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TRAFFIC & TRANSPORT STUDY
REZONING PROPOSAL
RESIDENTIAL SUBDIVISION
1 ABBOTSFORD ROAD, PICTON

Ref: 12-109

NOVEMBER 2012

TABLE OF CONTENTS

PAGE NO.

EXECUTIVE SUMMARY

This Practice has undertaken an assessment of the potential traffic, parking and transport related impacts resulting from the proposed rezoning of 66.6 hectares of land located at No. 1 Abbotsford Road. Based on the findings of this assessment, the following summary is provided:

- The rezoning is proposed to allow for a minimum allotment size of 4,000m^2. The rezoning would facilitate the creation of up to 50 standard households.

- The anticipated development uptake over time is such that the ultimate lot yield will be achieved sometime between 2016 and 2021.

- Gabites Porter was recently engaged by the subject applicant to update their previous *Wollondilly 2006 Transportation Model: Traffic Impact Study, Future Modelling Report* to incorporate the proposed rezoning of the subject land. The results of the updated TRACKS modelling is contained within their October 2012 *Wollondilly Transportation Model Traffic Impact Abbotsford Planning Proposal Report*. This process involved amending the future Wollondilly TRACKS Transportation Models to include the proposed residential rezoning development and to assess the impact of the proposed development on the surrounding traffic network. Traffic models for 2021, 2026, 2031 and 2036 were developed to forecast traffic volumes, congestion and infrastructure requirements in the Shire for the next 25 years.

- This report essentially forms an update to the abovementioned Gabites Porter TRACKS model generally in accordance with the Roads & Maritime Services' *Guide to Traffic Generating Developments*. The primary objective of this assessment was to investigate the need for State and local traffic infrastructure upgrades to support the proposed development of the study area.

- Following discussions between Gabites Porter and Wollondilly Shire Council, it was determined that the primary access intersections associated with the study area are four Thirlmere Way intersections as follows:

    - The junction of Barkers Lodge Road and Abbotsford Road; and
    - The junction of Argyle Street and Barkers Lodge Road.

- Assessment of the abovementioned primary access intersections has been undertaken utilising the computer based SIDRA model utilising the base 2010 peak hour movement profiles extracted from the Gabites Porter report indicating the following:

    - The priority controlled junction of Barkers Lodge Road and Abbotsford Road currently provides motorists with a LOS A without the subject proposal, representing good operating conditions with spare capacity.

- The signage controlled junction of Argyle Street and Barkers Lodge Road currently provides motorists with a total junction LOS A during peak periods, however the Barkers Lodge Road approach operates with a LOS D during both peak periods, representing operation near capacity.

- The two way generation of trips to and from the full development produced by the TRACKS model in 2021 were 43 vehicle trips in the morning peak hour and 53 vehicles in the afternoon peak hour.

- In order to estimate the future operational efficiency of the primary study area access intersections, a secondary SIDRA analysis has been undertaken utilising the projected Base (without the proposal) and Option (with the proposal) traffic volumes extracted from the Gabites Porter report for the years 2021, 2026, 2031 and 2036. The SIDRA analyses of the junction of Argyle Street and Barkers Lodge Road assumed that the planned Section 94 upgrade works to the junction (involving the provision of two formalised approach lanes within Barkers Lodge Road) are completed by 2021. The following provides a summary of the analysis results:

  <u>Junction of Barkers Lodge Road and Abbotsford Road</u>

  - The priority controlled junction is projected to provide a total junction level of service A until at least until 2036 with or without the proposal;
  - This level of service represents good operating conditions with spare capacity; and
  - Accordingly, the junction is projected to be capable of accommodating the proposed rezoning without the requirement for any upgrading works.

  <u>Junction of Argyle Street and Barkers Lodge Road</u>

  - Whilst the total junction LOS is projected to be D and B in 2021 without the proposal, the Barkers Lodge Road approach is projected to operate with a LOS of F during both peak periods;
  - Such operational conditions suggest that the some form of upgrade in addition to that planned to be completed within Council's Section 94 Plan is likely to be required in order to increase the capacity and safety of the junction;
  - The additional traffic projected to be generated by the subject proposal is minor in the total intersection context (representing a maximum of 2% of total intersection flows) thereby indicating that the abovementioned upgrade is likely to be required in the vicinity of 2020, with or without the development proposal; and
  - The costs associated with any upgrading works therefore should not be borne by the applicant.

- Picton Buslines operates a number of services within the vicinity of the subject land and the Picton Town Centre. These services could reasonably be extended / altered to directly provide efficient connectivity between the study area and Picton Railway Station, the surrounding Town Centre and beyond.

- Wollondilly Shire Council has recently adopted a Shared Cycleway Plan for the whole Shire. The Shared Cycleway Plan incorporates the provision of shared cycleways along Argyle Street and Barkers Lodge Road in the vicinity of the adjoining the study area. These paths could reasonably be extended to connect with Abbotsford Road to provide safe and efficient connectivity between the subject land and the surrounding Picton Town Centre.

- The following provides a summary of the considerations of the internal subdivision:

    - New subdivision access roads are expected to provide carriageway widths of 8m (defined by kerb and guttering) within a reservation of 20m in accordance with Wollondilly Development Control Plan 2011.
    - The access roads will intersect with Abbotsford Road under major / minor priority control with the existing road performing the priority route.
    - Any terminating cul-de-sacs are to be capable of accommodating garbage collection vehicle turnaround manoeuvres.
    - The intersections of the new cul-de-sac access roads and Abbotsford Road are to be located to ensure that a sight distance to accord with the relevant Roads & Maritime Services and Austroads specifications for the planned sign posted speed limit.
    - It is likely that the existing 80km/h section of Abbotsford Road to the west of Fairleys Road will be amended to a reduced speed limit more commensurate with the altered roadside environment and land-use.
    - It is understood that the section of Abbotsford Road to the west of Fairleys Road is likely to be realigned to improve the vertical and horizontal alignment of the road for increased driver vision as well as creating a greater separation of the road from the creek, thereby limiting the potential for roadway flooding.
    - Further, Abbotsford Road will be required to be upgraded to provide carriageway widths of 8m (defined by kerb and guttering) within a reservation of 20m in accordance with Wollondilly Development Control Plan 2011.
    - Such upgrading works will improve the level of safety and amenity experienced by motorists throughout the study area.

1. INTRODUCTION

A Planning Proposal is to be lodged with Wollondilly Council and the Department of Planning and Infrastructure for rezoning of a large parcel of land comprising approximately 66.6 hectares located at No. 1 Abbotsford Road, Picton. The proposal involves the rezone of the land from RU2 Rural Landscape to part R5 Large Lot Residential, part E3 Environmental Management and part RE1 Public Recreation. The rezoning is proposed to allow for a minimum allotment size of 4,000m^2. The rezoning would facilitate the creation of up to 50 residential lots.

The Department of Planning and Infrastructure's Gateway Determination requires the Planning Proposal incorporate, among other specialist studies, a Traffic and Transport Study. Upon completion, the Planning Proposal, including the Traffic & Transport Study, will be submitted to Council for comments and / or approval. Subsequent to Council's approval, the Proposal will be submitted to the Department of Planning and Infrastructure for comments and / or approval.

The Practice of Thompson Stanbury Associates has accordingly been engaged by Cove Group, on behalf of the land owner/s, to prepare the required Traffic & Transport Study to accompany the Planning Proposal. This report assesses and documents the potential parking, traffic and transport impacts of the development on the surrounding road network in terms of traffic efficiency and safety. Particular consideration has been given to the following specific issues:

- Likely traffic generated by the rezoning;
- The impact of this additional traffic on the existing surrounding road network;
- The extent and timing of infrastructure upgrading works (related to all road users being vehicles, pedestrians and cyclists in conjunction with public transport considerations) required within the subject land to adequately accommodate the proposal; and
- The proposed allotment access arrangements and suitability with respect to existing environmental and traffic conditions.

This report has been prepared with reference to the following documents:

- The Roads & Maritime Services' *Guide to Traffic Generating Developments*;
- Gabites Porter's *Wollondilly 2006 Transportation Model: Traffic Impact Study, Future Modelling Report*;
- Gabites Porter's *Wollondilly Transportation Model: Traffic Impact, Abbotsford Planning Proposal Report,* and

- Wollondilly Shire Council's *Wollondilly Development Contributions Plan 2011*.

The report has been prepared pursuant to State Environmental Planning Policy (Infrastructure) 2007.

2. SITE DETAILS

2.1 Site Location

The subject land is located on the western side of Abbotsford Road in the vicinity of Fairleys Road, approximately 1.3km to the north-west of the Picton Town Centre. The extent and location of the land is illustrated overleaf as **Figure 1** being an extract of UBD's *Australian City Streets – Version 4*.

2.2 Site Description

The Study Area comprises a single allotment of land known providing a street address of No. 1 Abbotsford Road, Picton. The subject site forms an irregularly shaped parcel of land providing frontage of approximately 940m and 260m to Abbotsford Road, to the west and south of Fairleys Road respectively.

The area of the subject parcel of land is approximately 66.6 hectares.

2.3 Existing Use

The land currently accommodates a large rural residential type dwelling, located approximately 300m to the west of the junction of Abbotsford Road and Fairleys Road.

2.4 Surrounding Uses

Rural residential land holdings, similar to that currently accommodating the subject site surround the subject site.

A small residential subdivision, similar to that proposed is located further to the south towards Barkers Lodge Road, accessed via Equestrian Drive.

The Picton Town Centre is located approximately 1.3km to the south-east of the subject site.

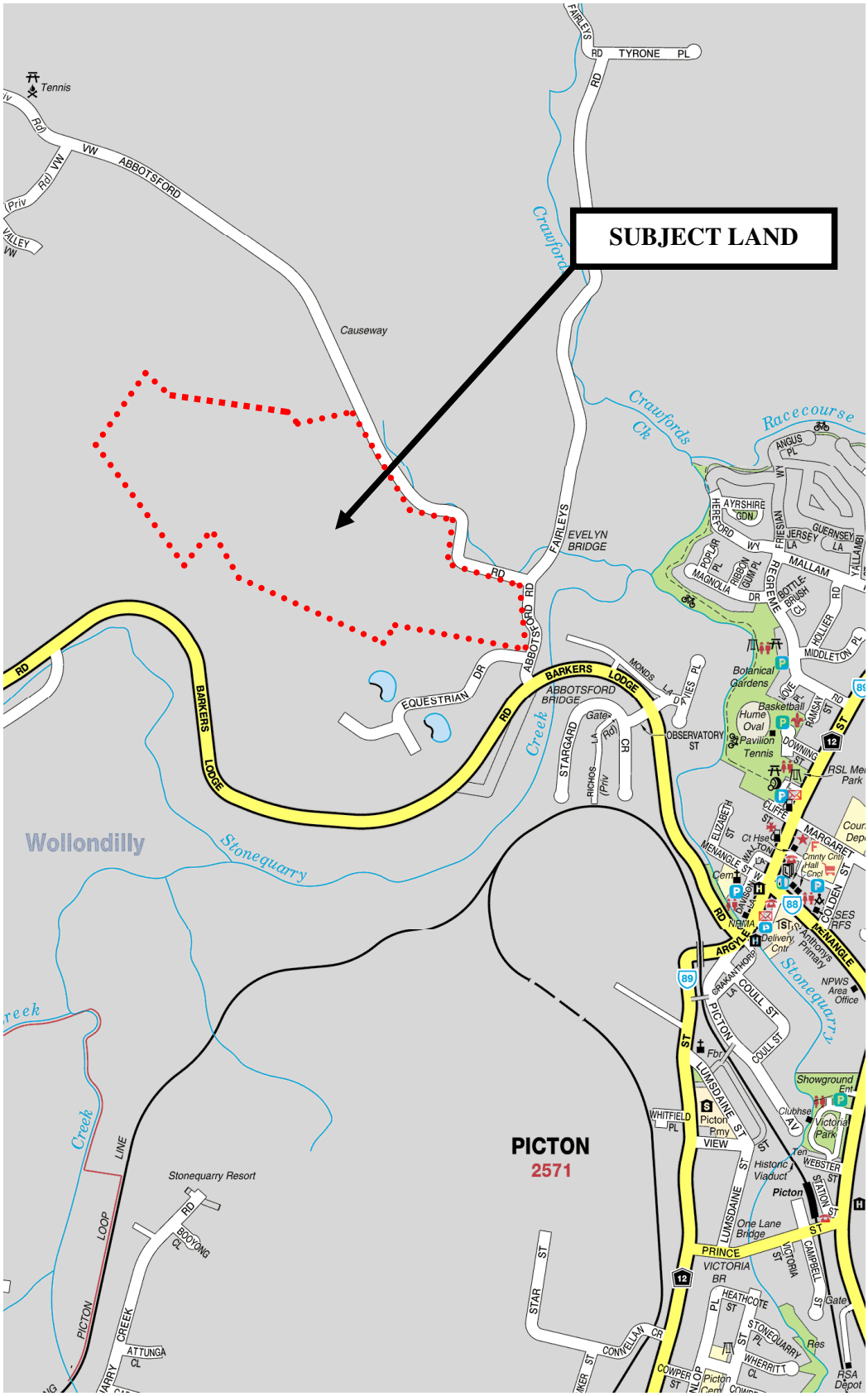


FIGURE 1 – EXTENT AND LOCATION OF SUBJECT LAND

3. PROPOSED DEVELOPMENT

3.1 Residential Subdivision

The proposal involves the rezoning of a large parcel of land comprising approximately 66.6 hectares located on the western side of Abbotsford Road in the vicinity of Fairleys Road, approximately 1.3km to the north-west of the Picton Town Centre. The rezoning proposes the subdivision of the existing parcel of land to facilitate the provision of up to 50 smaller lots with a minimum allotment size of 4,000m^2.

A subdivision plan was not available at the time of writing this report however it is expected that a majority of the allotments will be serviced by new cul-de-sac access roads, intersecting with the existing road network in Abbotsford Road.

This Practice has been advised that the development uptake over time is such that the ultimate lot yield will be achieved sometime between 2016 and 2021.

The traffic generating ability of the abovementioned development yield and the impacts associated with this generation is contained within subsequent sections of this report.

4. PREVIOUS AND CURRENT NETWORK ASSESSMENTS

4.1 Wollondilly 2006 Transportation Model

Gabites Porter was engaged by Wollondilly Shire Council a number of years ago to prepare a TRACKS model for the Wollondilly Local Government Area. TRACKS is a conventional, four-step transport network model with features suited to strategic planning applications. It uses road network models established by the modeller for a particular evaluation year, in conjunction with land use data and associated trip estimation (generation), distribution and assignment models to provide corresponding estimates traffic volumes and travel statistics for the evaluation year.

The volumes of through traffic estimated from the model were used to establish existing and future levels of service (LOS) of road links and intersections, from which the need and timing of infrastructure improvement options have been identified and subsequently included within Wollondilly Shire Council's Draft Wollondilly Development Contributions Plan 2011.

The results of the abovementioned TRACKS modelling exercise are contained within Gabites Porter's *Wollondilly 2006 Transportation Model: Traffic Impact Study, Future Modelling Report*.

4.2 Updated Transportation Model Incorporating the Proposal

Gabites Porter was recently engaged by the Cove Group on behave of the land owner/s to update their previous assessment to incorporate the proposed rezoning of the subject land. The results of the updated TRACKS modelling is contained within their October 2012 *Wollondilly Transportation Model Traffic Impact Abbotsford Planning Proposed Report*.

The abovementioned report provided an overview of the work completed by Gabites Porter for the network wide assessment of the subject residential development. This process involved amending the future Wollondilly TRACKS Transportation Models to include the proposed rezoning and to assess the impact of the proposed development on the surrounding traffic network. Traffic models for 2021, 2026, 2031 and 2036 (with a base year of 2010) were developed to forecast traffic volumes, congestion and infrastructure requirements in the Shire for the next 25 years.

The base road networks for 2021, 2026, 2031 and 2036 were all based on the validated 2006 road network with upgrade as requested by Wollondilly Shire Council as follows:

- The priority control at the intersection of Argyle Street and Thirlmere Way has been assumed to operate under dual lane circulating roundabout control from the 2010 base model onwards; and

- Right turn movements at the intersection of Remembrance Driveway and Larkin Street have been assumed to be prohibited from the 2010 base model onwards.

The addition of households to the zone of the model encompassing the subject parcel of land was based on information supplied by the applicant with respect to the number, density of allotments and the household uptake rates, previously presented within this report.

The two way generation of trips to and from the full development produced by the TRACKS model in 2021 were 43 vehicle trips in the morning peak and 53 vehicles in the afternoon peak.

The TRACKS process estimated the inbound / outbound directional split to be 37/63 in the morning peak period and 63/37 in the afternoon peak.

The following provides an extract of Gabites Porter report findings:

> *It appears that there is little difference in the 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 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 located 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 Street 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 Street approach to the Prince / Menangle 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 Street 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 Street and Remembrance Drive improves from LOS E to D with a reduction in worst approach (Menangle Street East) delay decreasing from 36.6 seconds to 34.3 seconds which is just below the 35 second threshold.*

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

Notwithstanding the findings of the Gabites Porter report with respect to the regional road network, this report assesses the impacts of the proposed rezoning on the operation of the immediately surrounding road network and identifies the road upgrades which will be required, for which a Section 94 plan will be prepared.

5. EXISTING TRANSPORT CONDITIONS

5.1 Road Network Function and Controls

5.1.1 Regional Road Network

The precinct surrounding the subject land (including the Picton Town Centre) is primarily serviced by Remembrance Driveway / Argyle Street, Menangle Street / Picton Road, Barkers Lodge Road and Thirlmere Way.

Remembrance Driveway performs a State Road function under the care and control of the Roads & Maritime Services. It provides a north-south arterial route linking, Camden South (with Old Hume Highway) to the north to Picton and Tahmoor in the subject vicinity, prior to continuing to the south to Bargo and thence linking with Hume Highway at Yanderra.

Remembrance Driveway primarily provides one through lane of traffic in each direction with traffic flow generally being governed by a sign posted speed limit of 80km/h with the exception of a section of 100km/h on approach to Bargo. Pavement widening is provided at major junctions to accommodate exclusive turning lanes, particularly within the town centres of Picton and Tahmoor, where the sign posted speed limit reduces to 50km/h (with an intermediary limit of 60km/h).

Remembrance Driveway is known as Argyle Street within the vicinity of the Picton Town Centre where it forms junctions with Barkers Lodge Road and Menangle Street, both junctions operating under major / minor priority control with Argyle Street forming the priority route. Pavement widening facilitates the provision of an exclusive right turn lane within Argyle Street on approach to Barkers Lodge Road.

Barkers Lodge Road performs a Regional Road under the care and control of Wollondilly Shire Council, providing an east-west connection between Picton in the east to Mowbray Park and Oakdale in the west. It generally provides one through lane of traffic in each direction with traffic flow being governed by a sign posted speed limit of 100km/h, reducing to 80km/h, thence 60km/h and 50km/h on approach to and within the Picton Town Centre (to the west of Abbotsford Road).

Menangle Street / Picton Road performs a State Road function under the care and control of the Roads & Maritime Services, providing a north-west / south-east arterial function between the Picton Town Centre in the north-west to Hume Highway and thence onto Wollongong to the south-east. It generally provides one through lane of traffic in each direction with traffic flow being governed by a sign posted speed limit of 80km/h, reducing to 50km/h (with an intermediary limit of 60km/h) on approach to the Picton Town Centre.

To the south of the Picton town centre, Remembrance Driveway forms a cross-junction with Thirlmere Way and Antill Street operating under dual lane circulating roundabout control. Thirlmere Way performs an arterial function between Picton and Thirlmere under the care and control of the Roads & Maritime Services. It primarily

provides one through lane in each direction with traffic flow being governed by a sign posted speed limit of 80km/h.

To the south of the Thirlmere town centre, Thirlmere Road performs a local function under the care and control of Wollondilly Shire Council, providing a local connection with the Tahmoor town centre, finally intersecting again with Remembrance Driveway under single lane circulating roundabout control. This section of Thirlmere Way provides one through lane of traffic in each direction with traffic flow being governed by a sign posted speed limit of 60km/h.

5.1.2 Local Road Network

The subject parcel of land is adjoined by Abbotsford Road in the vicinity of its junction with Fairleys Road.

Abbotsford Road performs a local access function under the care and control of Wollondilly Shire Council. In this regard, it provides an access function between abutting development and Barkers Lodge Road, with which it forms a junction under major / minor priority control with Barkers Lodge Road forming the priority route.

Between Barkers Lodge Road and Fairleys Road, Abbotsford Road provides a 7.0m – 8.0m wide pavement within a 20m wide road reservation, providing one through lane of traffic in each direction. Traffic flow is governed by a speed limit of 60km/h, being a continuation of the Barkers Lodge Road speed limit.

Abbotsford Road forms a junction with Fairleys Road under major / minor priority control whereby the southern Abbotsford Road and Fairleys Road approaches form the priority route. To the west of Fairleys Road, Abbotsford Road provides a 5.0m – 5.5m wide pavement within a 20m wide road reservation. Traffic flow is governed by a sign posted speed limit of 80km/h, although an advisory 40km/h limit applies to eastbound traffic on approach to Fairleys Road.

5.2 Existing Traffic Volumes

5.2.1 Road Link Volumes

The October 2012 *Wollondilly Transportation Model Traffic Impact Abbotsford Planning Proposal Report* prepared by Gabites Porter provided base peak hour two directional traffic volumes for a majority of road links within the Wollondilly Shire. **Table 1** provides a summary of the reported two directional evening peak hour volumes within and surrounding the study area. Base volumes for 2010 have been provided to reflect demands (full details of base route traffic demands are provided within the Gabites Porter report).

TABLE 1 SUMMARY OF 2010 BASE ROAD NETWORK TRAFFIC VOLUMES TWO DIRECTION EVENING PEAK HOUR	
Road Link	**2010**
Abbotsford Road	
North of Barkers Lodge Rd	50
Barkers Lodge Rd	
East of Abbotsford Rd	309
West of Abbotsford Rd	268
North of Argyle St	360
Argyle St	
East of Menangle Rd	773
West of Barkers Lodge Rd	1090
Menangle Rd	
South of Argyle St	455

Table 2 indicates the following:

- Peak hour road link traffic demands are relatively low immediately adjoining the study area within Abbotsford Road, being in the vicinity of 50 vehicles;

- Barkers Lodge Road accommodates evening peak hour traffic demands on approach to Argyle Street of up to 360 vehicles;

- Argyle Street accommodates evening peak hour traffic demands in the vicinity of the Picton Town Centre of up to approximately 1,100 vehicles; and

- Menangle Street accommodates evening peak hour traffic demands in the vicinity of the Picton Town Centre of up to approximately 450 vehicles.

5.2.2 Primary Land Access Intersection Volumes

Following discussions between Gabites Porter and Wollondilly Shire Council, it was determined that the primary access intersections associated with the study area are four Barkers Lodge Road intersections as follows:

- The junction of Barkers Lodge Road and Abbotsford Road; and

- The junction of Argyle Street and Barkers Lodge Road.

The base 2010 peak hour movement profiles have been extracted from the Gabites Porter report for these intersections and are illustrated in the following pages by **Figures 2** and **3**.

FIGURE 2
BASE 2010 WEEKDAY PEAK TRAFFIC VOLUMES
JUNCTION OF BARKERS LODGE ROAD & ABBOTSFORD ROAD

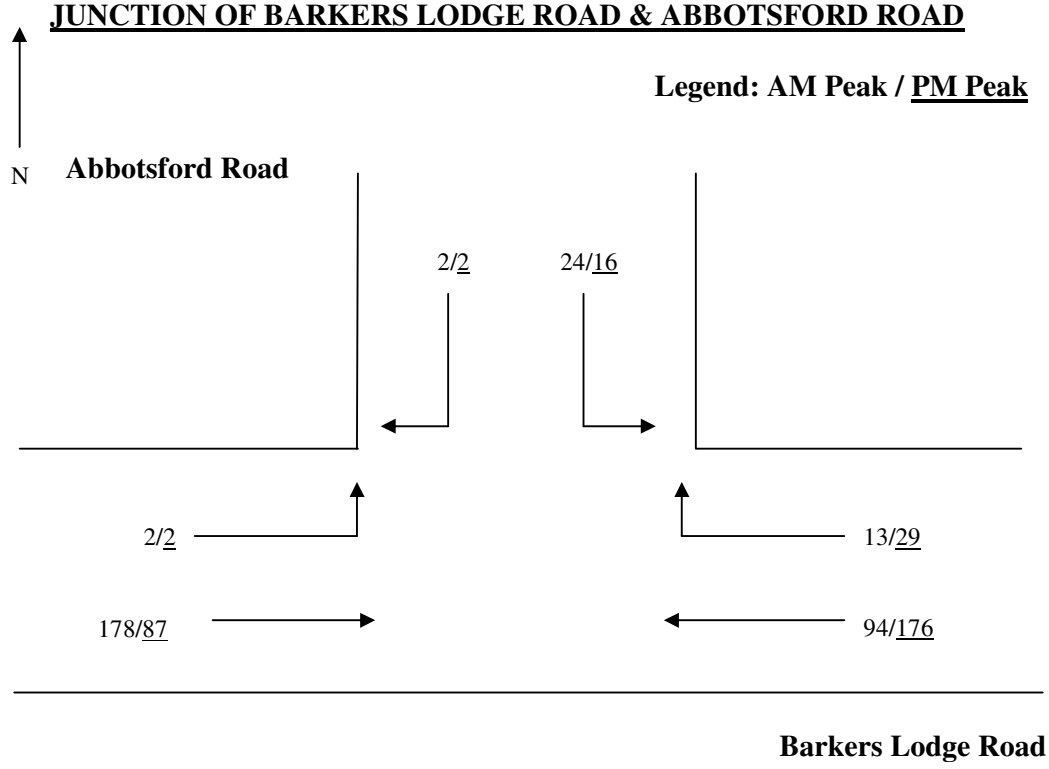
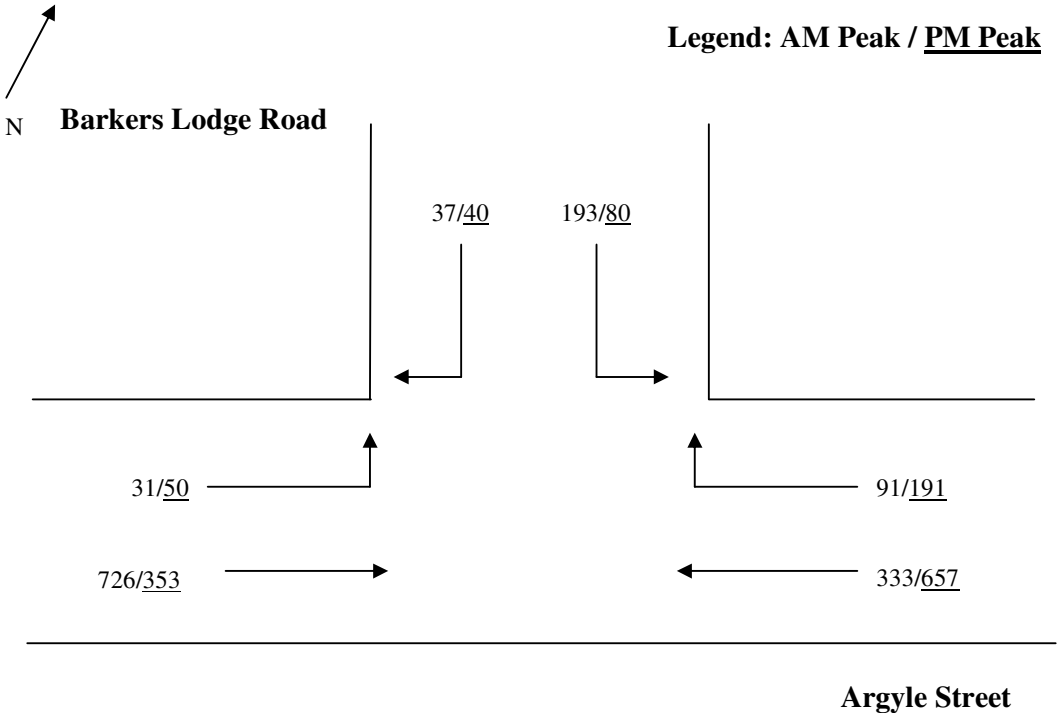


FIGURE 3
BASE 2010 WEEKDAY PEAK TRAFFIC VOLUMES
JUNCTION OF ARGYLE STREET & BARKERS LODGE ROAD



5.3 Existing Intersection Operation

In order to estimate the peak efficiency of the adjoining road network, a SIDRA analysis has been undertaken of the two primary study area access intersections. SIDRA is an intersection analysis software package developed by the Australian Road Research Board (Akcelik, 1989). Originally it was developed for the analysis of signalised intersections, but has now been extended to assess unsignalised intersections and intersections under roundabout control.

SIDRA is an advanced analytical tool for evaluation of alternative intersection designs. Key indicators of SIDRA include level of service, which is a summary indicator ranging from A to F, with A representing optimum intersection performance, and degree of saturation which represents a ratio of the demand of an approach to its capacity.

SIDRA uses detailed analytical traffic models coupled with an iterative approximation method to provide estimates of the abovementioned key indicators of capacity and performance statistics. Other key indicators provided by SIDRA are average vehicle delay, the number of stops per hour and the degree of saturation. Degree of saturation is the ratio of the arrival rate of vehicles to the capacity of the approach. It is a useful and professionally accepted measure of intersection performance. A value of 0.75 permits the intersection to operate in a generally satisfactory manner and provides tolerance for minor disturbances and fluctuations in the traffic conditions. For intersections controlled by a roundabout or give way or stop signs, a degree of saturation of 0.8 or less indicates satisfactory intersection operation.

SIDRA provides analysis of the operating conditions that can be compared to the performance criteria set out in **Table 2** below (adapted from the Roads & Maritime Services' *Guide to Traffic Generating Developments*).

TABLE 2
LEVELS OF SERVICE CRITERIA FOR INTERSECTION

Level of Service	Average Delay per Vehicle (secs/veh)	Traffic Signals, Roundabout	Give Way & Stop Signs
A	Less than 14	Good Operation	Good operation
B	15 to 28	Good with acceptable delays & spare capacity	Acceptable delays & Spare capacity
C	29 to 42	Satisfactory	Satisfactory, but accident study required
D	43 to 56	Operating near capacity	Near capacity & accident study required
E	57 to 70	At capacity; at signals, incidents will cause excessive delays Roundabouts require other control mode	At capacity, requires other control mode
F	> 70	Extra capacity required	Extreme delay, traffic signals or other major treatment required

The 2010 base conditions have been modelled utilising the peak hour traffic volumes presented within **Figures 2** and **3**. **Tables 3** and **4** provide a summary of the SIDRA output data whilst more detailed summaries are provided within **Appendix 1**.

TABLE 3
SIDRA OUTPUT – 2010 BASE INTERSECTION PERFORMANCE
JUNCTION OF BARKERS LODGE ROAD & ABBOTSFORD ROAD

	AM	PM
BARKERS LODGE ROAD EASTERN APPROACH		
Average Delay (secs)	1.8	1.7
Degree of Saturation	0.07	0.12
Level of Service	A	A
ABBOTSFORD ROAD APPROACH		
Average Delay (secs)	11.1	10.4
Degree of Saturation	0.04	0.02
Level of Service	B	B
BARKERS LODGE ROAD WESTERN APPROACH		
Average Delay (secs)	0.1	0.3
Degree of Saturation	0.10	0.05
Level of Service	A	A
TOTAL INTERSECTION		
Average Delay (secs)	1.6	1.8
Degree of Saturation	0.10	0.12
Level of Service	A	A

TABLE 4
SIDRA OUTPUT – 2010 BASE INTERSECTION PERFORMANCE
JUNCTION OF ARGYLE STREET & BARKERS LODGE ROAD

	AM	PM
ARGYLE STREET EASTERN APPROACH		
Average Delay (secs)	2.7	2.3
Degree of Saturation	0.19	0.37
Level of Service	A	A
BARKERS LODGE ROAD APPROACH*		
Average Delay (secs)	32.7	32.8
Degree of Saturation	1.00	0.43
Level of Service	D	D
ARGYLE STREET WESTERN APPROACH		
Average Delay (secs)	0.3	1.0
Degree of Saturation	0.43	0.23
Level of Service	A	A
TOTAL INTERSECTION		
Average Delay (secs)	6.3	4.6
Degree of Saturation	1.00	0.43
Level of Service	A	A

* Whilst not marked, the Barkers Lodge Road approach to Argyle Street was modelled with a short left turn lane in conjunction with a right turn lane to reflect current informal conditions facilitated by a wide pavement.

Table 3 indicates that the junction of Barkers Lodge Road and Abbotsford Road operates with a total intersection LOS A during peak periods, with a worst approach intersection LOS B, representing good operating conditions with spare capacity.

Table 4 indicates that the junction of Argyle Street and Barkers Lodge Road operates with a total intersection LOS A during peak periods. It is however noted that the Barkers Lodge Road approach operates with a LOS D during both peak periods, representing operation near capacity. This operation is supported by the degree of saturation of the side road approach during the morning peak of 1.0, representing operation at capacity. Whilst vehicle queues were not modelled to be excessive (maximum queue length of 31m), the approach intersection degree of saturation suggests that any minor variance in traffic demands could have significant impacts on the performance of the intersection.

5.4 Accident Analysis

The overall operation of the junction of Argyle Street and Barkers Lodge Road has been observed to be good during peak periods (vehicle queues are insignificant and there appears to significant spare capacity). It is however not uncommon for level of service of signage controlled intersections where the main road accommodates notable through demand to represent somewhat worse conditions than that which occurs in reality. The reduced level of service is a direct factor of delays experienced by vehicles exiting the side road/s as a result of the notable main road through demand. The level of service is therefore reduced whilst the intersection degree of saturation remains low thereby suggesting the intersection has significant capacity to accommodate additional demand.

The delays experienced by motorists exiting the side road can result in frustrated drivers taking unnecessary risks when entering or crossing the main road and therefore potentially result in the intersection accommodating a high accident rate. In this regard, it is general traffic engineering practice to undertake a review of the accident history for signage controlled intersections which provide a LOS of or below C.

This Practice has accordingly obtained 5 year (2007 – 2011 inclusive) a crash history from the Roads & Maritime Service for the junction of Argyle Street and Barkers Lodge Road. Further, for the purposes of completeness, a crash history for the junction of Barkers Lodge Road and Abbotsford Road has also been obtained.

The following provides a summary of the crash history results, whilst full details are contained within **Appendix 2**:

- One non-injury crash was recorded at the junction of Argyle Street and Barkers Lodge Road; and

- There were no recorded crashes at the junction of Barkers Lodge Road and Abbotsford Road.

The crash histories indicate that there is no current safety problem at the subject intersections. Accordingly, motorists are able to travel between the study land and the surrounding regional road network with a good level of safety.

5.5 Public Transport and Non-Car Travel

5.5.1 Train

Picton Train Station forms part of the Southern Highlands Line which accommodates services between Goulburn and Town Hall (Sydney). Services are generally provided with a frequency of approximately one hour. Connections to other major lines are provided at Campbelltown, Liverpool, Strathfield and the City stations.

5.5.2 Bus

Picton Buslines operates a number of services within the Picton Town Centre as illustrated by **Figure 4** overleaf (obtained from Picton Buslines).

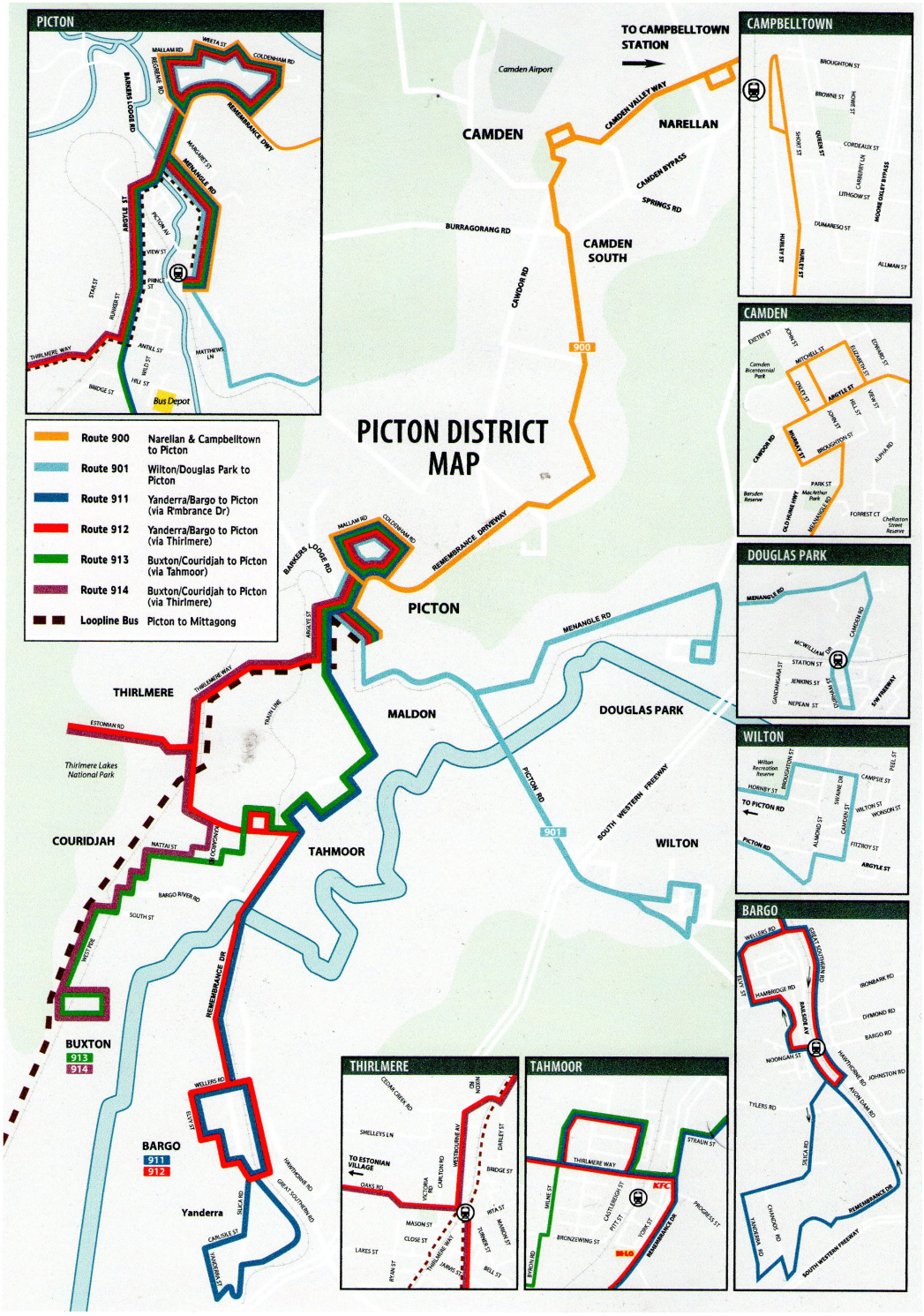


FIGURE 4 – PICTON BUSLINES BUS NETWORK MAP

The following provides a description of the services:

- Route 900 – Narellan / Campbelltown to Picton along Argyle Street;
- Route 901 – Wilton / Douglas Park to Picton along Argyle Street;
- Route 911 – Yanderra / Bargo to Picton along Argyle Street; and
- Route 912 – Yanderra / Bargo to Picton (via Thirlmere) along Argyle Street.

The above routes provide approximately six services per day each.

These services could reasonably be extended / altered to directly provide efficient connectivity between the study area and Picton Railway Station, the surrounding Town Centre and beyond.

5.5.3 Walk / Cycle

Wollondilly Shire Council has recently adopted a Shared Cycleway Plan for the whole Shire. Maps of the Picton shared cycleway paths are illustrated below by **Figure 5**.

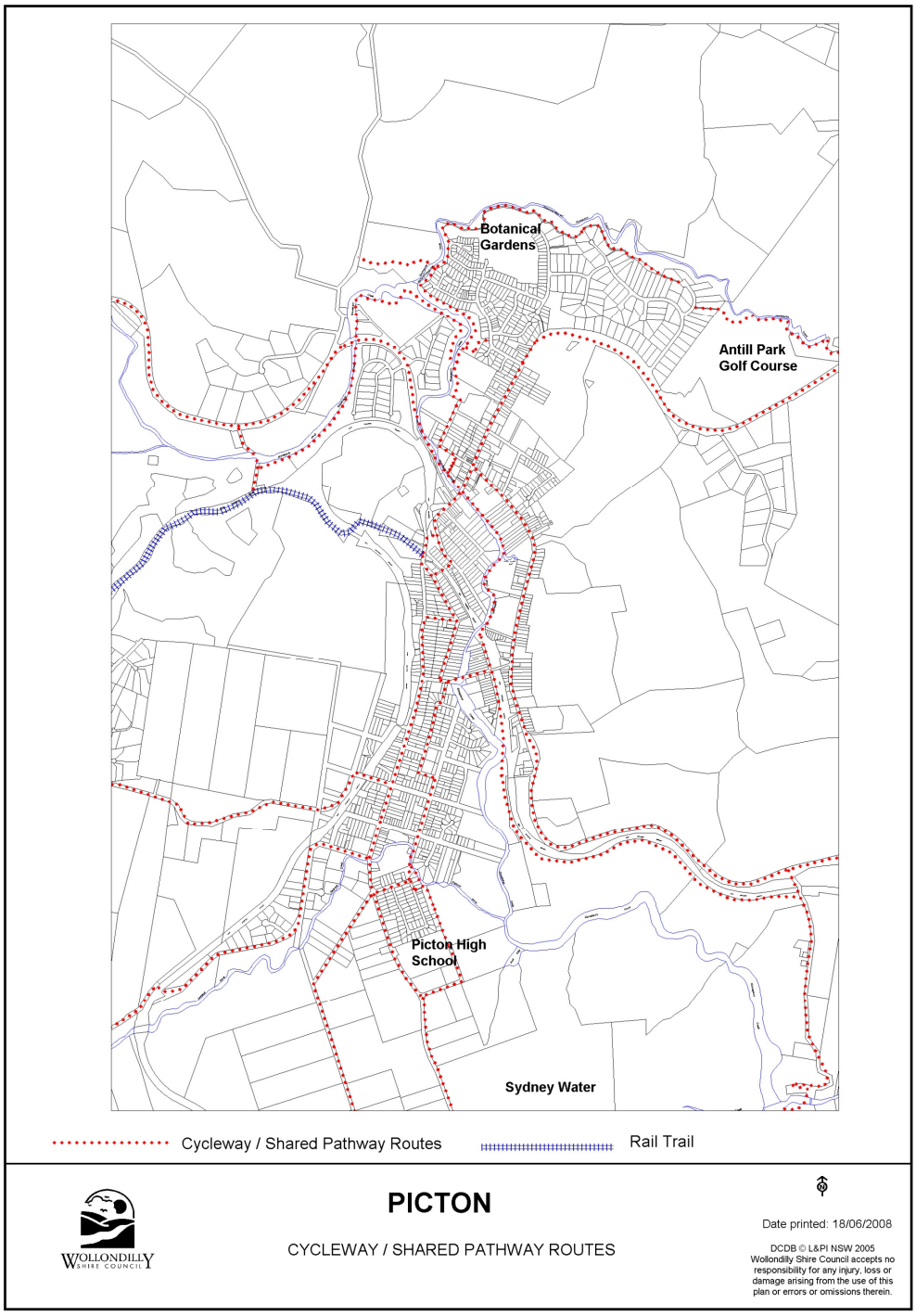


FIGURE 5 – PICTON SHARED CYCLEWAY ROUTES

The Shared Cycleway Plan incorporates the provision of shared cycleways along the following routes in the immediate vicinity of the study area:

- Barkers Lodge Road; and
- Argyle Street.

In addition to the above, a path is planned along Stonequarry Creek, linking with Fairleys Road to the north of Abbotsford Road. This path is planned to link with the residential precinct and the Botanical Gardens to the east.

These paths could reasonably be extended to connect with Abbotsford Road to provide safe and efficient connectivity between the subject land and the surrounding Picton Town Centre.

6. PROJECTED TRANSPORT CONDITIONS

6.1 Traffic Generation

The Gabites Porter TRACKS model was formulated based on the assumption that the proposed residential subdivision would generate in the vicinity of 0.9 – 1.0 peak hour trips per household, generally in accordance with the average traffic generation rate of a standard residential dwelling as provided by the Roads & Maritime Services within their *Guide to Traffic Generating Developments*.

The two way generation of trips to and from the full development produced by the TRACKS model in 2021 were 43 vehicle trips in the morning peak and 53 vehicles in the afternoon peak. Further, the TRACKS process estimated the inbound / outbound directional split to be 37/63 in the morning peak period and 63/37 in the afternoon peak.

6.2 Projected Traffic Volumes

6.2.1 Road Link Volumes

Projected traffic volumes with and without the subject proposal have been estimated by Gabites Porter within their October 2012 *Wollondilly Transportation Model Traffic Impact Abbotsford Planning Proposal Report*. This report provided a network wide assessment of the likely impacts of the residential development. Traffic models for 2021, 2026, 2031 and 2036 were developed to forecast traffic volumes, congestion and infrastructure requirements in the Shire for the next 25 years.

Table 5 overleaf provides a summary of the projected evening peak road link traffic volumes within and surrounding the study area, as extracted from the Gabites Porter report.

TABLE 5
SUMMARY OF ROAD NETWORK TRAFFIC VOLUMES
TWO DIRECTION EVENING PEAK HOUR
WITH AND WITHOUT THE REZONING APPLICATION

	2021		2026		2031		2036	
	Base	**Option**	**Base**	**Option**	**Base**	**Option**	**Base**	**Option**
Abbotsford Road								
North of Barkers Lodge Rd	58	110	60	111	60	111	61	111
Barkers Lodge Rd								
East of Abbotsford Rd	376	419	396	441	415	460	438	482
West of Abbotsford Rd	325	328	345	348	365	368	386	389
North of Argyle St	438	483	461	505	481	525	506	549
Argyle St								
East of Menangle Rd	1099	1106	1203	1209	1196	1199	1200	1212
West of Barkers Lodge Rd	1733	1744	1935	1946	1960	1966	1989	1999
Menangle Rd								
South of Argyle St	889	899	1033	1042	1102	1107	1185	1187

Notes:

1. 'Base' represents the traffic volume scenario without the subject proposal.

2. 'Option' represents the traffic volume scenario incorporating the subject proposal.

Table 5 indicates the following:

- Traffic volumes within Abbotsford Road are projected to increase by approximately 50%, incorporating the subject proposal;

- Notwithstanding the significant percentage increase in traffic demands within Abbotsford Road, volumes are still projected to be low, being significantly less than the environmental capacity of a local street of 300 vehicles per hour as specified by the Roads & Maritime Services' *Guide to Traffic Generating Developments*;

- Traffic volumes within Barkers Lodge Road are projected to increase by approximately 10% incorporating the subject proposal;

- Traffic volumes within Argyle Street are projected to increase by less than 1% as a result of the subject proposal; and

- Traffic volumes within Menangle Road are projected to by up to approximately 1% incorporating the subject proposal.

6.2.2 Primary Subject Land Access Intersection Volumes

Base and Option intersection movement profiles have been extracted from the Gabites Porter report for the following previously presented primary study area access intersections:

- The junction of Barkers Lodge Road and Abbotsford Road; and
- The junction of Argyle Street and Barkers Lodge Road.

The Base and Option 2021, 2026, 2031 and 2036 peak hour movement profiles for these intersections are illustrated within **Appendix 3**.

6.3 Projected Intersection Operation

In order to estimate the future operational efficiency of the primary study area access intersections, a secondary SIDRA analysis has been undertaken utilising the projected Base and Option traffic volumes extracted from the Gabites Porter report and illustrated within **Appendix 3**. **Tables 6**, **7**, **8** & **9** contained within the following pages provide a summary of the most pertinent results whilst a more detailed summary is contained within **Appendix 4**.

TABLE 6
SIDRA OUTPUT – PROJECTED INTERSECTION PERFORMANCE
JUNCTION OF BARKERS LODGE ROAD & ABBOTSFORD ROAD
AM PEAK

	2021		2026		2031		2036	
	Base	**Option**	**Base**	**Option**	**Base**	**Option**	**Base**	**Option**
BARKERS LODGE ROAD EASTERN APPROACH								
Average Delay (secs)	1.9	2.7	1.9	2.7	2.0	2.7	2.0	2.7
Degree of Saturation	0.08	0.10	0.09	0.10	0.10	0.11	0.10	0.12
Level of Service	A	A	A	A	A	A	A	A
ABBOTSFORD ROAD APPROACH								
Average Delay (secs)	11.6	11.7	11.8	11.9	12.1	12.2	12.4	12.5
Degree of Saturation	0.04	0.08	0.05	0.09	0.05	0.09	0.06	0.10
Level of Service	B	B	B	B	B	B	B	B
BARKERS LODGE ROAD WESTERN APPROACH								
Average Delay (secs)	0.1	0.2	0.1	0.2	0.1	0.1	0.1	0.1
Degree of Saturation	0.12	0.12	0.13	0.13	0.14	0.14	0.15	0.15
Level of Service	A	A	A	A	A	A	A	A
TOTAL INTERSECTION								
Average Delay (secs)	1.7	2.7	1.6	2.6	1.7	2.5	1.6	2.5
Degree of Saturation	0.12	0.12	0.13	0.13	0.14	0.14	0.15	0.15
Level of Service	A	A	A	A	A	A	A	A

TABLE 7
SIDRA OUTPUT – PROJECTED INTERSECTION PERFORMANCE
JUNCTION OF BARKERS LODGE ROAD & ABBOTSFORD ROAD
PM PEAK

	2021		2026		2031		2036	
	Base	**Option**	**Base**	**Option**	**Base**	**Option**	**Base**	**Option**
BARKERS LODGE ROAD EASTERN APPROACH								
Average Delay (secs)	1.8	2.7	1.8	2.6	1.8	3.2	1.7	2.6
Degree of Saturation	0.15	0.17	0.16	0.18	0.16	0.19	0.17	0.19
Level of Service	A	A	A	A	A	A	A	A
ABBOTSFORD ROAD APPROACH								
Average Delay (secs)	10.7	10.8	10.8	10.9	10.9	12.5	11.0	11.1
Degree of Saturation	0.03	0.05	0.03	0.06	0.03	0.07	0.03	0.06
Level of Service	B	B	B	B	B	B	B	B
BARKERS LODGE ROAD WESTERN APPROACH								
Average Delay (secs)	0.3	0.3	0.3	0.4	0.2	0.1	0.2	0.3
Degree of Saturation	0.07	0.07	0.07	0.07	0.07	0.14	0.08	0.08
Level of Service	A	A	A	A	A	A	A	A
TOTAL INTERSECTION								
Average Delay (secs)	1.8	2.8	1.8	2.8	1.8	2.5	1.7	2.6
Degree of Saturation	0.15	0.17	0.16	0.18	0.16	0.19	0.17	0.19
Level of Service	A	A	A	A	A	A	A	A

TABLE 8
SIDRA OUTPUT – PROJECTED INTERSECTION PERFORMANCE
JUNCTION OF ARGYLE STREET & BARKERS LODGE ROAD
AM PEAK

	2021		2026		2031		2036	
	Base	**Option**	**Base**	**Option**	**Base**	**Option**	**Base**	**Option**
ARGYLE STREET EASTERN APPROACH								
Average Delay (secs)	5.3	5.8	8.6	9.5	10.5	12.5	13.0	15.9
Degree of Saturation	0.46	0.49	0.69	0.73	0.77	0.83	0.85	0.90
Level of Service	A	A	A	A	B	B	B	C
BARKERS LODGE ROAD APPROACH								
Average Delay (secs)	210.7	217.1	296.6	306.3	323.0	336.0	356.7	374.2
Degree of Saturation	1.00	1.01	1.00	1.00	1.00	1.00	1.00	1.00
Level of Service	F	F	F	F	F	F	F	F
ARGYLE STREET WESTERN APPROACH								
Average Delay (secs)	0.3	0.3	0.2	0.3	0.2	0.3	0.2	0.3
Degree of Saturation	0.70	0.70	0.76	0.77	0.77	0.77	0.77	0.77
Level of Service	A	A	A	A	A	A	A	A
TOTAL INTERSECTION								
Average Delay (secs)	28.7	31.6	39.9	43.9	45.5	50.4	53.2	59.4
Degree of Saturation	1.00	1.01	1.00	1.00	1.00	1.00	1.00	1.00
Level of Service	D	D	E	E	E	F	F	F

TABLE 9
SIDRA OUTPUT – PROJECTED INTERSECTION PERFORMANCE
JUNCTION OF ARGYLE STREET & BARKERS LODGE ROAD
PM PEAK

	2021		2026		2031		2036	
	Base	**Option**	**Base**	**Option**	**Base**	**Option**	**Base**	**Option**
ARGYLE STREET EASTERN APPROACH								
Average Delay (secs)	1.9	2.0	1.9	2.0	2.0	2.2	2.1	2.3
Degree of Saturation	0.64	0.64	0.73	0.73	0.73	0.73	0.73	0.73
Level of Service	A	A	A	A	A	A	A	A
BARKERS LODGE ROAD APPROACH								
Average Delay (secs)	166.4	175.3	226.5	242.1	233.4	247.8	244.3	262.7
Degree of Saturation	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Level of Service	F	F	F	F	F	F	F	F
ARGYLE STREET WESTERN APPROACH								
Average Delay (secs)	0.8	0.9	0.8	0.9	0.7	0.8	2.7	0.8
Degree of Saturation	0.31	0.32	0.34	0.34	0.35	0.35	0.36	0.37
Level of Service	A	A	A	A	A	A	A	A
TOTAL INTERSECTION								
Average Delay (secs)	13.8	15.7	17.5	20.1	18.4	21.0	19.7	22.5
Degree of Saturation	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Level of Service	B	C	C	C	C	C	C	C

6.3.1 Junction of Barkers Lodge Road & Abbotsford Road

Tables 6 and **7** indicate that the priority control junction of Barkers Lodge Road and Abbotsford Road is projected to provide a total intersection LOS A until at least until 2036. This level of service represents good operating conditions with spare capacity. Accordingly, the junction of Barkers Lodge Road & Abbotsford Road is projected to be capable of accommodating the proposed rezoning without the requirement for any upgrading works.

6.3.2 Junction of Argyle Street & Barkers Lodge Road

Tables 8 and **9** indicate that the SIDRA model calculates a total intersection LOS at the junction of Argyle Street and Barkers Lodge Road of D and B incorporating the base 2021 traffic demands during the morning and evening peaks respectively. However, the Barkers Lodge Road approach is projected to operate with a LOS of F during both peak periods. The side road degree of saturation of 1.0 indicates operation at capacity, thereby suggesting that minor variances in traffic flow are likely to have pronounced impacts on approach and total intersection performance levels. Barkers Lodge Road approach queues are significant, particularly during the morning peak period where vehicle queues of approximately 200m are projected.

A LOS D represents satisfactory operation however suggests that an accident history is required. The crash analysis previously presented indicates that the junction currently doesn't have any recorded safety concerns. However, sight distance from Barkers Lodge Road to the south-west is limited as a result of the inconsistent Argyle Street alignment. Accordingly, it could be anticipated that level of safety afforded by the intersection could reduce over time as traffic demands increase to 2021 levels.

Such operational conditions suggest that the some form of upgrade is likely to be required in order to increase the capacity and safety of the junction.

The additional traffic projected to be generated by the subject proposal as captured by the option scenario results in the 2021 afternoon peak junction LOS reducing from B to C. However, the afternoon junction LOS is projected to remain at D. Whilst minor increases to the Barkers Lodge Road queue lengths are projected (increasing from approximately 200m to 220m), the junction degree of saturation is projected to remain at 1.0. In consideration of this, as this junction upgrade is likely to be required in the vicinity of 2020, with or without the development proposal, the costs associated with such works however should not be borne by the applicant.

Inspection of **Tables 8** and **9** indicates that the operational performance of the junction of Argyle Street and Barkers Lodge Road is projected to worsen over time, particularly during the morning peak such that the junction LOS is projected to reduce to E by 2026 and thence F by 2036, further necessitating implementation of a more positive intersection control. It must however once again be reiterated that these undesirable service levels are projected to occur with or without the minor levels of additional traffic projected to be generated by the subject proposal. In this regard, the additional traffic projected to be generated by the subject proposal is projected to

result in a maximum increase in total junction traffic volumes during peak periods of 2%. Accordingly, any costs associated with the junction upgrading works should not be borne by the applicant.

7. INTERNAL SUBDIVISION CONSIDERATIONS

7.1 Lot Access

Whilst a subdivision plan was not available at the time of writing this report, it is expected that a majority of the allotments will be serviced by new cul-de-sac access roads, intersecting with the existing road network in Abbotsford Road. The cul-de-sac access roads are expected to provide carriageway widths of 8m (defined by kerb and guttering) within a reservation of 20m in accordance with Wollondilly Development Control Plan 2011.

The cul-de-sac access roads will intersect with Abbotsford Road under major / minor priority control with the existing road performing the priority route.

The terminating cul-de-sacs are to be capable of accommodating garbage collection vehicle turnaround manoeuvres.

The intersections of the new cul-de-sac access roads and Abbotsford Road are to be located to ensure that a sight distance to accord with the relevant Roads & Maritime Services and Austroads specifications for the planned sign posted speed limit of Abbotsford Road. In this regard, it is likely that the existing 80km/h section of Abbotsford Road to the west of Fairleys Road will provide a reduced speed limit more commensurate with the altered roadside environment and land-use.

7.2 Parking Considerations

The minimum allotment size of 4,000m^2 will ensure that all household parking demand will be suitably capable of being accommodated off-street. Notwithstanding this, on-street parking is not planned to be prohibited, with the exception of where such on-street parking would impact road user safety.

7.3 Road Network Layout Design

It is understood that the section of Abbotsford Road to the west of Fairleys Road is likely to be realigned to improve the vertical and horizontal alignment of the road for improved driver visibility plus creating a greater separation of the road from the creek, thereby limiting the potential for roadway flooding.

Further, Abbotsford Road will be required to be upgraded to provide carriageway widths of 8m (defined by kerb and guttering) within a reservation of 20m in accordance with Wollondilly Development Control Plan 2011. Such upgrading works will improve the level of safety and amenity experienced by motorists throughout the study area.

7.4 Intersection Design

All new intersections within the study area are to be governed by major / minor priority control. The traffic demands within the study area are such that it is not expected that there will be any warrant for the provision of more positive intersection control, with the exception of assigning the priority through the provision of appropriate signage and linemarking.

8. CONCLUSION

This Practice has undertaken an assessment of the potential traffic, parking and transport related impacts resulting from the proposed rezoning of 66.6 hectares of land located at No. 1 Abbotsford Road, Picton. This report essentially forms an update to the October 2012 *Wollondilly Transportation Model Traffic Impact Abbotsford Planning Proposed Report* in accordance with the Roads & Maritime Services' *Guide to Traffic Generating Developments*.

Following discussions between Gabites Porter and Wollondilly Shire Council, it was determined that the primary access intersections associated with the study area are follows:

- The junction of Barkers Lodge Road and Abbotsford Road; and

- The junction of Argyle Street and Barkers Lodge Road.

The primary objective of this assessment was to investigate the need for State and local traffic infrastructure upgrades to support the proposal. Based on this assessment, the following conclusions are provided:

- Assessment of the abovementioned primary access intersections has been undertaken utilising the computer based SIDRA model utilising the base 2010 peak hour movement profiles extracted from the Gabites Porter report indicating the following:

    - The priority controlled junction of Barkers Lodge Road and Abbotsford Road currently provides motorists with a LOS A without the subject proposal, representing good operating conditions with spare capacity; and
    - The signage controlled junction of Argyle Street and Barkers Lodge Road currently provides motorists with a total junction LOS A during peak periods, however the Barkers Lodge Road approach operates with a LOS D during both peak periods, representing operation near capacity.

- The two way generation of trips to and from the full development produced by the TRACKS model in 2021 were 43 vehicle trips in the morning peak and 53 vehicles in the afternoon peak.

- In order to estimate the future operational efficiency of the primary study area access intersections, a secondary SIDRA analysis has been undertaken utilising the projected Base and Option traffic volumes extracted from the Gabites Porter report for the years 2021, 2026, 2031 and 2036. The following provides a summary of the analysis results:

Junction of Barkers Lodge Road and Abbotsford Road

- The priority controlled junction is projected to provide a total junction level of service A until at least until 2036 with or without the proposal;
- This level of service represents good operating conditions with spare capacity; and
- Accordingly, the junction is projected to be capable of accommodating the proposed rezoning without the requirement for any upgrading works.

Junction of Argyle Street and Barkers Lodge Road

- Whilst the total junction LOS is projected to be D and B in 2021 without the proposal, the Barkers Lodge Road approach is projected to operate with a LOS of F during both peak periods;
- Such operational conditions suggest that the some form of upgrade in addition to the planned to be completed within Council's Section 94 Plan is likely to be required in order to increase the capacity and safety of the junction;
- The additional traffic projected to be generated by the subject proposal is minor in the total intersection context (representing a maximum of 2% of total intersection flows) thereby indicating that the abovementioned upgrade is likely to be required in the vicinity of 2020, with or without the development proposal; and
- The costs associated with any upgrading works therefore should not be borne by the applicant.