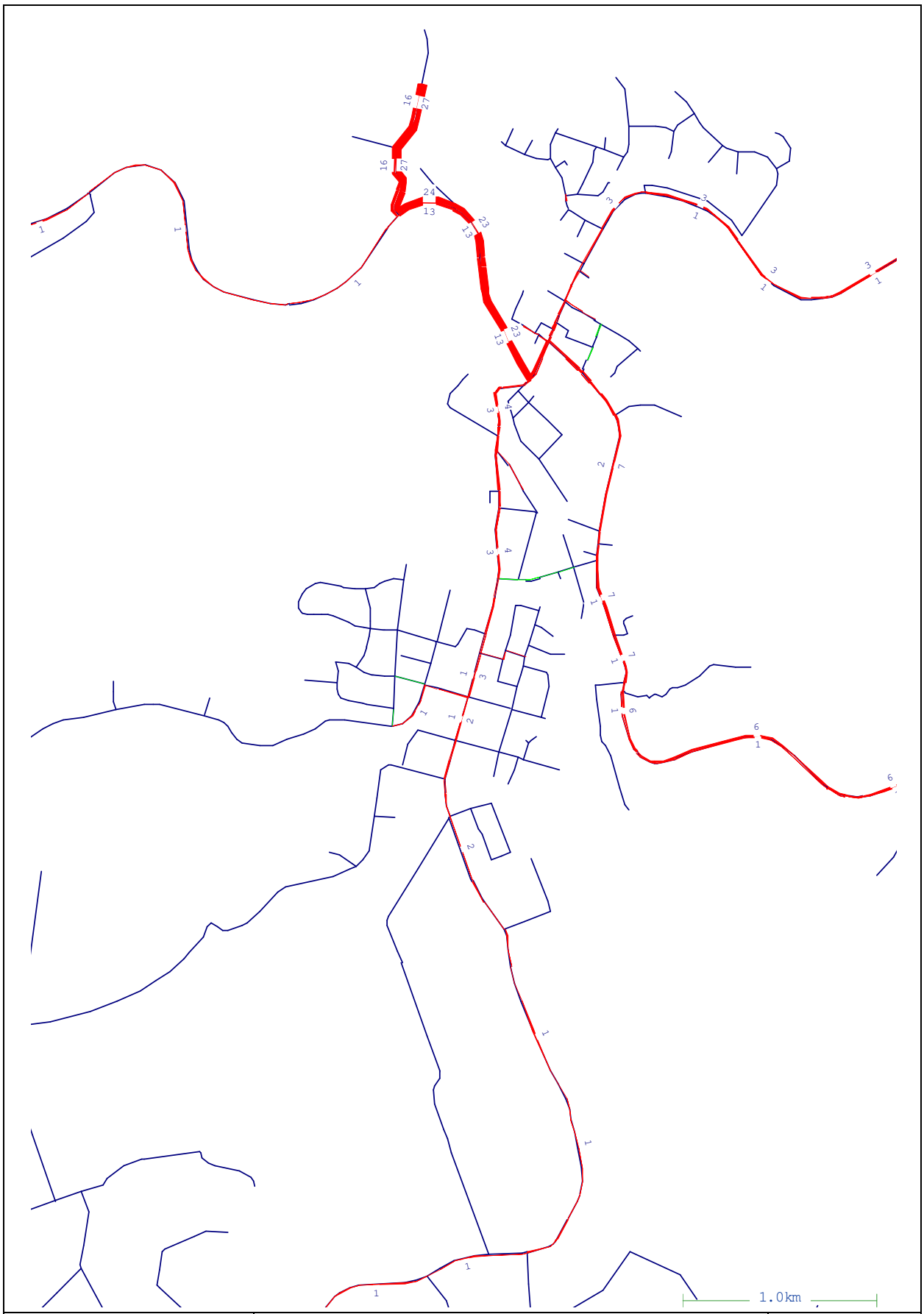
Wollondilly Transportation Model	**Volume Change Plot** **2021 PM Peak** **Base v Option**	**Figure 32**
Gabites Porter		



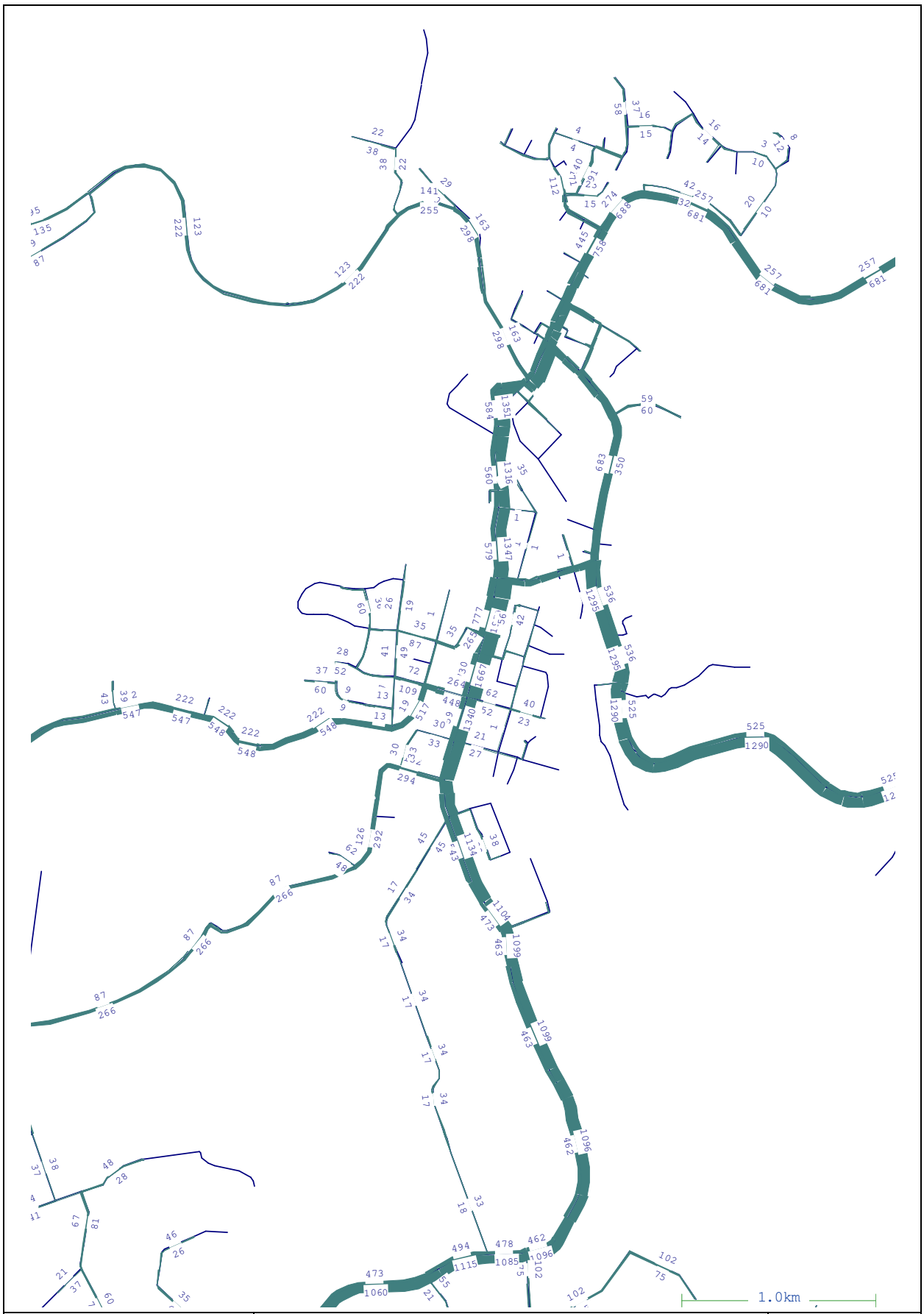
Wollondilly Transportation Model	**2026 Base** **AM Peak** **Modelled Traffic Volume**	**Figure 33**
Gabites Porter		



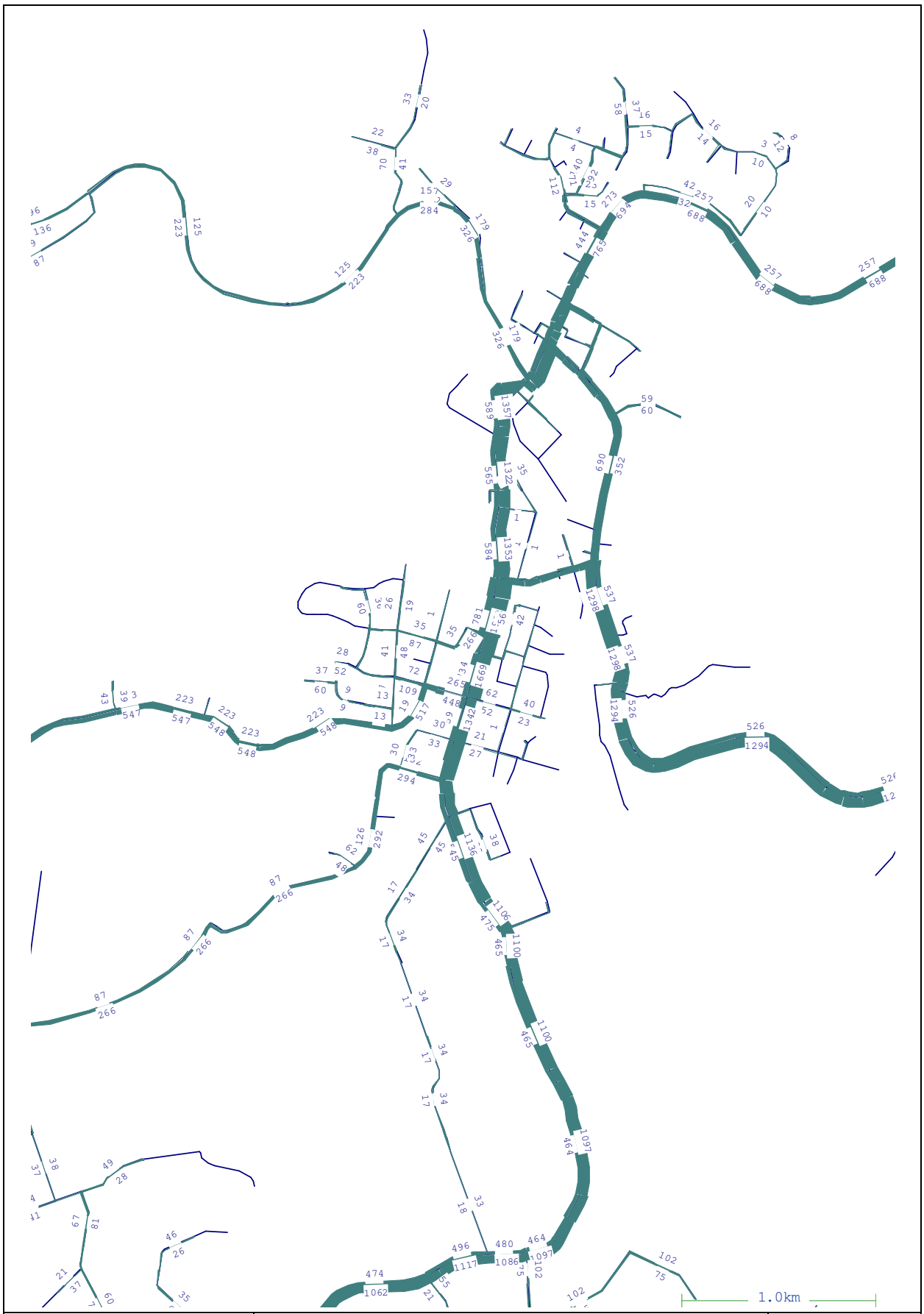
Wollondilly Transportation Model	**2026 Option** **AM Peak** **Modelled Traffic Volume**	**Figure 34**
Gabites Porter		



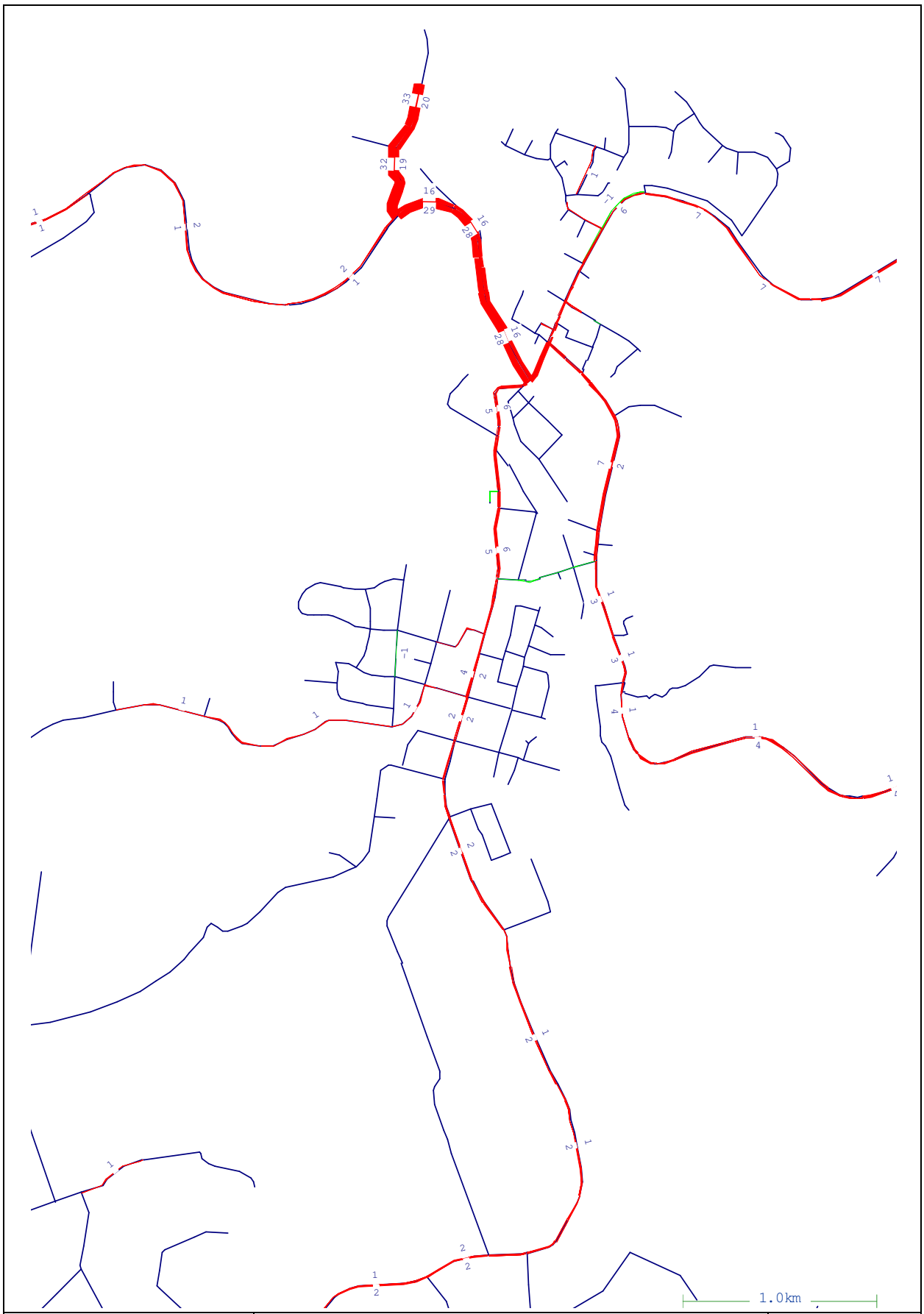
Wollondilly Transportation Model	**Volume Change Plot** **2026 AM Peak** **Base v Option**	**Figure 35**
Gabites Porter		



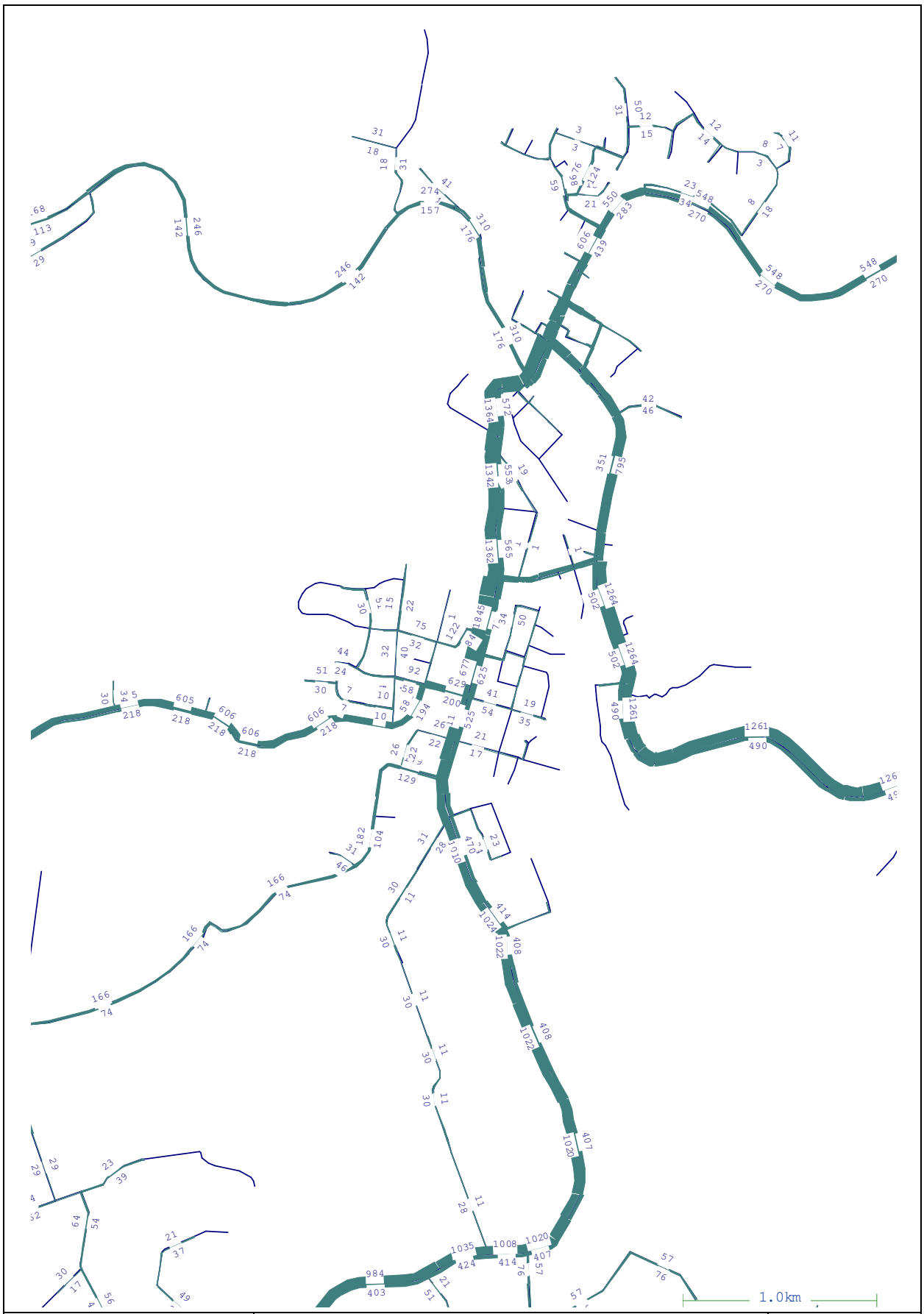
Wollondilly Transportation Model	**2026 Base** **PM Peak** **Modelled Traffic Volume**	**Figure 36**
Gabites Porter		



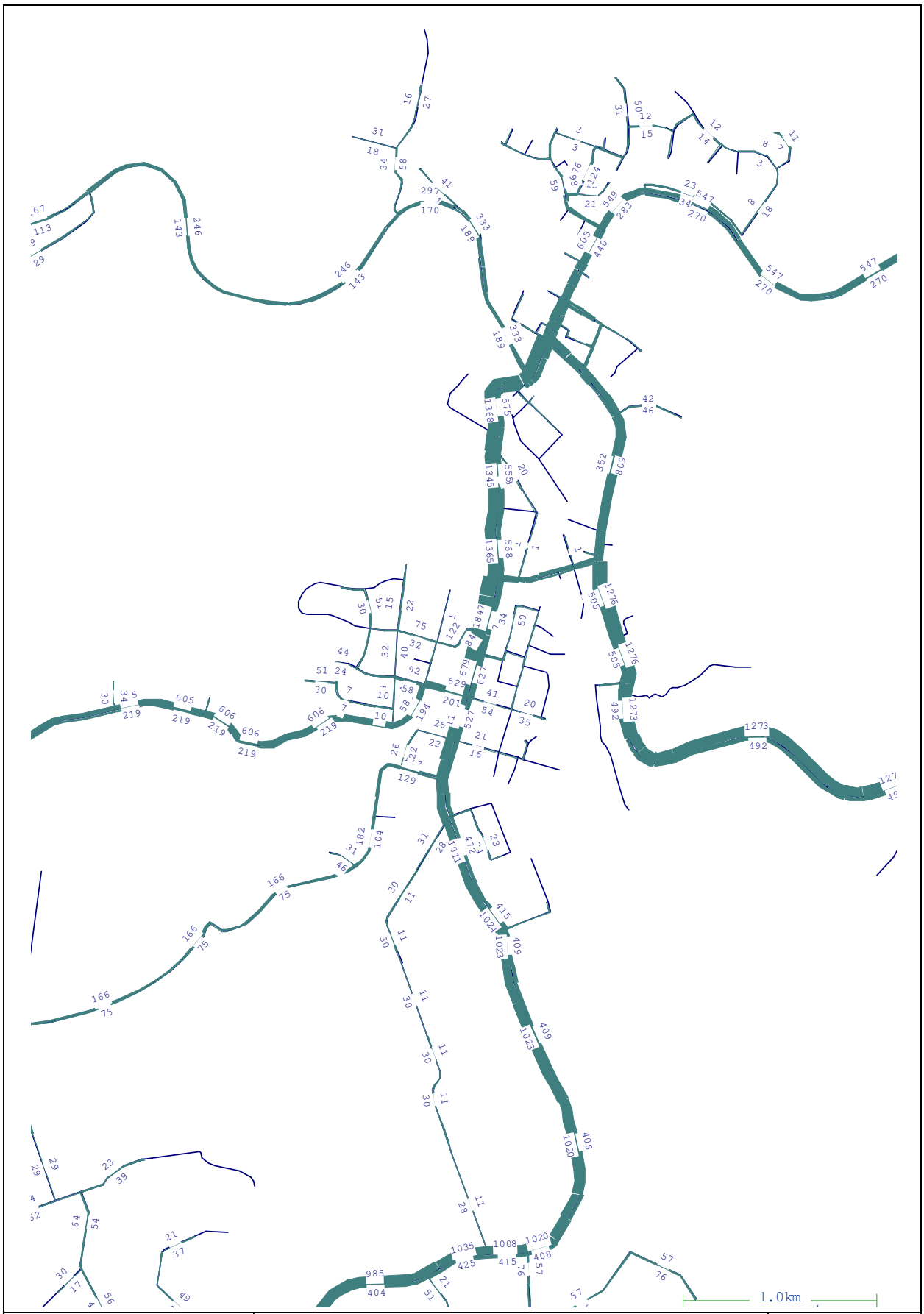
Wollondilly Transportation Model	**2026 Option** **PM Peak** **Modelled Traffic Volume**	**Figure 37**
Gabites Porter		



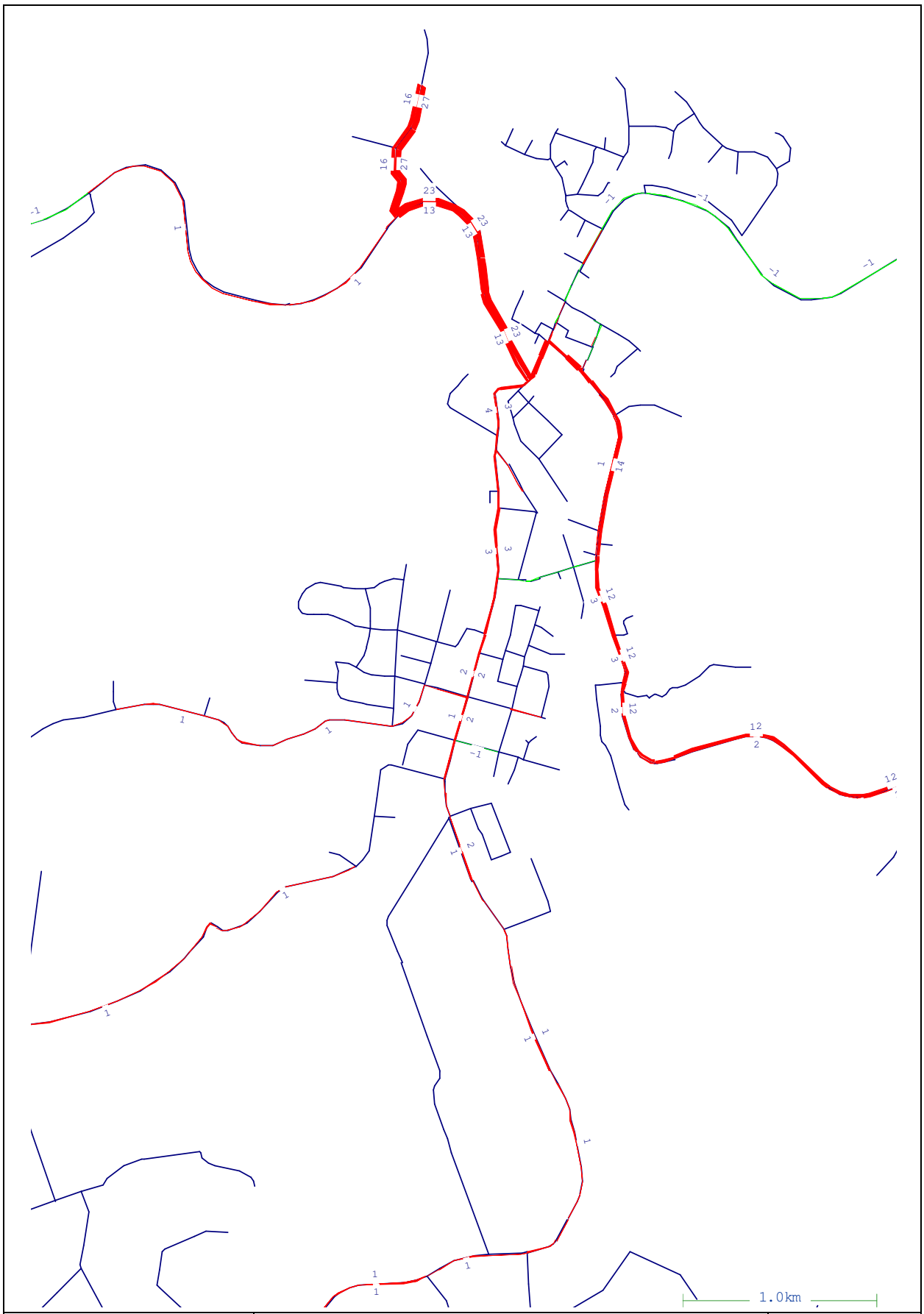
Wollondilly Transportation Model	**Volume Change Plot** **2026 PM Peak** **Base v Option**	**Figure 38**
Gabites Porter		



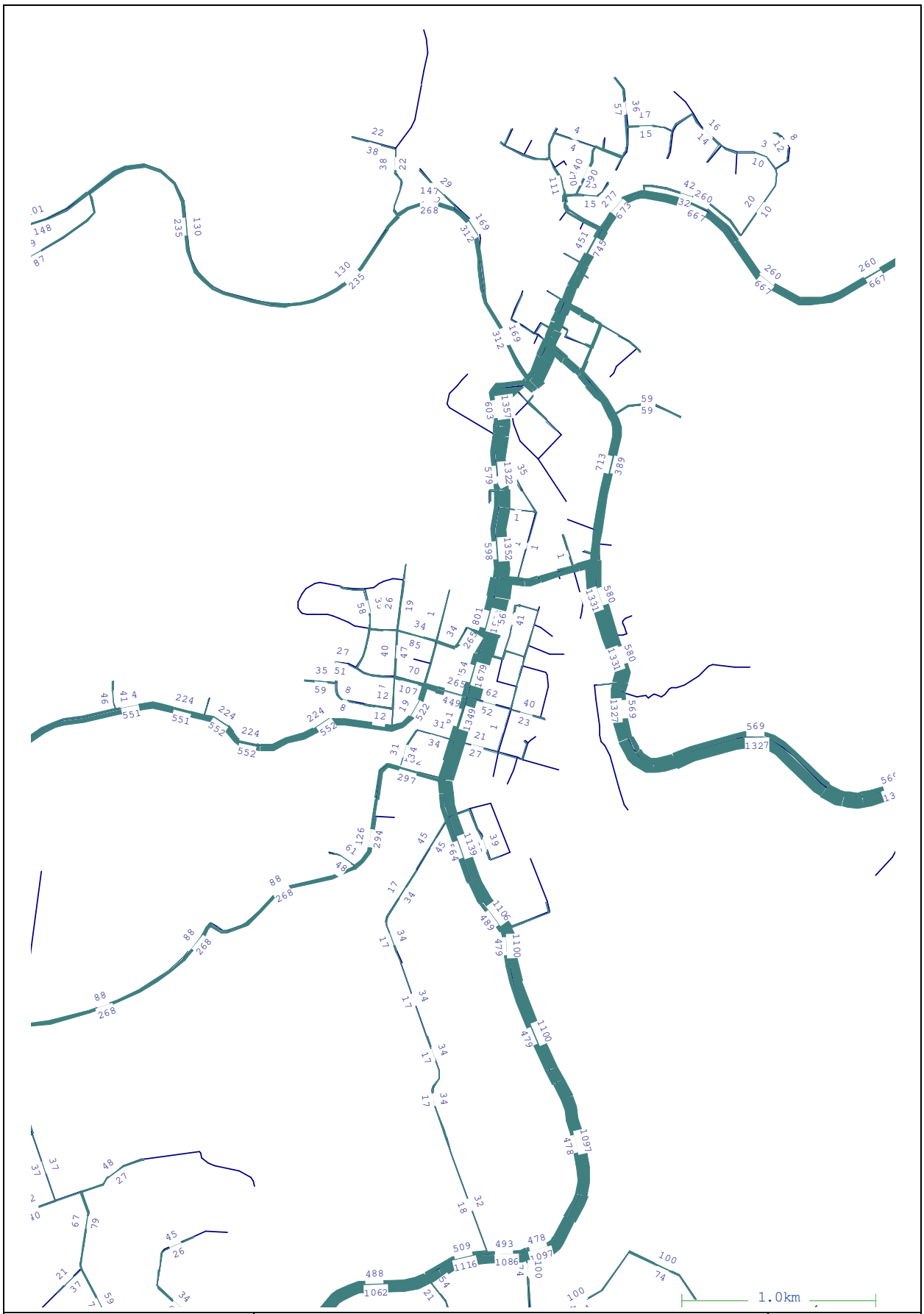
Wollondilly Transportation Model	**2031 Base** **AM Peak** **Modelled Traffic Volume**	**Figure 39**
Gabites Porter		



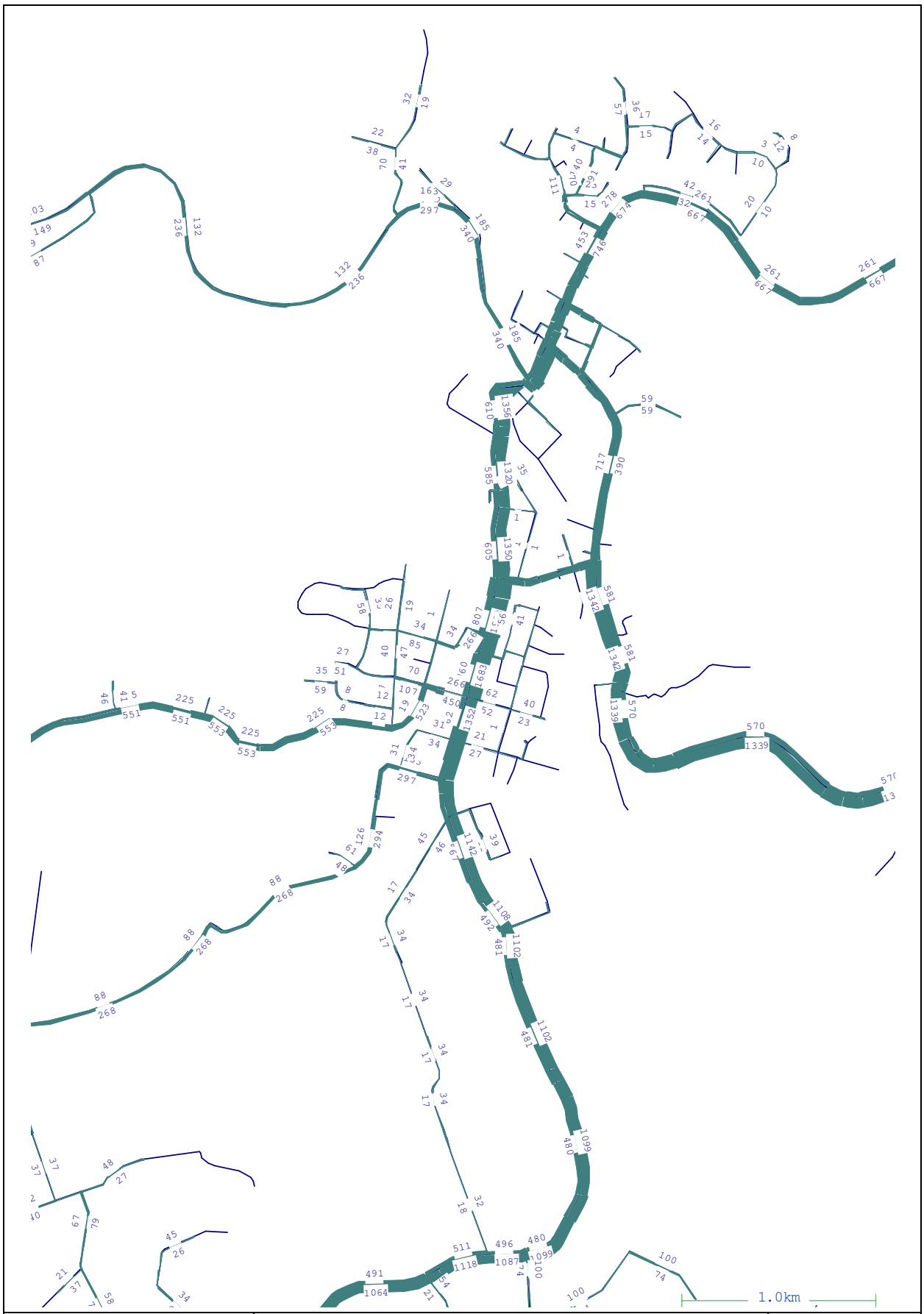
Wollondilly Transportation Model	**2031 Option** **AM Peak** **Modelled Traffic Volume**	**Figure 40**
Gabites Porter		



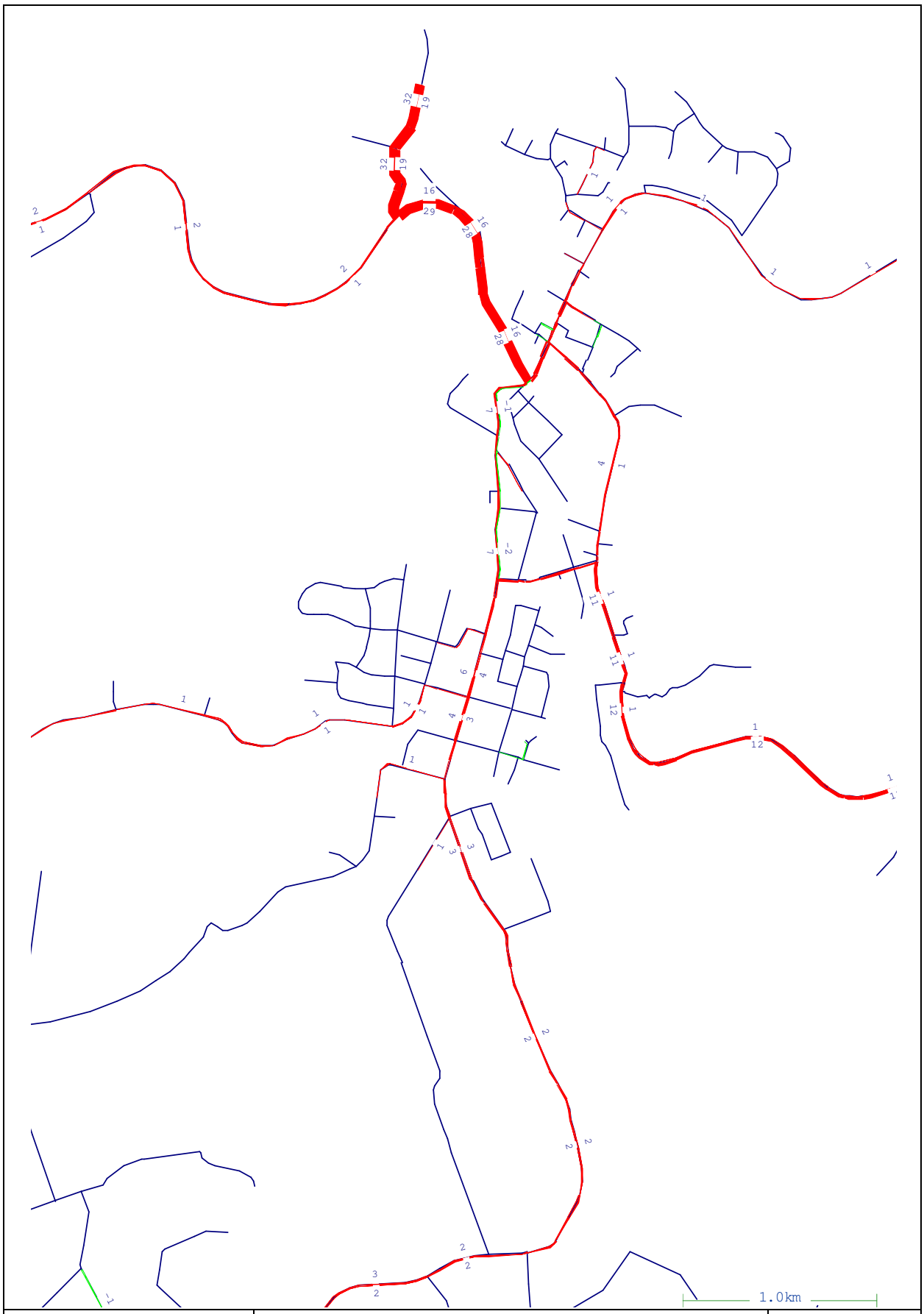
Wollondilly Transportation Model	**Volume Change Plot** **2031 AM Peak** **Base v Option**	**Figure 41**
Gabites Porter		



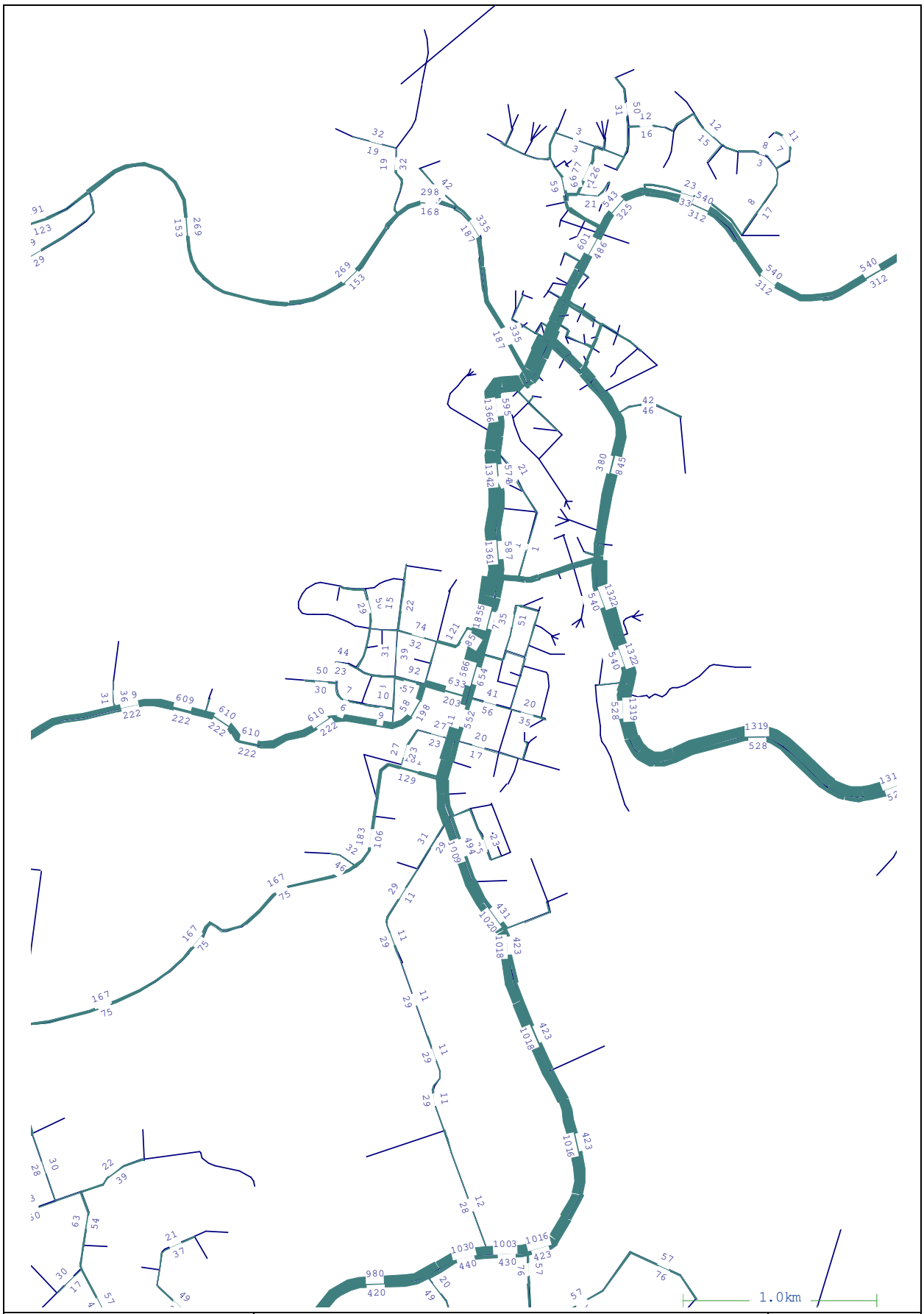
Wollondilly Transportation Model	**2031 Base** **PM Peak** **Modelled Traffic Volume**	**Figure 42**
Gabites Porter		



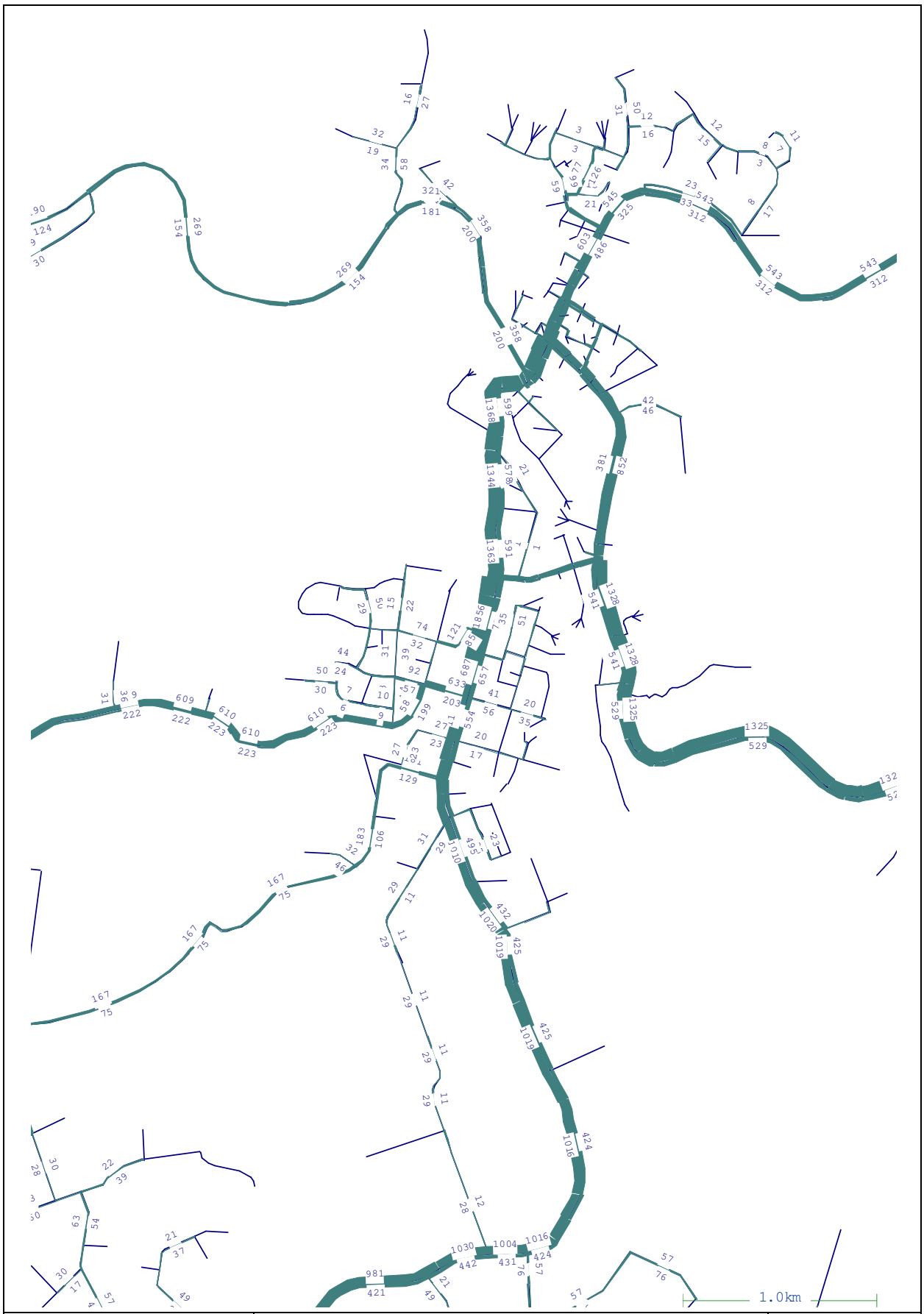
Wollondilly Transportation Model	**2031 Option** **PM Peak** **Modelled Traffic Volume**	**Figure 43**
Gabites Porter		



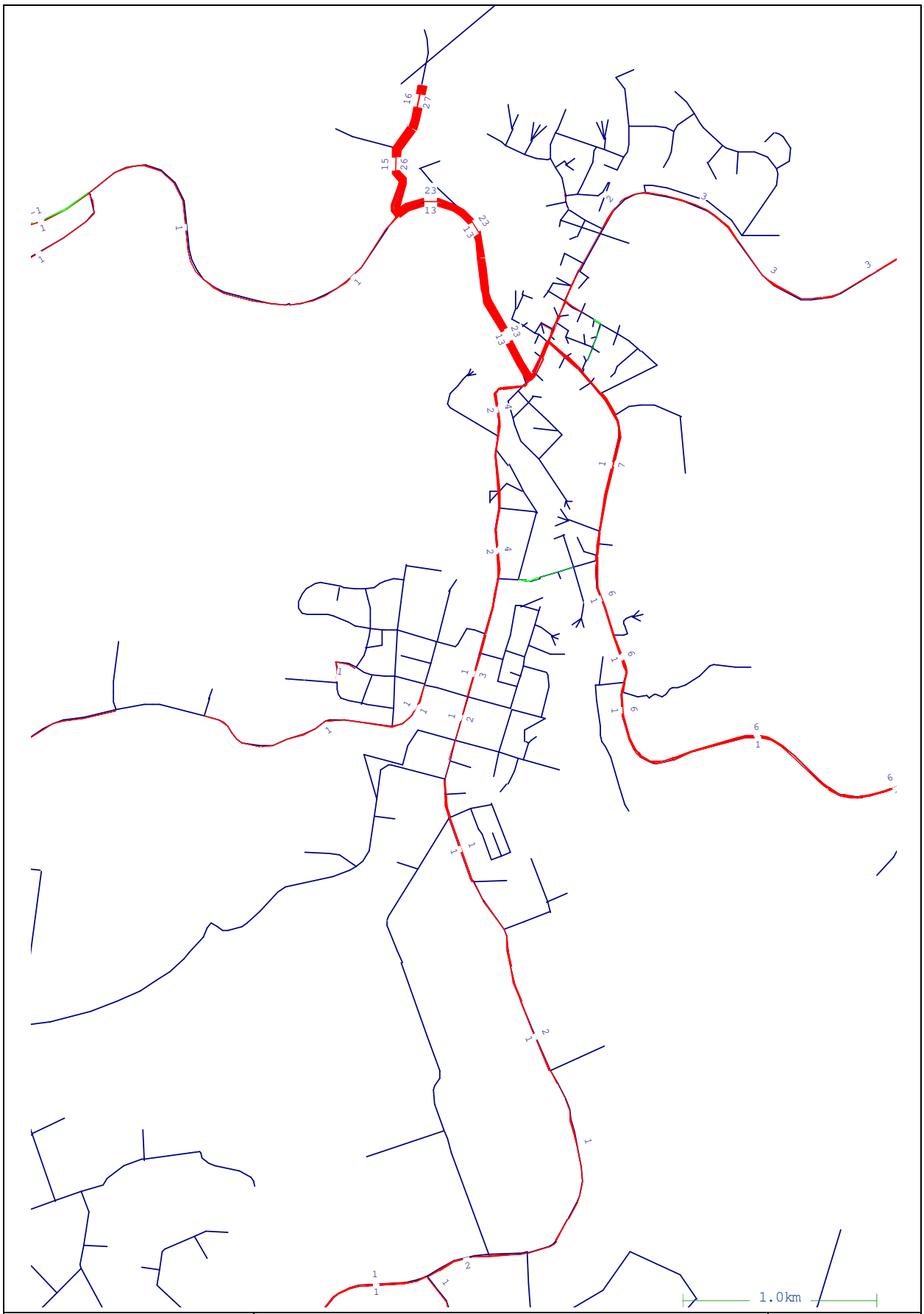
Wollondilly Transportation Model	**Volume Change Plot** **2031 PM Peak** **Base v Option**	**Figure 44**
Gabites Porter		



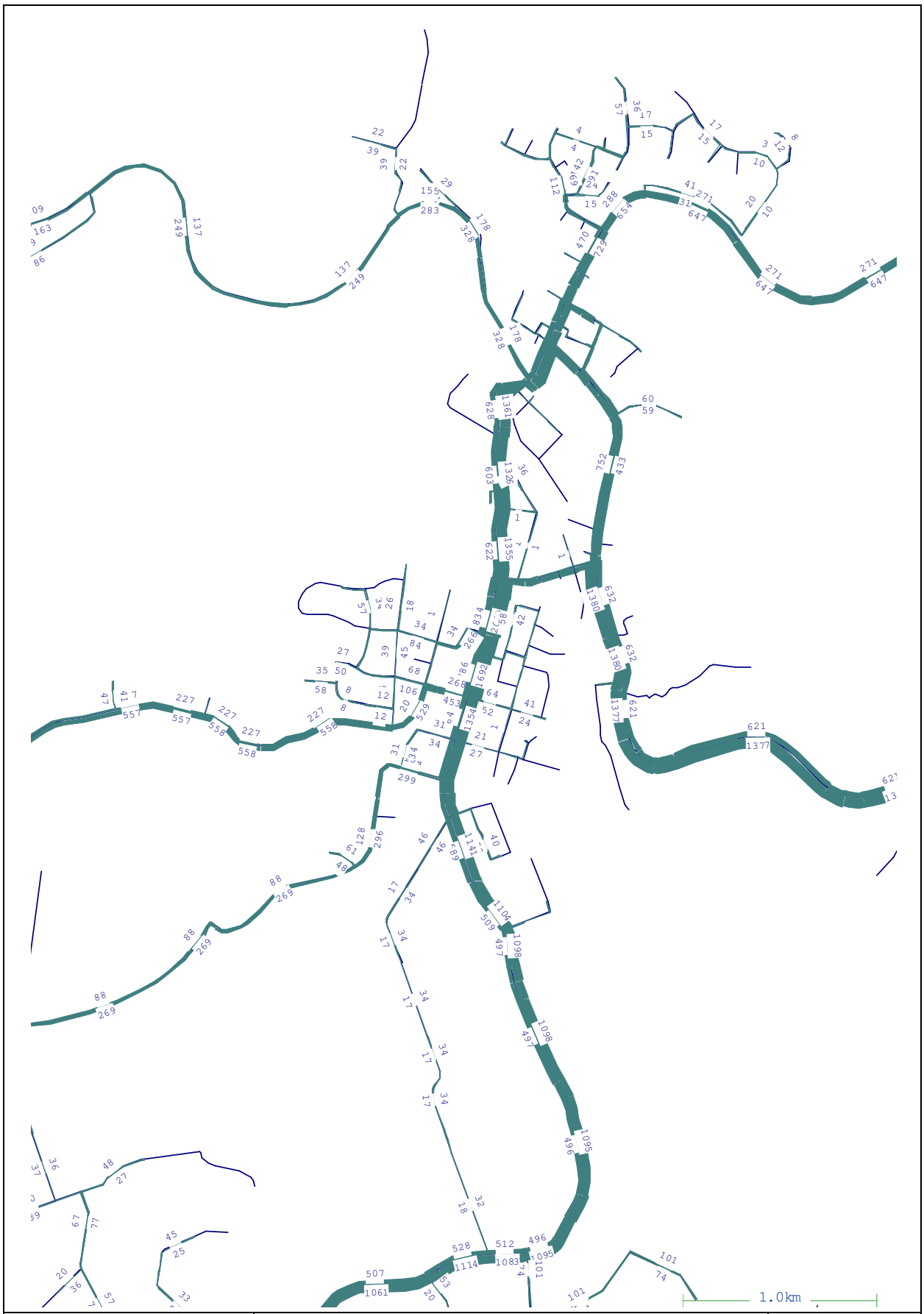
Wollondilly Transportation Model	**2036 Base** **AM Peak** **Modelled Traffic Volume**	**Figure 45**
Gabites Porter		



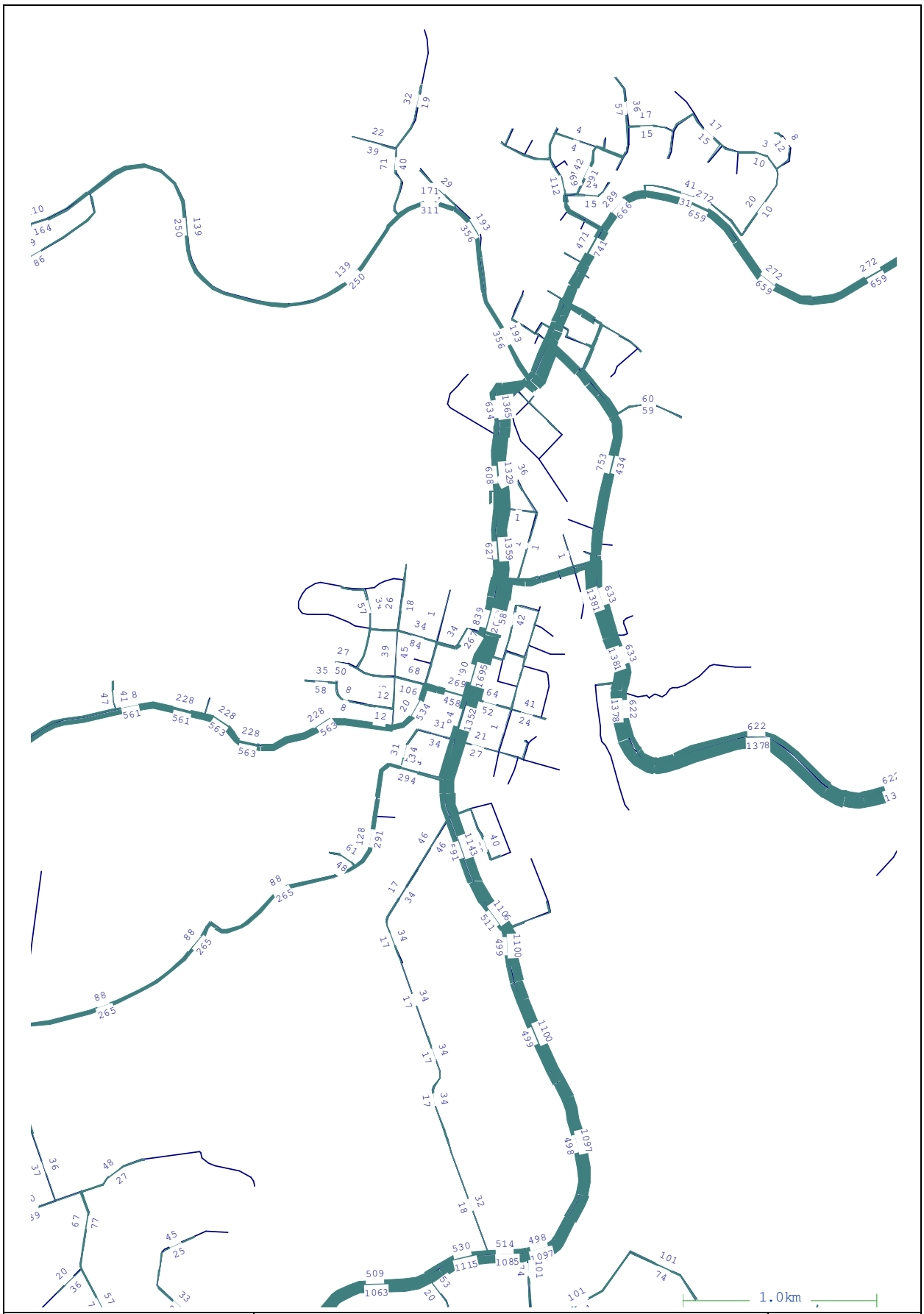
Wollondilly Transportation Model	**2036 Option** **AM Peak** **Modelled Traffic Volume**	**Figure 46**
Gabites Porter		



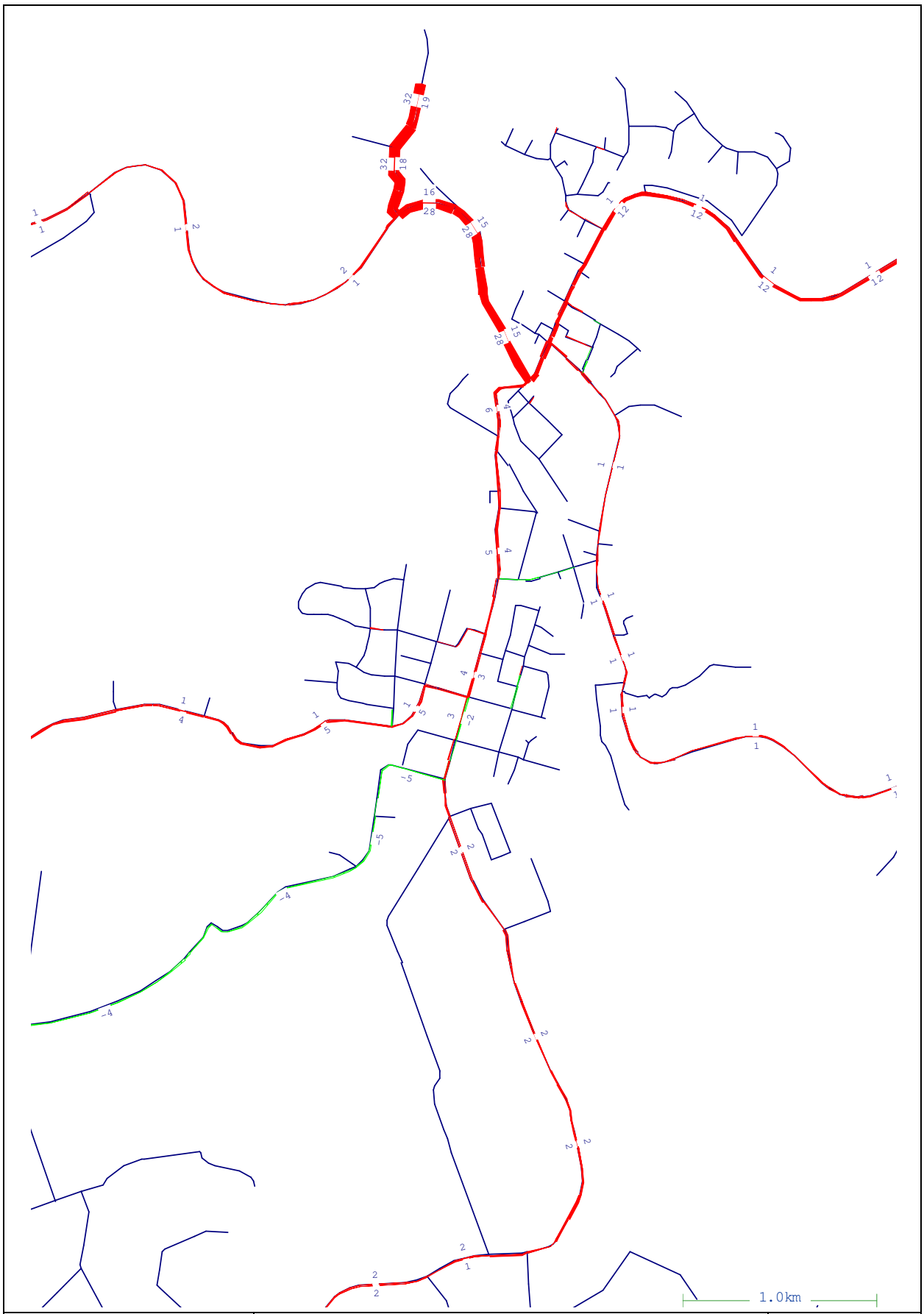
Wollondilly Transportation Model	**Volume Change Plot** **2036 AM Peak** **Base v Option**	**Figure 47**
Gabites Porter		



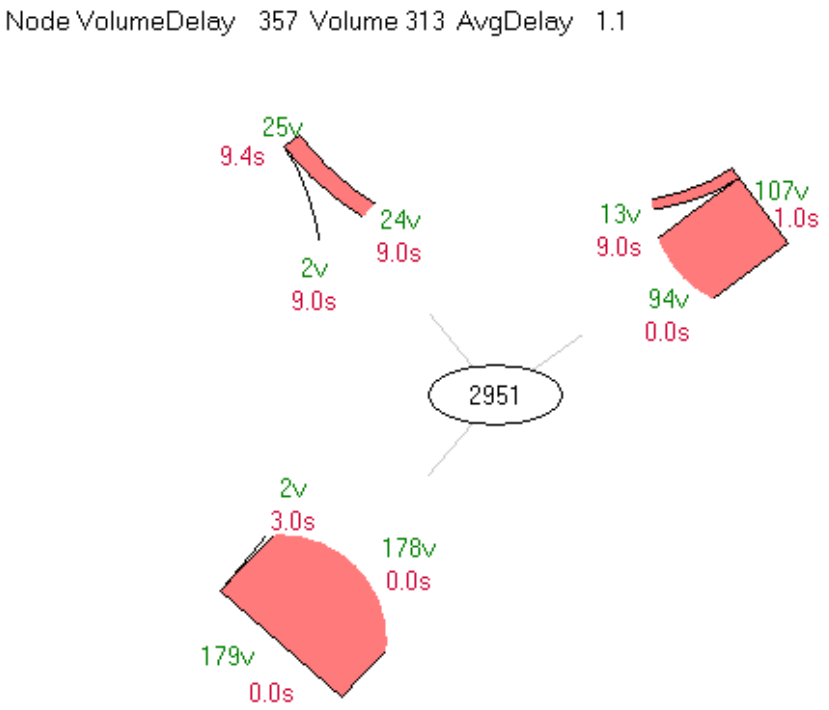
Wollondilly Transportation Model	**2036 Base** **PM Peak** **Modelled Traffic Volume**	**Figure 48**
Gabites Porter		



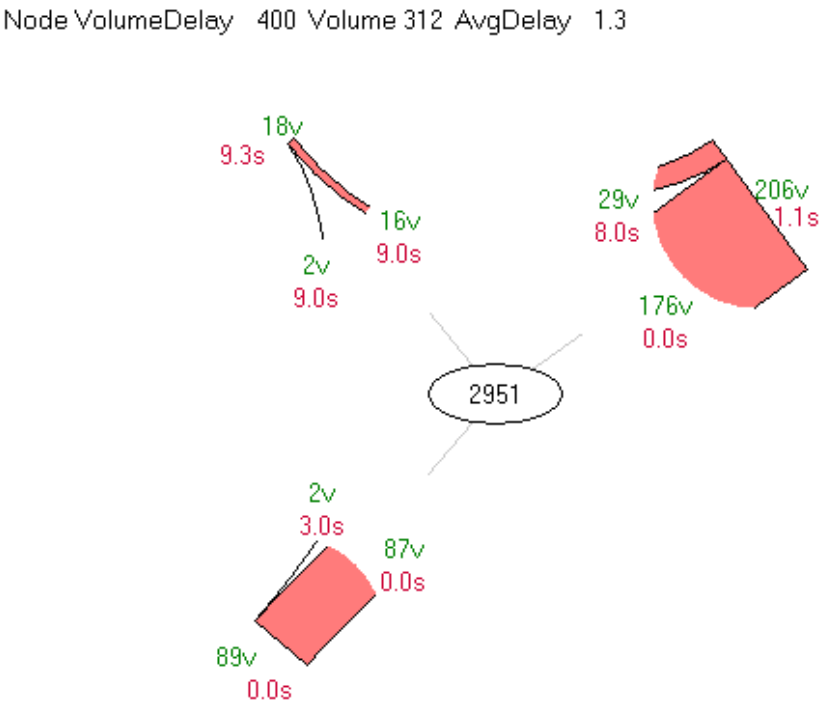
Wollondilly Transportation Model	**2036 Option** **PM Peak** **Modelled Traffic Volume**	**Figure 49**
Gabites Porter		



Wollondilly Transportation Model	**Volume Change Plot** **2036 PM Peak** **Base v Option**	**Figure 50**
Gabites Porter		



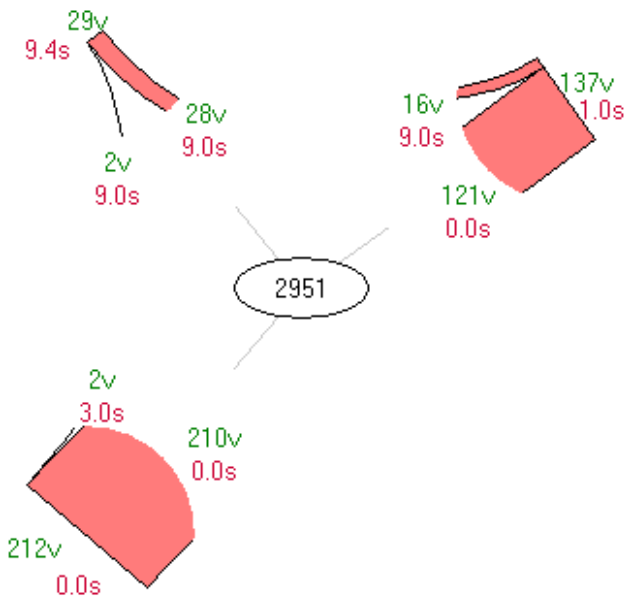
AM Peak Turning Movements



PM Peak Turning Movements

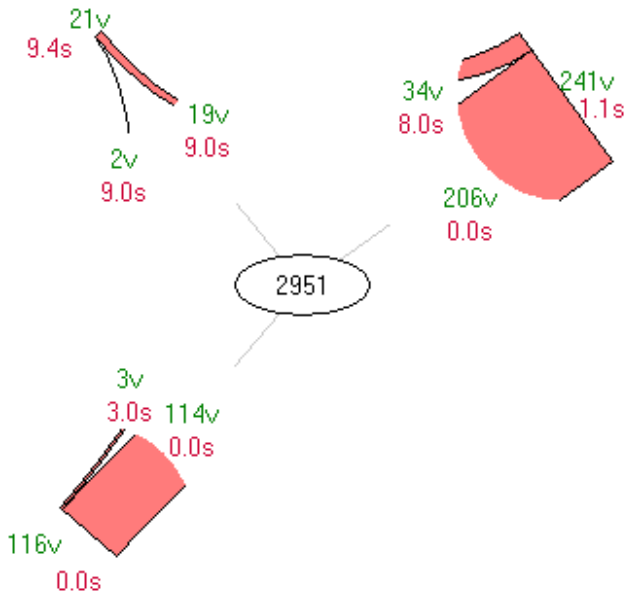
Wollondilly Transportation Model	**2010 Base Turning Movements** **Barkers Lodge Road / Abbotsford Road** AM and PM Peak	**Figure 51**
Gabites Porter		

Node VolumeDelay 420 Volume 379 AvgDelay 1.1



AM Peak Turning Movements

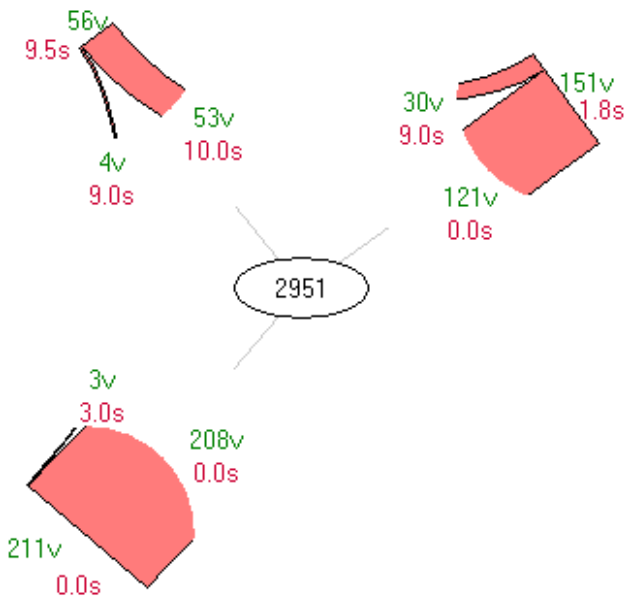
Node VolumeDelay 470 Volume 378 AvgDelay 1.2



PM Peak Turning Movements

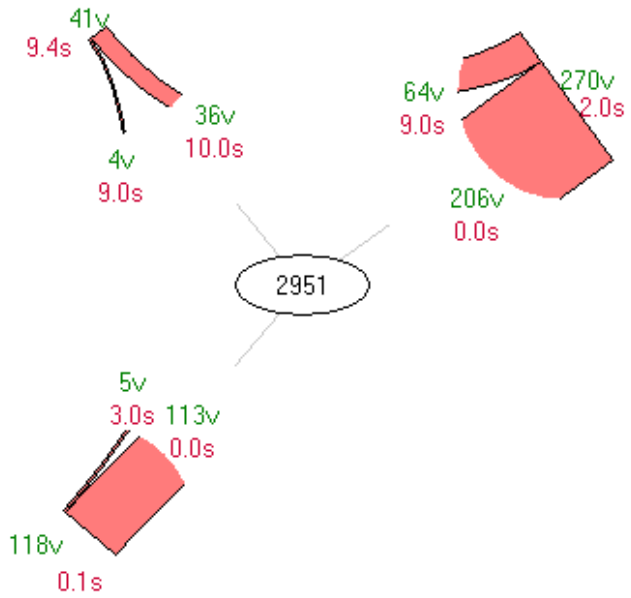
Wollondilly Transportation Model	**2021 Base Turning Movements** **Barkers Lodge Road / Abbotsford Road** AM and PM Peak	**Figure 52**
Gabites Porter		

Node VolumeDelay 845 Volume 419 AvgDelay 2.0



AM Peak Turning Movements

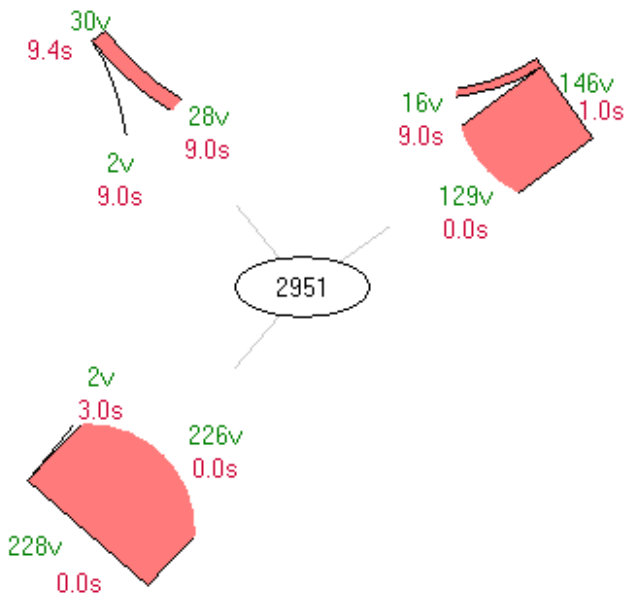
Node VolumeDelay 987 Volume 428 AvgDelay 2.3



PM Peak Turning Movements

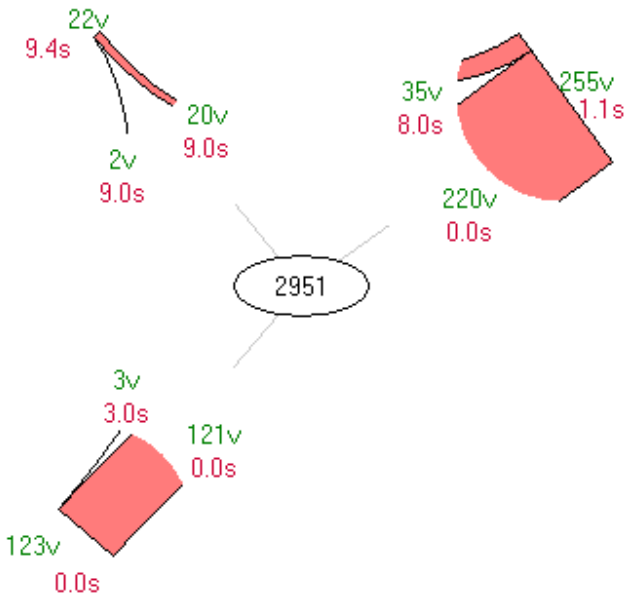
Wollondilly Transportation Model	**2021 Option Turning Movements** **Barkers Lodge Road / Abbotsford Road** AM and PM Peak	**Figure 53**
Gabites Porter		

Node VolumeDelay 420 Volume 403 AvgDelay 1.0



AM Peak Turning Movements

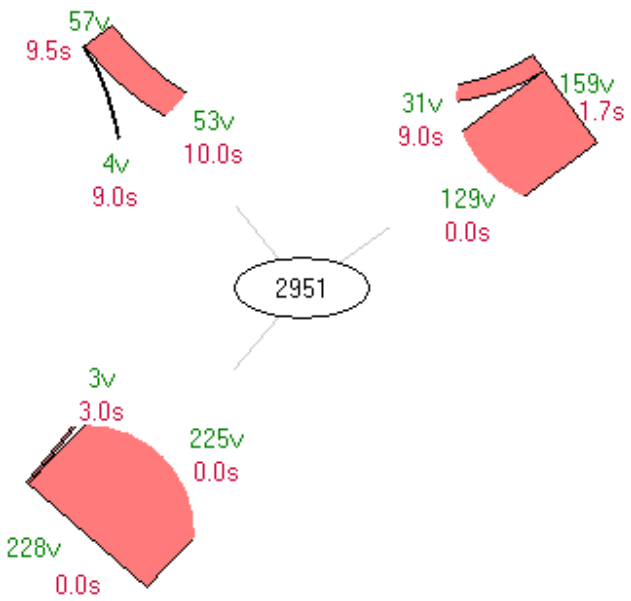
Node VolumeDelay 487 Volume 401 AvgDelay 1.2



PM Peak Turning Movements

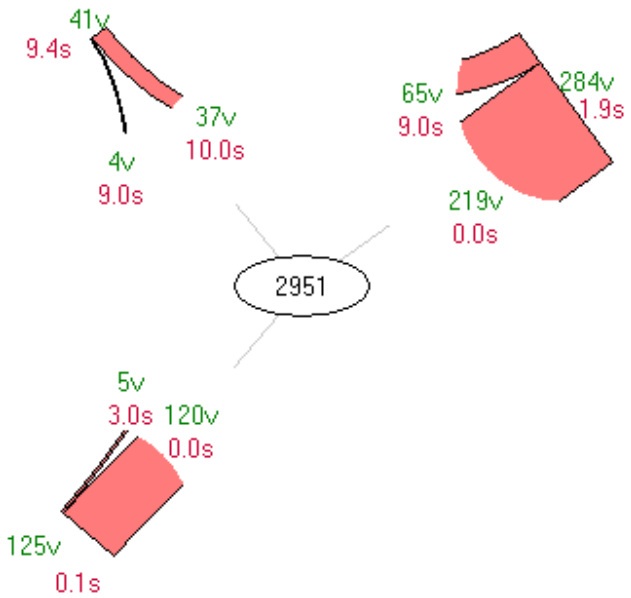
Wollondilly Transportation Model	**2026 Base Turning Movements** **Barkers Lodge Road / Abbotsford Road** AM and PM Peak	**Figure 54**
Gabites Porter		

Node VolumeDelay 854 Volume 445 AvgDelay 1.9



AM Peak Turning Movements

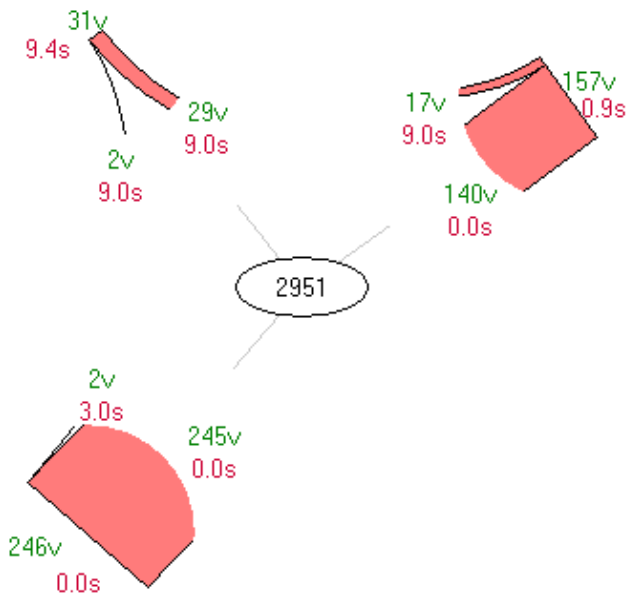
Node VolumeDelay 1006 Volume 450 AvgDelay 2.2



PM Peak Turning Movements

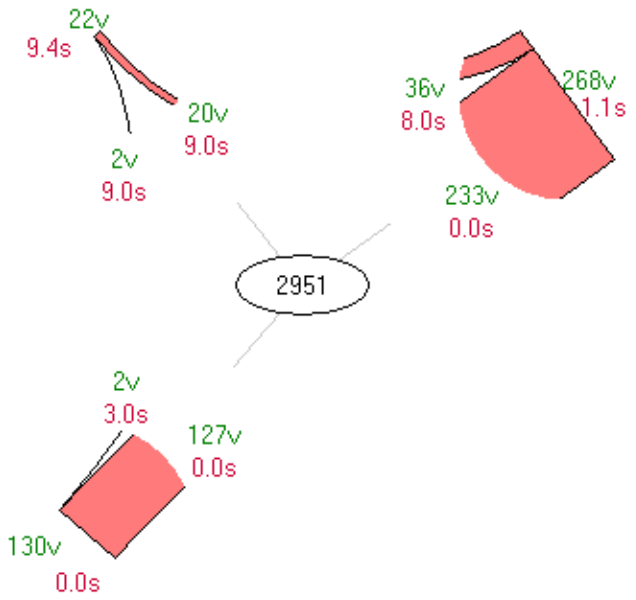
Wollondilly Transportation Model	**2026 Option Turning Movements** **Barkers Lodge Road / Abbotsford Road** AM and PM Peak	**Figure 55**
Gabites Porter		

Node VolumeDelay 438 Volume 435 AvgDelay 1.0



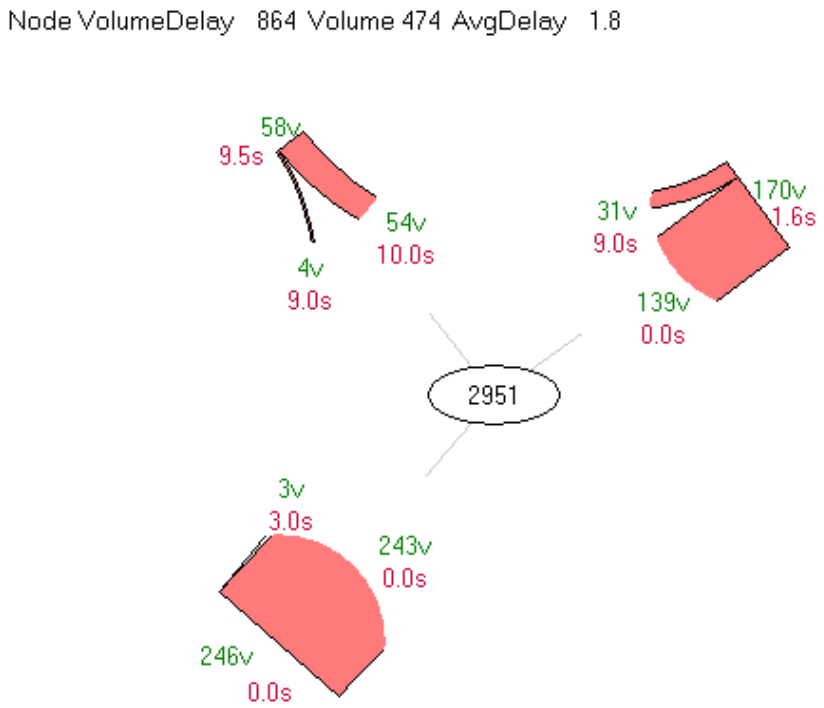
AM Peak Turning Movements

Node VolumeDelay 492 Volume 420 AvgDelay 1.2

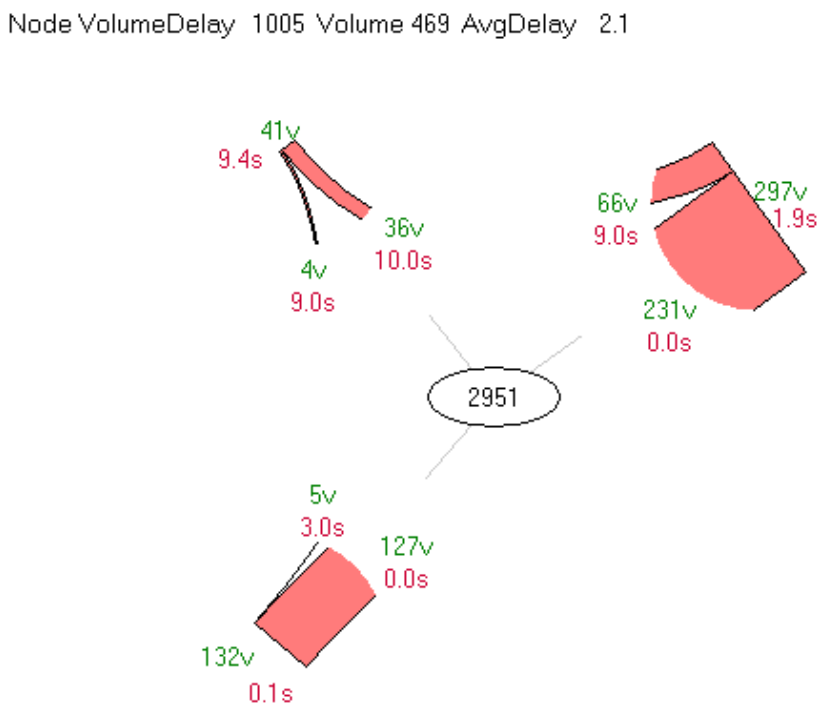


PM Peak Turning Movements

Wollondilly Transportation Model	**2031 Base Turning Movements** **Barkers Lodge Road / Abbotsford Road** AM and PM Peak	**Figure 56**
Gabites Porter		

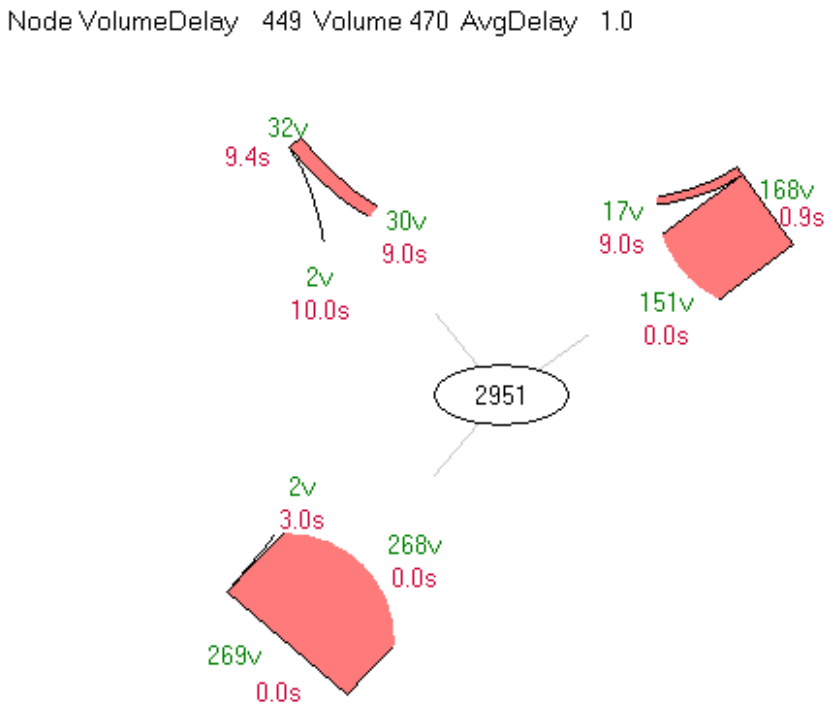


AM Peak Turning Movements

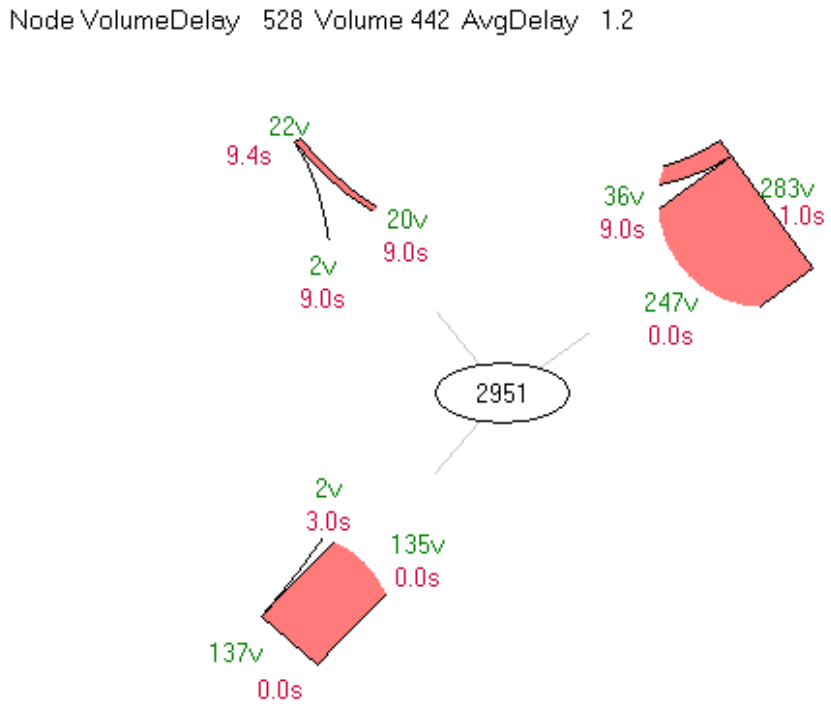


PM Peak Turning Movements

Wollondilly Transportation Model	**2031 Option Turning Movements** **Barkers Lodge Road / Abbotsford Road** AM and PM Peak	**Figure 57**
Gabites Porter		



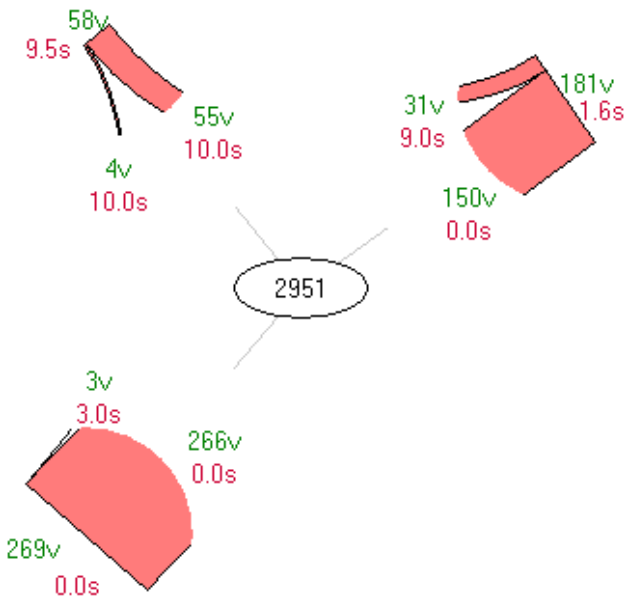
AM Peak Turning Movements



PM Peak Turning Movements

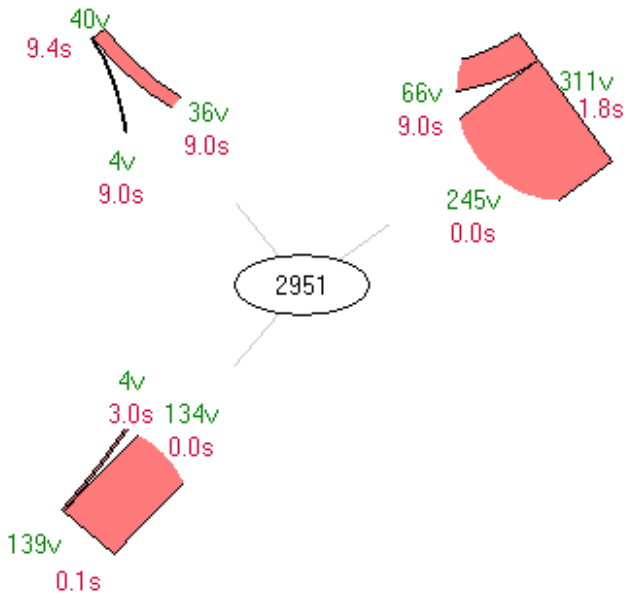
Wollondilly Transportation Model	**2036 Base Turning Movements** **Barkers Lodge Road / Abbotsford Road** AM and PM Peak	**Figure 58**
Gabites Porter		

Node VolumeDelay 878 Volume 509 AvgDelay 1.7



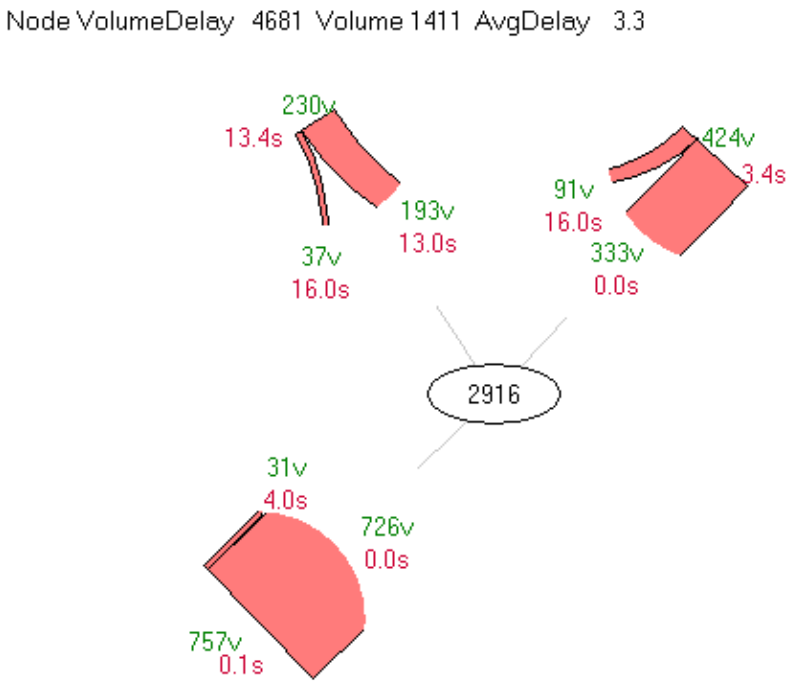
AM Peak Turning Movements

Node VolumeDelay 966 Volume 489 AvgDelay 2.0

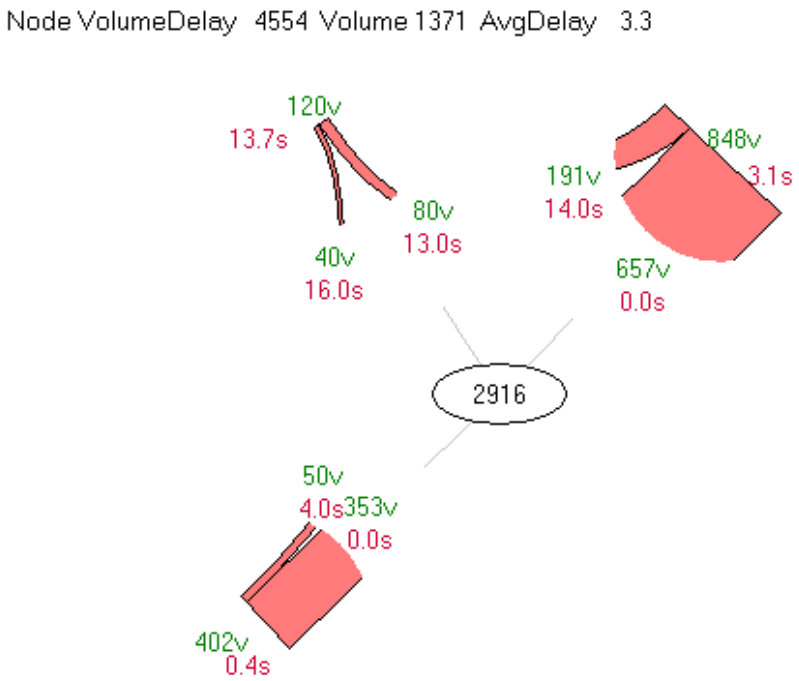


PM Peak Turning Movements

Wollondilly Transportation Model	**2036 Option Turning Movements** **Barkers Lodge Road / Abbotsford Road** AM and PM Peak	**Figure 59**
Gabites Porter		

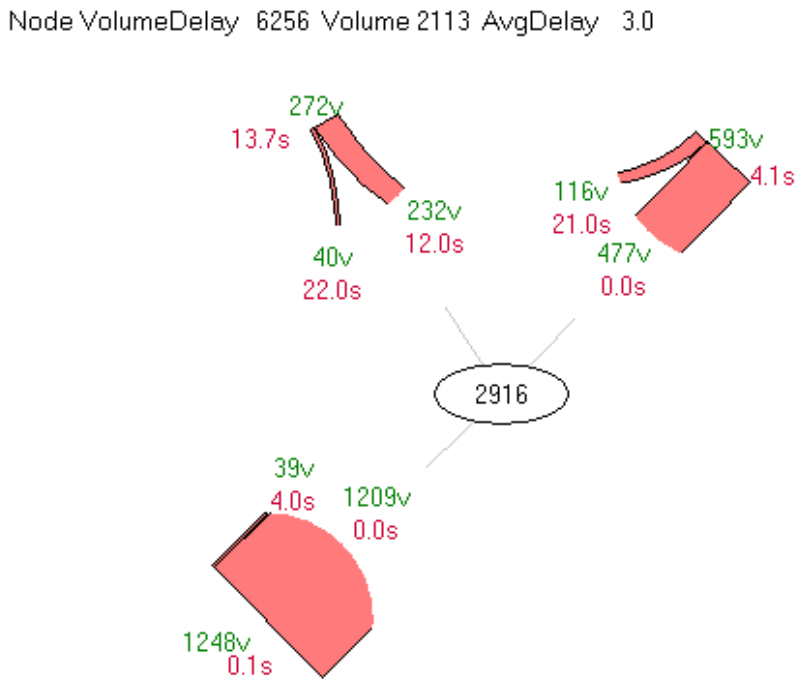


AM Peak Turning Movements

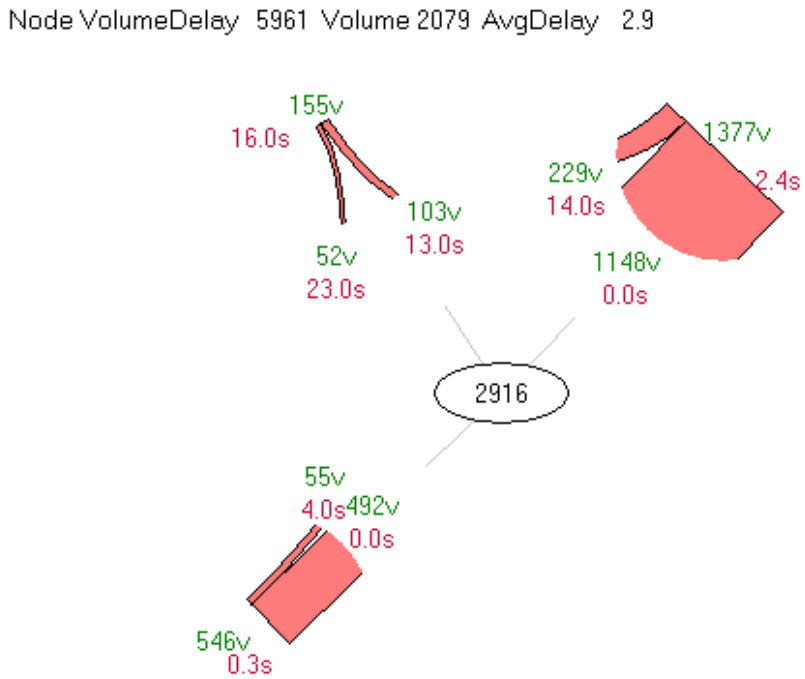


PM Peak Turning Movements

Wollondilly Transportation Model	**2010 Base Turning Movements** **Barkers Lodge Road / Argyle Street** AM and PM Peak	**Figure 60**
Gabites Porter		

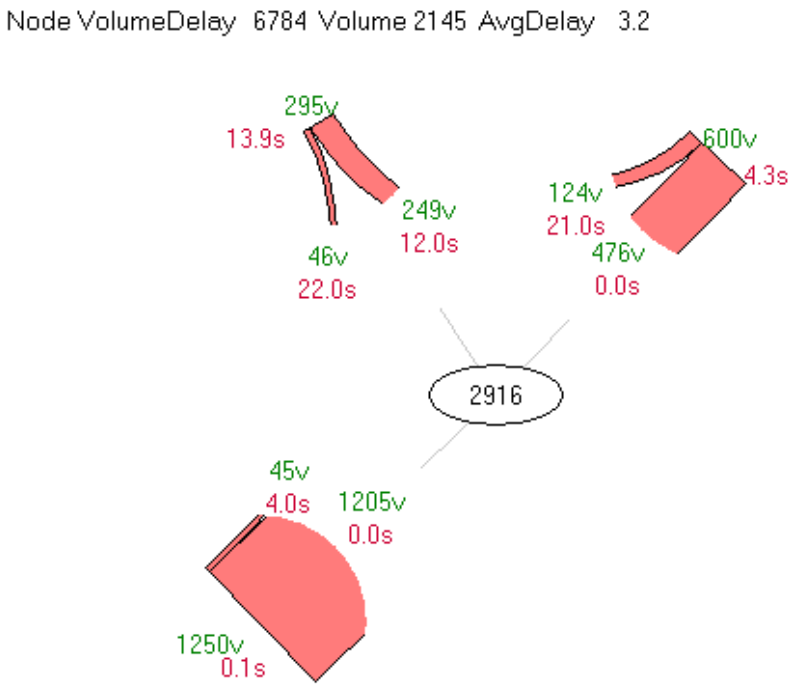


AM Peak Turning Movements

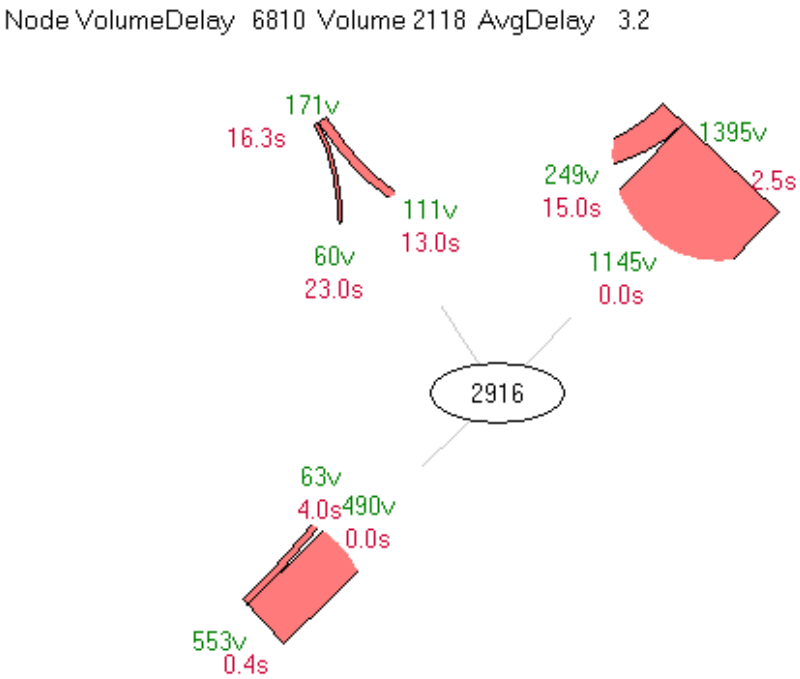


PM Peak Turning Movements

Wollondilly Transportation Model	**2021 Base Turning Movements** **Barkers Lodge Road / Argyle Street** AM and PM Peak	**Figure 61**
Gabites Porter		

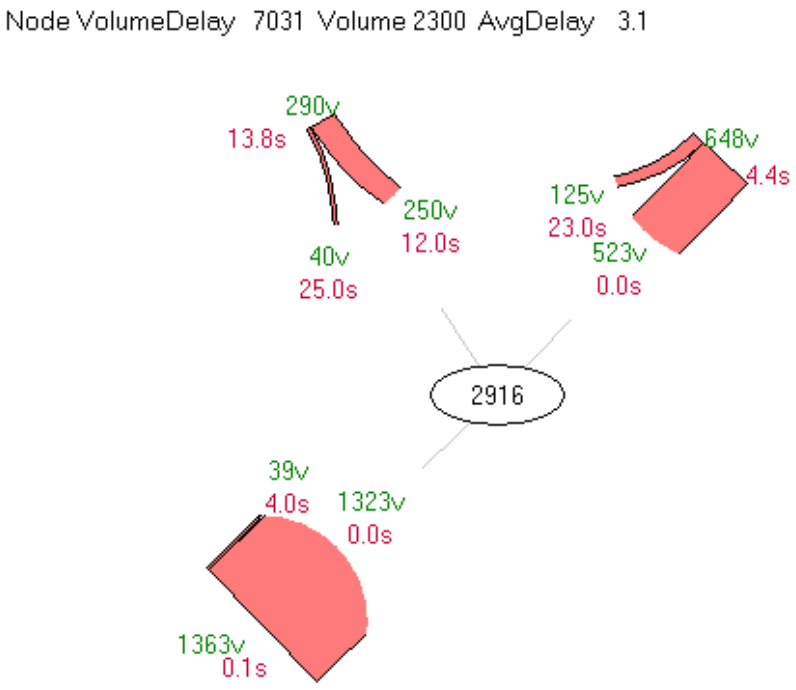


AM Peak Turning Movements

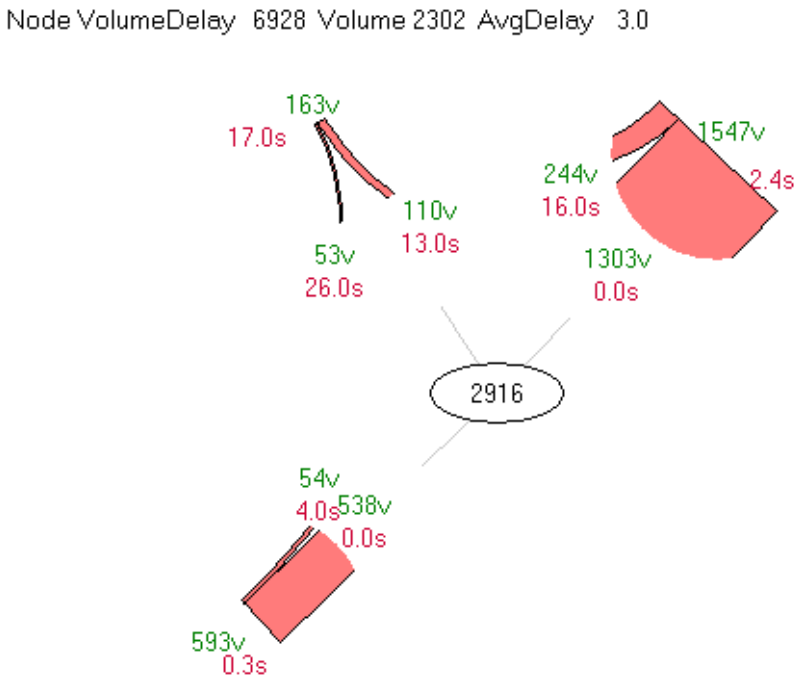


PM Peak Turning Movements

Wollondilly Transportation Model	**2021 Option Turning Movements** **Barkers Lodge Road / Argyle Street** AM and PM Peak	**Figure 62**
Gabites Porter		

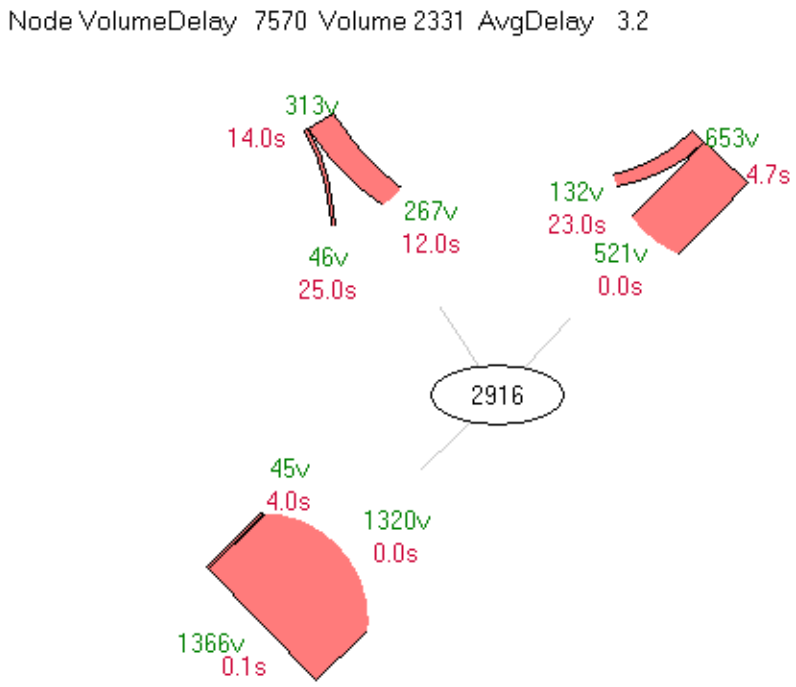


AM Peak Turning Movements

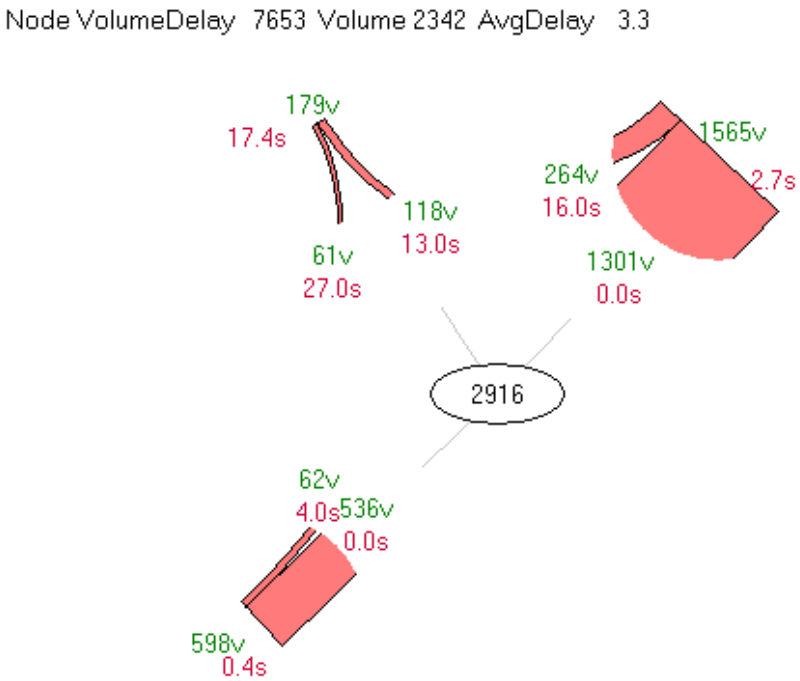


PM Peak Turning Movements

Wollondilly Transportation Model	**2026 Base Turning Movements** **Barkers Lodge Road / Argyle Street** AM and PM Peak	**Figure 63**
Gabites Porter		

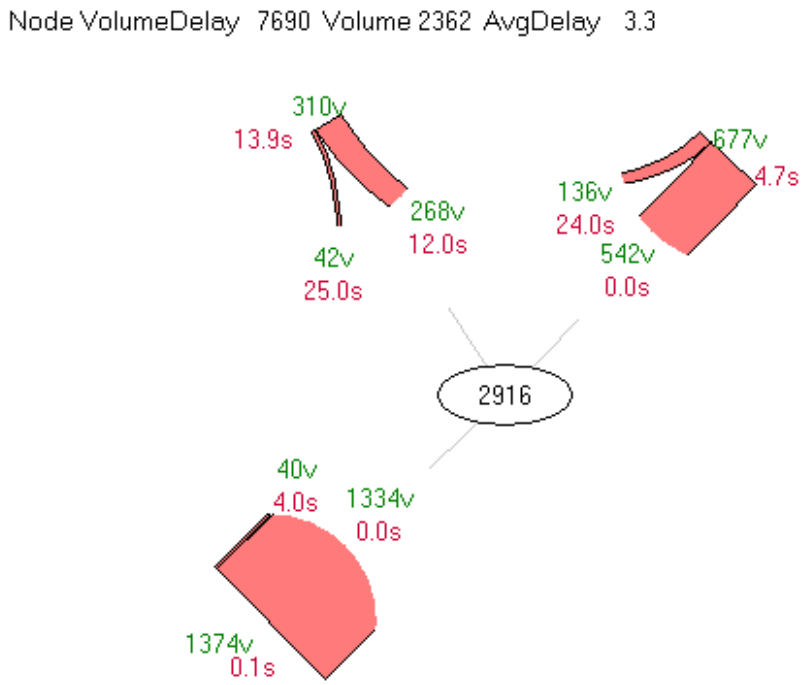


AM Peak Turning Movements

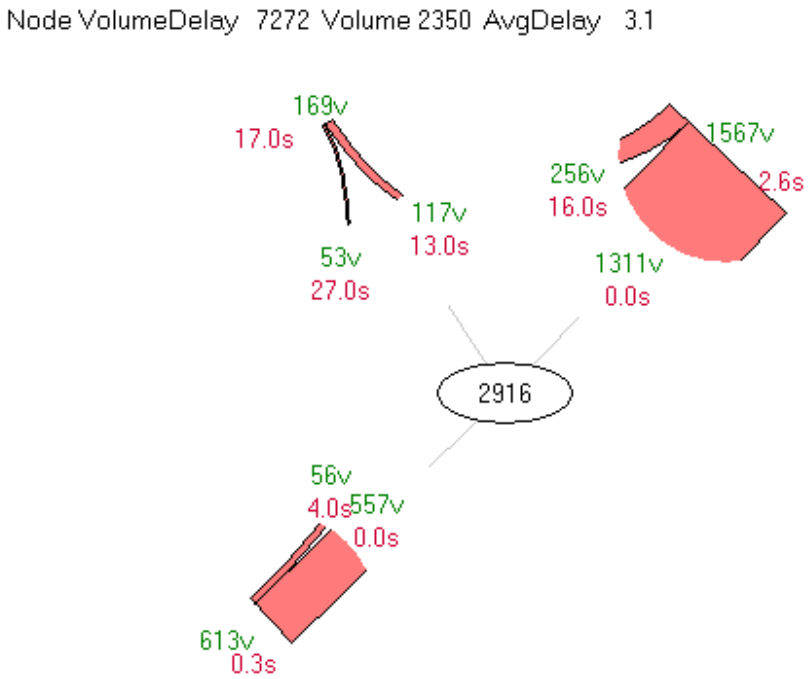


PM Peak Turning Movements

Wollondilly Transportation Model	**2026 Option Turning Movements** **Barkers Lodge Road / Argyle Street** AM and PM Peak	**Figure 64**
Gabites Porter		

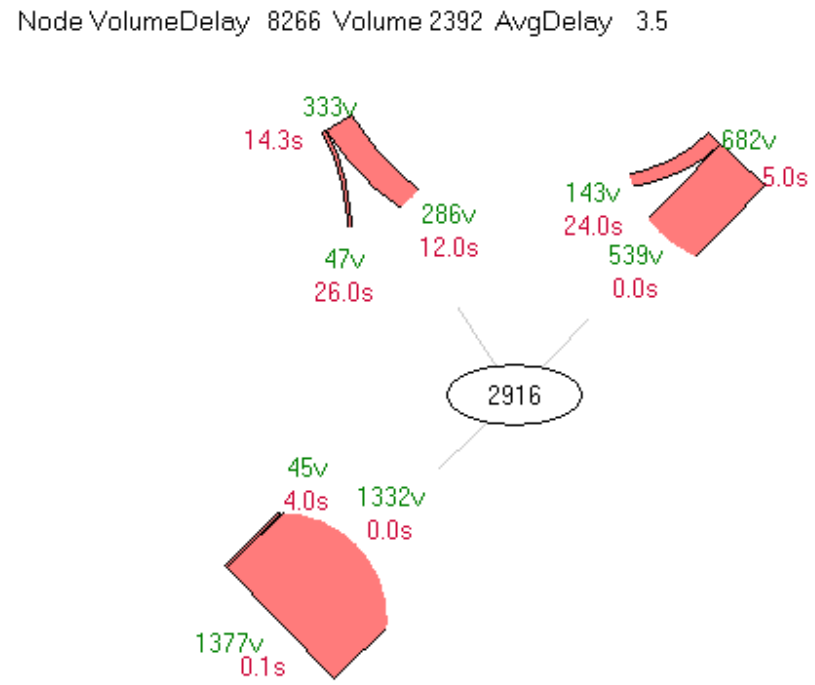


AM Peak Turning Movements

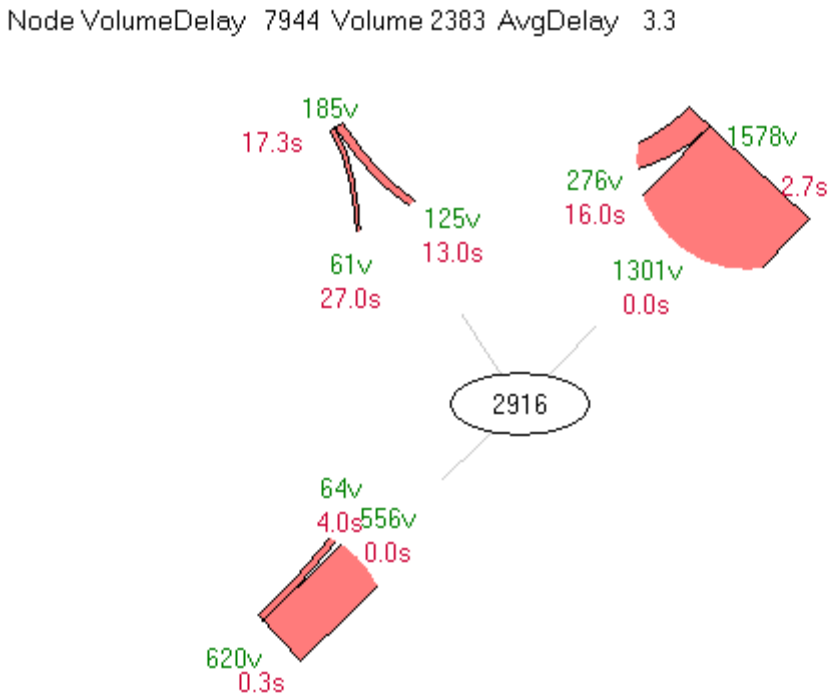


PM Peak Turning Movements

Wollondilly Transportation Model	**2031 Base Turning Movements** **Barkers Lodge Road / Argyle Street** AM and PM Peak	**Figure 65**
Gabites Porter		

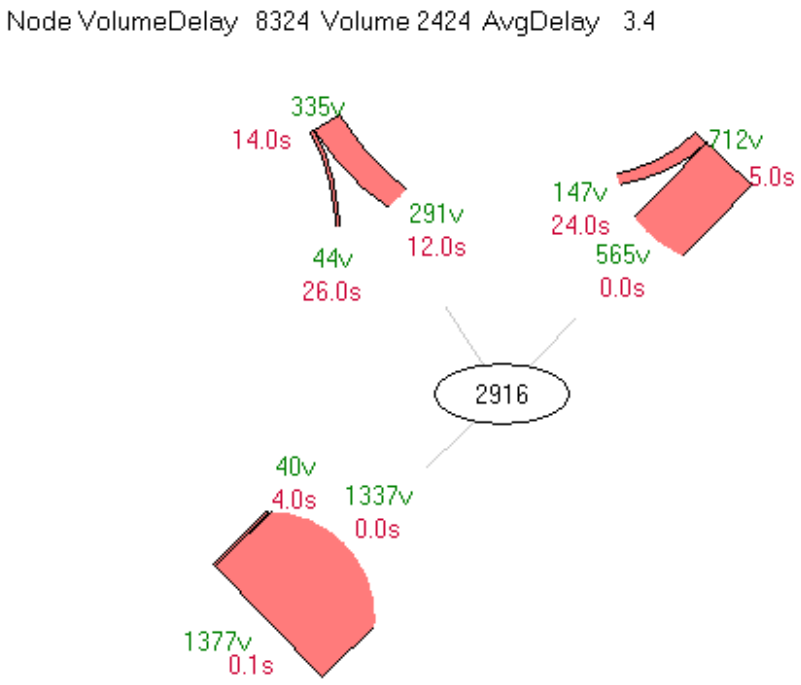


AM Peak Turning Movements

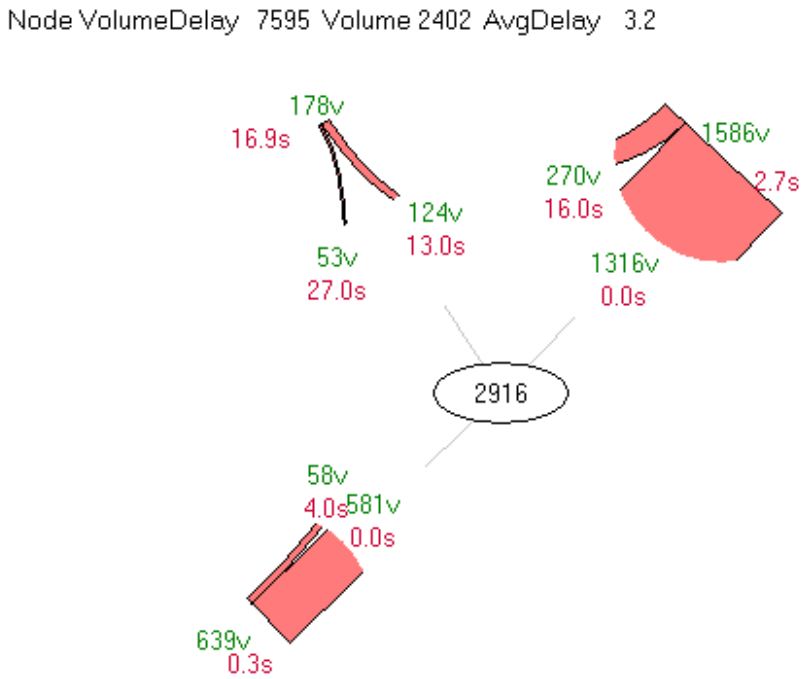


PM Peak Turning Movements

Wollondilly Transportation Model	**2031 Option Turning Movements** **Barkers Lodge Road / Argyle Street** AM and PM Peak	**Figure 66**
Gabites Porter		

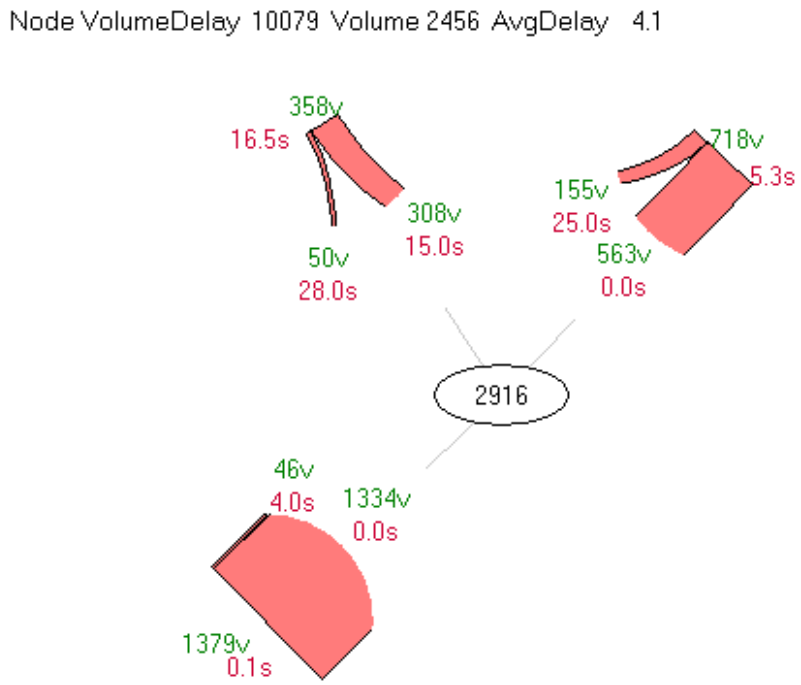


AM Peak Turning Movements

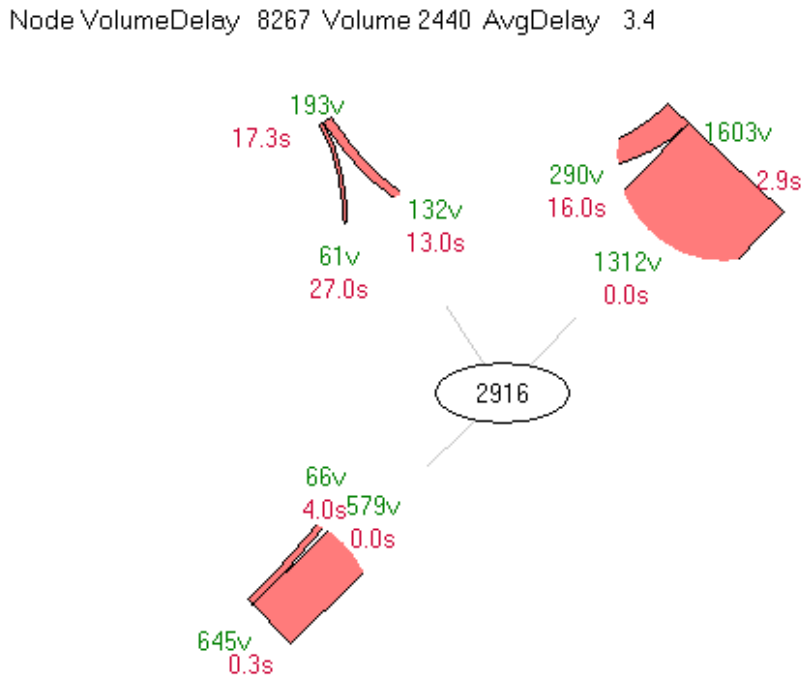


PM Peak Turning Movements

Wollondilly Transportation Model	**2036 Base Turning Movements** **Barkers Lodge Road / Argyle Street** AM and PM Peak	**Figure 67**
Gabites Porter		



AM Peak Turning Movements



PM Peak Turning Movements

Wollondilly Transportation Model	**2036 Option Turning Movements** **Barkers Lodge Road / Argyle Street** AM and PM Peak	**Figure 68**
Gabites Porter		