SHAOLIN TEMPLE FOUNDATION (AUSTRALIA) LTD

TRAFFIC IMPACT ASSESSMENT
FOR
PROPOSED SHAOLIN TOURIST RESIDENTIAL DEVELOPMENT
AT
COMBERTON GRANGE,
SOUTH NOWRA, NSW

Prepared by:

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EXECUTIVE SUMMARY

- A detailed analysis has been carried out using comprehensive traffic data provided by Shoalhaven City Council and the RTA and 2011 traffic volume and classification counts by the consultant to determine annual growth rates in AADT and the 120 HH for projection to 2021.

- The consultant has carried out traffic and patronage surveys at the Nan Tien Temple complex at Unanderra during the Land and Water Dharma Function (2009) and the Chinese New Year festival (2010) to obtain data from a comparable development. Because the proposed Shaolin tourist residential development has a number of other major facilities such as:

    - 300 Residential dwellings
    - Town centre retail / commercial complex
    - 18 hole golf course
    - Serviced apartments
    - Larger tourist hotel
    - Kung Fu Academy Martial Arts / Education facilities
    - Amphitheatre

  reference has been made to the traffic and parking generation rates in the RTA Guide to Traffic Generating Developments and other sources for these additional components.

- The proposed tourist residential development at South Nowra will be the first development by the Shaolin Temple Foundation in Australia. There are a number of Shaolin Temple complexes in Southern China, some of which have been visited by the project architect at Conybeare Morrison International. There have been ongoing communications with Mr Patrick Pang representing the Shaolin Temple Foundation and Conybeare Morrison concerning the modus operandi of the various facilities in the proposed complex. These matters which explain the development content are germane because of their impact on transport modes, traffic generation and parking.

- The traffic generation potential of the proposed development in Stage 1 and Ultimate is based upon a number of assumptions the first of which is the number of tourists from mainland China who are expected to attend the religious and cultural ceremonies, and the second is the timing of construction of the various building components and the third is the growth rates adopted in projection of the historical annual growth in traffic volumes for the next 10 years.

- The proposed development is expected to make a major contribution to the tourist industry in the Shoalhaven region. The majority of the labour force is expected to live in the Shoalhaven Shire.

- Analysis of the parking demands of each component of the development has been made by Conybeare Morrison and **972** parking spaces for cars have been provided in **8** car parks that are conveniently located near each major facility. The parking demand for each component and the total development has been reviewed because the peak parking demand will depend on the car travel mode and the fact that not all facilities will attract peak crowds at the same time or on the same day. The peak parking demand assessed for the Ultimate development is **728**. Strict application of the Shoalhaven Parking Code DCP18 requires **781** spaces in Stage 1 and **1640** spaces ultimately.

  As the parking requirements may change it is reasonable to provide the areas as shown on the Masterplan for **972** spaces and to build the car parks progressively according to the actual demand.

- For the reasons described in the report the use of Tracks modelling to determine the distribution of traffic to and from the development is not appropriate. The distribution of traffic to and from Nowra / Bomaderry is clear cut based upon analysis of traffic movements to and from Jervis Bay Road. It is assumed that 95 percent of the external traffic generated by the development will travel to the north on the Princes Highway.

- The analysis of road and intersection capacity is based upon the 120th HH criteria adopted by Shoalhaven City Council because Shoalhaven is a major tourist destination.

- Only one road link is required for the ultimate development. This is to be the northern road link to Forest Road. A two lane 6.7 metre wide sealed carriageway constructed to Austroads rural design standard will be required at the commencement of the project because the current dirt road connection to Comberton Grange Road is in very poor condition and is not suitable for construction traffic.

- It is recommended that the CHR type intersection upgrading at Forest Road be constructed in conjunction with the northern access road for traffic safety reasons.

- Based upon traffic growth projections to 2021 120th HH, SIDRA analysis of the performance of the upgraded Forest Road / Princes Highway tee intersection shows that the LoS for the critical right turn from Forest Road in the 4.00-5.00pm peak hour will worsen from LoS D to F and the delay will increase from 50.4 seconds to 284 seconds.

- Under future 2021 120th HH plus Stage 1 tourist development the delay in the critical right turn from Forest Road in the 4.00-5.00pm peak hour increases to 1240.6 seconds and is clearly unacceptable. Under future 2021 120th HH plus Ultimate tourist development the delay in the critical right turn from Forest Road in the 4.00-5.00pm peak hour increases to 2099 seconds.

- Analysis of this intersection under two phase traffic signal control and dual right turn lanes shows that the LoS for the critical right turn movement improves to LoS C in the 12.00-1.00pm and 4.00-5.00pm peak hours with delays of 35.5 and 39 seconds. The average delay all vehicles improves from 99.1 seconds in the 12.00-1.00pm peak hour to 10.6 seconds and in the 4.00-5.00pm peak hour from 134.7 seconds to 9.3 seconds.

- The indicative estimated cost of providing traffic signals at Forest Road plus the road widening for the additional 60 metre long right turn lane is $356,000 plus GST. By comparison the indicative cost of a single lane flyover for the right turn would be in the order of $1.51 million plus GST at current prices.

- The right turn from Jervis Bay Road currently operating in 2011 at LoS F with a delay of 112.3 seconds. By 2021 the LoS will still be F but the delay will increase to 1176.1 seconds. This intersection is not impacted by the Shaolin tourist development and the right turn delay is clearly unacceptable. Signalisation of this tee intersection with dual right turn lanes would provide a comparable improvement in the LoS as for Forest Road at similar cost.

- The critical movement in the 2021 120th HH at the BTU Road / Princes Highway tee intersection is the right turn into BTU Road in the 8.00-9.00am peak hour where the LoS is F and the delay is 236.8 seconds. Traffic generated by Shaolin tourist development has no impact on the LoS and delay. This is confirmed by SIDRA analysis of 2021 120th HH plus Stage 1 of the Tourist Development.

- The critical movement at lunch time in the future 2021 120th HH is the right turn from BTU where the LoS is E and the delay is 69.2 secs. Under the future 2021 120th HH plus Shaolin Stage 1 development the LoS for the right turn from BTU worsens to LoS F with a delay of 167.9 secs. This LoS and delay is comparable with the LoS for the right turn from Jervis Bay Road in the 4.00-5.00pm peak hour under existing 2011 120th HH traffic volumes where the delay is 112.3 secs. Hence the future delay at BTU Road can probably be tolerated.

- At the appropriate time when sufficient infrastructure is completed it is recommended that a regular 7 day bus service operate between Nowra / Bomaderry and the site. Timetables may permit services that operate on Routes 732 and 733 to drop off passengers at the tourist centre on the outgoing trip and pick up passengers on the return journey.

- The distributor and collector road system shown on the Masterplan is generous in its design standards for carriageway and road reserve widths. These should be reviewed at the design stage with the road standards in DCP100 Amendment 2 and downgraded.

- The site topography as depicted by the 2 metre contours indicates that road gradients will generally be below 5% and that the steeper sections with grades of 8 and 9 per cent will be relatively short. The proposed cycle paths would therefore have gradients suitable for cycling as shown in Figure 6.2 of Austroads Part 14 – Bicycles. End of trip facilities such as bike racks should be provided at each major attraction in each precinct to encourage cycling. The topography and dispersed location of the Town Centre facilities are conducive to cycling.

- The road network, road widths and road alignment are suitable for use by delivery vehicles. Adequate unloading / loading facilities can be provided at the design stage.

1.0 INTRODUCTION

1.1 Background

This report has been prepared for the Shaolin Temple Foundation (Australia) Ltd to assess the traffic impacts of the Development Masterplan prepared by Conybeare Morrison International Pty Ltd for a tourist and residential development at the site of Comberton Grange which is located approximately 12 km south of Nowra town centre. This report is to be annexed to the Environment Assessment (EA) dated January 2012 prepared by Conybeare Morrison for the Part 3A Project Application to the Department of Planning, N.S.W. and is to be read in conjunction with the EA report. The site is shown in **Figure 1, Locality Map.**

1.2 The Site, Location and Road Access

As described in the EA, the Comberton Grange site is approximately 1284 hectares. The northern portion of the site (approx. 120ha) was formerly a pine plantation and the south and south western portion of land adjacent to Currambene Creek (approx. 110ha) was used as grazing land. A former quarry and man made lake are located in the central part of the site. The site is currently vacant.

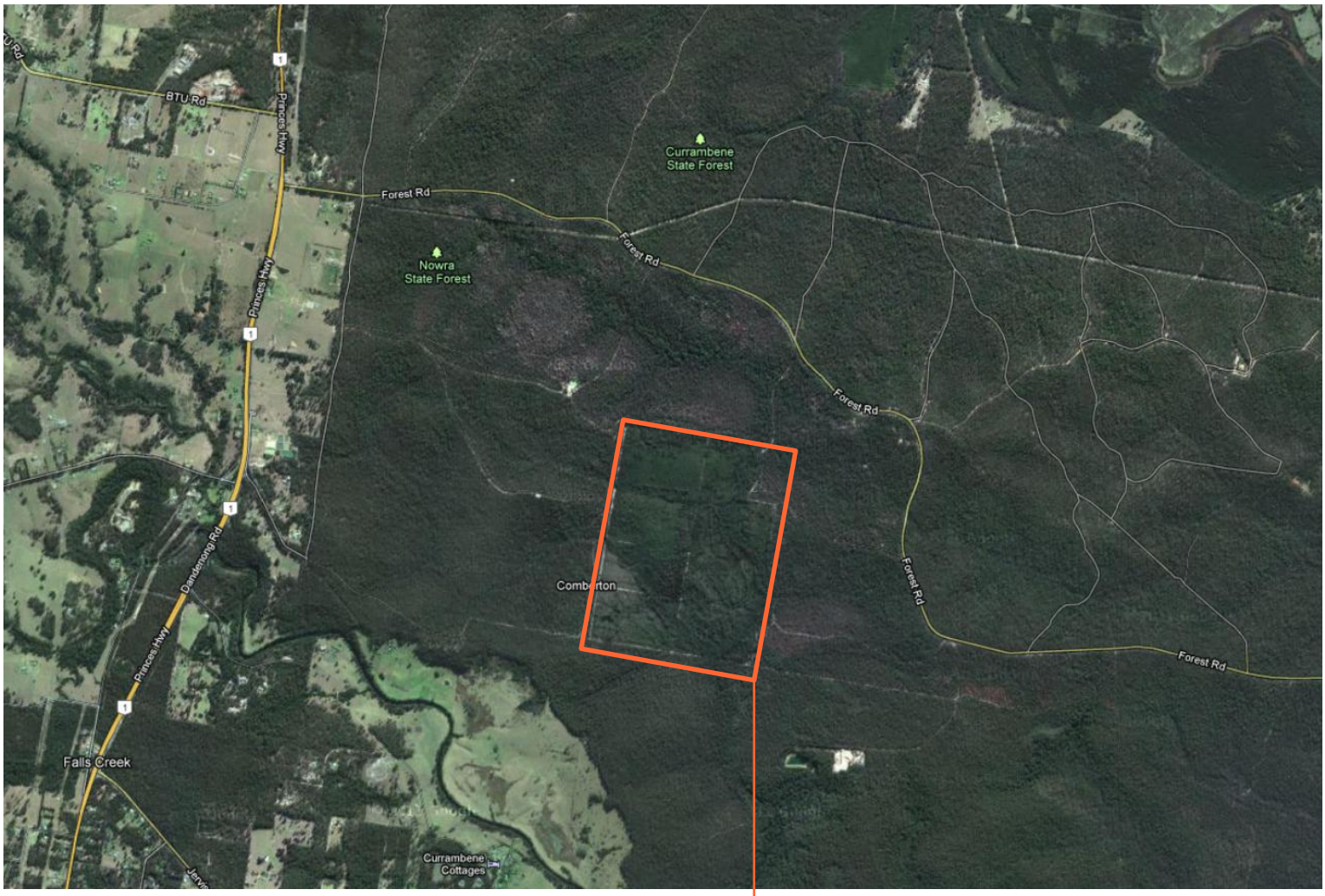
The former homestead and agricultural land are accessed to the west by Comberton Grange Road, constructed to rural formation standard only and only accessible by 4 wheel drive vehicles. The quarry is also accessed from Forest Road by a similar standard rural road.

1.3 Acknowledgements

The assistance of the following officers of Shoalhaven City Council and the RTA (RMS) Regional Office at Wollongong in providing their traffic date volume base, advice on traffic patterns and recreational traffic and plans of the current duplication of Princes Highway from Kinghorne Street to Forest Road, South Nowra is gratefully acknowledged.

Shoalhaven City Council
Scott Wells: Traffic and Transport Manager
Brett Williams: Transport Engineer
John Britton: Major Project 3A Coordinator

RTA (RMS) Regional Office, Wollongong
Chris Millet: Manager Development Assessment Unit
Bradley Collins: Traffic Management Analyst.
Tim Wester: Development Assessment Officer
Shaun Walsh: Project Manager



SITE

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FIGURE 1
LOCALITY MAP

1.4 Traffic Study Requirements

i) Director-General's EA Requirements 20/10/10

7. Traffic and Access

7.1 Prepare a traffic impact study in accordance with Table 2.1 of the RTA's *Guide to Traffic Generating Developments,* based on the maximum development potential for the site, which addresses the following matters.

- Access to and within the site, with consideration of the one site access only (either Forest Road or Comberton Grange Road);
- Need for junction upgrades. Appropriate intersection analysis (for Princes Highway with Comberton Grange Road/Forest Road) using SIDRA to determine projected traffic growth for the next 10 years with and without the development; AM and PM peak volumes and recreation peak volumes.
- Identify road infrastructure required to ameliorate the impacts of the development at the junctions of Princes Highway / Comberton Grange Road, Princes Highway / Forest Road, Princes Highway / Parma Road, and Princes Highway / BTU Road. Provide a concept plan (notating property boundaries) of any proposed treatments. (Note: suitable agreement with affected property owners will be required where treatments are located outside of the road reserve).
- Capacity of the road network to safely and efficiently cater for the additional traffic generated;
- Servicing and parking arrangements. Prepare a parking needs study which investigates parking demand generated by each component of the proposed development;
- Connectivity to existing developments;
- Impact on public transport, including school bus routes; and
- Provision of access for pedestrians and cyclists to, through and within the site.

ii) RTA (RMS) Requirements Letter Dated 29/4/2008 to General Manager SCC.

- A detailed description of the potential development on the site to enable an estimation of the likely traffic generation from the site.

1.4 ii) (Continued)

- Intersection modelling using SIDRA should be undertaken considering the following:
  - o AM and PM peaks volumes and holiday peak volumes.
  - o Existing traffic volumes with and without development and 10 year projected volumes with and without the development.
- The applicant should identify road infrastructure required to ameliorate the impacts of the development at the junction of the Princes Highway and Comberton Grange Road. In determining an appropriate treatment consideration should be given to the junction of the Princes Highway and Parma Road. A concept plan of the proposed treatment should be provided and include property boundaries. If the treatment does not fit within the existing road reserve the applicant should attain suitable agreements with affected property owners to ensure the works can be completed pending approval.

iii) Traffic, car parking and access issues (Shoalhaven City Council)

Based on a review of preliminary EA May 2008, SH1/Forest Road intersection indicates that there is a very limited capacity to absorb increases in *right turn* traffic movements onto / off the Princes Highway from Forest Road, which is a critical movement. Similarly at Comberton Grange Road, with RTA banning turn movements at Comberton Grange Road / Princes Highway intersection as part of the current scope of works at Falls Creek.

RTA has recently constructed interim seagull treatment at the intersection of Princes Highway / Forest Road to improve safety to right turn out. RTA has advised that they intend to realign BTU Road to the north and construct sea gull junctions to RTA standards at BTU Road and Forest Road.

These intersections have limited capacity to accommodate traffic growth, however Council is of the opinion that it DOES NOT have the capacity to accommodate the Shaolin development: It is anticipated that approx. 70% of traffic will have origin / destination to the north; 15% to the east; and 15% to the south. The development is anticipated to generate approx. 15,000 vehicle movements / day.

AUSTROADS Capacity Manual recommends as a guide for 2 lane-2 way rural roads provide less than 8,000 daily vehicle movements to maintain Level of Service C (reasonable traffic flow and safety conditions).

1.4 iii) (Continued)

Council suggests:

- 3 access points from the site: 2 (north and eastwards) to Forest Road and 1 (southwards) to Comberton Grange Road;
- A non-mountable roundabout at the intersection of Forest Road with northern access point;
- Channellised intersection at the intersection of Forest Road with eastern access road, with right and left turn bays; 4 lanes on Forest Road from intersection to Highway;
- Traffic treatment at the intersection of Princes Highway / Forest Road;
- No upgrade at intersection of Princes Highway / Comberton Grange Road (to be left as left-in, left-out).

Car parking and site servicing:
Internal roads and car parking areas designed and constructed in accordance with DCP & AS 2890.1.

Recommendations (SCC)

2 (a) Preparation of a **Traffic Impact Study** in accordance with RTA guidelines, with:

- Details of the proposal;
- Traffic modelling analysis;
- Surveys of traffic volumes and traffic patterns on regional road network surrounding the site;
- Traffic generation and distribution; Traffic impacts of the development, with seasonal assessment;
- Traffic impacts of regional impacts;
- No. of access points, road and intersection upgrade requirements;
- Internal hierarchical layouts of roads, with accommodation of 14.5m rigid buses;

(b)
- Internal pedestrian and cycle infrastructure, with preparation of **Pedestrian / cyclist Management Plan**, external cyclist demands, etc; **Servicing and Waste Management Plan,** with identification of largest design vehicle, vehicle routes and operational requirements;
- Concept layouts for all external works, including road and intersection upgrades.

1.4 iii) (Continued)

12. Preparation of a **Parking Needs Study** which investigates parking demand generated by each component of the proposed development, to accommodate all on-site parking, to include:
    - Minimal parking requirements for peak demand;
    - No. of full time employees, contractual employees;
    - Parking for all service vehicles, delivery and loading areas.

Access to Currambene / Georges Creek:

Details to be provided on how it is proposed to manage the informal and formal access to the creek (e.g. impact from vehicles).

2.0 EXISTING TRAFFIC CONDITIONS ON STATE, REGIONAL AND LOCAL ROADS

2.1 Inventory of Road Widths, Road Conditions and Traffic Management in Princes Highway

2.1.1 Regional Road System

The Princes Highway SH1 is the major road servicing the NSW South Coast and links Sydney and Melbourne. It passes through Nowra and South Nowra. The proposed development site has no direct access from the Princes Highway but is accessible to the north from Forest Road, a collector road linking the Princes Highway to the coastal towns at Callala Bay, Currarong and Culburra Beach. Comberton Grange Road is a local road that provides direct access from Princes Highway to the western part of the site.

Jervis Bay Road is a classified Main Road MR312 that provides access to Jervis Bay and Huskisson from the Princes Highway. The road system in the vicinity of the development site is shown in **Figure 2.**

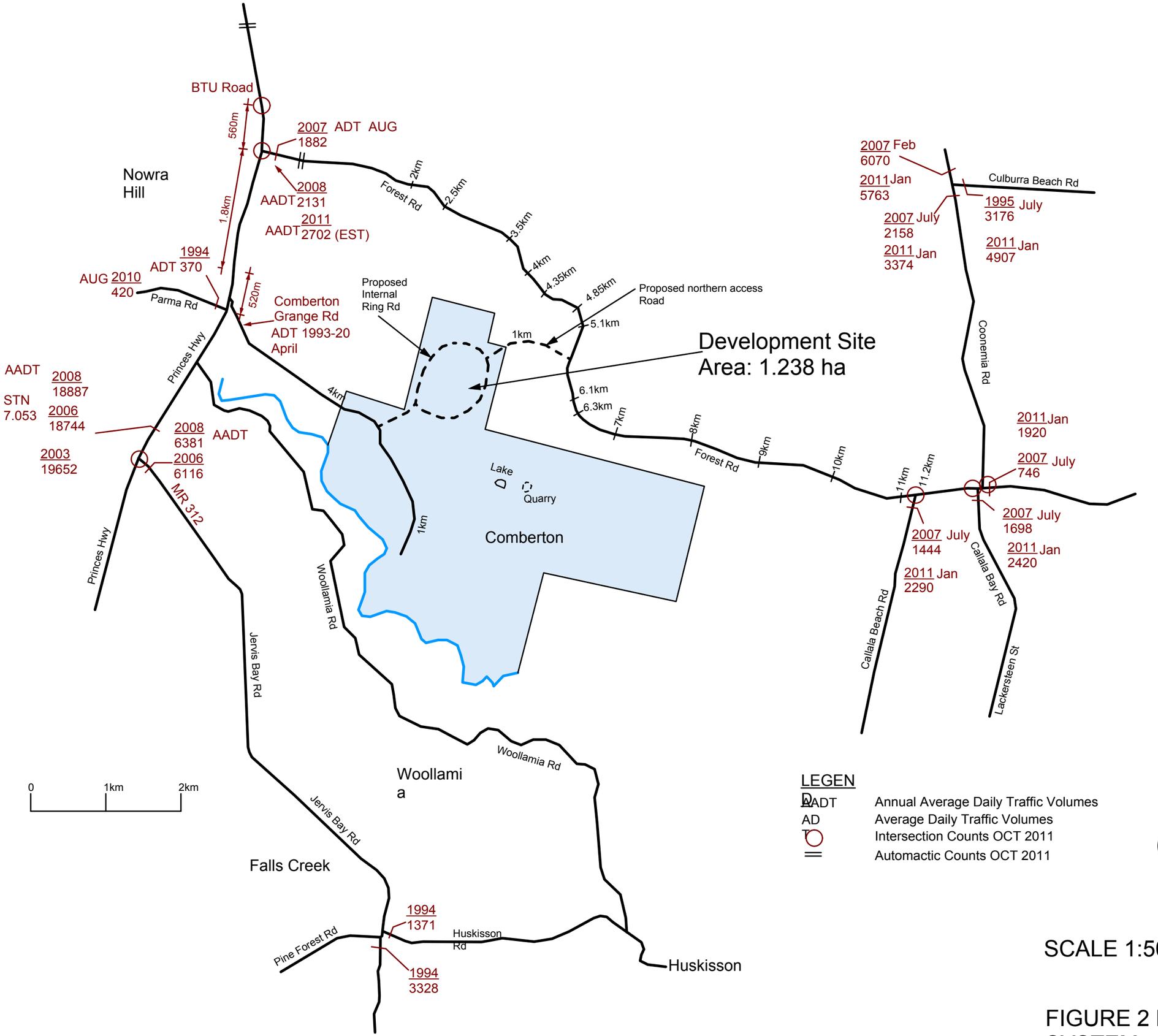
2.2 Current Road Construction Standards

2.2.1 Princes Highway

The Princes Highway was upgraded to a 4 lane dual carriageway between Forest Road and Jervis Bay Road prior to December 2008 with a full seagull type intersection improvements at Jervis Bay Road, partial seagull intersection improvements at Forest Road, channelization at Comberton Grange Road to provide for right turn entry from the Highway, a U turn facility at Parma Road, Comberton Grange Road and Forest Road. These road safety improvements are illustrated in **Figure 3.**

2.2.2 Forest Road

Forest Road was upgraded at the end of 2007 and has been sealed for its full length with a *two coat hot flush bitumen seal*. The pavement is linemarked with edgelines and RPMS and barrier centrelines. The pavement width between edgelines is **6.7** metres and there are **1.0** metre wide sealed shoulders. **Photographs P1, P2** and **P3** show the seagull intersection at Princes Highway, **Photograph P4** shows Forest Road and *U-turn bay* east of Princes Highway and **Photographs P5, P6** and **P7** show Forest Road west and east of the access road to the former quarry on the development site.



SCALE 1:50,000

FIGURE 2 REGIONAL ROAD SYSTEM

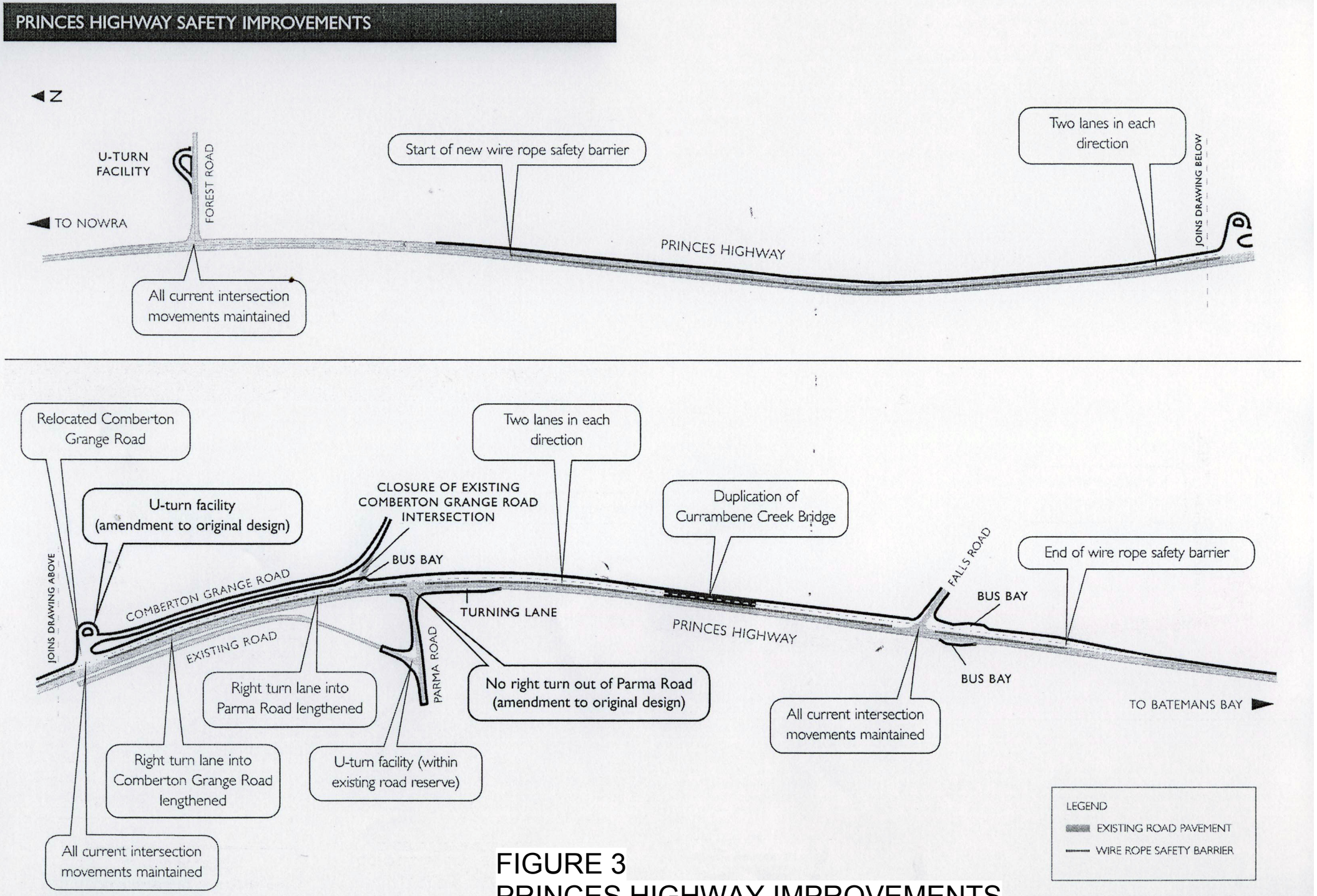


FIGURE 3
PRINCES HIGHWAY IMPROVEMENTS

PHOTO P1 **Princes Highway North of Forest Road Intersection 2009.**

PHOTO P2 **Seagull at Princes Highway and Forest Road Intersection June 2009.**

PHOTO P3 Princes Highway South from Forest Road.

PHOTO P4 Forest Road East of Princes Highway

PHOTO P5 **View West of Forest Road 6.8km from Highway.**

PHOTO P6 **Forest Road view East at Ch 6.8km.**

PHOTO P7 **Access Road to Quarry from Forest Road 6.8 km from Highway.**

PHOTO P8 **Princes Highway South at Comberton Grange Road Intersection.**

2.0 (Continued)

2.2.3 Comberton Grange Road

This road has been sealed and reconstructed for a length of about **200** metres from the intersection at Princes Highway. A **Photograph P8** shows the right turn entry bay at the intersection. **Photograph P9** shows sealed pavement **6** metres wide with edgelines and **Photograph P10** shows the road constructed to *earth formation standard* beyond the upgraded section. The standard of the road deteriorates with deep potholes and is only accessible by *4 wheel drive* to the development site.

2.3 Daily and Peak Hour Traffic Volumes

2.3.1 AADT, ADT

Automatic tube counts were made over 7 days from 21st to 28th October 2011 in Princes Highway about 1.5km north of BTU Road and in Forest Road, 500 metres east of Princes Highway. The ADT (average daily) volumes were 21650 and 2597 respectively and are shown on **Figure 2**. Historical Average Annual Daily Traffic Volumes (AADT) were provided by Shoalhaven City Council and the RTA, Wollongong for years up to 2008 and Average Daily Traffic volumes (ADT) on local roads east of Princes Highway were provided by Shoalhaven City Council to January 2011. These counts at the locations are shown in **Figure 2**. There has been a significant growth in daily traffic in Princes Highway, Forest Road and MR312 Jervis Bay Road in the period 2008 to 2011. The compound annual growth factors have been calculated **(Appendix 1**) as follows for use in expanding 2008 AADT traffic volumes to 2011 and for the 10 year traffic projections.

Compound Annual Growth Factors
Years 2011 to 2021 and 2008 to 2011:

	Yrs 2011 to 2021	Yrs 2008 to 2011
SH1 Princes Highway	2.24%	4.4%
Forest Road	2.5%	7.0%
MR312	2.5%	6.6%
BTU Road	2.1%	4.2%

AADT Traffic Volumes 2011:

SH1 (North of MR312)	21268 (Est)
MR312	7707 (Est)
Forest Road	2702

The calculations are included in **Appendix 1.**

2.3.2 Peak Hour Intersection Traffic Volumes

Turning movement counts were made from **7.30am** to **10.30am**, **11.00am** to **1.00pm** and **2.30pm** to **5.30pm** on Friday *28th October 2011* at the following intersections:

PHOTO P9 **Comberton Grange Road at end of sealed pavement 2009.**

PHOTO P10 **Comberton Grange Road formation only 2009.**

2.0 (Continued)

2.3.2 (Cont)

1. Forest Road / Princes Highway.
2. BTU Road / Princes Highway.
3. Jervis Bay Road / Princes Highway.
4. Forest Road / Callala Beach Road.
5. Forest Road/Callala Bay Road
6. Forest Road / Currawong Road / Coonemia Road

The busiest hours in the Princes Highway were **8.00-9.00am**, **12.00-1.00pm** and **4.00-5.00pm**. The intersection traffic volumes during each of these **3** hours from north of BTU Road to south of **MR312** are illustrated in **Figure 4a, 4b** and **4c.** The summary of the *7 day automatic tube counts* in Princes Highway and Forest Road are included in **Appendix 2.** The *historical traffic volumes* in Comberton Grange Road, Falls Road and Parma Road are *very small* and have not been counted.

In the **8.00-9.00am** peak hour some **78.3** percent of traffic exiting from Forest Road was travelling north on the Princes Highway towards Nowra. In the same period some **97.5** percent of traffic exiting from Jervis Bay Road travelled north along the Princes Highway. In the **4.00-5.00pm** *peak hour* some **81.9** percent of traffic turned left into Forest Road from the Princes Highway and **96.7** percent of traffic turned left into Jervis Bay Road. A review of an intersection traffic count conducted by the RTA in May 2007 at the Forest Road / Princes Highway intersection showed that some **73** percent of traffic exiting from Forest Road travelled north along the highway. In the **4.00-5.00pm** peak some **79.8** percent of traffic entering Forest Road travelled south and turned into Forest Road therefore it may be concluded that there is a very strong distribution of traffic to Nowra / Bomaderry.

Turning movement counts were made during the **7.30-10.30am**, **11.00-1.00pm** and **2.30-5.30pm** periods on *Friday 28/10/11* at the intersections with Forest Road and Callala Beach Road, Forest Road and Callala Bay Road and Forest Road / Coonemia Road / Currawong Road. The peak hours were **8.00-9.00am**, **12.00-1.00pm** and **3.00-4.00pm**. The peak hour volumes are shown in **Figures 5a, 5b** and **5c.**

The westbound traffic volume in Forest Road to the Princes Highway in the **8.00-9.00am** peak hour was about **70%** of the northbound volume in Coonemia Road towards Nowra. In the **pm** peak hour **3.00-4.00pm** the traffic volume eastbound in Forest Road from the Princes Highway was about **55%** of the southbound volume in Coonemia Road.

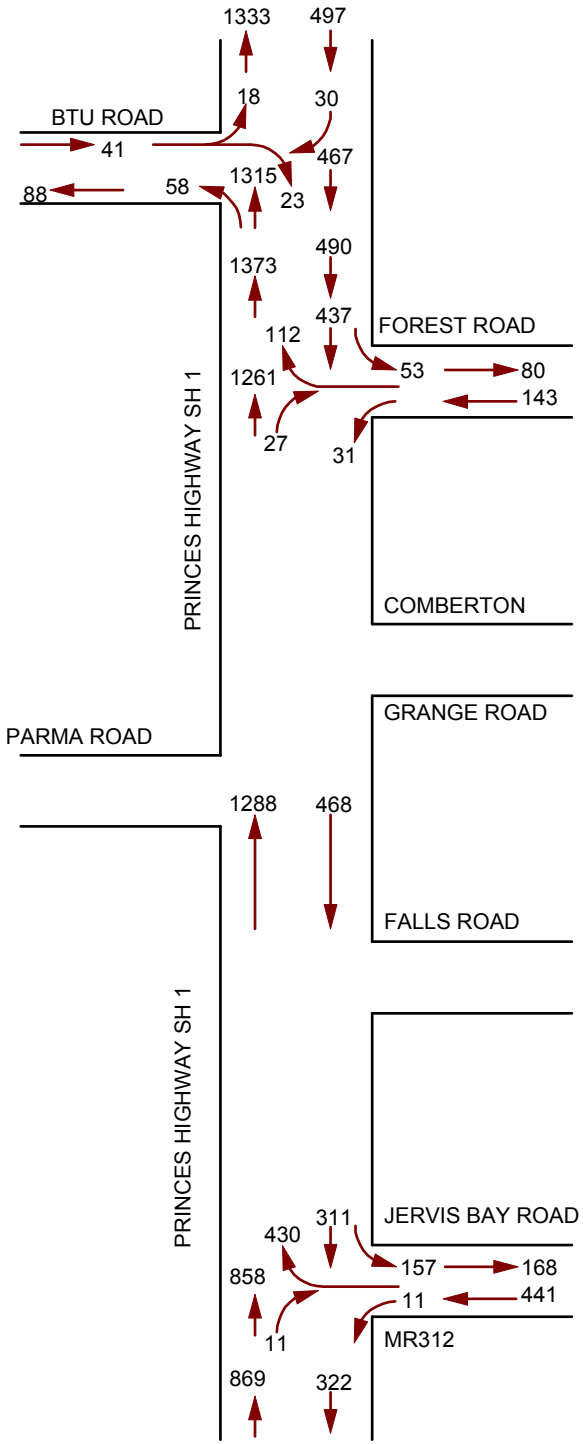


FIGURE 4a
8-9am

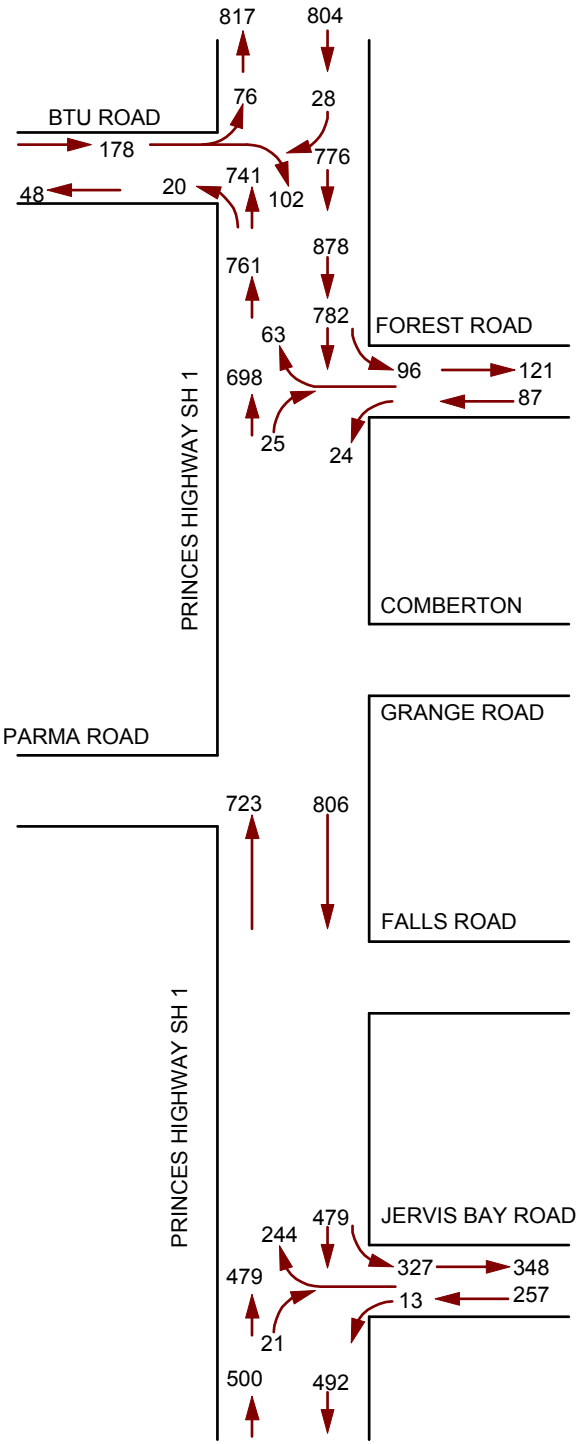


FIGURE 4b
12-1pm

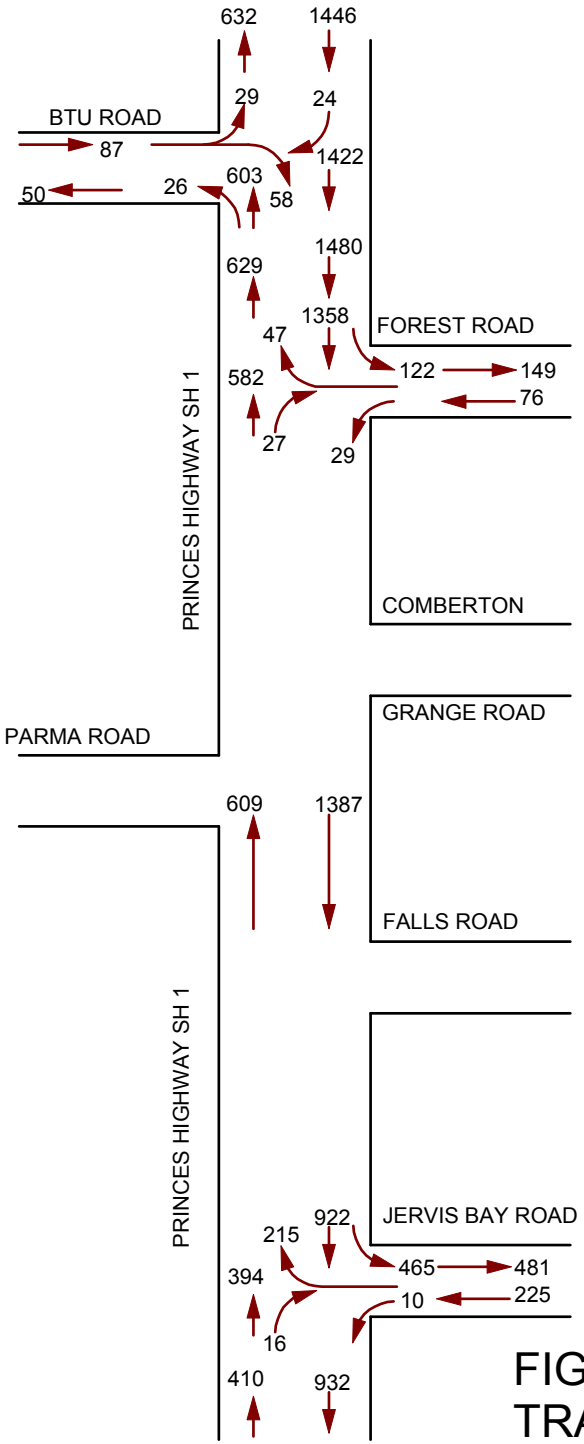


FIGURE 4c
4-5pm

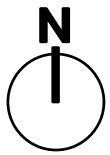
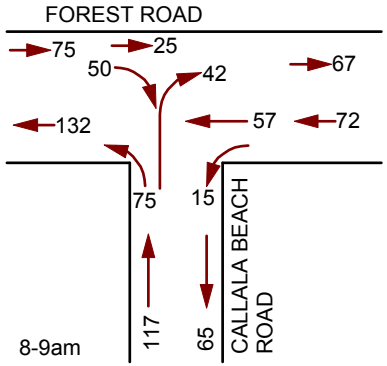
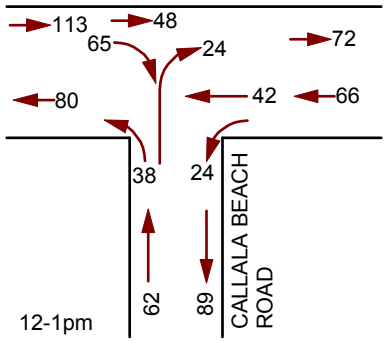


FIGURE 4 HOURLY TRAFFIC VOLUMES FRIDAY 28-10-11





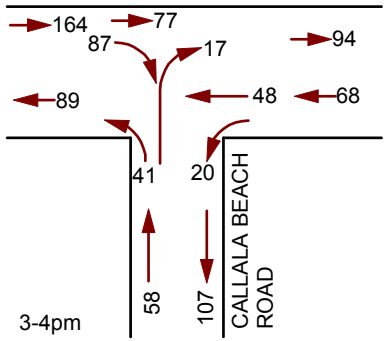
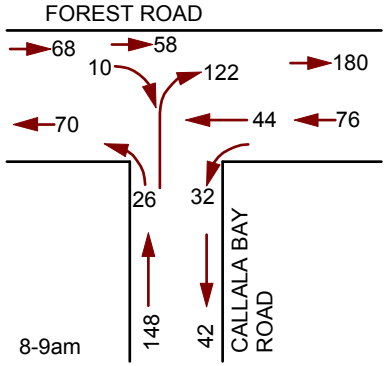
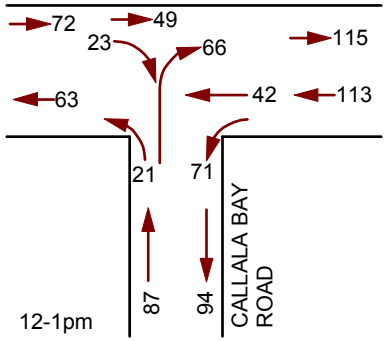


FIGURE 5a





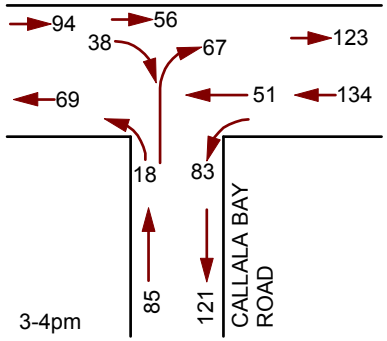
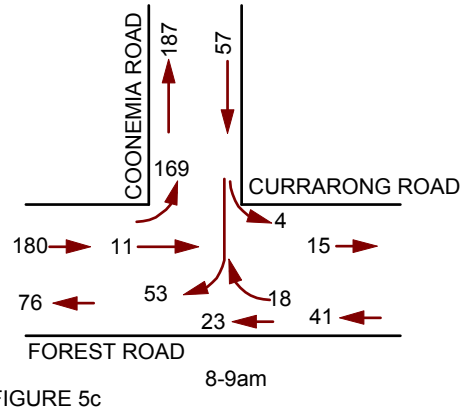
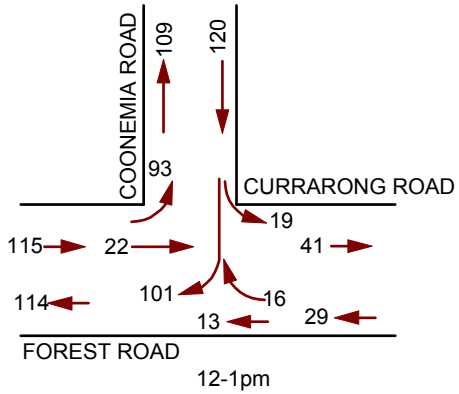


FIGURE 5b





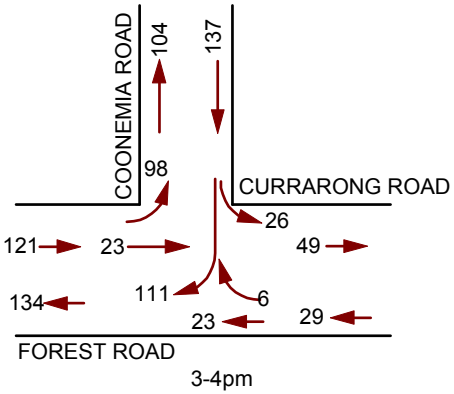


FIGURE 5c

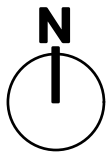


FIGURE 5
PEAK AM, PM AND MIDAY TRAFFIC VOLUMES
FRIDAY 28-10-11

2.3.3 Composition of Traffic

Analysis of the 7 day tube counts in Forest Road and Princes Highway in October 2011 shows the following percentages of heavy vehicles during the peak hours on weekdays.

Hour	Forest Road	Princes Highway
8.00-9.00am	7.25%	7.6%
12.00-1.00pm	8.0%	8.5%
4.00-5.00pm	3.7%	5.1%

The number of the largest vehicles recorded in the 7 day count were:-

Road	Class 9 Triaxle Semi	Class 10 B Double
Forest Road	22	1
Princes Highway	1110	85

2.4 Recreational Traffic Volumes 120th HH

Traffic volumes in the road system are significantly higher during the December / January holiday period.

Hourly and daily traffic volumes were provided by Shoalhaven City Council for the calendar year 2008 for Forest Road and Jervis Bay Road. This data was analysed by Council staff to determine the **AADT** and *120th Highest Hour in 2008.* Similar daily traffic volumes at *Station 07.053* in Princes Highway north of **MR 312** for the calendar years **2007** and **2008** were provided by the **RTA**, *Wollongong. Hourly Traffic Volumes* ranked in *order of magnitude* by *direction* for the period **1/7/2007** to 31/1/2007 and **1/1/2008** to **30/6/2008** were also provided. The data has been sorted/processed using Excel to obtain the *combined north and south volumes* for the corresponding hour on each day to determine the *120th highest hour*. Some of the data is missing.

The 120th highest hour 2-way traffic volumes on each road in 2008 were as follows:-

Road	Location	120th Highest Hourly Volume	Date	Day	Time	Number of Hours/Year	Percentile
SH1 Princes Highway	North of MR312	1922	15/02/08	Friday	4:00-5:00pm	366	94.81
MR 312	East of Princes Highway	743	24/02/08	Sunday	1:00-2:00pm	366	95.63
Forest Road	East of Princes Highway	232	03/01/08	Thursday	4:00-5:00pm	262	92.75
			18/01/08	Friday	4:00-5:00pm	262	92.75
			29/04/08	Tuesday	4:00-5:00pm	262	92.75

2.4 (Continued)

In email dated *23/4/2009* Scott Wells Traffic and Transport Manager advised that traffic data needs to be factored to obtain equivalent peak hour flows and 120th highest hour flows. This to ensure that the *Level of Service* on the access roads to the development does not drop below *Level of Service* (**LoS**) ***C*** for equivalent **AADT** *peak hour flow conditions* and LoS **D** for the equivalent *120th* ***HH*** *flow*.

The *two way hourly traffic volumes* in the Princes Highway at *Station 07.053* for the period *1/2/07 to 30/6/08* are ranked in order of magnitude in **Table 4** in **Appendix 3** showing the ***120th*** *Highest Hour (****HH****)*.

The ***120 HH*** for the **8:00 – 9:00am** and **4:00 – 5:00pm** weekday peak hours and the **12:00-1:00pm** *midday peak hours in 2008* have been estimated based upon the percentile of the *120th HH* in the hour in which it occurred. Where the array of volumes in the hours under investigation do not include weekends, the number of weekday hours is **262**.

In Forest Road the percentile ranking is of the **120th HH** is **92.75** and is the **19th** highest in **Table 1.** Where weekends are included, the total hours are **366** and the percentile ranking of the **120th HH** is **92.62** and is the **27th** highest in **Table 1**. In **MR 312**, the percentile ranking is **95.63** for the **120th HH** and is the **16th** highest in **Table 2A**. In Princes Highway the percentile ranking for the **120th HH** is **94.81** and is the **19th** highest in **Table 3**. These estimated **120th HH** equivalents are *shaded* in **Tables 1, 2A, 2B** and **3**.

These **120th HH** have been factored by the *annual compound growth factors* listed in **Appendix 1** to obtain estimated **120th HH** in 2011 for assessment of intersection performance using **SIDRA** under existing 120th HH traffic volumes in 2011. The intersection turning counts in **Figure 4** will be factored to estimated ***120th HH*** *turning movements in 2011*.

The turning movements at the **3** Princes Highway seagull intersections for the estimated **120th HH** in 2011 have been calculated based upon the existing turning movement distribution. These are the existing base case for SIDRA Analysis. The analysis assumes that the Princes Highway duplication is completed. The daily traffic counts in BTU Road conducted by Shoalhaven City Council in 2003 and 2011 indicate an average annual compound growth rate of **2.1%**. It has been assumed that the **120th HH volumes** show a similar pattern to Princes Highway in the **8:00 – 9:00**am, **11:00 – 12:00** noon and **4:00 – 5:00**pm *peak hour*. The turning movements at the **3** intersections are shown in **Figure 6**.

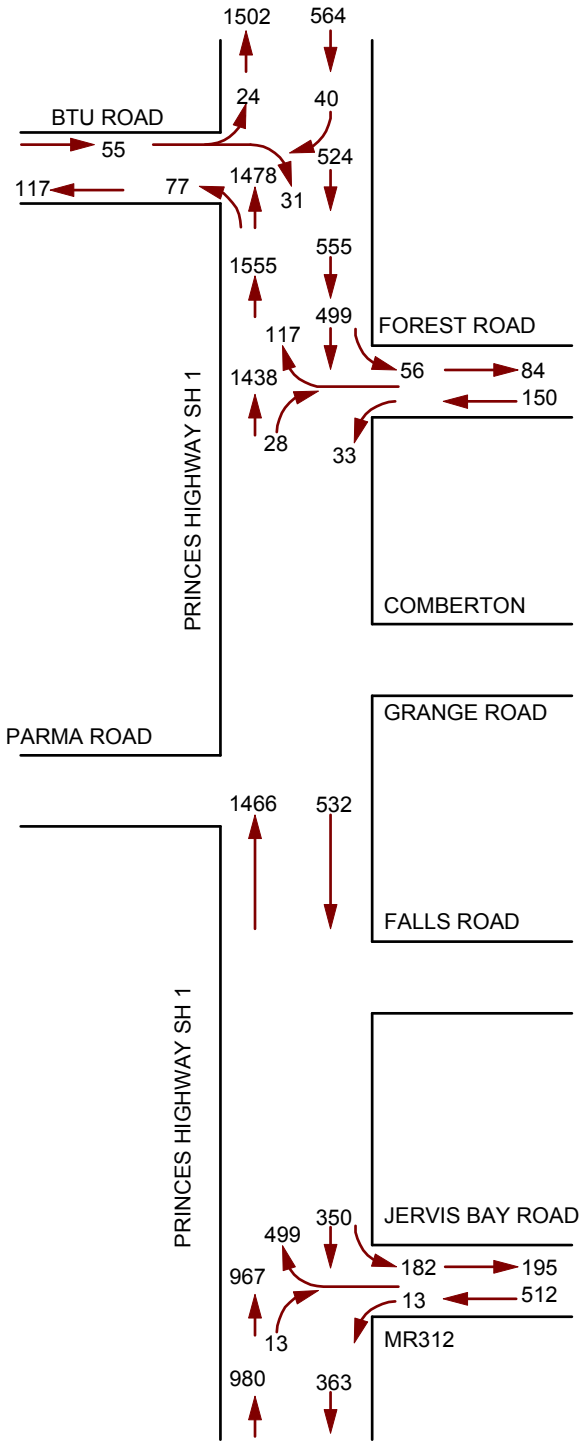


FIGURE 6a
8-9am

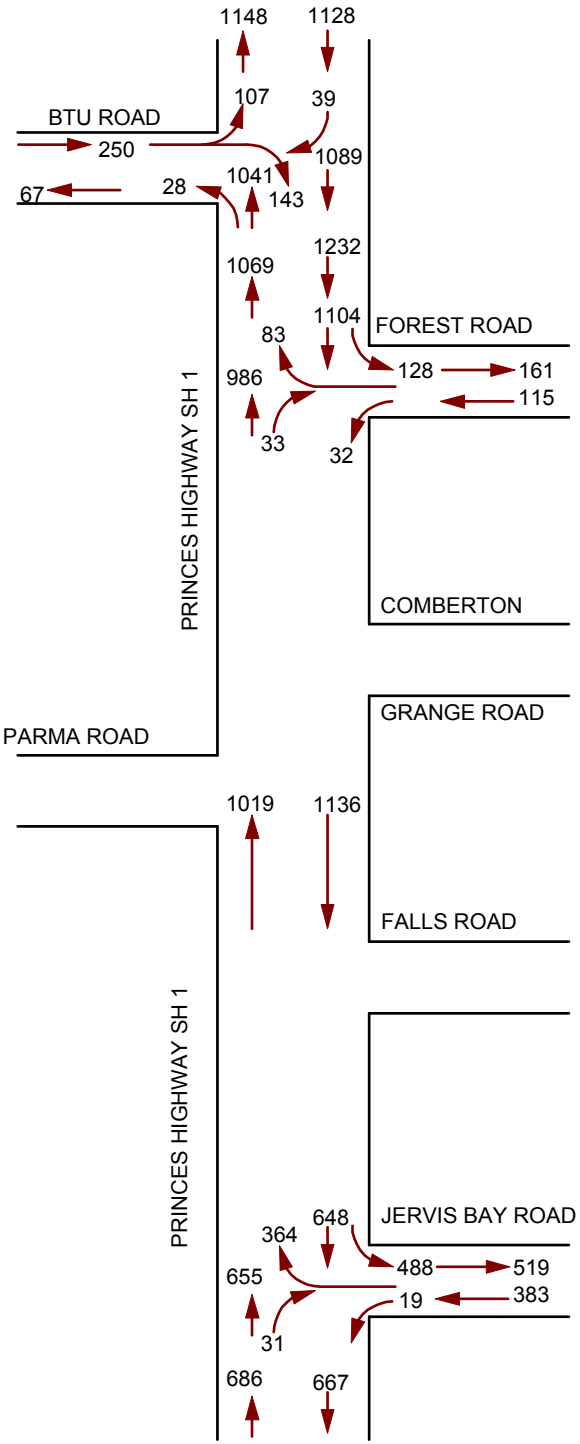


FIGURE 6b
12-1pm

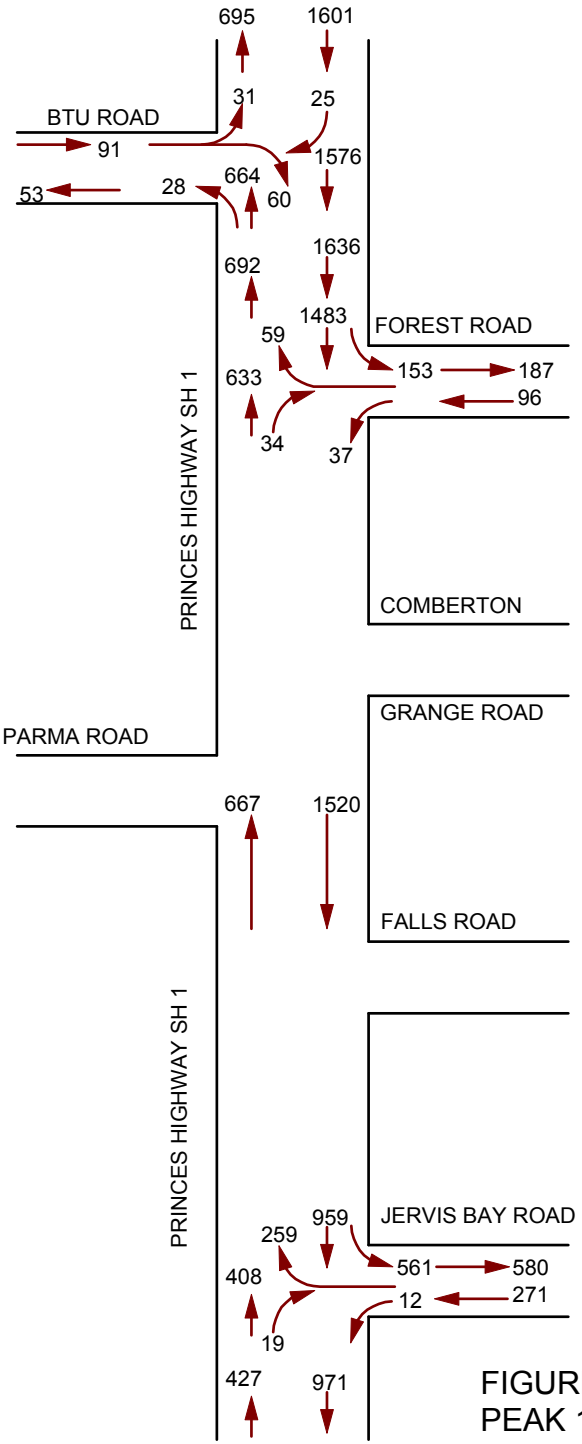


FIGURE 6c
4-5pm

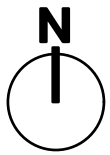


FIGURE 6
PEAK 120th H.H HOUR
RECREATIONAL TRAFFIC
VOLUMES IN BASE YEAR 2011

2.5 SIDRA Analysis

2.5.1 Levels of Service Criteria.

The impact on traffic efficiency is determined by the Level of Service (LoS) which is a qualitative assessment based upon *speed, volume of traffic, geometry of the intersection, type of control, traffic conditions upstream and downstream and type of traffic*. There are **six Levels of Service** and the Level of Service Criteria are shown in **Table 4.2** from the *RTA Guide to Traffic Generating Developments 2002*. The LoS is a qualitative measure of the performance describing operational conditions. The six Levels of Service range from **A** to **F** with **A** representing the *best operational condition* and Level of Service **F** representing the *worst.*

Table 4.2
Level of Service criteria for intersections.

Level of Service	Average Delay per Vehicle (secs/veh)	Traffic Signals, Roundabout	Give Way & Stop Signs
A	< 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	Over 70	Extra capacity required	Extreme delay, traffic signals or other major treatment required

Adapted from RTA Guide to Traffic Generating Developments, December 2002

2.5.2 SIDRA Analysis

The intersections of BTU Road, Forest Road and MR 312 with the Princes Highway have been analysed under existing (2011) 120th HH traffic volumes in the **8:00 – 9:00**am and **4:00 – 5:00**pm peak hours and the busiest midday period **12:00 noon- 1.00pm,**.

The intersection performance is shown in **Table 2.5.2.**

2.5.2 (Continued)

TABLE 2.5.2: EXISTING INTERSECTION PERFORMANCES 120th HH (SIDRA INTERSECTION 5.1)

Intersection	Peak Hour	Degree of Saturation(1)	Average Delay(2) (sec/vehicle)	Level of Service(3)	Control Type	Worst Movement
EXISTING PERFORMANCE (BASED ON RTA PLANS)						
BTU / Princess Highway	8:00 – 9:00 AM	0.40	2.4 (47.5)	**A** (Worst: D)	Giveway	Right turn into BTU
BTU / Princess Highway	12:00pm – 1:00pm	0.47	3.6 (23.7)	**A** (Worst: B)	Giveway	Right turn from BTU
BTU / Princess Highway	4:00 – 5:00 PM	0.42	1.2 (16.7)	**A** (Worst: B)	Giveway	Right turn into BTU
Forest Rd/ Princess Highway	8:00 – 9:00 AM	0.40	2.0 (16.1)	**A** (Worst: B)	Giveway	Right turn into Forest Road
Forest Rd/ Princess Highway	12:00pm – 1:00pm	0.35	2.7 (27.4)	**A** (Worst: B)	Giveway	Right turn into Forest Road
Forest Rd/ Princess Highway	4:00 – 5:00 PM	0.65	3.7 (50.4)	**A** (Worst: D)	Giveway	Right turn from Forest Road
Jervis Bay Rd/ Princess Highway (4L)	8:00 – 9:00 AM	0.71	7.9 (21.7)	**A** (Worst: B)	Giveway	Right turn from Jervis Bay Rd
Jervis Bay Rd/ Princess Highway (4L)	12:00pm – 1:00pm	0.99	15.1 (72.7)	**A** (Worst: F)	Giveway	Right turn from Jervis Bay Rd
Jervis Bay Rd/ Princess Highway (4L)	4:00 – 5:00 PM	1.04	16.4 (112.3)	**A** (Worst: F)	Giveway	Right turn from Jervis Bay Rd

NOTES:

(1) Degree of Saturation is the ratio of demand to capacity for the most disadvantaged movement.

(2) Average delay is the delay experienced on average by all vehicles. The value in brackets represents the delay to the most disadvantaged movement.

(3) Level of Service is a qualitative measure of performance describing operational conditions. There are six levels of service, designated from A to F, with A representing the best operational condition and level of service F the worst. The LoS of the intersection is shown in bold, and the LoS of the most disadvantaged movement is shown in brackets.

(4L) Represents a four lane configuration as the concept plans did not show any upgrade to this intersection.

As these intersections have been analysed under peak holiday traffic conditions, delays are expected and whilst the Level of Services is F for the right turn from Jervis Bay Road to Princes Highway, the delay on this critical movement reflects the existing situation.

The Level of Service for the critical right turn movement at BTU and Forest Road intersections with the Princes Highway are satisfactory.

2.6 Public Transport

2.6.1 Rail

The rail terminal on the Sydney to Nowra rail link is at Bomaderry north of the Shoalhaven River. The rail service requires changing trains at Kiama on route to and from Sydney. The train also stops at Berry on route to and from Kiama.

Trains operate seven days a week from Bomaderry and Berry Stations with services running at roughly two hours apart from early in the morning, to late at night. Extra commuter services run during the week.

2.6.2 Bus and Coach:

There are a number of bus routes that travel along the Princes Highway. These routes are:

- Route 732: Woollamia to Huskisson, Vincentia, Sanctuary Point, St Georges Basin, Basin View, Tomerong, Nowra and Bomaderry.

- Route 733: Erowal Bay Village to Hyams Beach, Jervis Bay Village, Wreck Bay, Nowra and Bomaderry.

3.0 COMMITTED AND PLANNED TRANSPORT INFRASTRUCTURE UPGRADING. TRANSPORT MODELLING

3.1 Public Transport

There are no planned or committed improvements in rail services to Bomaderry and bus services in the Princes Highway to Jervis Bay.

3.2 Regional Road Upgrading

The Princes Highway is to be duplicated to provide two lanes in each direction between Kinghorn Street and Forest Road, South Nowra. Work commenced on *31st October 2011* and is expected to be completed in *approximately 2 years* in late February (early March 2014). The conceptual layout prepared by the RTA and published in a Community Update in June 2011 is reproduced in **Figure 7**. These regional roadworks will be completed prior to the completion of **Stage 1** of the proposed *Shaolin Tourist Residential development*.

3.3 Transport Modelling

The **am** and **pm** peak hour and **midday** traffic counts at the Jervis Bay Road **MR 312** intersection with the Princes Highway show that over **95** per cent of traffic travelled to and from Nowra / Bomaderry. It is expected that all traffic generated by the *proposed tourist residential development* will be to and from Nowra Bomaderry. The volumes of traffic travelling east along Forest Road to Callala Bay / Carrawong / Culburra Beach / Greenwell Point will increase due to general traffic growth in the Shoalhaven region as discussed in Section *2.3.1 of this report*. The growth factors will allow for any minor traffic volumes that may be generated by the proposed development.

The **2006 ABS Census** data on '*Journey to Work in Shoalhaven LGA*' has been analysed by Shoalhaven City Council and presented in a Community Profile. The car/truck driver travel mode to work was **64.7 per cent**.

Planning Area 2 comprises Calla Bay Callala Beach, Currawong and Culburra Beach. The population declined from **6610** in **6416** in **2006.** It appears that the spike in traffic growth between 2007 and 2008 after the widening and sealing of Forest Road is due to a redistribution of traffic to Forest Road / Princes Highway and away from the Coonemia Road/Culburra Road / Greenwell Point Road route to Nowra / Bomaderry.

The percentages of trips made by trip purpose in Appendix 4 have also been obtained from the Shoalhaven City Council data base 2007 Transport Indicators Home LGA by Trip Purpose.

It is considered that the use of the Tracks Model is unnecessary because the dominant distribution of traffic to and from Nowra / Bomaderry and the dominance of the upgraded Forest Road / Princes Highway as the most convenient route.

4.0 THE PROPOSED MASTERPLAN DEVELOPMENT. STAGE 1 AND ULTIMATE

4.1 Development Context

The proposed tourist residential development at South Nowra will be the first development by the Shaolin Temple Foundation in Australia. There are a number of Shaolin Temple complexes in southern China, some of which have been inspected by Audrey Thomas, Conybeare Morrison International. There have been ongoing communications with Mr. Patrick Pang representing the Shaolin Temple Foundation and Conybeare Morrison concerning the modus operandi of the various facilities in the proposed complex. It is relevant therefore to explain the development philosophy because of the implications relating to the traffic generation and transport modes.

The festival events held by the Nan Tien Temple at Unanderra provide a good indication on the traffic generated by "out-of-towners" to these events. Nan Tien has successfully accommodated the influx of people with the use of coaches and has organised their stay within their own premises – their mini-hotel, as well as distributed the excess of international visitors to surrounding hotels/motels in Wollongong. Hence, the Nan Tien Temple has proved to be a successful contribution to the tourist industry of the Wollongong region.

However, the Nan Tien facility has the attraction of a Temple, Museum, Pagoda, Auditorium, Dining Hall but lacks major ancillary features that the Shaolin Temple and its branding will have, such as a Town Centre with an Asian tourist flavour, Kung-Fu Academy and its student exhibitions/demonstrations, the Traditional Chinese Medicine Centre, golf course, agricultural farms, education facilities and residential dwellings.

Due to the anticipated cost of each residence which will aim at a more affluent demographic, the type of buyers to this development will be:

- Chinese Nationals either middle class business people looking to live in a precinct that has a strong Chinese cultural flavour; or
  Chinese Nationals retirees who still have business interests in China, but looking for a tranquil place to retire/settle, under the Shaolin umbrella (75%);

- Middle class to rich Australians, predominantly retirees (over 55s) seeking a tree-change/sea change life style away from Sydney or Canberra, looking for a gated community lifestyle, with attraction of golf course, lovely gardens etc., maintained under a body corporate entity (25%).

All the above groups are not likely to have work commitments in Nowra or surrounding area, to require a daily pattern of travel to work.

It is anticipated that the labour force will come from the local Nowra area, with the premises likely to be run by Chinese/overseas investment (e.g. say a hotel chain, say, Hilton or Sheraton, etc.).

The justification for this development is that it will contribute to tourism in the South Coast region and the local labour force of people, goods and services.

4.1 (Continued)

Retail shops with an Asian flavour will be run by Chinese, as with any other commercial enterprise, such as import of Asian artefacts, books, religious paraphernalia and Chinese herbal medicines.

Also the Educational Academy and Traditional Chinese Medicine Centre are likely to be operated with Chinese nationals.

It is anticipated that 80% of these students will come from China (to learn English and gain an education) with the aim of future settlement in Australia and stay 1 to 2 weeks. Some may have families working in major urban centres such as Sydney and Canberra and sent here for the above purpose – a pathways educational course for integration into mainstream Australian education.

It is anticipated that there will be ultimate accreditation with the Dept of Education as a private school, similar to the Independent Schools in NSW. The school will have a religious flavour and offer a pastoral direction of belief, behaviour and discipline, with strong emphasis on martial arts as a sport.

The facility will also offer holiday programs for both local and external, as holiday camps for school children to learn the martial arts, much in the same vein as holiday camps. These could occur during the Australian school holidays.

In addition to local residents outsiders will be encouraged to play at this golf course, either as for visitors to stay all weekend as a retreat to enjoy the other facilities within the site as well as to play golf. A lot of Asians enjoy weekends away to play golf.

A good proportion of shop owners will be living within the development. Because of the housing and infrastructure costs, it is expected that 50% of shop owners will come in from outside the residential precincts.

The development will be tourist orientated but will also rely on the residents who will be encouraged to use the Town Centre as a local neighbourhood centre with convenient stores such as chemist, bakery, fast food, etc. available for those living there and not wanting to get out and get day-to-day goods except for the occasional branded supermarket shopping. A lot of residential estates in Asia have small supermarkets within the precinct that cater for meat, vegetables and other essentials, but not at exorbitant costs. Supermarkets, e.g. in Hong Kong are small branded stores (Park and Shop, Wellcome, etc) and all these stores are smallish, but with everything in them.

The Serviced apartments are expected to be occupied by overseas guests or out-of-towners, from Sydney and Canberra. These may also cater for an aged population as independent living units. This development will occur when the Town Centre is largely completed.

The Chinese and some Australians are expected to visit the Chinese Medicine Centre. Naturopathic medicine is becoming more popular, but not as mainstream as in Asia. Asians will tend to go for both. Even in basic processes such as pregnancy and common diseases, Asians in Asia adopt a combination of both Western medicine and Asian herbs for the healing process.

4.1 (Continued)

Western medicine cannot be taken for long periods of time, hence the Asian herbs are used for continual good health and for its toxic and cleansing purposes.

The development could implement programs of wellness for weekends, 5 days etc., as a treatment holiday. It is expected that local tourists would constitute 80% of clients and Chinese Nationals 20%.

The facility should operate like a normal medical centre, but focused on traditional Chinese and naturopathic medicines. It would have a small proportion of tourists coming in to visit the tourist aspects of the facility, and this one of it tourist events.

It is anticipated that persons using the meeting and hotel convention rooms will come for a day visit or be booked for say 2 days or more for a convention / seminar.

4.2 Proposed Facilities and Floor Areas

As tabulated in Section 7.6.13 Development Summary in the EA prepared by Conybeare Morrison, the proposed development facilities, land and building gross floor areas and staging of the development and staffing are as follows:-

Facility	Area (approx)	Stage 1	Maximum Development (inclusive of Stage 1)
Buddhist Sanctuary Precinct	**44 hectares**		
• Monks-in-residence (located within the Temple Precinct)	72,000m^2 (200m x 360m excluding Pagoda)	30 monks/staff	50 monks/staff
• Prayer Hall		330 seats	330 seats
Educational Precinct	**5.3 hectares**		
• Educational & residential buildings • (Students-in-residence)	12,000m^2 (2 storeys)	150 students	300 students
• Staff (in residence – 6 people)		15 people	30 people
• Sports field (+ exhibition demonstrations)			
Wellness Precinct (staff and practitioners)	**2.3 hectares**		
• Clinics for traditional Chinese medicine practitioners, treatment areas	6,000m^2 initially & up to 10,000 m^2	20 people/staff	50 people/staff
Hotel Precinct	13.4 hectares		
• Accommodation		100 rooms (200 person capacity)	218 rooms and 16/4 person cabins (500 person capacity)
4 star hotel with associated dining facilities		12 staff	30 staff
• Restaurant		100 seats	200 seats
Staff live locally		8 staff	16
from Shoalhaven Shire		16 staff	38
• Café		16 patrons	38 seats
Staff live locally		1 staff	2
From Shoalhaven Shire		3 staff	6
• Convention areas with meeting rooms for 60 & 150 people		Shared with above or temporary staff	Shared with above or temporary staff

4.2 (Continued)

Facility	Area (approx)	Stage 1	Maximum Development (inclusive of Stage 1)
Town Centre Precinct	**8 hectares**		
• Retail/commercial/dining spaces		5,000m^2	20,000m^2
		100 staff	400 staff
• Residential – serviced apartments			
• Convention Centre		300 people	600 people
• Amphitheatre (within public domain)			
Information Precinct			
• Information Centre, Museum, Gallery Administration & golf cart hire facilities		1,000m^2	1,000m^2
• Staff		4-6 staff	4-6 staff
Heritage Precinct			
• Café and lookout	150m^2 50 seats	0	50 seats
Staff from Shoalhaven Shire		0	3
Residential Precincts A, B & C			
• Dwellings		100 dwellings	300 dwellings (approx)
Residential Precinct D			
• Multi –unit residential dwellings			60 apartments
Agricultural			
• Agricultural & herbal farms • Agricultural huts		10 workers & 20 monks	10 workers & 20 monks
Recreation			
• Clubhouse (for golfers)	Up to 300m^2 50 seats	3 staff	3 staff
• Golf course	18 holes	Maintenance as above	
• Chinese garden complex			

A copy of the Masterplan, Dwg. No. 07062SK080226-01 prepared by Conybeare Morrison is reproduced and is included in this section of the report. Enlargements of the various facilities and residential precincts are included in **Appendix 5.**

4.3 Traffic Generation and Distribution

All vehicular and coach / bus trips generated by Stage 1 and the Ultimate Stage of the development have been distributed to the Forest Road / Princes Highway Route to Nowra / Bomaderry and to Sydney. The main vehicular access to the development is the northern access road to Forest Road as indicated in the Masterplan.

It is proposed that Comberton Grange Road will provide emergency access to the site from Princes Highway to the western site boundary. Within the site the existing vehicular track leading from Comberton Grange Road to the former homestead on the north eastern slopes of Currumbene Creek will be upgraded and sealed to form the internal access road to *residential precinct C*.

4.3 (Continued)

As an alternative to upgrading Comberton Grange Road as a secondary emergency fire evacuation route, it may be cost effective to upgrade a link from the collector road in *residential precinct C* to the former quarry site and upgrade the short section of existing road (track) from the quarry site to Forest Road. Traffic could then travel to the east and then north to Greenwell Point Road and thence to Nowra. If the quarry is re-opened as a source of road base materials this would provide a further incentive to upgrade this alternative route.

Hourly traffic volumes by *direction* were recorded over a *14 day* period by automatic tube counters in the access road to the Nan Tien Temple and in Berkeley Road north of the roundabout *before*, *during* and after the *Chinese New Year celebrations* at Nan Tien Temple on 14/02/2010. The *traffic volume* and classification counts and a *Summary Table 1* are included in **Appendix 6.2**.

A survey of the number of visitors present at the Nan Tien Water and Land Dharma Festival on Saturday 10/10/2009, together with a parking accumulation count are contained in **Appendix 6.1** together with a colour Brochure describing the facilities at the Nan Tien Temple. At the peak time **2:00pm** the peak attendance was estimated to be **1331** persons. The peak parking accumulation was **306** cars, **3** large coaches and **2** / 21 seat mini buses. The car occupancy from **11:00am – 12 noon** was estimated to be **2.14** *persons per car* from a 1 *hour survey*. However, based upon the patronage counts and car parking accumulation surveys, the car travel mode is estimated to be **3** *persons per vehicle*. The major differences between the Nan Tien Temple operated by the International Buddhist Association of Australia and the Shaolin Temple Tourist Residential Development to be owned by the Shaolin Temple Foundation (Australia) Ltd are:-

- 300 Residential Dwellings.
- Village Centre Retail Shopping Complex.
- 18 Hole Golf Course.
- 60 Serviced Apartments.
- Larger Tourist Hotel.
- Kung Fu Academy Martial Arts.
- Health and Wellness Centre.

4.3.1 Estimated Daily Traffic Generation 7:00am to 7:00pm, Tourist Facilities

Based upon the traffic volume counts at the Nan Tien Temple in February 2010 and patronage and parking accumulation counts at the Water and Land Dharma Festival in September 2009 it is reasonable to assume that the proposed Shaolin Tourist Residential development could generate comparable tourist patronage from **7:00am** to **7:00pm** as described in the following analysis.

		Average Weekday	Busiest	Busy	Busy	PEAK
		Chinese New Year Festival 12/2/10 to 25/2/10	Weekday During Festival Tuesday 16/2/10	Saturday 20/2/10	Sunday 221/2/10	Sunday Chinese New Year 14/2/10
Vehicular Movements		472	606	1212	1468	2790
Persons	**Car**	450	540	1360	1460	2610
	Bus/Taxi	190	220	570	610	1090

4.3 (Continued)

4.3.2 Residential Dwellings Estimated Hourly Trip Generation Weekdays and Weekends

Residential Housing – 100 Dwellings Stage 1,
300 Detached Dwellings, Ultimate

Hour	Weekdays				Weekends							
	5 Weekday Average				Saturday				Sunday			
	EAST		WEST		EAST		WEST		EAST		WEST	
	300DW	100DW	300DW	100DW	300DW	100DW	300DW	100DW	300DW	100DW	300DW	100DW
7-8am	47	16	118	39	29	10	41	14	16	5	26	9
8-9am	53	18	102	34	49	16	64	21	38	13	32	11
9-10am	48	16	85	28	56	19	60	20	65	22	64	21
10-11am	54	18	63	21	103	34	83	28	66	22	84	28
11-12noon	61	20	58	19	90	30	71	24	83	28	102	34
12-1pm	66	22	55	18	96	32	69	23	86	29	83	28
1-2pm	71	24	58	19	85	28	79	26	99	33	70	23
2-3pm	76	25	60	20	70	23	85	28	68	23	89	30
3-4pm	94	31	64	21	77	26	65	22	72	24	110	37
4-5pm	123	41	64	18	77	26	63	21	67	22	87	29
5-6pm	114	38	37	12	62	21	56	19	64	21	76	25
6-7pm	67	22	25	8	47	16	28	9	41	14	43	14
Total	872	291	779	257	840	281	763	255	765	256	866	289
Total 24Hr	1053	351	940	313	959	320	888	296	875	292	972	324

Serviced Apartments

Assumptions	Stage 1	Ultimate
Chinese Nationals Retirees	0	60 Apartments

4.3.3 Licensed Hotel – Weekdays and Weekends

Assumptions	Stage 1	Ultimate
	100 rooms (200 persons)	(218 Rooms + 16 Cabins (500 persons)
Occupancy	80% (160)	174 R + 13C
Average Length Stay	2 Nights	2 Nights
Travel Mode Car	70% - 28 cars in & 28 out/day	70% - 68 cars in/out/day
Travel Mode Mini Bus	30% - 1 coach in & out/day	30% - 2C & 1MB in/out/day
Staff	24	54
- live locally	8	16
- from Shoalhaven Shire	16	38
64.7% Driver Travel Mode car/truck	10 cars in & out/day	25 cars in & out/day

4.3.4 Kung Fu Academy (Monday to Sunday)

Assumptions		Stage 1	Ultimate
Capacity		150 students	300 students
Length of Stay		14 nights	
Travel Mode	Overseas 80%	By Coach. 2 coaches in/out per week	3 coaches in/out per week
	Aust. 20%	8 cars in and out per week	10 cars in/out per week
			1 Mini Bus in/out per week

4.3.5 Golf Course

Assumptions	Players Per Day			
	Stage 1		Ultimate	
	Weekdays	Weekends	Weekdays	Weekends
Players/day from Shoalhaven Shire/Outside Shire	50	100	50	100
Players/day local residents	20	40	50	100
Mini Bus in and out / day 21 passengers	0	1 mini bus	0	1 mb
Cars in and out/day	33	53	33	53
Car occupancy 1.5 persons				

C Coach
MB Mini-Bus
*** Coaches and Buses included in Traffic Volumes In and Out**

4.3.6 Religious Ceremonies/Convention/Auditorium

Assumption Weekdays only. No Conferences on Weekends.
One day 11:00am – 3:00pm

	Stage 1	Ultimate
Convention Centre	300 seats	600 seats
Number Delegates	180	360
Accommodation in Hotel	60	120
Accommodation in Shire	120	240
Travel Mode Coach 75% 45 per, 3 coaches /day in/out/day Car 25% @ 2 per. car, 20 cars in/out/day.		5 coaches/day in/out/day. 38 cars in/out/day.

4.3.7 TOURISM - Tourist Facilities

Temple: Temple garden; Walking Trails; Dining Facilities; Retail/Commercial Precinct; Agricultural/Herbal farm; Cultural Centre / Museum/Gallery; Pagoda, Heritage Precinct; Wellness Precinct; Amphitheatre; Information Precinct.

Visitors: **790** persons **AM** and **PM** – **369** cars.

Traffic during busy pre and post Chinese New Year Festival from Friday 12/2/10 to Thursday 25/02/10 as listed in **Appendix 6.2.**

4.3.8 Town Centre

Retail/Commercial/Dining Facilities:

Assumptions	Stage 1	Ultimate
Gross Floor Area m2	5000	20,000
GLFA (RTA 75%)	3750	15,000
Staff Normal Small Shops (1 per 20.3 GLFA)		
CM (Staff	100	400
Live Locally - 50%	50	200
Car Occupancy 1.2 No Cars in / out/day 8am-5pm Hourly Nowra Bus Service.	 42 Passengers - 0	 67 120

All customers are tourists and local residents.

4.3.9 Miscellaneous Employees

(i) Information Centre	Stage 1	Ultimate
No. of Staff Local	0	0
Shire	4	6
Number of Cars in/out/day Car Driver Travel Mode 64.7%	3	4
(ii) Wellness Precinct		
Building Floor Area GFA	6000	10,000
Staff / Practitioners	20	50
Live Locally	0	10
Live in Shire External	20	40
Nowra Bus Service	10	20
Car Driver Trips in/out/day	6	12

4.3 (Continued)

4.3.9 (Cont)

	Stage 1	Ultimate
(iii) Heritage Café	0	
Patronage – Tourist and Local Residents		
Area (seats)	0	50
Staff	0	3
Car Driver Trips in/out/day	0	3
Car Driver Mode 64.7%		
(iv) Agricultural Workers		
Live Externally	10	10
Car Driver Trips in/out/day	6	6
Car Driver Mode 64.7%		

4.3.10 (a) Total External Hourly Traffic Generation Busy Weekday

Stage 1

Time Interval	Residential		Tourist Facilities *		Licensed Hotel		Golf Course		Kung Fu Academy		Religious Convention/Auditorium		Miscellaneous Workers		Total Traffic	
	In	Out	In	Out	In	Out	In	Out	In	Out	In	Out	In	Out	In	Out
7-8am	16	39	1	0			19						6		42	39
8-9am	18	34	13	7	10		16		10		2C,MB 22C		3		85	41
9-10am	16	28	20	5		7			C,2	C			6		45	41
10-11am	18	21	42	21	C	C, 14				2					61	59
11-12.00	20	19	43	85	3	7									66	111
12-1pm	22	18	53	45	7			17							82	80
1-2pm	24	19	22	55	7			16							53	90
2-3pm	25	20	24	39	7										56	59
3-4pm	31	21	18	44	4			2						6	53	73
4-5pm	41	18	11	29								2C,MB 22C			52	72
5-6pm	38	12	5	20		10				10				9	43	51
6-7pm	22	8	1	3											23	11
TOTAL	**291**	**257**	**253**	**353**											**661**	**727**
24 Hr	**664**		**626**												**1598**	

Ultimate

Time Interval	Residential		Tourist Facilities *		Licensed Hotel		Golf Course		Kung Fu Academy		Religious Convention/Auditorium		Miscellaneous Workers		Total Traffic	
	In	Out	In	Out	In	Out	In	Out	In	Out	In	Out	In	Out	In	Out
7-8am	47	118	1	0			19						6		73	118
8-9am	53	102	13	7	25		16		20		6C,MB 45		7		166	109
9-10am	48	85	20	5		17			2C, MB 2	2C, MB			12		85	110
10-11am	54	63	42	21	1C, 1MB	1C,MB, 34				2					98	122
11-12.00	61	58	43	85	8	17									112	160
12-1pm	66	55	53	45	17			17							136	117
1-2pm	71	58	22	55	17			16							110	129
2-3pm	76	60	24	39	17										117	99
3-4pm	94	64	18	44	9			2						6	121	116
4-5pm	123	54	11	29										3	134	138
5-6pm	114	37	5	20		25				20				16	119	98
6-7pm	67	25	1	3											68	28
TOTAL	**872**	**779**	**253**	**353**										**Total**	**1339**	**1344**
24 Hr	**2215**		**626**												**3084**	

C Coach
MB Mini-Bus
*** Coaches and Buses included in Traffic Volumes In and Out**

4.3.10 (b) Total External Hourly Traffic Generation Saturday

Stage 1

Time Interval	Residential		Tourist Facilities *		Licensed Hotel		Golf Course		Kung Fu Academy		Religious Convention/Auditorium		Miscellaneous Workers		Total Traffic	
	In	Out	In	Out	In	Out	In	Out	In	Out	In	Out	In	Out	In	Out
7-8am	10	14	1	3			29								40	17
8-9am	16	21	17	5	10		26		10				3		82	26
9-10am	19	20	27	12		7	MB						6		53	39
10-11am	34	28	53	19	C	C, 14									88	62
11-12.00	30	24	84	28	3	7									117	59
12-1pm	32	23	110	75	7			27							149	125
1-2pm	28	26	91	92	7			26							126	144
2-3pm	23	28	72	89	7			MB							102	118
3-4pm	26	22	73	102	4			2							103	126
4-5pm	26	21	46	81											72	101
5-6pm	21	19	39	49		10				10				9	60	97
6-7pm	16	9	23	21											39	30
TOTAL	**281**	**255**	**636**	**576**											**1031**	**944**
24 Hr	**616**		**1332**												**2243**	

Ultimate

Time Interval	Residential		Tourist Facilities *		Licensed Hotel		Golf Course		Kung Fu Academy		Religious Convention/Auditorium		Miscellaneous Workers		Total Traffic	
	In	Out	In	Out	In	Out	In	Out	In	Out	In	Out	In	Out	In	Out
7-8am	29	41	1	3			29								59	44
8-9am	49	64	17	5	25		26		20				7		138	69
9-10am	56	60	27	12		17	MB						12		96	89
10-11am	103	83	53	19	C,MB	C,MB 34									158	138
11-12.00	90	71	84	28	8	17									182	116
12-1pm	96	69	110	75	17			27							223	171
1-2pm	85	79	91	92	17			26							193	197
2-3pm	70	85	72	89	17			MB							159	175
3-4pm	77	65	73	102	9			2							159	169
4-5pm	77	63	46	81										3	123	147
5-6pm	62	56	39	49		25				20				16	101	166
6-7pm	47	28	23	21											70	49
TOTAL	**840**	**763**	**636**	**576**										**Total**	**1661**	**1520**
24 Hr	**1815**		**1332**												**3750**	

C Coach
MB Mini-Bus
*** Coaches and Buses included in Traffic Volumes In and Out**

4.3.10 (c) Total External Hourly Traffic Generation Sunday

Stage 1

Time Interval	Residential		Tourist Facilities *		Licensed Hotel		Golf Course		Kung Fu Academy		Religious Convention/ Auditorium		Miscellaneous Workers		Total Traffic	
	In	Out	In	Out	In	Out	In	Out	In	Out	In	Out	In	Out	In	Out
7-8am	5	9	0	4			29								34	13
8-9am	13	11	12	18	10		26		10				3		74	29
9-10am	22	21	47	30		7	MB		C, 2	C			6		79	59
10-11am	22	28	90	36	C	C 14				2					113	81
11-12.00	28	34	149	48	3	7									180	82
12-1pm	29	28	121	131	7			27							157	186
1-2pm	33	23	93	152	7			26							133	201
2-3pm	23	30	82	124	7			MB							112	155
3-4pm	24	37	44	112	4			2							72	151
4-5pm	22	29	29	81											51	110
5-6pm	21	25	9	36		10				10				9	30	90
6-7pm	14	14	6	14											20	28
TOTAL	**256**	**289**	**682**	**786**											**1055**	**1185**
24 Hr	**616**		**1580**												**2910**	

C Coach
MB Mini-Bus
*** Coaches and Buses included in Traffic Volumes In and Out**

4.3.10 (c) (Continued)

Ultimate

Time Interval	Residential		Tourist Facilities *		Licensed Hotel		Golf Course		Kung Fu Academy		Religious Convention/ Auditorium		Miscellaneous Workers		Total Traffic	
	In	Out	In	Out	In	Out	In	Out	In	Out	In	Out	In	Out	In	Out
7-8am	16	26	0	4			29								45	30
8-9am	38	32	12	18	25		26		20				7		128	50
9-10am	65	64	47	30		17	MB		2C,MB 2	2C, MB			12		307	114
10-11am	66	84	90	36	C,MB	C,MB 34				2					158	158
11-12.00	83	102	149	48	8	17									240	167
12-1pm	86	83	121	131	17			27							224	241
1-2pm	99	70	93	152	17			26							209	248
2-3pm	68	89	82	124	17			MB							167	214
3-4pm	72	110	44	112	9			2							125	224
4-5pm	67	87	29	81										3	96	171
5-6pm	64	76	9	36		25				20				16	73	173
6-7pm	41	43	6	14											47	57
TOTAL	**765**	**866**	**682**	**786**										**Total**	**1819**	**1847**
24 Hr	**1847**		**1580**												**4385**	

C Coach
MB Mini-Bus
*** Coaches and Buses included in Traffic Volumes In and Out**

4.3.10 (d) Total External Hourly Traffic Generation Peak Sunday

Stage 1

Time Interval	Residential		Tourist Facilities *		Licensed Hotel		Golf Course		Kung Fu Academy		Religious Convention/ Auditorium		Miscellaneous Workers		Total Traffic	
	In	Out	In	Out	In	Out	In	Out	In	Out	In	Out	In	Out	In	Out
7-8am	5	9	14	5			29								48	14
8-9am	13	11	69	22	10		26		10				3		131	33
9-10am	22	21	196	46		7	MB		C, 2	C			6		228	75
10-11am	22	28	287	134	C	C 14				2					310	179
11-12.00	28	34	97	199	3	7									128	240
12-1pm	29	28	105	190	7			27							141	245
1-2pm	33	23	100	212	7			26							140	261
2-3pm	23	30	137	174	7			MB							167	205
3-4pm	24	37	139	269	4			2							167	308
4-5pm	22	29	56	208											78	237
5-6pm	21	25	14	84		10				10				9	35	138
6-7pm	14	14	6	27											20	41
TOTAL	**256**	**289**	**1220**	**1570**											**1593**	**1976**
24 Hr	**616**		**3138**												**3630**	

Ultimate

Time Interval	Residential		Tourist Facilities *		Licensed Hotel		Golf Course		Kung Fu Academy		Religious Convention/ Auditorium		Miscellaneous Workers		Total Traffic	
	In	Out	In	Out	In	Out	In	Out	In	Out	In	Out	In	Out	In	Out
7-8am	16	26	14	5			29								59	31
8-9am	38	32	69	22	25		26		20				7		178	54
9-10am	65	64	196	46		17	MB		2C,MB 2	2C, MB			12		279	130
10-11am	66	84	287	134	C,MB	C,MB 34				2					355	256
11-12.00	83	102	97	199	8	17									188	318
12-1pm	86	83	105	190	17			27							208	300
1-2pm	99	70	100	212	17			26							216	308
2-3pm	68	89	137	174	17			MB							222	264
3-4pm	72	110	139	269	9			2							220	381
4-5pm	67	87	56	208										3	123	298
5-6pm	64	76	14	84		25				20				16	78	221
6-7pm	41	43	6	27											47	70
TOTAL	**765**	**866**	**1220**	**1570**										**Total**	**2173**	**2631**
24 Hr	**1847**		**3138**												**4985**	

C Coach
MB Mini-Bus

- **Coaches and Buses included in Traffic Volumes In and Out**

4.4 Future 120th HH Traffic Volumes 2021

The **120th HH** traffic volumes shown in **Figure 6** have been increased by the compound annual growth rate stated in Section 2.3.1 for Forest Road MR312, BTU Road and Princes Highway for the 10 year period 2011 to 2021.

The 10 year growth factors are:

Princes Highway SH1	:	1.2480
Jervis Bay Road MR312	:	1.280
Forest Road	:	1.280
BTU Road	:	1.2310

The estimated development traffic for weekdays in Tables 4.3.10 a) Stage 1 and ultimate has been added to the 120th HH 8.00-9.00am and 4.00-5.00pm traffic to obtain the design hourly volumes.

On weekends the highest midday hour in Forest Road was 12.00-1.00pm on Saturday and this hour has been selected as the 120th HH. The estimated 120th in 2011 shown in **Figure 6** has been factored by the growth rate in **Appendix 1** for the 10 year period 2011 to 2021.

The development traffic is estimated for 12.00-1.00pm on Saturday in Tables 4.3.10 b) Stage 1 and ultimate to provide the design flows for SIDRA analysis. It has been assumed that 95 percent of the development traffic travels to and from Nowra/Bomaderry on SH1.

The 120th HH flows in 2021 without the development traffic and are illustrated in **Figure 8.** The general traffic volumes plus the development traffic Stage 1 are shown in **Figure 9** and general traffic plus development traffic ultimate are shown in **Figure 10**.

The peak Sunday development traffic is expected to occur once a year and is an extreme event. The major intersections should not be designed to provide for this extreme event and the **120th HH**.

The development will have a northern access road connection to Forest Road. The 120th HH volumes plus Stage 1 and Ultimate development traffic are shown in **Figure 11**.

4.4 SIDRA Analysis

The intersections of BTU Road, Forest Road and MR312 (Jervis Bay Road) with the Princes Highway and the proposed development northern access road / Forest Road intersection have been analysed under future 2021 traffic conditions as, listed below:-

Future 120th HH	Future 120th HH plus Development Stage 1	Future 120th HH plus Ultimate Development
8.00-9.00am	8.00-9.00am	8.00-9.00am
12 noon–1.00pm	12 noon–1.00pm	12 noon–1.00pm
4.00-5.00pm	4.00-5.00pm	4.00-5.00pm

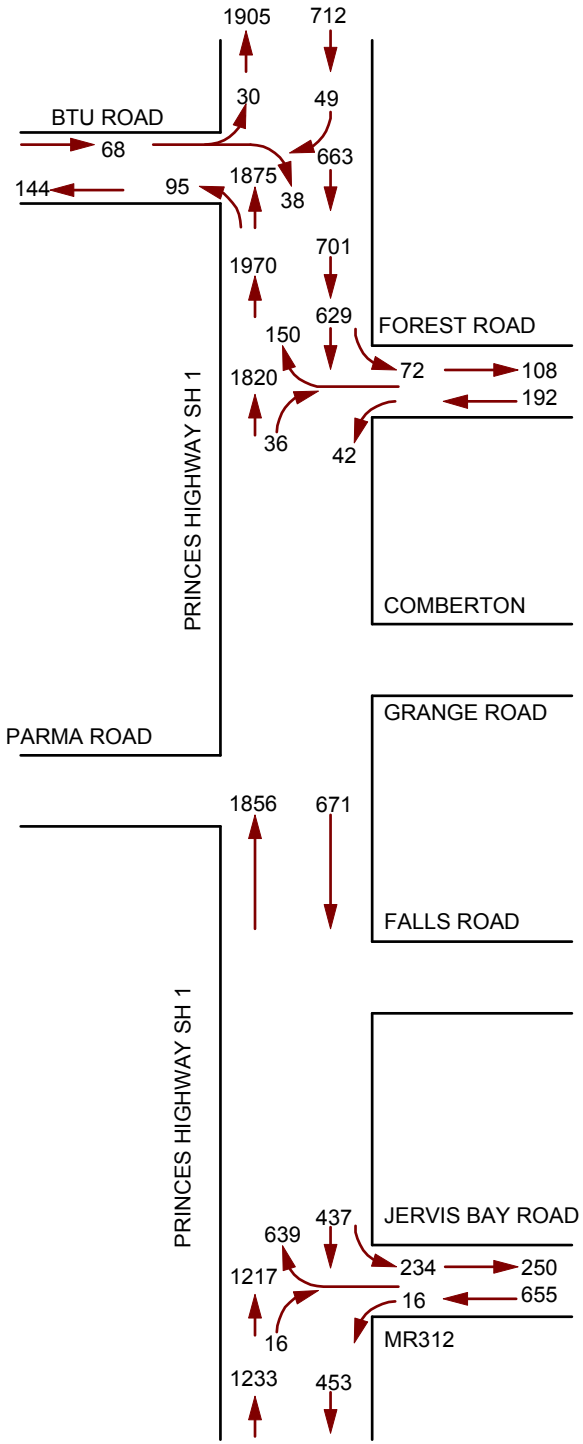


FIGURE 8a
8-9am

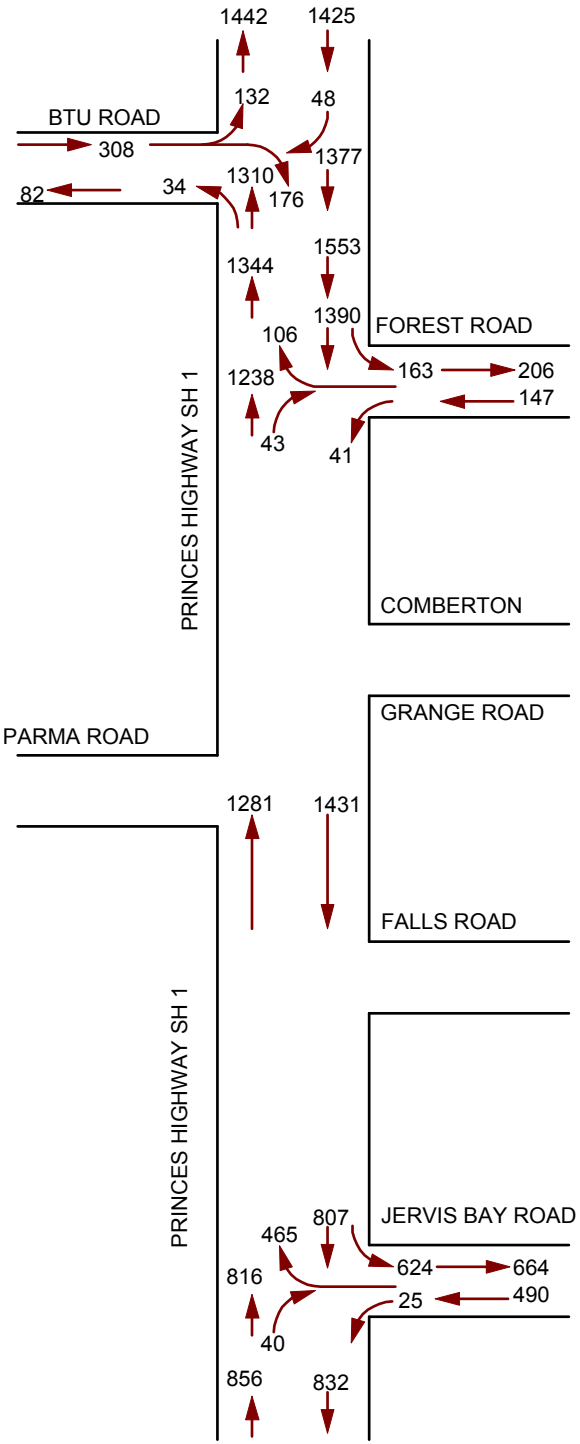


FIGURE 8b
12-1pm

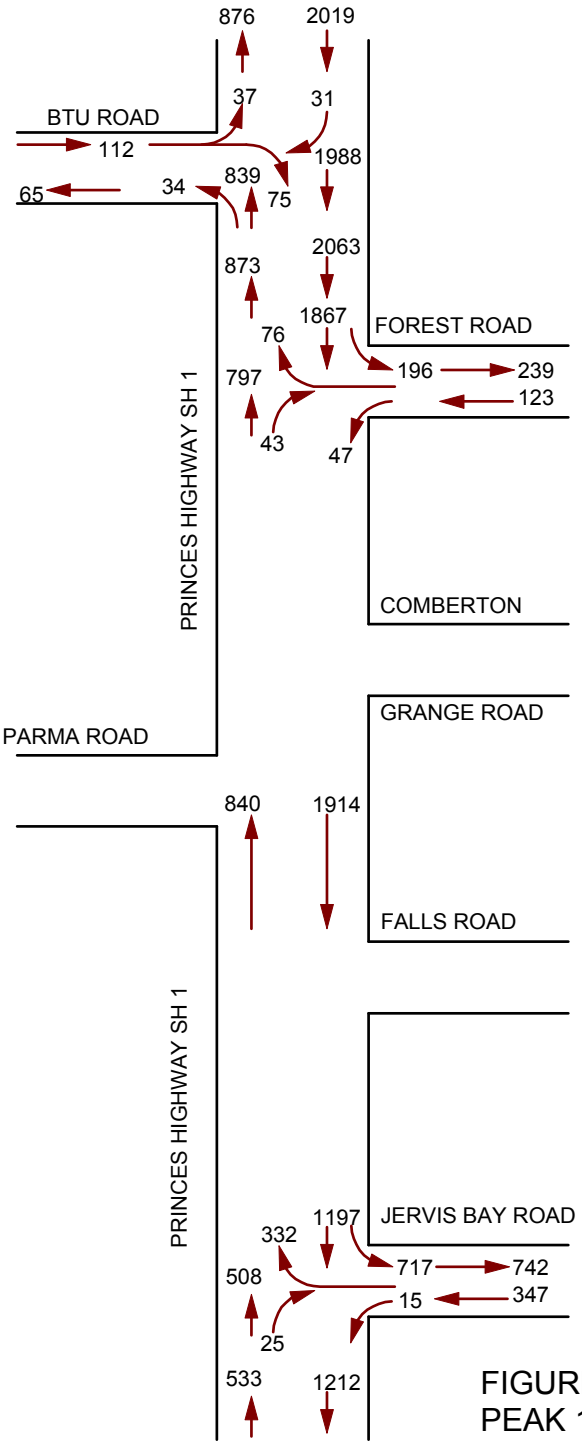


FIGURE 8c
4-5pm

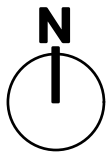


FIGURE 8
PEAK 120th H.H HOUR
RECREATIONAL TRAFFIC
VOLUMES IN YEAR 2021

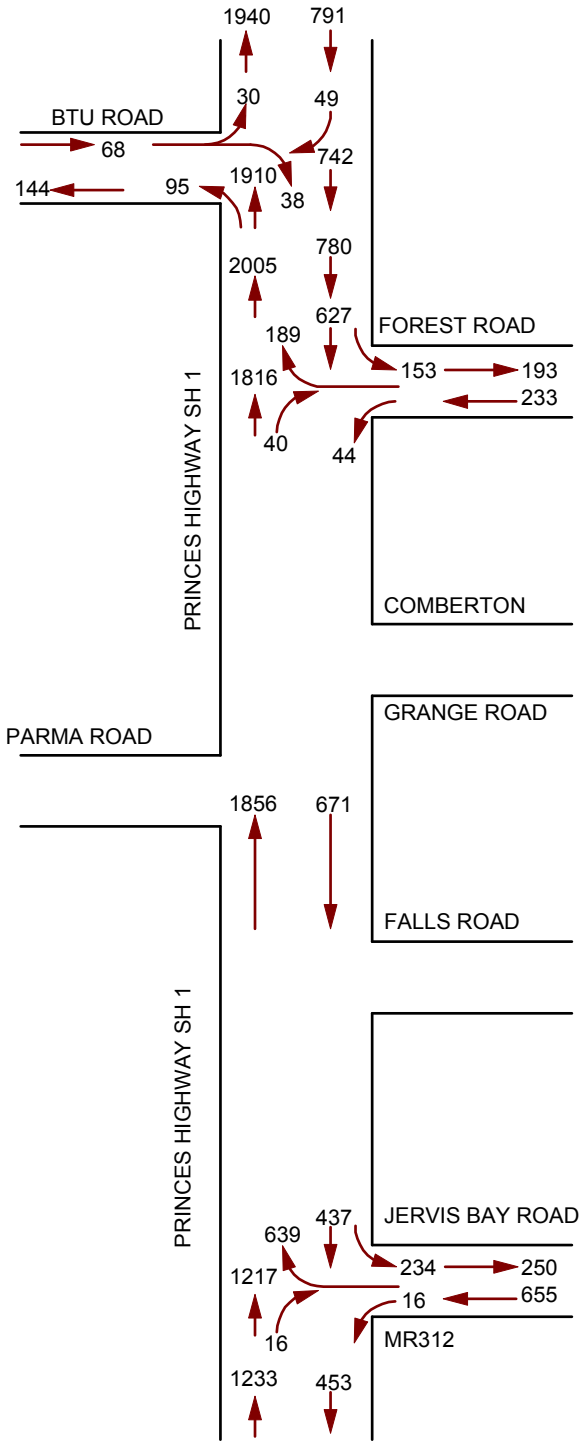


FIGURE 9a
8-9am

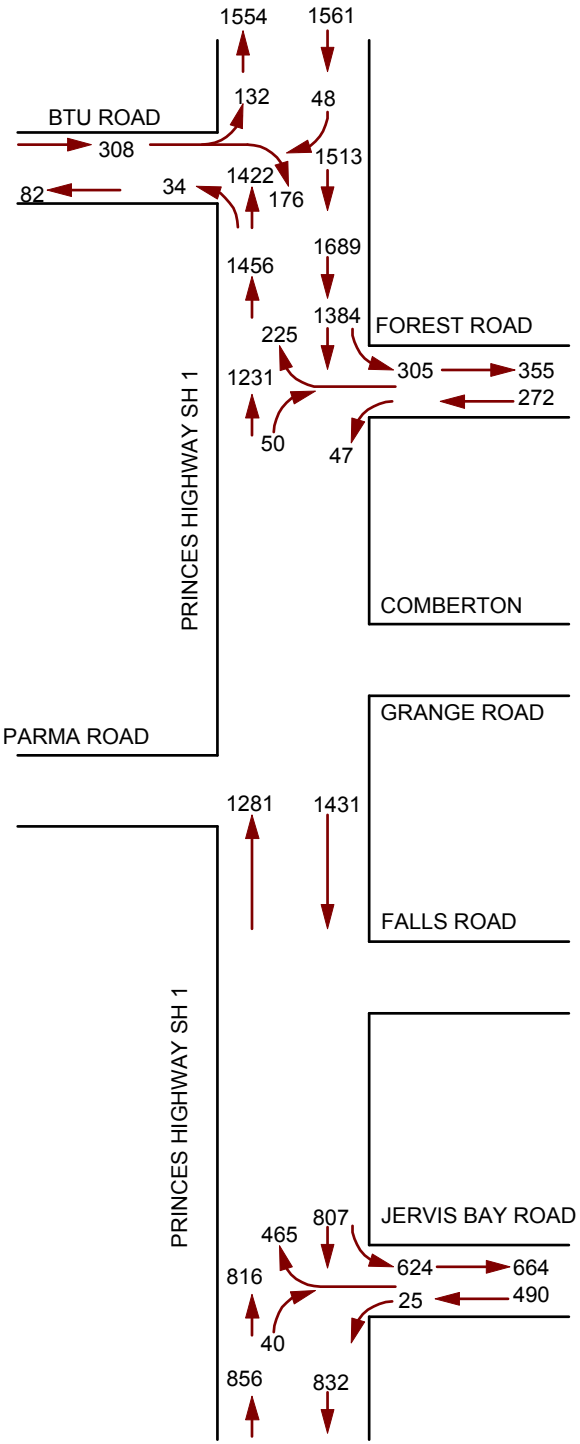


FIGURE 9b
12-1pm

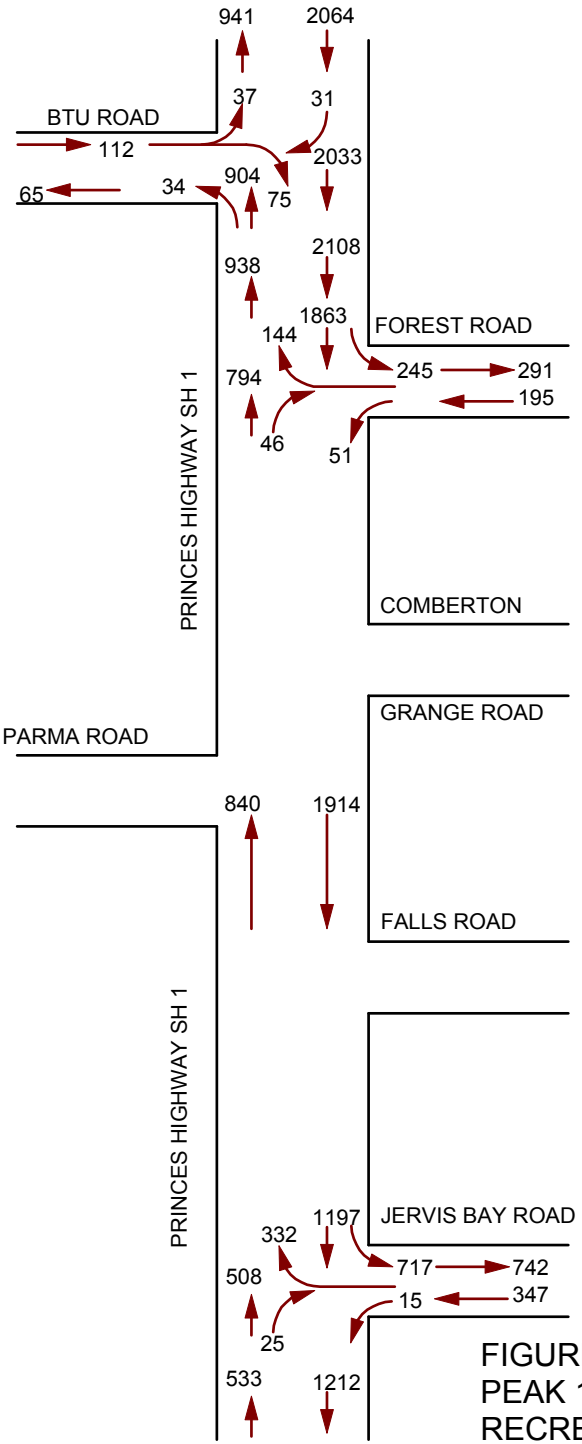


FIGURE 9c
4-5pm

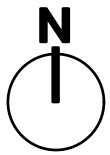


FIGURE 9
PEAK 120th H.H HOUR
RECREATIONAL TRAFFIC
VOLUMES IN YEAR 2021 PLUS
DEVELOPMENT STAGE 1

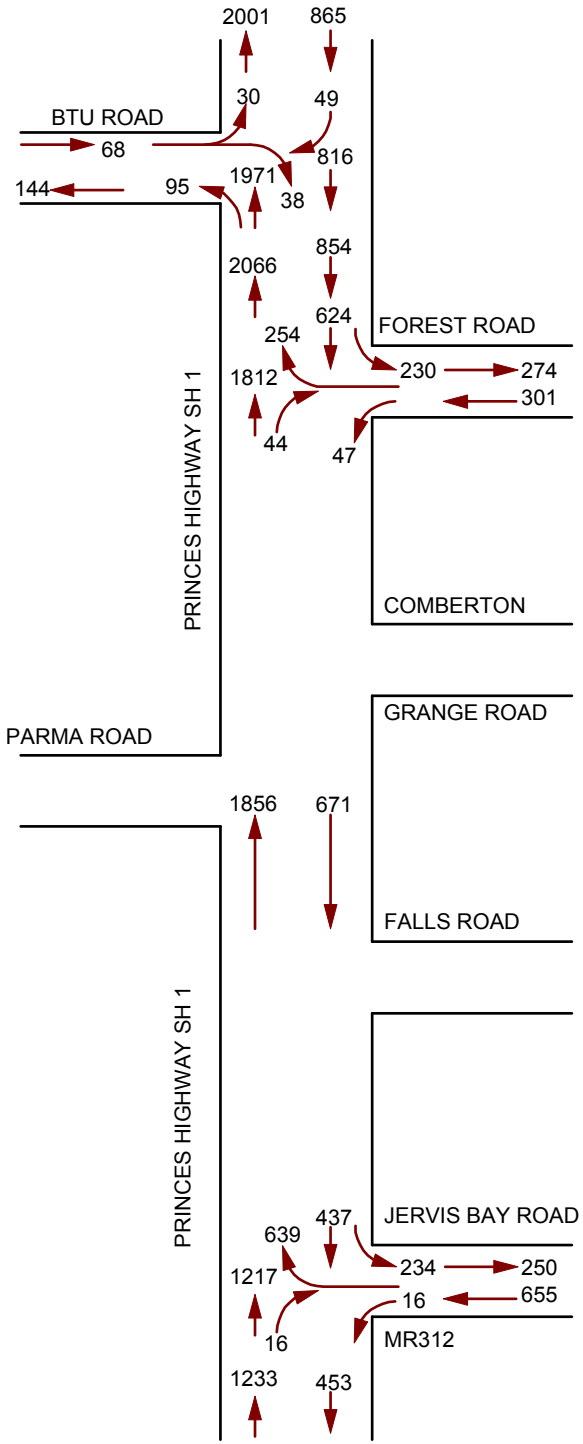


FIGURE 10a
8-9am

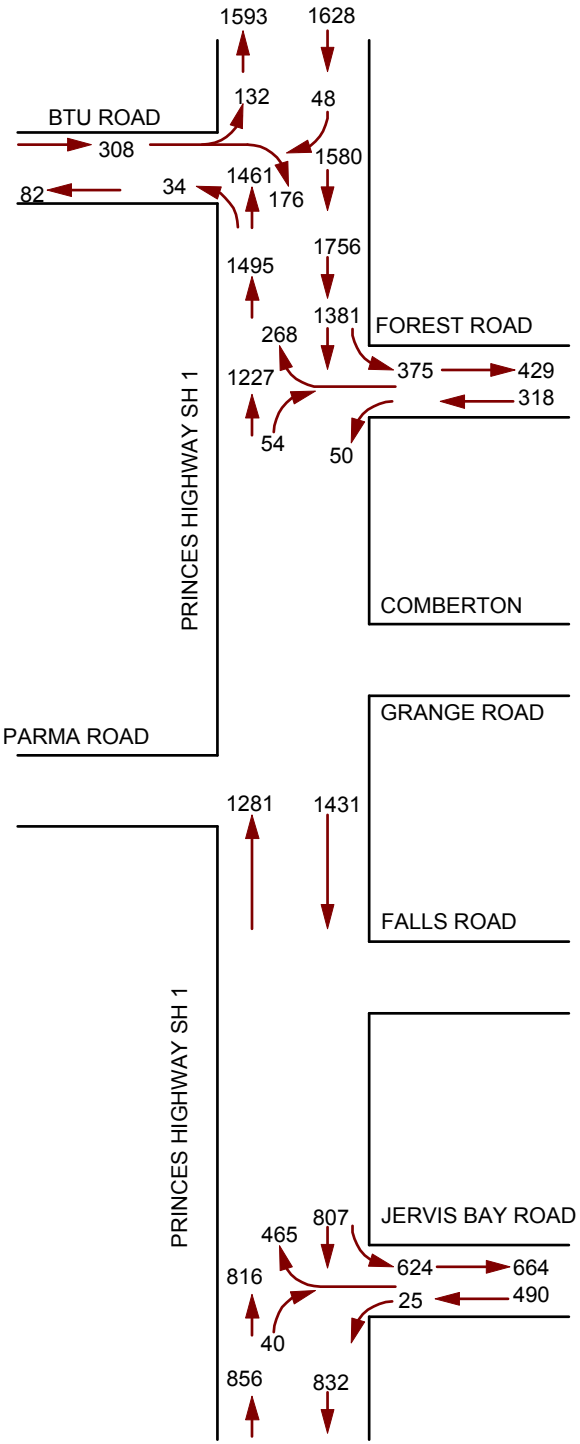


FIGURE 10b
12-1pm

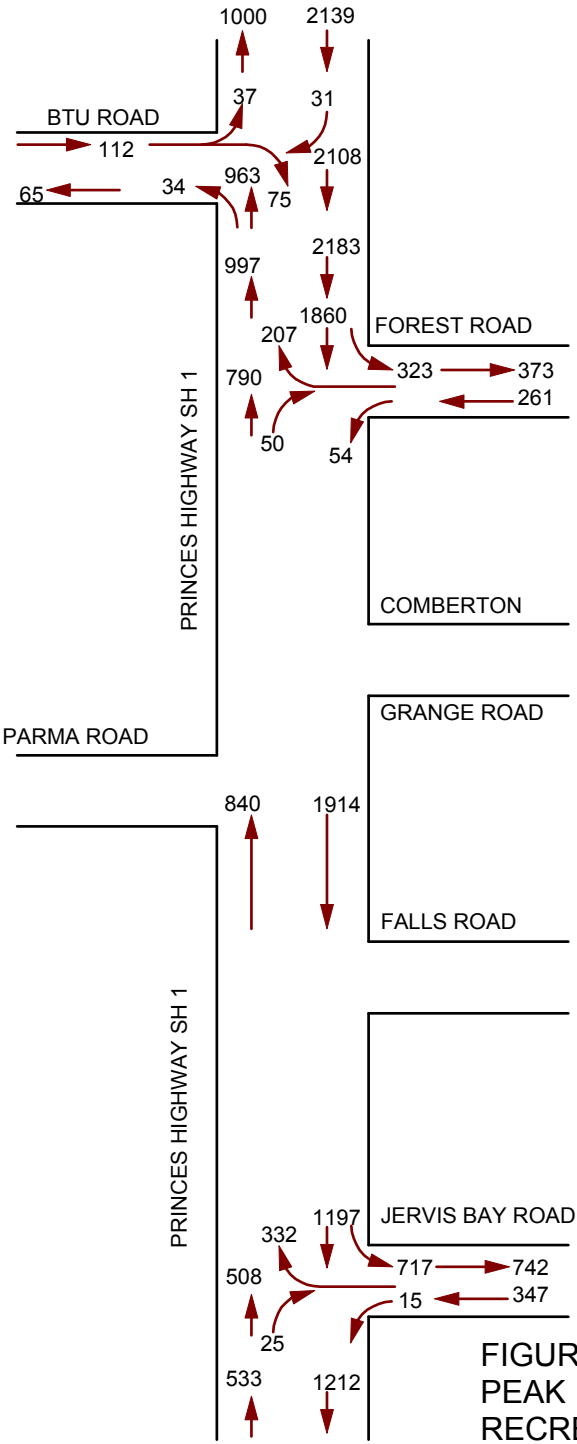


FIGURE 10c
4-5pm

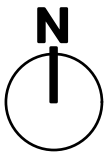


FIGURE 10
PEAK 120th H.H HOUR
RECREATIONAL TRAFFIC
VOLUMES IN YEAR 2021 PLUS
ULTIMATE DEVELOPMENT

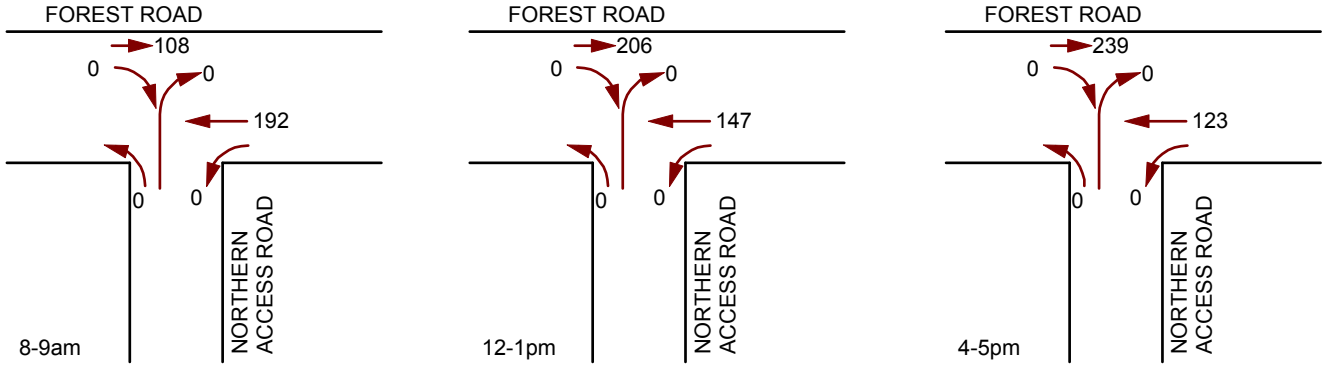


FIGURE 11a NO DEVELOPMENT TRAFFIC FUTURE 120th H.H

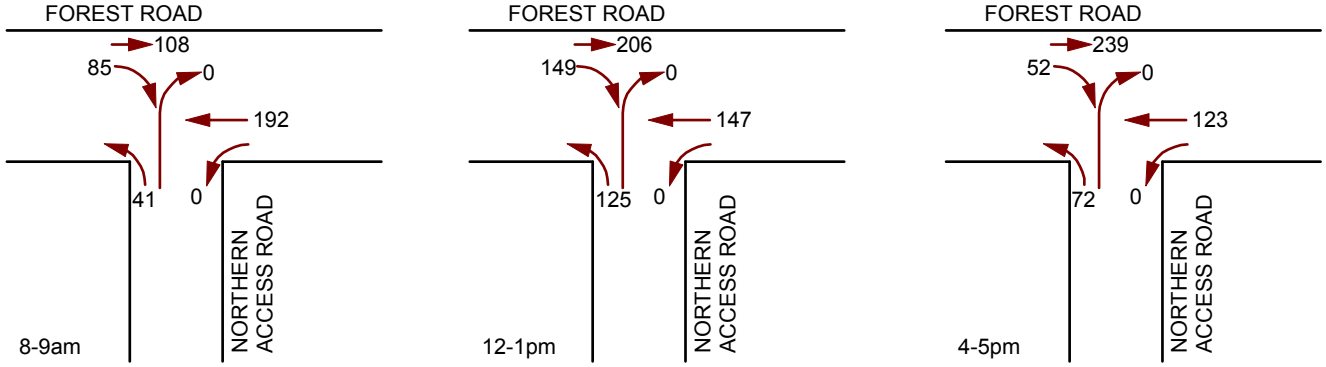


FIGURE 11b FUTURE 120th H.H PLUS STAGE 1 DEVELOPMENT

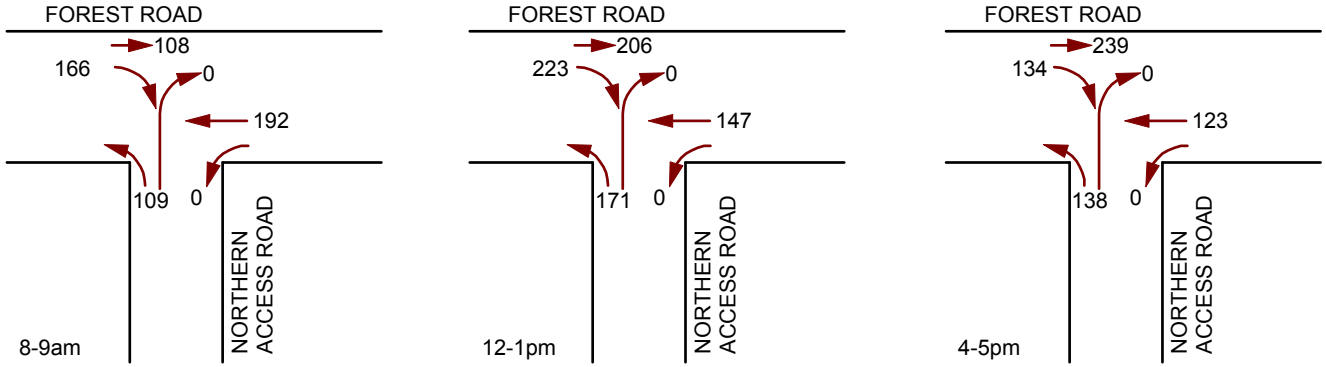


FIGURE 11c FUTURE 120th H.H PLUS ULTIMATE DEVELOPMENT

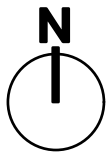


FIGURE 11
FUTURE TRAFFIC VOLUMES 120th H.H 2021
NORTHERN ACCESS ROAD / FOREST ROAD

4.5 (Continued)

The future intersection performance is shown in **Tables 4.5.1, 4.5.2** and **4.5.3** for the **3** *cases*.

TABLE 4.5.1: FUTURE 2021 INTERSECTION PERFORMANCES (SIDRA INTERSECTION 5.1)

Intersection	Peak Hour	Degree of Saturation[1]	Average Delay[2] (sec/vehicle)	Level of Service[3]	Control Type	Worst Movement
2021 PERFORMANCE						
BTU / Princess Highway	8:00 – 9:00 AM	1.00	6.8 (236.8)	**A** (Worst: F)	Giveway	Right turn into BTU
BTU / Princess Highway	12:00pm – 1:00pm	0.89	6.6 (69.2)	**A** (Worst: E)	Giveway	Right turn from BTU
BTU / Princess Highway 4L	4:00 – 5:00 PM	0.55	1.3 (19.8)	**A** (Worst: B)	Giveway	Right turn into BTU
Forest Rd/ Princess Highway 4L	8:00 – 9:00 AM	0.49	2.1 (17.5)	**A** (Worst: B)	Giveway	Right turn into Forest Road
Forest Rd/ Princess Highway	12:00pm – 1:00pm	0.77	4.4 (63.6)	**A** (Worst: E)	Giveway	Right turn from Forest Road
Forest Rd/ Princess Highway 4L	4:00 – 5:00 PM	1.14	12.5 (284.0)	**A** (Worst: F)	Giveway	Right turn from Forest Road
Jervis Bay Rd/ Princess Highway (4L)	8:00 – 9:00 AM	1.05	20.8 (85.9)	**A** (Worst: F)	Giveway	Right turn from Jervis Bay Rd
Jervis Bay Rd/ Princess Highway (4L)	12:00pm – 1:00pm	1.82	116.8 (779.9)	**A** (Worst: F)	Giveway	Right turn from Jervis Bay Rd
Jervis Bay Rd/ Princess Highway (4L)	4:00 – 5:00 PM	2.25	129.7 (1176.1)	**A** (Worst: F)	Giveway	Right turn from Jervis Bay Rd

TABLE 4.5.2: FUTURE 2021 + STAGE 1 INTERSECTION PERFORMANCES (SIDRA INTERSECTION 5.1)

Intersection	Peak Hour	Degree of Saturation[1]	Average Delay[2] (sec/vehicle)	Level of Service[3]	Control Type	Worst Movement
2021+ STAGE 1 PERFORMANCE						
BTU / Princess Highway	8:00 – 9:00 AM	1.00	6.7 (233.5)	**A** (Worst: F)	Giveway	Right turn into BTU
BTU / Princess Highway	12:00pm – 1:00pm	1.09	11.5 (167.9)	**A** (Worst: F)	Giveway	Right turn from BTU
BTU / Princess Highway	4:00 – 5:00 PM	0.54	1.3 (20.1)	**A** (Worst: B)	Giveway	Right turn into BTU
Forest Rd/ Princess Highway	8:00 – 9:00 AM	0.49	2.9 (17.5)	**A** (Worst: B)	Giveway	Right turn into Forest Road
Forest Rd/ Princess Highway	12:00pm – 1:00pm	1.86	57.2 (832)	**A** (Worst: F)	Giveway	Right turn from Forest Road
Forest Rd/ Princess Highway	4:00 – 5:00 PM	2.27	60.9 (1240.6)	**A** (Worst: F)	Giveway	Right turn from Forest Road
Jervis Bay Rd/ Princess Highway (4L)	8:00 – 9:00 AM	1.05	21.1 (87.3)	**A** (Worst: F)	Giveway	Right turn from Jervis Bay Rd
Jervis Bay Rd/ Princess Highway (4L)	12:00pm – 1:00pm	1.82	116.8 (779.9)	**A** (Worst: F)	Giveway	Right turn from Jervis Bay Rd
Jervis Bay Rd/ Princess Highway (4L)	4:00 – 5:00 PM	2.25	129.7 (1176.1)	**A** (Worst: F)	Giveway	Right turn from Jervis Bay Rd
Forest Rd/ New Access	8:00 – 9:00 AM	0.07	11.5 (15.7)	**A** (Worst: B)	Roundabout	Right turn into New Access
Forest Rd/ New Access	12:00pm – 1:00pm	0.11	11.5 (15.7)	**A** (Worst: B)	Roundabout	Right turn into New Access
Forest Rd/ New Access	4:00 – 5:00 PM	0.09	10.7 (15.7)	**A** (Worst: B)	Roundabout	Right turn into New Access
Forest Rd/ New Access	8:00 – 9:00 AM	0.10	7.9 (13.4)	**A** (Worst: A)	Giveway	Right turn into New Access
Forest Rd/ New Access	12:00pm – 1:00pm	0.12	8.5 (13.2)	**A** (Worst: A)	Giveway	Right turn into New Access
Forest Rd/ New Access	4:00 – 5:00 PM	0.13	7.3 (13.0)	**A** (Worst: A)	Giveway	Right turn into New Access

4.5 (Continued)

TABLE 4.5.3: FUTURE 2021 ULTIMATE DA INTERSECTION PERFORMANCES (SIDRA INTERSECTION 5.1)

Intersection	Peak Hour	Degree of Saturation[1]	Average Delay[2] (sec/vehicle)	Level of Service[3]	Control Type	Worst Movement
2021+ ULTIMATE DEVELOPMENT PERFORMANCE						
BTU / Princess Highway	8:00 – 9:00 AM	1.00	6.8 (228)	**A** (Worst: F)	Giveway	Right turn into BTU
BTU / Princess Highway	12:00pm – 1:00pm	0.99	11.3 (117)	**A** (Worst: F)	Giveway	Right turn from BTU
BTU / Princess Highway	4:00 – 5:00 PM	0.54	1.3 (21.5)	**A** (Worst: B)	Giveway	Right turn into BTU
Forest Rd/ Princess Highway	8:00 – 9:00 AM	0.55	3.9 (20.1)	**A** (Worst: B)	Giveway	Right turn into Forest Road
Forest Rd/ Princess Highway	12:00pm – 1:00pm	2.37	99.1 (1290)	**A** (Worst: F)	Giveway	Right turn from Forest Road
Forest Rd/ Princess Highway	4:00 – 5:00 PM	3.23	134.7 (2099)	**A** (Worst: F)	Giveway	Right turn from Forest Road
Jervis Bay Rd/ Princess Highway (4L)	8:00 – 9:00 AM	1.05	21.1 (87.3)	**A** (Worst: F)	Giveway	Right turn from Jervis Bay Rd
Jervis Bay Rd/ Princess Highway (4L)	12:00pm – 1:00pm	1.82	116.8 (779.9)	**A** (Worst: F)	Giveway	Right turn from Jervis Bay Rd
Jervis Bay Rd/ Princess Highway (4L)	4:00 – 5:00 PM	2.25	129.7 (1176.1)	**A** (Worst: F)	Giveway	Right turn from Jervis Bay Rd
Forest Rd/ New Access	8:00 – 9:00 AM	0.10	11.9 (15.7)	**A** (Worst: B)	Roundabout	Right turn into New Access
Forest Rd/ New Access	12:00pm – 1:00pm	0.16	11.8 (15.7)	**A** (Worst: B)	Roundabout	Right turn into New Access
Forest Rd/ New Access	4:00 – 5:00 PM	0.12	11.1 (15.7)	**A** (Worst: B)	Roundabout	Right turn into New Access
Forest Rd/ New Access	8:00 – 9:00 AM	0.14	9.0 (13.4)	**A** (Worst: A)	Giveway	Right turn into New Access
Forest Rd/ New Access	12:00pm – 1:00pm	0.18	9.1 (13.2)	**A** (Worst: A)	Giveway	Right turn into New Access
Forest Rd/ New Access	4:00 – 5:00 PM	0.13	8.3 (13.0)	**A** (Worst: A)	Giveway	Right turn into New Access

4.6 Internal Road Layout and Road Hierarchy

The Masterplan Dwg. No. **07062 SK080226-01** prepared by Conybeare Morrison shows the proposed northern road access from Forest Road to the site, the internal ring road that encompasses the village and temple complex, part of the existing Comberton Grange track to the western site boundary and the internal subdivision collector and local roads in residential **Precincts A, B** and **C**.

The minimum radius of the ring road is approximately **360** metres. This would permit a travel speed of **80 km/hr**. Since all but two of the proposed car parks have access from the ring road and there are at least two pedestrian crossing points, traffic slow points will be required to reduce traffic speeds to **50 km/hour** on the ring road. The design speed for the residential streets and collector access roads should be **50 km/hr**. Traffic slow points / mini roundabouts at road junctions may be required to reduce travel speeds.

The estimated *24 hour traffic volumes* on *weekdays* and *weekend days* are for the Ultimate Residential Development contained in **Appendix 4**.

These volumes do not include local traffic (10%). The estimated *24hour traffic volumes* on *weekdays and weekends* for *Stage 1* and *Ultimate* are contained in **Appendix 6.2**. It has been assumed that traffic generated by the tourist facilities will be the same in Stage 1 and the Ultimate development. This is conservative and will over estimate the traffic generation in Stage 1. The following summary provides the *estimated 24 hour traffic volumes* in *Stage 1* and the *Ultimate development*.

Road	Busy Weekday		Saturday		Sunday	
	Stage 1	Ultimate	Stage 1	Ultimate	Stage 1	Ultimate
Northern Access Road	1524	2862	2175	3545	2842	4180

The carriageway width of **7** metres in the northern access road to Forest Road is adequate for the volume and classes of traffic. The main ring road will carry less traffic and the carriageway could be reduced to **9** metres because parallel parking is not required or desirable. The carriageway widths in the collector road in the residential precincts can also be reduced to **9** metres because the traffic volumes will be considerably less and kerbside parking would be intermittent and still provide for a **8.5** metre long semi rigid garbage vehicle and bus/mini-bus access. The total traffic expected to be generated by the largest residential **Precinct A (**199 lots) is **1790** to **1800** vehicle trips per *24 hours* on a weekday and slightly less on weekends.

There are *two collector roads* to Precinct **A** and so the daily traffic volume will be around **1200** *movements per day* on the *more direct collector road*. The eastern collector road could be reduced in width to a local street because dwellings have access to 'one side only' and the daily traffic is not expected to exceed *600* to *700 movements per day*. The two *four-way intersection* on the main collector will require mini roundabouts to slow traffic and provide traffic safety instead of relying on stop signs in the minor road. However, the total number of Lots in **Precincts A**, **B** and **C** is **346** and exceeds the permitted maximum of **300 lots**.

4.6 ((Continued)

Vertical Alignment

A preliminary check of the vertical alignment using the **2 metre** contour indicates that the *maximum grades* should *not exceed* **9** per cent in **Precinct A** and **8** per cent in **Precincts B** and **C.**

5.0 PARKING ASSESSMENT FOR PROPOSED MASTERPLAN DEVELOPMENT. STAGE 1 AND ULTIMATE

5.1 Parking Provision

The various car parks care accessed from the main ring road are conveniently located near each of the precincts. The distance around the ring road starting and ending at the car park in the information precinct is **3.75km**.

For the large number of tourists who arrive by coach or bus a mini-bus service that does a circuit of the ring road would be essential as the walking distances are too great. Another advantage of this service is that the driver could point out and describe the various facilities of interest. This service could be provided by a private operator or by the Temple Foundation.

Each car park is shown on the Masterplan drawing and on the enlarged precinct drawings in **Appendix 5**.

The approximate number of spaces in each car park is as follows as listed in *Section 7.9* of the EA.

Precinct	Number of Spaces in Car Park	Distance from Information Centre Car Park in Km.
Information	130 + 5 coach + Mini-Bus	0
Buddhist Temple	176 + Coach	1.1
Village Centre	358 (2 car parks)	1.5 & 1.8
Health and Wellness	28	2.1
Education Admin.	56	2.25
Hotel & Golf Course	130	2.79
Heritage	38	4.69
Education Sports Field	70	2.5
Residential Precinct D	60	
Basement unstated	Assume 60	
Total	972	

5.2 Parking Requirements (DCP No. 18)

The proposed development is not a conventional type of development such as a retail shopping centre because of the many tourist facilities that a tourist may visit. The overall car parking demand will not be the sum of the peak demands in each precinct but much less because the parking demand at each facility will not peak at the same time. Based upon traffic counts at the Nan Tien Temple complex at Unanderra during the Chinese New Year and Land and Water Dharma function and the large proportion of overseas visitors from mainland China some 31 percent of tourists (Appendix 4) are expected to arrive by coach, thus reducing parking demand. The golf course because of its linear shape around the perimeter of the Tourist complex is some 100 acres and larger than Cypress Lakes golf course which is 74 acres.

The strict application of Council's Car Parking Code DCP18 requires the following number of car parking spaces in each precinct.

5.2 (Continued)

Precinct	Facility	Floor Area m^2	DCP Parking Rate	Number of Spaces	
				Stage 1	Ultimate
Perimeter of Tourist Site	18 Hole Golf Course	100 acres	Not stated. Allow 1 space 2 acres	50	50
Buddhist Temple	Buddhist Temple Residential Accom. Pagoda	72000m^2 Prayer Hall 330 seats	1 per 10 seats	33	33
Information	Information Centre Museum, Gallery	1000m^2 GFF	1 per 40m^2	25	25
Town Centre	Retail Shops Commercial Retail Shops Commercial	Stage 1 – 4,000 GFA 3,000 GLFA 1,000 GFA Ultimate 20,000 GFA 12,000 GLFA 4,000 GFA	 1 per 24m^2 GLFA 1 per 40m^2 1 per 24m^2 GLFA 1 per 40m^2 GFA	 125 25 - -	 - - 500 100
	Serviced Apartments (Basement Parking)	60 Units	1 per Unit Site Manager	-	60 1
	Auditorium Stage 1 Ultimate	 300 seats 600 seats	 1 per 10 seats 1 per 10 seats	 30 -	 60
Wellness	Clinics for Traditional Chinese Medicine Stage 1 Ultimate	 6,000 GFA 10,000 GFA	 1 per 24m^2 GFA 1 per 24m^2 GFA	 250 -	 - 417
Educational	Educational & Residential Buildings Stage 1 Students Staff Ultimate Students Staff Field	 150 15 (Travel) 300 30 (Travel) 1 Local Field	 1 per 10 students 1 per employee 1 per 10 students 1 per employee 30 per field	 15 15 - - 30	 - - 30 30 30
Hotel (Tourist)	Accommodation Stage 1 100 Rooms Ultimate 218 Rooms 16 Cabins		 1 per Room 1 per Room 1 per Cabin	 100 - -	 - 218 16
	Restaurant Stage 1 Ultimate Café Stage 1 Ultimate Convention Rooms (2)	 100 seats 200 seats 50 seats 100 seats 60 & 150 seats	 1 per 2 seats^2 by 50% 1 per 2 seats^2 by 50% 1 per 2 seats^2 by 50% 1 per 2 seats^2 by 50% 1 per 10 seats^3 by 50%	 25 12.5 11	 50 25 11
Heritage	Café & Lookout	50 seats	1 per 2 seats	25	25
Agricultural	Herbal Farms	10 workers	1 per employee	10	10
			Total	**781**	**1640**

5.3 Estimated Parking Demand

Based upon the peak parking demand of 306 spaces at the Nan Tien Temple the parking requirements based upon DCP 18 will exceed the peak demand. This is because segmental assessment of different components in a mixed-use development is the method adopted by Council and does not recognise that different uses peak at different times in a mixed or multi functional development such as the proposed tourist development. The parking demand has been assessed for Stage 1 and Ultimate based upon the estimated patronage in each facility on a busy Saturday or Sunday. The estimated daily usage of each facility is as detailed in Section 4.3 of this report and the car parking demand is based upon the assessment in Section 4.3.

The estimated parking demand is summarised below:-

Facility	**Car Spaces**	
Hotel (Ref. 4.3.3)	**Stage 1**	**Ultimate**
Guest Accommodation	28	68
Guest Accommodation 50% overlap	14	34
Staff Driving to work	10	25
Coach Parking	1	2
Mini bus	0	1
Total Cars	**52**	**127**
Kung Fu Academy (Ref. 4.3.4 & 4.2)	**Stage 1**	**Ultimate**
(Weekday) Students (Aust.)	16	32
Coach Parking	1	1
Staff (from Shoalhaven)	(9 x .647) = 6	(24 x .647) = 16
Total Cars	**22**	**48**
Golf Course (Ref. 4.3.5 & 4.2)	**Stage 1**	**Ultimate**
Players	53	53
Staff	2	2
Mini bus	1	1
Total Cars	**55**	**55**
Town Centre Convention Centre (Ref. 4.3.6)	**Stage 1**	**Ultimate**
Attendees not accommodated in Hotel	20	38
Coaches	3	5
Tourist Facilities (Ref. 4.3.7 & Appendix 6.1)		
Temple & Prayer Hall, Temple Garden, Walking Trails, Dining Facilities, Retail/Commercial, Agricultural herb farm, cultural centre, museum, gallery, Pagoda, Wellness Precinct, Heritage Precinct, Amphitheatre, Information Precinct.		
Total Tourist 790 persons by car am and pm	**369**	**369**

5.3 (Continued)

Facility	Car Spaces	
Town Centre (Ref. 4.3.8)	**Stage 1**	**Ultimate**
Retail / Commercial / Dining Facilities Staff from Nowra Bus Service to/from Nowra (all customers are tourists and local residents)	 42 ✓	 67 ✓
Miscellaneous Staff / Employees (Ref. 4.3.9)		
(i) Information Centre	3	4
(ii) Wellness Precinct		
Staff / Practitioners from Shire	6	12
Nowra Bus Service	Yes	Yes
(iii) Heritage Café Staff (3)	0	2
(iv) Agricultural Workers	6	6
Total Car Spaces	**575**	**728**
Coach Parking	5	8
Mini bus	1	2
Nowra Bus Service	✓	✓

5.4 Summary

The parking provision of **972** spaces shown on the Masterplan comfortably exceeds the estimated ultimate demand of **728** and allows for variations in car travel mode and possible future development sites on the Masterplan.

5.5 Functional Design Layout of Car Parks

The Shoalhaven City Council Car Parking Code DCP No. 18 was amended on 25/7/2000 and therefore predates AS/NZS 2890.1 – 2004 Part 1 : Off-Street Car Parking and AS/NZS 2890.6 – 2009 Part 6 : Off-Street Parking for people with disabilities.

The parking space dimensions for disabled parking in DCP 18 do not comply with AS/NZS 2890.6 and it is recommended that disabled parking spaces comply with the Australian Standard.

There is no distinction in parking space dimensions between employee and visitor parking spaces in DCP18. For a tourist development it is recommended that all parking spaces be designed for User Class 3 in Table 1.1 in AS/NZS 2890.1 to promote flexibility and optimise the use of spaces.

All 8 ground level car parks shown on the Masterplan provide 90 degree angle parking spaces. The parking module width for User Class 3 in Figure 2.2 in AS/NZS 2890.1 – 2004 is 16.6 metres compared to 18 metres in Diagram 1a in DCP18. Section 2.8 Construction Standards of DCP18 states that ground level car parks are to comply with the requirements of the Roads and Traffic Authority (RMS). The RTA Guide to Traffic Generating Developments 2002 refers to Australian Standard AS/2890.1 – 1993 for internal design of car parks. Our recommendation is that the requirements of AS/NZS 2890.1 – 2004 be adopted.

5.5 (Continued)

The conceptual layout, circulation and access to the car parks comply with the principles described in DCP No. 18. Further refinement and landscaping will be made in the detailed design.

It is recommended that bicycles be available for hire as well as golf carts and that bicycle racks be provided in all precincts.

6.0 SITE ACCESS AND STANDARDS

6.1 Access Principles and Road Design Standards

6.1.1 Forest Road

Analysis of the future 2021 120th HH peak hour and midday traffic volumes plus the estimated ultimate development traffic in Figure 11 shows that Forest Road between the northern access road and Princes Highway has adequate capacity to carry the increased traffic volumes. The service flow rates for Level of Service C in level terrain assuming 20 percent of Forest Road has sight distance less than 450 metres and percentages of heavy traffic as shown in Section 2.3.3 are as follows:

Road	Location	Hour	Two-Way Flow Vphr	Distribution of Traffic	Service Flow Rate SF_c Vphr
Forest	West of Northern Access Rd	8.00-9.00am	300	30/70	833
		12.00-1.00pm	353	40/60	872
		4.00-5.00pm	362	70/30	867

Forest Road carried one B Double in the 7 day October 2011 classification count. The design vehicle is a tri-axle semi trailer Class 9.

6.1.2 Northern Access Road

The estimated 2021 120th HH midday peak hour plus the ultimate development traffic is 394 vphr. Therefore a two lane sealed carriageway 6.7 metres wide with one metre wide sealed shoulders and 1 metre gravel shoulders is a suitable standard based upon Austroads Rural Road Design to carry the volume and type of traffic. It is expected that there will be a small percentage of Class 9 vehicles but the general maximum will be a 3 axle heavy rigid vehicle Class 4. The signposted speed limit on this road in a rural environment should be a maximum of 80 km/hr.

6.1.3 Intersection Northern Access Road / Forest Road

Based upon Figure 6.41 Warrant for Rural Turn Lanes in Austroads Guide to Engineering Practice Part 5 : Intersections at Grade, a type CHR right turn treatment as illustrated in Figure 6.39 is required.

An alternative would be a roundabout with a single lane circulating lane 7 metres wide and one lane on each approach. The central island would require a minimum radius of 16 metres and meet the design requirements of Austroads Guide to Road Design Part 4B Roundabouts. A well designed roundabout is the safest form of intersection control in this location where there are no pedestrians. Lighting will be required so that a driver is able to perceive the layout and drive safely.

6.2 Access Roads to the Site

The northern access road to Forest Road is the primary road access to the site. The estimated 2021 HH peak hour traffic volumes plus the ultimate stage development only requires one access road.

6.2 (Continued)

The benefits and costs of upgrading Comberton Grange Road as a secondary emergency access to the site compared with the alternative discussed in Section 4.3 of this report need to be evaluated in the detailed design stage of this project.

6.3 Proposed Bus / Coach Facilities

Six coach spaces are shown in the car park south east of the Temple / Sanctuary Precinct together with a drop off zone in front of the temple.

One coach space is likely to be required at other locations because of the distance between each of the major attractions. Other locations are the Information Centre, Town Centre, Wellness Precinct, Education Precinct and hotel.

A regular bus service to and from Nowra / Bomaderry is recommended when Stage 1 of the development has progressed to a certain stage to transport workers from their homes in the Shoalhaven district, tourists travelling by train to Bomaderry and residents of the development to Nowra town centre. The coach drop off points would be suitable as bus stops for the Nowra bus service and each stop could have a unique name that describes the dominant activity where it is located.

A bus route around the ring road is close enough for residents to walk from Precinct B. However the cul-de-sac heads will require pathways to the open space to reduce the trip length to 400 metres maximum. Initially and subject to patronage the bus service could terminate at the Information Centre and be supplemented internally by a mini bus service.

6.4 Internal Road Network / Pedestrian and Cyclist Infrastructure

The internal road network would require a 50 km/hr speed limit for safety reasons. Some suggestions to reduce carriageway widths have been made in Section 4.6 of this report. On-street parking should be banned on the northern road link to the ring road, the ring road and the western link to the ring road for safety reasons.

Further reduction in the width of cul-de-sac streets, collector streets and ring road (local distributor road) maybe desirable as permitted in Table 1 – Classification of Streets in Amendment 2 to DCP10 Subdivision Code. The road carriageway width in the collector and ring roads as specified in Section 7.7.4 of the EA report were determined without the benefit of this traffic report and can be reduced. Some variations to the road reserve widths may be desirable to comply with Table 3 Residential streets and road types in Amendment 2 to DCP10.

Bicycle storage facilities should be provided in convenient locations in the Information Precinct, Temple Precinct and at all major facilities in each Precinct to encourage cycling and complement the cycle paths that are proposed in Section 7.7.4 of the EA report.

7.0 TRAFFIC IMPACT OF PROPOSED DEVELOPMENT

7.1 External Roads and Intersections

One primary two lane rural type access road from Forest Road to the development site will have adequate capacity at Level of Service C to carry the future 2021 120th HH peak hour and midday traffic volumes plus the ultimate development traffic. The road design will be in accordance with Austroads Rural Road Design.

A secondary rural type emergency access is proposed to link with Comberton Grange Road, a dirt road serving a small number of rural properties. An alternative link from the Collector road in Precinct C to the quarry site and from the quarry site to Forest Road is shorter and would appear to have less environmental impact and have greater commercial benefit to the development.

Forest Road / Northern Access Road Intersection

The proposed intersection at Forest Road and the Northern Access road is to be a type CHR (channelized right turn) or a large roundabout designed in accordance with Austroads design standards. The intersection will comfortably carry the future 2021 120th HH peak hour plus ultimate development traffic. There are no adverse traffic impacts. The SIDRA Analysis in Table 4.5.3 shows that the CHR treatment has LoS A whereas the roundabout has LoS B. The CHR treatment with painted median and RPMS is recommended.

Forest Road / Princes Highway Seagull Intersection

Based upon the traffic growth to 2021 the delay for the critical right turn from Forest Road will be LoS F in the 4.00-5.00pm peak hour with average delays of 284 seconds. This is much lower than the delay for the right turn from Jervis Bay Road (1158 seconds)

Under future 2021 120th HH plus Stage 1 tourist development the delay on the critical right turn from Forest Road in the 4.00-5.00pm peak hour increases to 1240.6 seconds. This delay is comparable with the right turn from Jervis Bay Road in the 4.00-5.00pm peak hour (1176 seconds). Traffic generated by the proposed Shaolin tourist development has no impact on Jervis Bay Road.

Under future 2021 120th HH plus Ultimate tourist development the delay in the critical right turn from Forest Road in the 4.00-5.00pm hour increases to 2099 seconds. This is clearly unacceptable.

The installation of traffic signals with dual right turn lanes from Forest Road would provide LoS **C** for the critical right turn from Forest Road in the 12.00-1.00pm and 4.00-5.00pm peak hours and reduce the delay to 35.5 and 39 seconds respectively. The road widening in Forest Road for the shared left/right and right turn lanes would be 3.3 metres for 60 metres plus a 20 metre taper. The left turn slip lane that would be required in the Princes Highway forms part of the RTA road improvements currently under construction. The indicative cost estimate cost of the signals and road widening at present day costs is $356,000 plus GST. By comparison the indicative cost of a single lane flyover for the right turn would be in the order of $1.51 million at current prices.

7.1 (Continued)

Jervis Bay Road / Princes Highway Intersection

The critical movement in the existing **120 HH** 12.00 -1.00pm and 4.00-5.00pm peak hours is the right turn from Jervis Bay Road into Princes Highway where the LoS is **F** and the delays are 7.27 and 112.3 seconds respectively. Under 2021 **HH** traffic volumes the delays for the right turn from Jervis Bay Road will increase to **779.9** and **1176.1** seconds respectively. The proposed Shaolin tourist development in **Stage 1** and **Ultimate** has no impact and the delays remain the same. The delays are unacceptable. Signalisation of the tee intersection with dual right turn lanes would provide a comparable improvement in the LoS as for Forest Road at similar cost and reduce delays to acceptable levels.

BTU Road / Princes Highway Intersection

The critical movement in the future 2021 **120th HH** is the right turn into BTU Road in the 8.00-9.00am peak hour where the LoS is **F** and the delay is **236.8** seconds. Traffic generated by the Shaolin tourist development has no impact on the LoS and delay.

The critical movement at lunch time in the future 2021 **120th HH** is the right turn from BTU where the LoS is **E** and the delay is **69.2** secs. Under the future 2021 **120th HH** plus **Stage 1** Shaolin development the LoS for the right turn from BTU worsens to LoS **F** with a delay of **167.9** secs. Although there is no increase in the volume of traffic turning right due to the Shaolin tourist development there is an increase in northbound traffic to Nowra that causes the LoS to worsen. This LoS is comparable with the LoS for the right turn from Jervis Bay Road in the 4.00-5.00pm peak hour under existing 2021 120th HH traffic volumes (112.3 secs.) and can probably be tolerated.

7.2 Proposed Bus / Coach Facilities

The facilities described in *Section 6.3* of this report will be essential for overseas tourists who are expected to travel by air and coach mainly from Sydney. These facilities will reduce car travel demand and thus have a positive benefit. The mini bus service discussed in Section 6.3 is considered essential initially because of the dispersed location of the various tourist attractions and will augment the golf cart hiring provision described in the EA report and bicycle hire.

7.3 Pedestrian and Cyclist Facilities

The proposed facilities described in the EA report plus the terminal bike racks discussed in *Section 6.4* of this report will reduce the demand for local car travel and provide health and environmental benefits.

7.4 Servicing

Although not described in the EA report and shown in the Masterplan concept sketches this matter will be investigated in the design stage and provision made for the class of delivery vehicle required for the various components of the development. The distributor and collector road system described in the EA report and shown on the Masterplan concept sketches is suitable for HRV (heavy rigid trucks) and the occasional AV (articulated vehicle).