

# 01

## **the current transport situation**



## 1.1 INTRODUCTION

In May 2010, Eurobodalla Shire Council commissioned Cardno to undertake a traffic study of the northern area of Eurobodalla Shire; a key component of this traffic study is the construction of a TRACKS strategic land use/traffic model. Council has also commissioned other consultants to prepare a Paramics micro-simulation model of Batemans Bay CBD concurrently with this project and it is envisaged that the two studies will complement each other to present a clearer picture of future road network requirements.

This section – the Current Transport Situation – is to present an overview of the existing transport problems, constraints and opportunities.

### 1.1.1 BACKGROUND

Eurobodalla Shire stretches for approximately 100 kilometres along the south coast of NSW, including the towns of Batemans Bay, Moruya, Narooma and numerous small villages and hamlets. The shire has a population of 35,000, however this increases to over 100,000 during the peak holiday times – this has a significant effect upon the road network and other related infrastructure in the shire. Batemans Bay and the surrounding coastal villages, in particular, are very popular with ACT residents.

A number of proposed developments are planned in and around the Batemans Bay Central Business District (CBD), including the following:

- A new shopping centre including a supermarket and other specialty stores to be located at the southern end of Orient Street.
- An extension to the existing Batemans Bay Soldiers Club, located in Beach Road.
- A proposed Centrelink regional call centre to be located in Flora Crescent.
- Redevelopment and expansion of the existing Clyde River Motel, located in North Street.
- Redevelopment of the Bridge Plaza shopping centre located in Clyde Street.
- Redevelopment and expansion of Batemans Bay Marina, located in Beach Road.
- Redevelopment of the Clyde Street foreshore area (recently completed).
- Redevelopment of Innes' Boat Shed, located in Clyde Street.

In addition to the above, there are a number of proposed commercial and residential developments located to the south, including the following:

- A bulky goods precinct to be located at Surf Beach.
- An 800 lot residential subdivision located at Rosedale.
- A number of proposed residential subdivisions and aged care facilities to be located at Moruya.
- The continued expansion of the residential areas of Malua Bay, Rosedale, Tomakin and Broulee.

In order to address the impacts of these developments on the existing road network, Council commissioned Cardno to undertake a traffic study of the northern area of the Shire, i.e. from Long Beach to Moruya.

### 1.1.2 OBJECTIVES

The aim of the study is to produce a fully functioning land use/transport model that accurately models the present and future traffic situation within the northern area of Eurobodalla Shire, taking into account pedestrians, cyclists, parking and public transport needs; and to then use the validated model as a tool in the Council's future planning process.

The primary objectives for the study are:

- Assess the current (2010) traffic conditions within the Northern Area of the Shire.
- Assess the likely impact that future development and population expansion will have upon the existing road network.
- Identify and prioritise any improvements, alterations or additions that will need to be made to the road network to meet the future needs of the Shire – in particular the modelling needs to identify proposed future intersection treatment within the study area.

The objective of the Current Situation Transport Report is to ensure a good understanding of the current situation is obtained before examining future year scenarios and examines the current state of loading (2010) and congestion on the transport system.

### 1.1.3 STUDY AREA FOR TRANSPORT ASSESSMENT

The study area for the project is shown in Figure 1.1. It includes Long Beach and Maloney's Beach in the north, Moruya and Moruya Heads in the south and all the land to the east of the Princes Highway between these points.

## 1.2 STRATEGIC CONTEXT

Council provided a great deal of background information, studies and strategies to inform the preparation of the traffic study. Relevant information from these documents is outlined below.

### 1.2.1 FEDERAL POLICIES

#### **National Broadband Network**

As part of The National Broadband Network the Government has announced that all greenfield developments should have fibre optic infrastructure to prepare them for the future.

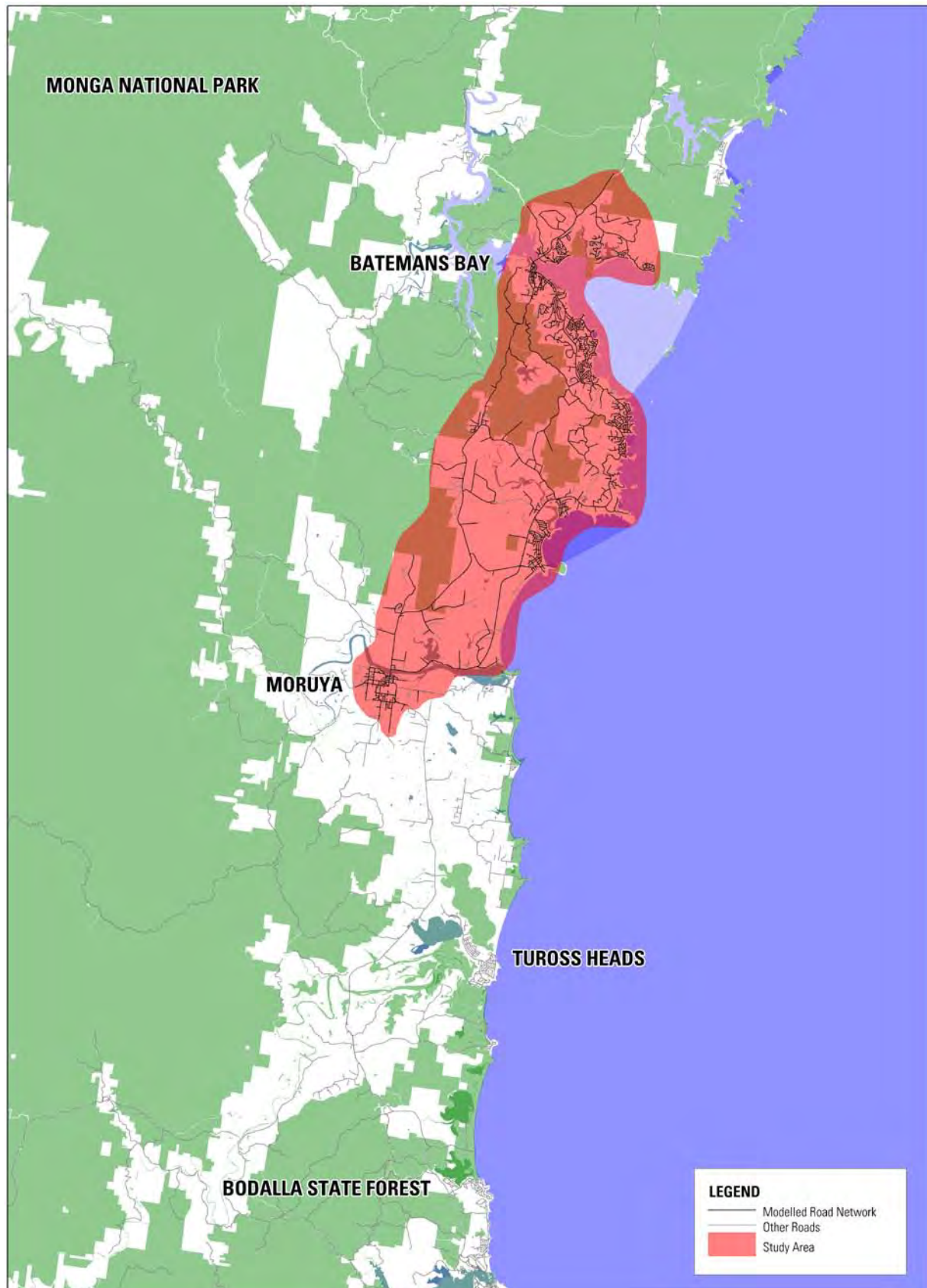
The objective of the program is to create opportunities for reductions in greenhouse gas emissions through greater use of improved telecommunications technologies and a reduction in the need to travel.

New developments will need to incorporate the broadband network in accordance with the national directions. The infrastructure will facilitate residents to work from home, reducing the need to travel.

### 1.2.2 STATE AND REGIONAL STRATEGIC POLICIES

The key driver behind state and regional strategic planning policies in recent years has been the desire to reduce the environmental impact of everyday life, such as through the reduction of greenhouse gas emissions. Key themes in these policies have been the need to reduce car dependency, increase the attractiveness and usage of sustainable transport modes, reduce the growth in vehicle kilometres travelled and provide an urban form which supports public transport provision.

**Figure 1.1 Study Area**



The following New South Wales government policies, plans and strategies contain the strategic context relevant to the local planning and development of the CUDP. The following documents have been reviewed:

- NSW State Plan 2010.
- NSW State Infrastructure Strategy 2008.

Other relevant government strategies reviewed include:

- Action for Air (2006 update).
- Action for Bikes – Bike Plan 2010.
- Integrating Land Use and Transport (2001).
- Section 117 Ministerial Decisions Direction no.17 – Integrating Land Use and Transport (2005).
- Planning Guidelines for Walking and Cycling (2004).
- Accessible Transport Action Plan (2007).
- Review of Bus Services in NSW – Final Report (2004).

Important aspects from the relevant state and regional documents have been summarised in Appendix 1-A. In relation to transport these strategies have the following common themes:

- Improve public transport.
- Integrating land use and transport.
- Reduction of mode share to private motor vehicles.
- Reducing the need to travel.

### **The NSW State Plan 2009**

The *NSW State Plan* sets out the goals and priorities for government action in a range of key areas. The State Plan now includes a target of improving the quality of urban and rural roads. The NSW Government was committed to invest \$118.7 million on roads in the South East in 2009–10 to improve transport links with:

- Major projects on the Kings Highway including the newly completed westbound overtaking lane east of Bungendore.
- Work continuing on the replacement of timber bridges on regional roads in the South East.
- Further improvements on main roads including continuing safety improvements and additional overtaking lanes
- An initiative to provide safe transport for young people from disadvantaged families to help them access youth services in Eurobodalla Shire.
- Work with Councils and the Community Transport Organisations to improve local transport information guides for the South East.

### **South Coast Regional Strategy (2006-2031)**

The NSW Department of Planning released the South Coast Regional Strategy (2006-2031). Some of the stated aims of the regional strategy are to:

- Cater for housing demand of up to 45,600 new dwellings by 2031 to accommodate 60,000 people.
- Increase the amount of housing in existing centres.
- Prioritise and manage the release of future urban lands.
- Ensure adequate supply of land to support economic growth and provide capacity to accommodate a projected 25,800 new jobs.

Appendix 1-B provides a copy of the South Coast Regional Strategy Map.



The strategy incorporates requirements set out in the State Infrastructure Strategy and is the pre-eminent strategic policy document for the region.

The targets established for Eurobodalla are:

- 10,700 new dwellings by 2031:
  - Existing vacant and urban land more than half of which is located around Batemans Bay plus the major towns of Moruya and Narooma will accommodate 7,600 of these dwelling.
  - The remaining 3,100 dwelling supply gap will be accommodated within and adjoining these centres through medium density development and investigation areas.
- 6,200 new jobs in the Eurobodalla area with increases expected in the areas of finance, administration, business services, health and aged care, as well as tourism.

Challenges are discussed, including in the areas of employment, economy, environment, population and housing. A vision to meet the challenges is presented, promoting a prosperous, diverse and sustainable region. Regional transport is an issue for the strategy, with few targets or recommendations relating to transport.

### **Illawarra and South Coast NSW Freight Study, Final Report (2005)**

This report was prepared for the Department of Planning as an attempt to identify and prioritise freight issues affecting the Illawarra and South Coast regions.

The study found that constraints within the region are not barriers to economic development but tended to only impact upon operational flexibility. The critical constraints were found to be linkages from the Illawarra to other regions – namely, linkages to Sydney and the Hume Highway. The study recommendations were focused mainly on improving linkages to/from the Illawarra as this is where the volume of freight is greatest.

### **Greater Batemans Bay Structure Plan (2006)**

The Greater Batemans Bay Structure Plan was prepared in 2006 and adopted by Council in May 2007. The Plan sets out the growth of Batemans Bay to 2031 and includes the urban areas from Maloney's Beach and Surfside, south to Malua Bay.

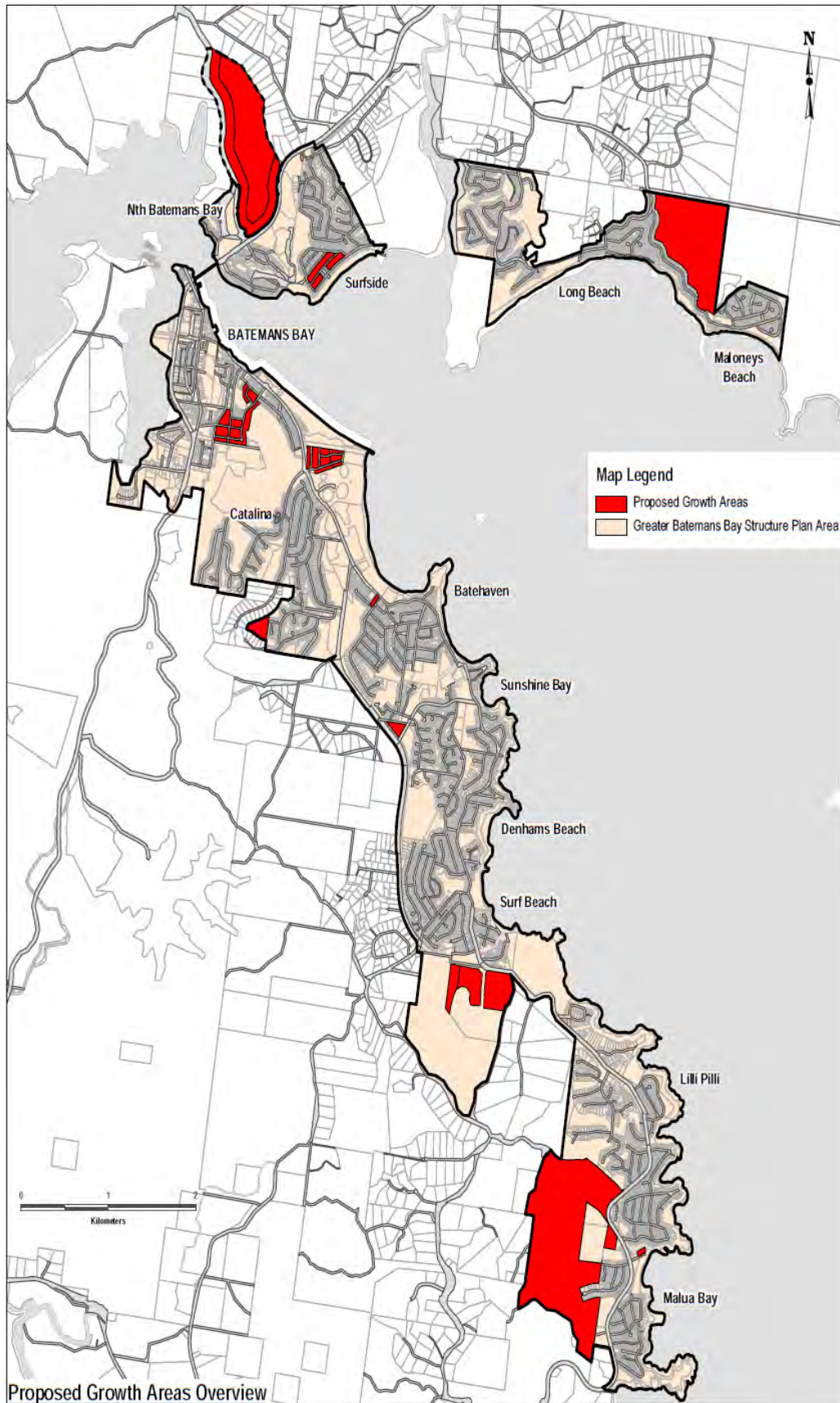
The Plan recommended that Greenfield development be restricted to urban expansion zones at the following locations:

- North Batemans Bay – low density residential and rural transition.
- Malua Bay – a mix of lot and dwelling sizes to provide a higher yield than traditional release areas.

Further residential expansion at Long Beach was deferred in favour of North Batemans Bay due to the latter being located closer to the Town Centre and being better able to contribute to the sustainability of Batemans Bay.

The growth areas around Batemans Bay identified in the Plan are shown in Figure 1.2.

**Figure 1.2 Growth Areas (Greater Batemans Bay Structure Plan)**



**Proposed Growth Areas Overview**

Source: Greater Batemans Bay Structure Plan, Map III.5

In addition to urban expansion, the Plan also recommended that more intensive and mixed use development be encouraged at the following locations within the existing urban area:

- Batemans Bay Marina.
- 'Hanging Rock' precinct at Catalina.
- Batehaven Town Centre.
- The immediate vicinity of Surfside village shops (The Vista).

With regard to access and movement, the Plan made the following key recommendations:

- Current road hierarchies should be maintained and reinforced.
- Roads with the potential to be converted into boulevards, particularly in foreshore areas, should be identified.
- Ribbon development should be prohibited.

Council should lobby the State Government for a firm timeframe for duplication of the bridge over the Clyde River at Batemans Bay.

### **Moruya Structure Plan (2006)**

The Moruya Structure Plan was prepared in 2006 and adopted by Council in May 2007. The Plan sets out the growth of the Moruya area to 2031 and includes the urban areas from North Moruya to Moruya and Moruya Heads.

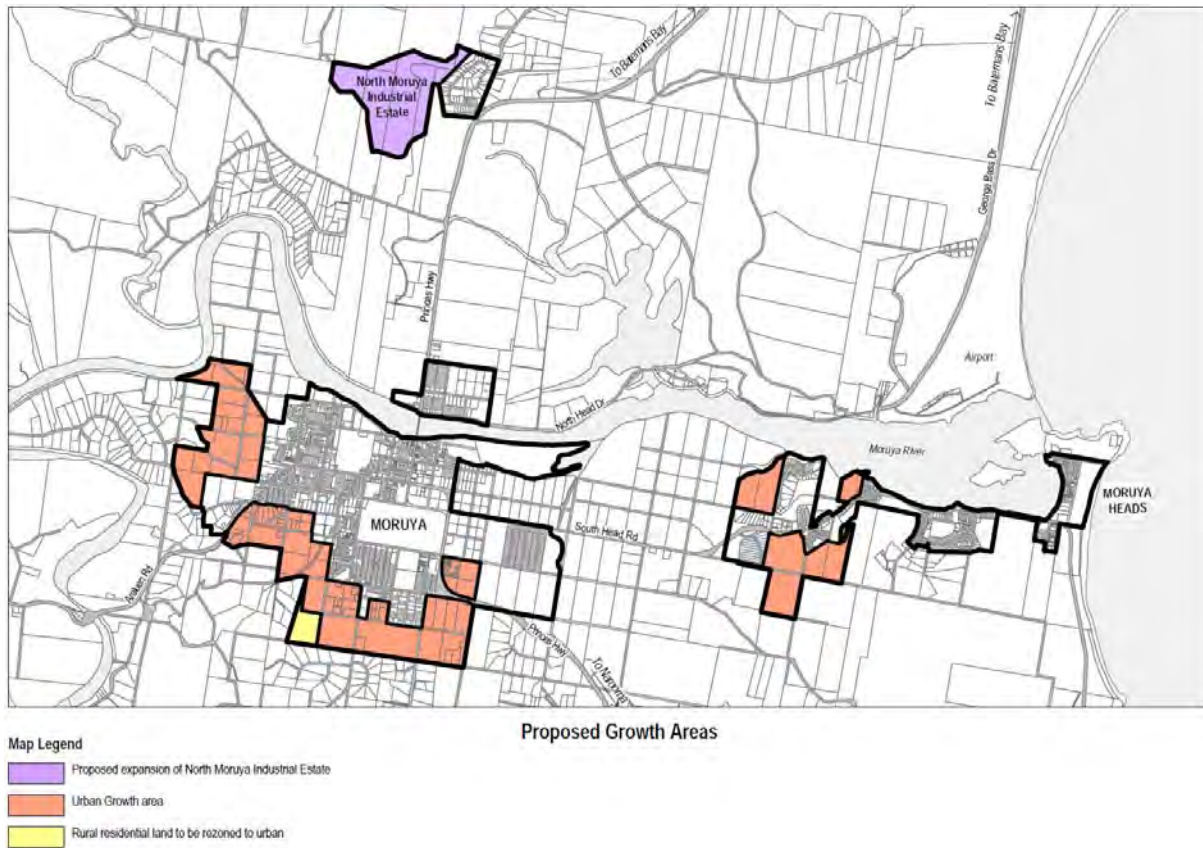
The Plan notes that traffic calming should be investigated for Ford Street to reduce vehicle speeds and encourage through traffic to remain on Princes Highway.

Key land use and transport recommendations of the Plan include:

- The rural zone separating Moruya from Moruya Heads should be retained.
- Residential development should be restricted to the current urban areas and the following urban expansion zones:
  - Moruya Heads (low-density residential).
  - South Moruya (low-density residential).
  - West Moruya (rural residential).
- Yarrangee Industrial Estate should not be expanded and future industrial development should be concentrated at North Moruya.
- Alternative modes of transport should be promoted to reduce dependence on the private vehicles.
- The existing road hierarchy should be maintained.

The growth areas around Moruya identified in the Plan are shown in Figure 1.3.



**Figure 1.3 Growth Areas (Moruya Structure Plan)**

Source: Moruya Structure Plan (2006), p.168

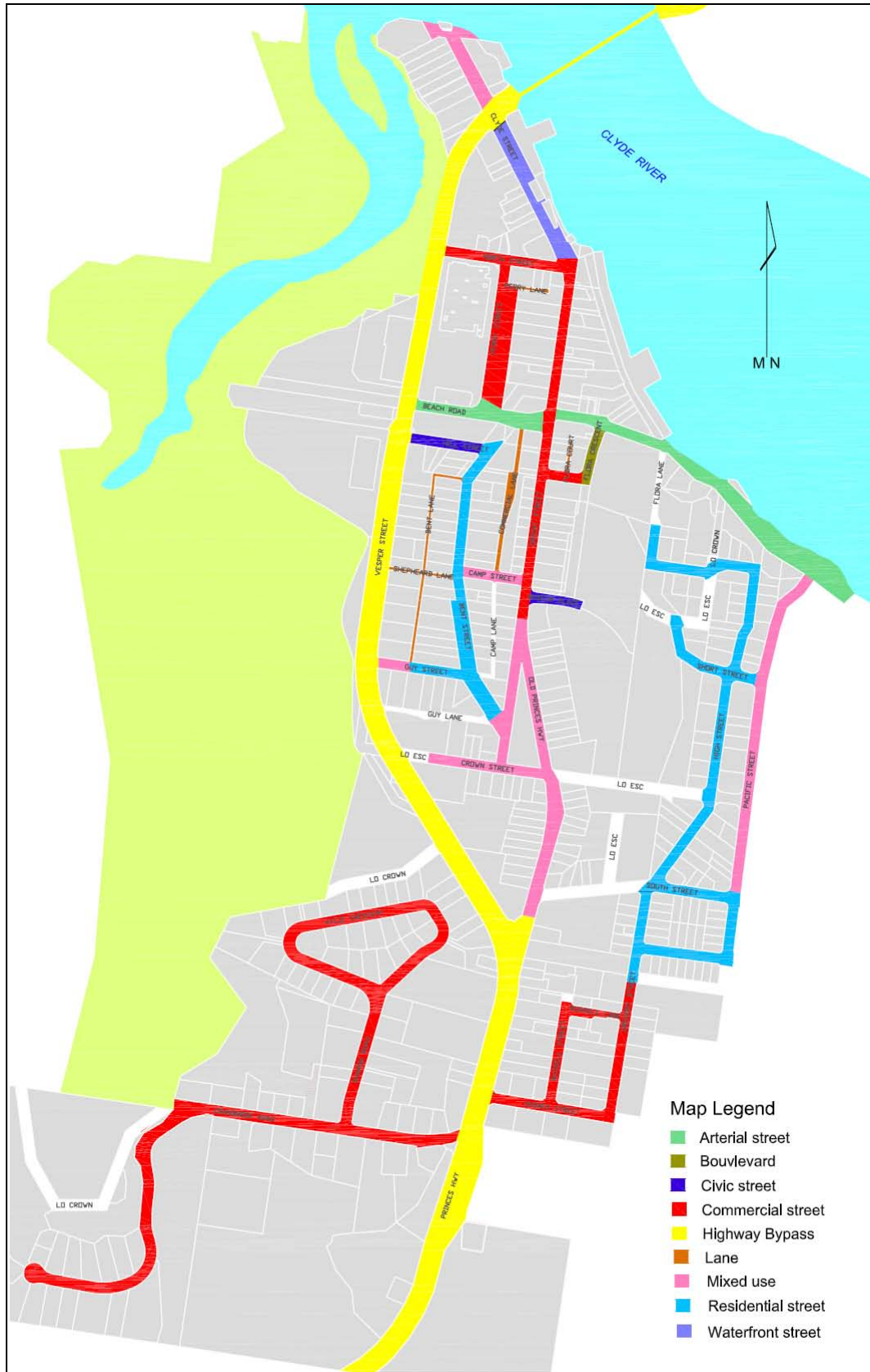
### Batemans Bay Town Centre Structure Plan (2008)

The Batemans Bay Town Centre Structure Plan was prepared in 2006-2007 and adopted by Council in April 2008. The Plan sets out the growth of the Town Centre to 2031.

Key conclusions of the Plan, relating to traffic and transport, included:

- The capacity of the existing road network is generally adequate to sustain future growth, except during peak tourist periods.
- Parking supply in the town centre is plentiful compared to other centres of a similar size and structure.
- Mixed use developments should be encouraged within the town centre in order to reduce the need for private vehicle trips and encourage use of alternative transport modes, such as walking and cycling.
- Construction of the Batemans Bay Link Road from Glenella Road to Princes Highway is a priority to divert traffic from Beach Road.
- Major intersection treatments should be provided, particularly on Princes Highway and Beach Road, to better manage peak traffic flows.
- Clyde Street/Orient Street/North Street should be investigated for speed reductions and improvements to pedestrian amenity.

The recommended road hierarchy for the town centre is shown in Figure 1.4.

**Figure 1.4 Recommended Road Hierarchy (Batemans Bay Town Centre Structure Plan)**

Source: Batemans Bay Town Centre Structure Plan (2008), Map 5.2.

### Draft Industrial Land Audit (2004)

The Industrial Land Audit was undertaken to inform a review of the Eurobodalla Rural Local Environmental Plan in conjunction with the Eurobodalla Rural Strategy. The audit provides an inventory of existing industrial land within the shire and investigates the demand for, and siting of, future industrial land.

The Audit identified that:

- The Batemans Bay industrial area is constrained by topography with limited room for future growth.
- The Surf Beach site, adjacent to the George Bass Drive/Beach Road intersection, appears to be suitable for a bulky goods retail or business park type development.
- The North Moruya industrial area is well located and should be expanded to cater for future demand.
- Market forces may result in future consolidation and restructure of industrial precincts.

These recommendations were generally adopted as part of the Batemans Bay Town Centre and Moruya Structure Plans.

### Batemans Bay Traffic Model

Bitzios Consulting are currently undertaking a detailed Paramics micro-simulation modelling exercise, covering the Batemans Bay CBD, Batemans Bay Traffic and Transport Study (Bitzios Consulting, September 2010).. The results of this modelling work will inform the strategic modelling being undertaken by Cardno as part of this project. Traffic volume and parking location and inventory data collected as part of the CBD model has also been utilised in the TRACKS modelling to date.

The Model Development and Current Situation Assessment found that:

- No significant traffic delays currently occur in the study area on typical weekdays, with most queues associated with traffic signals which clear within one cycle.
- Approximately 60% of the traffic entering the CBD from the Clyde River bridge is destined for the CBD, whilst approximately 50% of traffic entering the CBD from Princes Highway south is destined for the CBD.
- Beach Road between Princes Highway and Flora Crescent has a considerable number of conflicting movements, including pedestrians, cyclists, local and through traffic, which leads to occasional delays and potential safety considerations.
- Approximately 20% of traffic entering the study area in the midday peak and 27% in the PM peak is through traffic.
- Current parking supply appears adequate to cater for the average weekday demand.

### 1.2.3 OTHER STUDIES

In addition to the above, the following background studies and strategies have been reviewed:

- Neighbourhood Centres Retail Policy and Guidelines (Eurobodalla Shire Council, October 2006).
- Batemans Bay Bulky Goods Feasibility Study (Hill PDA, December 2004).
- Illawarra and South Coast Employment Lands Strategy (Hill PDA, October 2005).
- Surf Beach Industrial Land investigation reports and documentation.
- Urban Growth Analysis data and documentation.

## 1.3 POPULATION AND LAND USE

### 1.3.1 EXISTING LAND USE

Existing land use zoning within the Study Area is presented in Figure 1.5. It should be noted that this figure shows residentially zoned land which may not yet have been fully developed and includes some rural residential land holdings.

The majority of the study area contains rural land, mainly consisting of mountainous forested terrain with dairying and other farming activities concentrated on the flatter terrain adjoining the Moruya River.

Batemans Bay and Moruya are the major settlements, with the services, facilities and development expected in townships. The remaining urban residential land is generally located along the coastal route (Beach Road/George Bass Drive) between Batemans Bay and Broulee, with other residential development also located at Moruya Heads and on the northern bank of the Clyde River mouth. Rural residential development can also be found in many of the flatter areas north of Batemans Bay, between Rosedale and Mogo, and between Mogo and North Moruya.

The major commercial centres are Batemans Bay and Moruya town centres; however other lower tier commercial and retail centres include:

- Surfside.
- Batehaven.
- Tomakin.
- Broulee.

Significant industrial lands are located in the following areas:

- Yarragee (west Moruya).
- North Moruya.
- Cranbrook Road, Batemans Bay.
- A site adjacent to the George Bass Drive/Beach Road junction at Surf Beach has been earmarked for future development as a bulky goods/light industrial complex.

A detailed review of the Eurobodalla land use assumptions and analysis is provided in Appendix 1-C.

### 1.3.2 KEY TRIP ATTRACTORS AND GENERATORS

Batemans Bay is the main commercial centre of Eurobodalla Shire and has the highest concentration of key trip attractors and generators. Facilities and services within the town centre include the Village Centre, the marina, library, hotels and cafes and so on. The concentration of trip attractors and generators is greatest along Orient Street, Perry Street and Clyde Street.

Moruya provides similar facilities to Batemans Bay on a smaller scale. Eurobodalla Shire Council's offices are located adjacent to the Princes Highway/Campbell Street intersection and retail development concentrated along Vulcan Street (Princes Highway) between the river and Campbell Street.



**Figure 1.5 Existing Land Use**

The village of Mogo and Mogo Zoo, located on Tomakin Road, are key tourist attractions which attract significant weekend traffic. The coastal strip from Batemans Bay through Catalina to Batehaven also contains a concentration of tourist establishments, such as restaurants, clubs, recreational areas and accommodation.

High schools are located in Batehaven and Moruya, with two private schools also located at Broulee. Primary schools are located in Surfside, Batehaven, Sunshine Bay, Mogo, Broulee and Moruya. A small campus of the University of Wollongong and Batemans Bay TAFE is located at Catalina, between Batemans Bay and Batehaven. The Moruya TAFE is located south of the town centre on the Princes Highway.

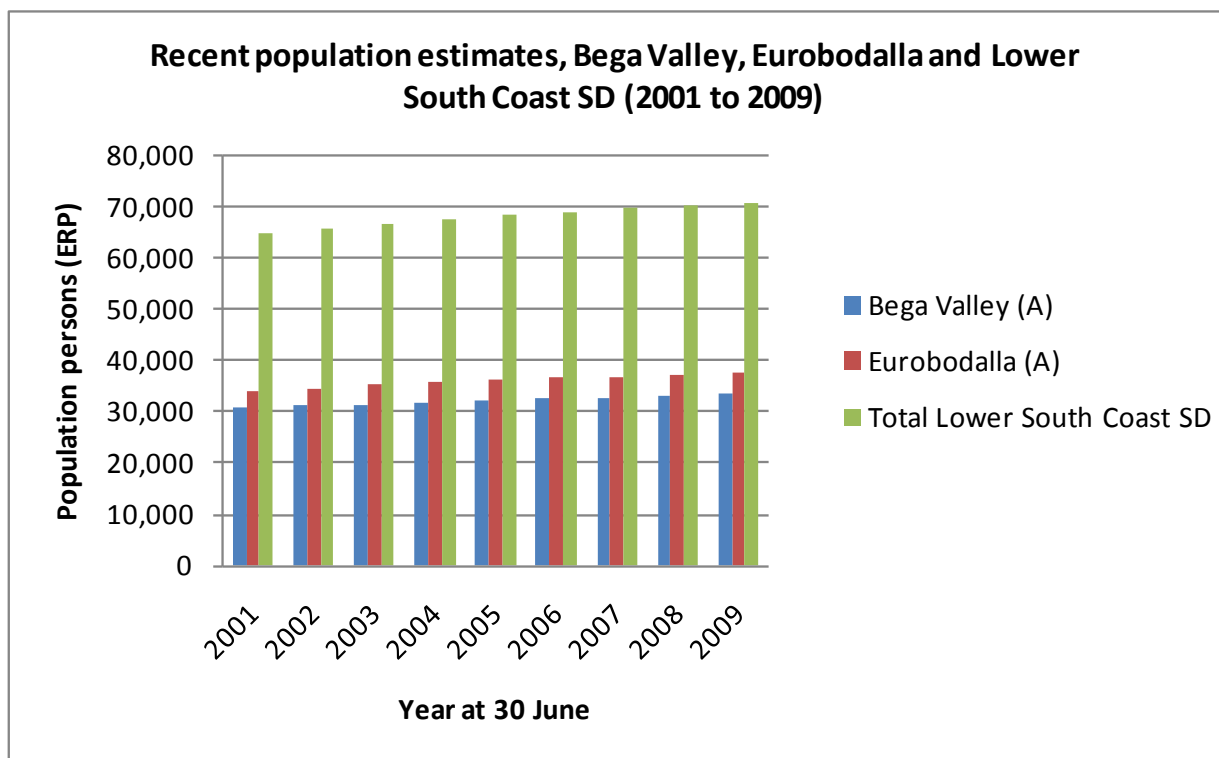
Moruya Airport is a major transport connection with Sydney and Melbourne and is located between Moruya and Broulee.

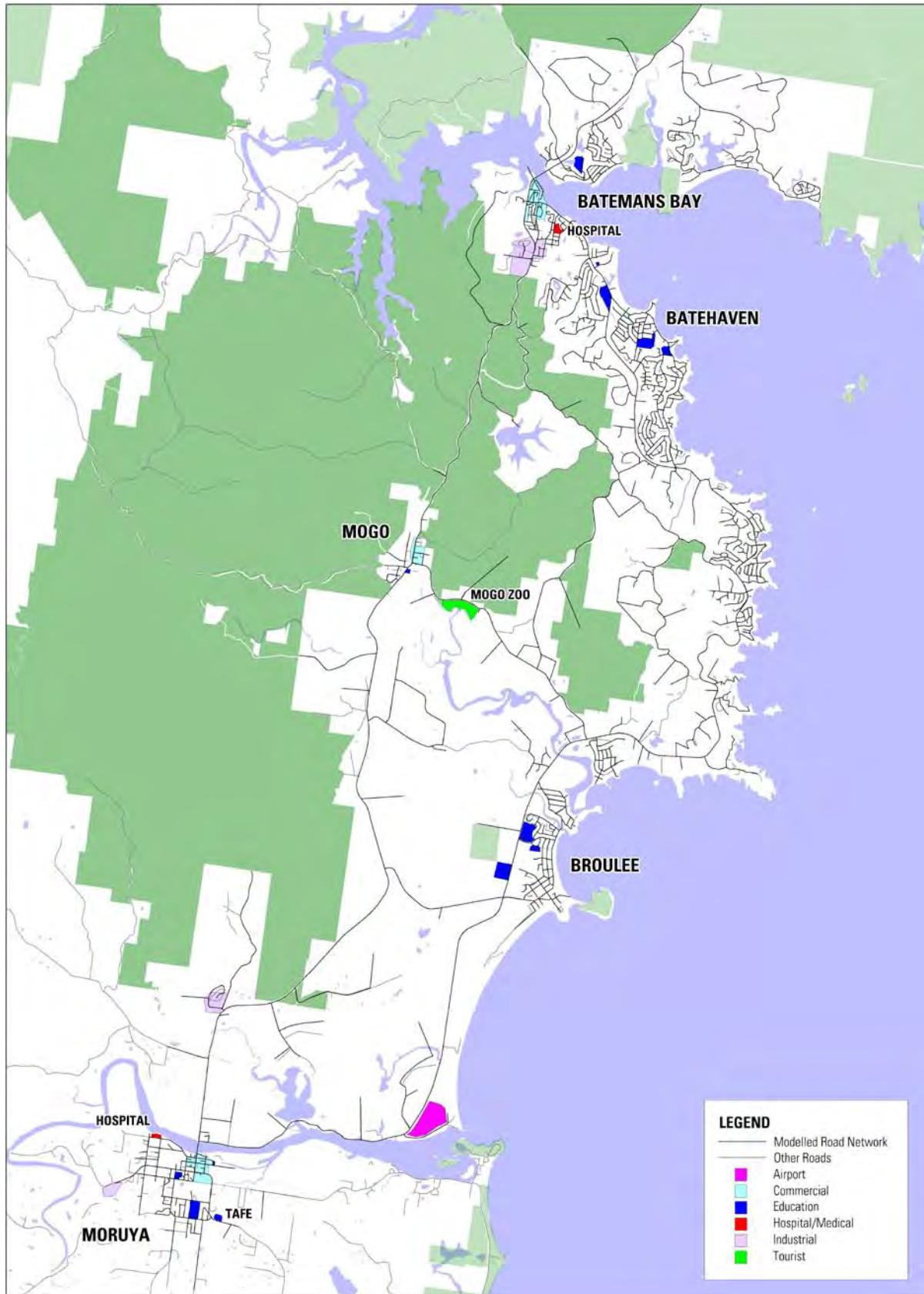
The major trip generators and attractors are illustrated in Figure 1.7.

### Eurobodalla Shire

The most recent estimate for the population of Eurobodalla LGA is 37,442 as at 30 June 2009 (ABS 32180, March 2010). Figure 1.6 shows how population in Eurobodalla, Bega Valley and combined (Lower South Coast statistical division [SD]) has changed from 2001 to 2009.

**Figure 1.6 Recent Population Estimates**



**Figure 1.7 Land Use Attractors**



The estimated annual changes are shown in Table 1.1.

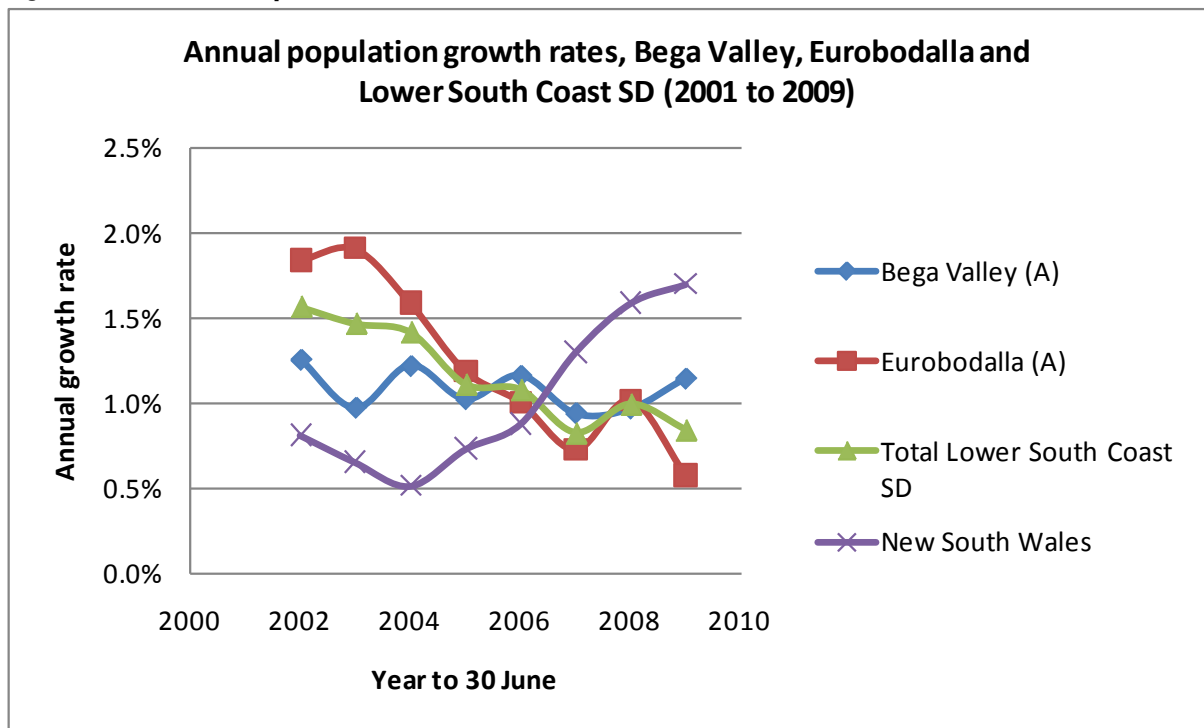
**Table 1.1 Estimated Annual Growth in Population (persons)**

SLA	2002	2003	2004	2005	2006	2007	2008	2009
Bega Valley (A)	387	303	384	326	374	306	318	380
Eurobodalla (A)	626	661	561	426	365	266	376	215
Total Lower South Coast SD	1013	964	945	752	739	572	694	595

The year on year population growth rates for these three series are plotted in Figure 1.8, along with the New South Wales series, to provide a context in which to consider the growth rates of the Lower South Coast.

Eurobodalla's year on year growth rates have declined from reasonably high levels of just less than 2% pa, down to the most recent rates of just over 0.5%pa. Bega has shown a degree of volatility, tracking in a band between around 1% and 1.5%. Of some interest is that these growth rates do not correlate well with overall growth rates for NSW.

**Figure 1.8 Annual Population Growth Rates**



## Study Area

Table 1.2 presents a breakdown of the 2006 population statistics for the study area, by small area. This data was compiled by .id Pty Ltd. The data shows that the Batehaven-Surf Beach urban area has the largest population, followed by Batemans Bay-Catalina.



**Table 1.2 Study Area Population Breakdown**

Area	2006
Eurobodalla Shire	36,574
Batemans Bay – Catalina	4,019
Batemans Bay Rural Hinterland	2,641
Broulee - Tomakin - Mossy Point	2,791
Malua Bay - Lilli Pilli - Rosedale - Guerilla Bay	2,309
Surf Beach - Batehaven - Sunshine Bay - Denhams Beach	5,549
Surfside - Long Beach - Maloneys Beach - North Batemans Bay	2,902
Urban Moruya - Moruya Heads	3,395
Broad Study Area sub-total	23,606

Source: .id Pty Ltd

### Household Numbers

Table 1.3 provides a summary of household numbers in 2006 and 2010. The 2006 data is taken from the ABS Census, whilst the 2010 data is an estimated taken from population projections prepared for Council by .id Pty Ltd. The data shows that the Batehaven-Surf Beach urban area has the largest volume of households, followed by Batemans Bay-Catalina.

**Table 1.3 Summary of Household Numbers**

Area	2006	2010
Eurobodalla Shire	15,672	16,683
Batemans Bay – Catalina	1,799	1,871
Batemans Bay Rural Hinterland	1,042	1,111
Broulee - Tomakin - Mossy Point	1,201	1,305
Malua Bay - Lilli Pilli - Rosedale - Guerilla Bay	984	1,077
Surf Beach - Batehaven - Sunshine Bay - Denhams Beach	2,344	2,426
Surfside - Long Beach - Maloneys Beach - North Batemans Bay	1,169	1,272
Urban Moruya - Moruya Heads	1,487	1,589
Broad Study Area sub-total	10,026	10,652

Source: 2006 data from .id Pty Ltd. 2010 estimates prepared by Cardno using linear interpolation based on projections by .id Pty Ltd

### Household Size

Table 1.4 presents a summary of the average household sizes in 2006 and 2010. The 2006 data is taken from the ABS Census, whilst the 2010 data is an estimated taken from population projections prepared for Council by .id Pty Ltd. The data shows that the Batemans Bay Rural Hinterland and Surfside – Long Beach – Maloneys Beach – North Batemans Bay areas have the largest average household size. This is most likely due to predominance of rural residential dwellings.

**Table 1.4 Summary of Average Household Size**

Area	2006	2010
Eurobodalla Shire	2.33	2.30
Batemans Bay – Catalina	2.23	2.22
Batemans Bay Rural Hinterland	2.53	2.50
Broulee - Tomakin - Mossy Point	2.32	2.31
Malua Bay - Lilli Pilli - Rosedale - Guerilla Bay	2.35	2.29
Surf Beach - Batehaven - Sunshine Bay - Denhams Beach	2.37	2.34
Surfside - Long Beach - Maloneys Beach - North Batemans Bay	2.48	2.47
Urban Moruya - Moruya Heads	2.28	2.26
Broad Study Area sub-total	2.35	2.33

Source: 2006 data from .id Pty Ltd. 2010 estimates prepared by Cardno using linear interpolation based on projections by .id Pty Ltd

## 1.4 EXISTING NETWORK PERFORMANCE

### 1.4.1 EXISTING TRANSPORT NETWORK DESCRIPTION

#### Road Classification

There are two main systems for the classification of roads in New South Wales, the functional classification system and the funding classification system. A third system that defines the environmental capacity of residential streets is also a form of classification, however is not used in this study.

#### Funding Classification

The RTA has adopted a “funding related” classification system that is primarily for administrative purposes. The key road classifications under the funding classification system are defined as:

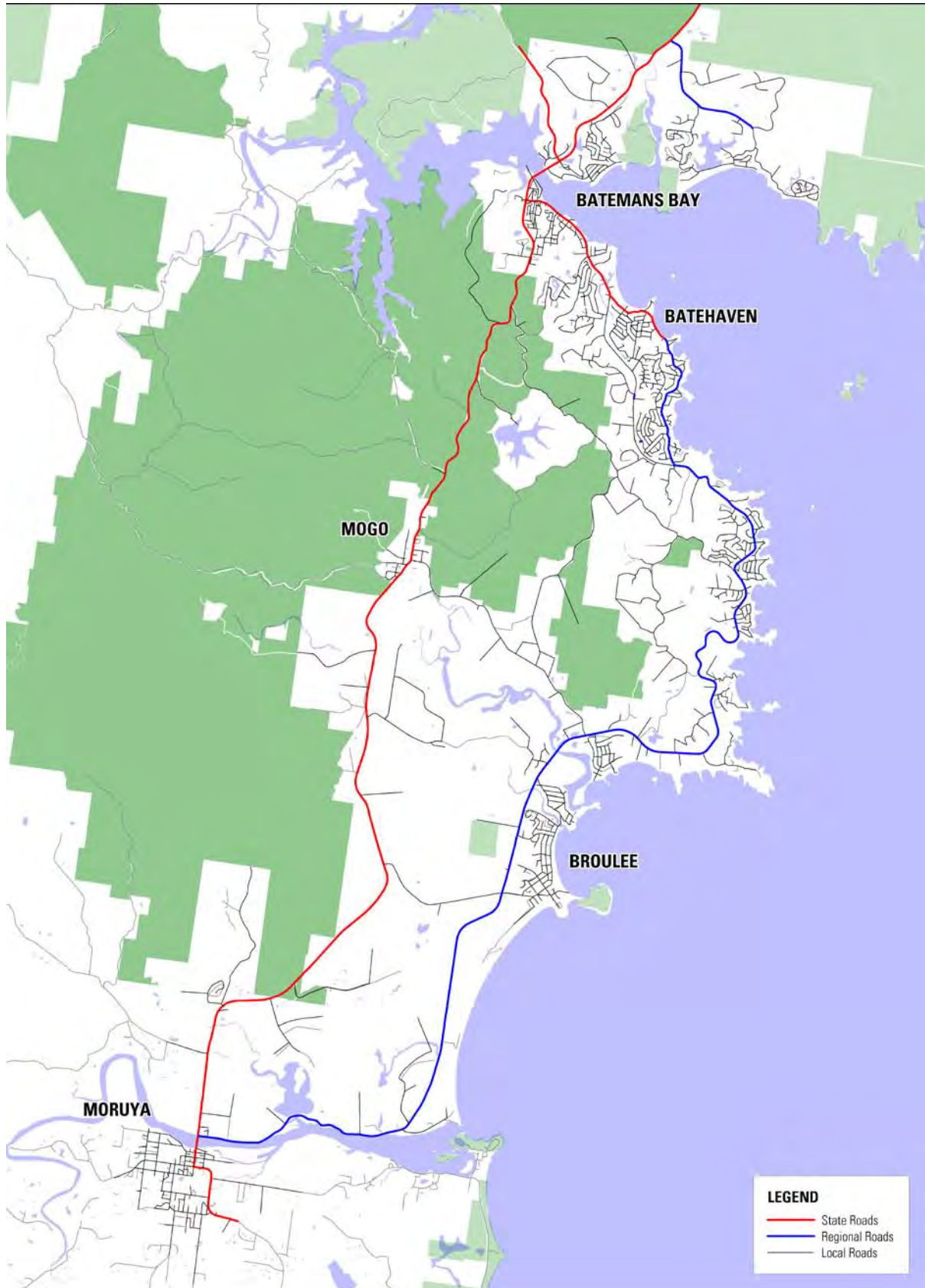
- **State Roads** – roads performing an important state function and for which the RTA fully funds the maintenance cost. State roads are essentially arterial roads.
- **Regional Roads** – roads performing a significant regional function and for which the RTA and Council share the costs of maintenance. Regional roads are essentially sub-arterial roads.
- **Local Roads** – roads performing a local or collector function and for which the Councils fully fund the maintenance cost. Additional funding is available from the RTA in certain circumstances on the grounds of urban amenity and road safety.

The funding road classification in the Northern Eurobodalla study area is presented in Figure 1.9.

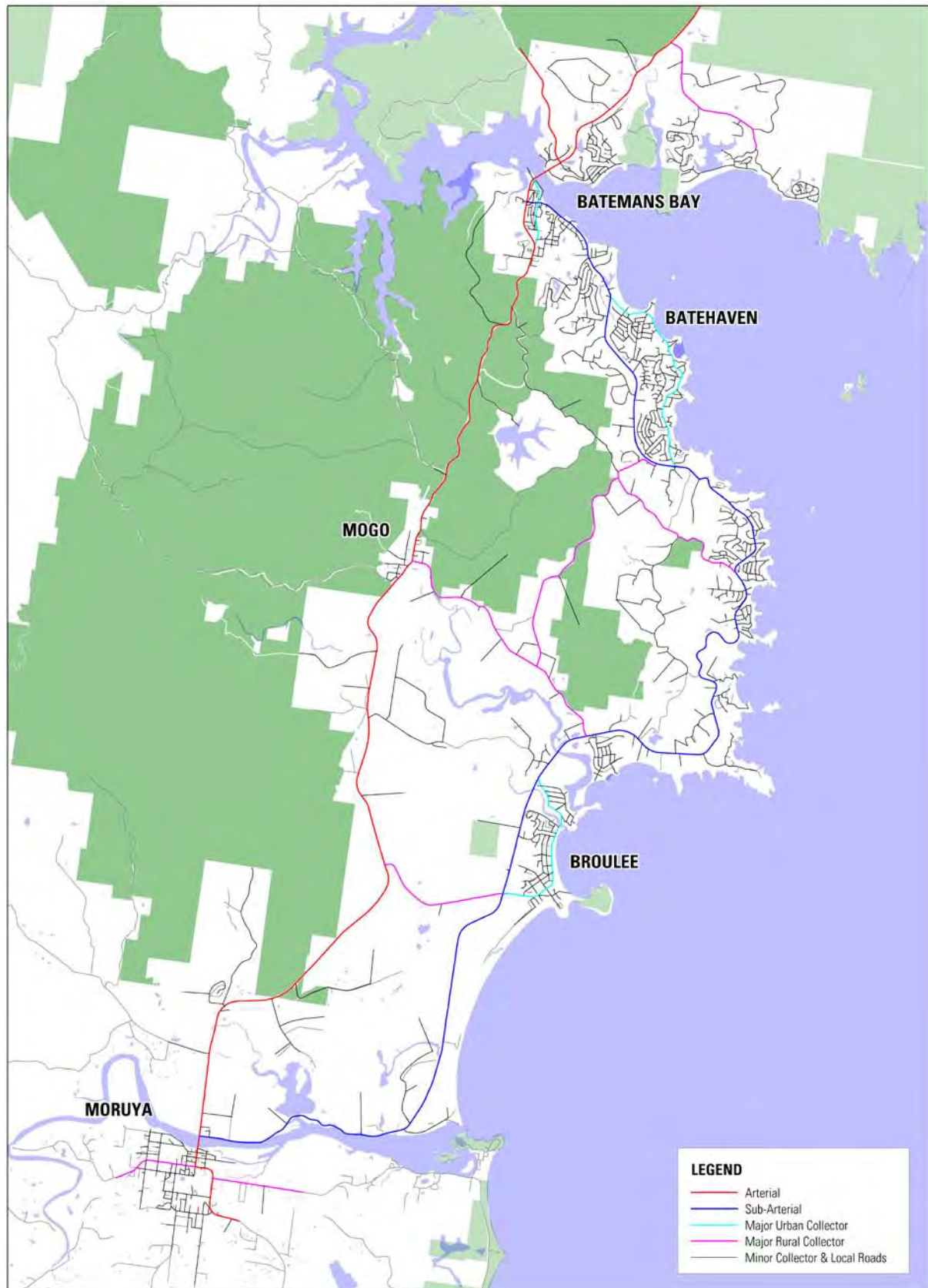
#### Functional Classification

The functional role or performance of individual roads can be appraised according to the classification of that road within an overall road hierarchy. Changes to traffic flows on the road can then be assessed within the context of the road hierarchy. The functional hierarchy consist of arterial, sub-arterial, collector and local roads. A detailed explanation of functional classification is contained in Appendix 1-D.

The functional road classification (Road Hierarchy) in the Northern Eurobodalla study area is represented in Figure 1.10.

**Figure 1.9 Road Funding Classifications**



**Figure 1.10 Functional Road Hierarchy**



## Freight Routes

The Princes Highway is the major freight corridor for Eurobodalla Shire, linking with Sydney, the Illawarra and Victoria. The Kings Highway provides freight access across the coastal escarpment to Canberra and the Southern Tablelands.

Freight access to/from Eurobodalla Shire has been a much publicised issue in recent years, particularly following a number of serious crashes involving both light and heavy vehicles between Kiama and Bega.

B-double access is restricted to Princes Highway, Kings Highway and the section of Beach Road from Princes Highway to Batehaven. Access along these routes is restricted to 19m B-doubles, 23m and 25/26m B-doubles are not authorised to operate on any roads within the Shire. Figure 1.11 illustrates the approved B-double routes within the Northern Eurobodalla study area.

## Road Network Description

The major road network in the study area consists of the following key routes:

- Princes Highway.
- Kings Highway.
- Beach Road /George Bass Drive/North Head Drive.
- Cullendulla Drive.
- Clyde Street/Orient Street/Old Princes Highway.
- Tomakin Road.
- Dunns Creek Road/Tallgums Way.
- Broulee Road.
- Campbell Street/Araluen Road.
- South Head Road.

## Princes Highway

Princes Highway is a State Road and the backbone of road transport network in the South Coast region, forming part of an important tourist and freight link between Sydney, the South Coast, Gippsland and Melbourne. It is generally a two-lane undivided road with overtaking lanes provided at frequent intervals, particularly along the steeper grades (e.g. between Batemans Bay and Mogo, and between Mogo and North Moruya). The speed limit is generally 100km/h, with lower limits through urban areas and on the winding section between Batemans Bay and Mogo.

North of Batemans Bay, the highway is generally two lanes wide with frequent overtaking lanes in both directions. The Clyde River Bridge at Batemans Bay has been acknowledged as a capacity constraint, being a narrow, two-lane bridge with an opening span and carrying all traffic on the immediate northern approach to Batemans Bay.

Through Batemans Bay, the highway has been deviated from its former route along Clyde and Orient Streets to bypass the town centre. A four-lane divided carriageway is provided along part of this deviation, as well as south from Old Princes Highway to Cranbrook Road.

Between Batemans Bay and Mogo, the highway is steep and winding with a 90km/h speed limit and overtaking lanes provided in both directions. Through the village of Mogo, the speed limit reduces to 50km/h and there is significant conflict between through traffic, vehicles parking and pedestrians. A school zone is located outside of the Mogo Public School, just south of the narrow bridge over Mogo Creek.

**Figure 1.11 B-Double Routes**

South of Mogo, the highway passes through more mountainous terrain with overtaking lanes provided in both directions. The alignment is generally good with a speed limit of 100km/h. After passing the North Moruya industrial estate, the highway passes across the floodplain into Moruya.

Through Moruya, the Princes Highway passes along the main street (Vulcan Street) of the town centre, before turning east into Campbell Street. Since the installation of traffic signals at the intersection of Vulcan Street/Church Street rat-running by southbound vehicles along Shore and Ford Streets has been identified.

No public planning has occurred for Princes Highway bypasses of Mogo or Moruya.

### **Kings Highway**

Kings Highway is a State Road linking Canberra, Braidwood and Batemans Bay, providing one of only four escarpment crossings between Nowra and Bega, across Clyde Mountain. The road is heavily used on weekends and in holiday periods as ACT traffic heads to the South Coast for recreation/tourism purposes.

Within the study area, the road is generally three lanes wide, with a climbing lane provided in the westbound direction for the climb from North Batemans Bay towards Nelligen.

### **Beach Road/George Bass Drive/North Head Drive**

This corridor forms a secondary, Regional Road loop from the Princes Highway between Batemans Bay and Moruya, serving the coastal villages. The quality of the route varies from a four-lane undivided urban road between Batemans Bay and Batehaven, to a high-quality rural limited-access type road along the recently completed section of George Bass Drive between Batehaven and Surf Beach. The section between Surf Beach and Rosedale is a lower standard, winding alignment with reduced speed limits of 60-70km/h. South of Rosedale, the alignment improves with a 100km/h speed limit south to Moruya Airport. North Head Drive runs along the northern bank of the Moruya River and has an 80km/h speed limit.

### **Cullendulla Drive**

Cullendulla Drive is the access route from Princes Highway to Long Beach and Maloney's Beach. For the most part, it is a two-lane rural road with an 80km/h speed limit, slowing to 50km/h in the urban areas.

### **Clyde Street/Orient Street/Old Princes Highway**

This corridor is the former Princes Highway alignment through Batemans Bay. Clyde and Orient Streets pass through the heart of the town centre and are slow speed environments with one-way southbound traffic in operation south of North Street. South of Beach Road, the route is a typical two-lane residential street, with a steep grade climbing the hill from Crown Street to South Street.

### **Tomakin Road**

Tomakin Road is two-lane rural road of high standard, linking Princes Highway at Mogo with George Bass Drive at Tomakin. It has been reconstructed in recent years by Council and the speed limit is generally 100km/h.

### **Dunns Creek Road/Tallgums Way**

Dunns Creek Road and Tallgums Way are two-lane rural roads with a speed limit range of 60-80km/hr, linking Tomakin Road with George Bass Drive at Surf Beach. In addition to serving an area of rural residential development, this route

provides a link between Surf Beach and the Princes Highway, as well as a link to George Bass Drive, which avoids the built up areas of Batemans Bay.

### **Broulee Road**

Broulee Road is a short connecting road between George Bass Drive at Broulee and Princes Highway between North Moruya and Mogo. It is a two-lane undivided rural type road with a speed limit of 100km/h.

### **Campbell Street/Araluen Road**

Campbell Street is a typical residential street with two traffic lanes and two parking lanes. It leads to Araluen Road, which begins as a typical two-lane rural road before losing its sealed surface as it enters the Moruya River valley. This route serves the Yarragee industrial estate, as well as residential areas on the western side of Moruya.

### **South Head Road**

South Head Road is a two-lane rural road linking Moruya with Moruya Heads.

### **Speed Zones**

The speed zones included in the modelled road network are provided in Figure 1.12.

### **Intersection Controls**

The majority of intersections through in the study area are priority controlled. The signalised and roundabout controlled intersections are shown on Figure 1.13.

Signalised intersections are provided at the following intersections:

- Princes Highway/North Street, Batemans Bay.
- Princes Highway/Beach Road, Batemans Bay.
- Princes Highway/Cranbrook Road, Batemans Bay.
- Beach Road/Orient Street, Batemans Bay.
- Beach Road/Flora Crescent, Batemans Bay.
- Beach Road/Country Club Drive/Caitlin Avenue, Catalina.
- Beach Road/George Bass Drive, Batehaven.
- Beach Road/Edward Road, Batehaven.
- Princes Highway/Church Street, Moruya.



**Figure 1.12 Speed Zones**

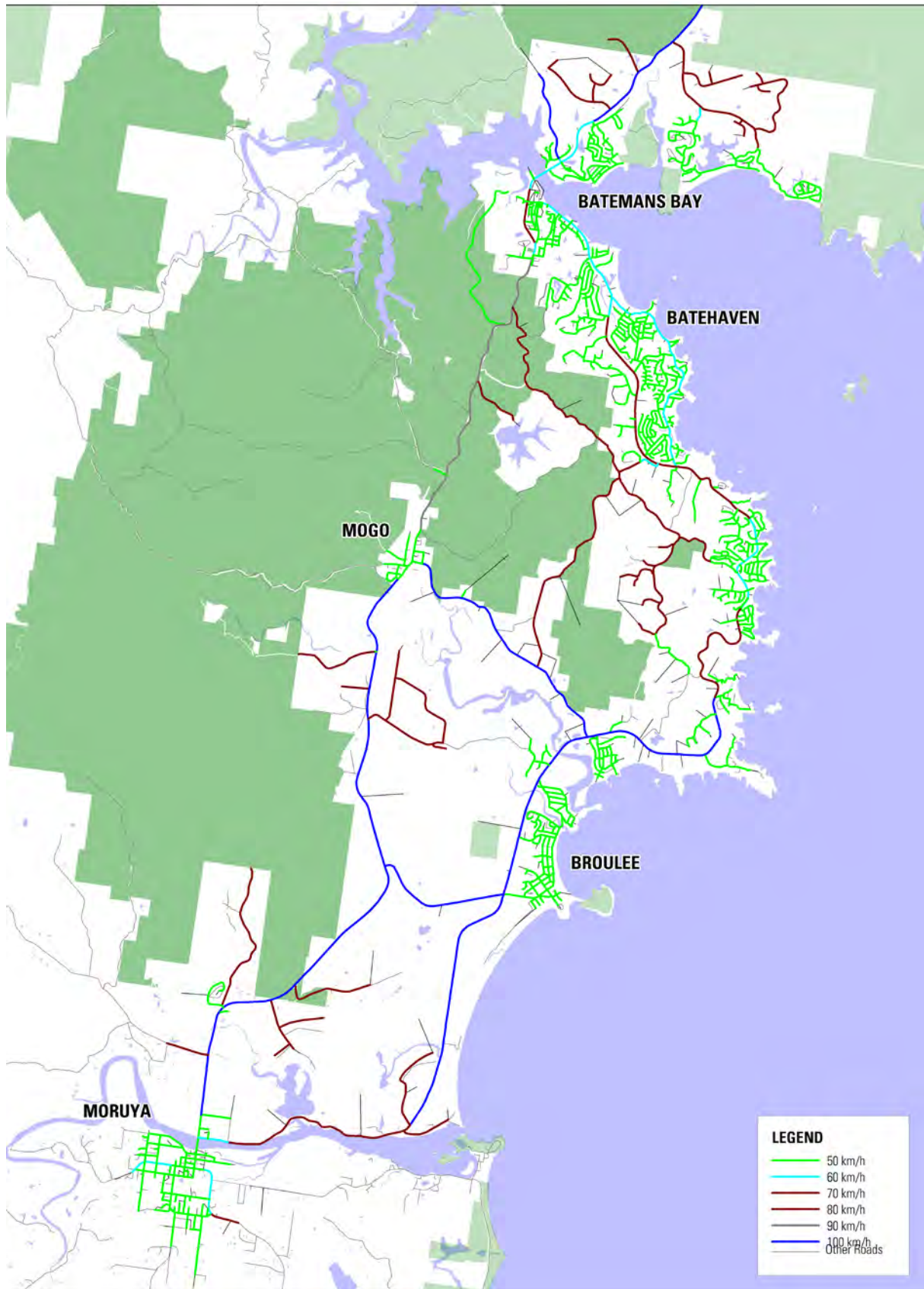
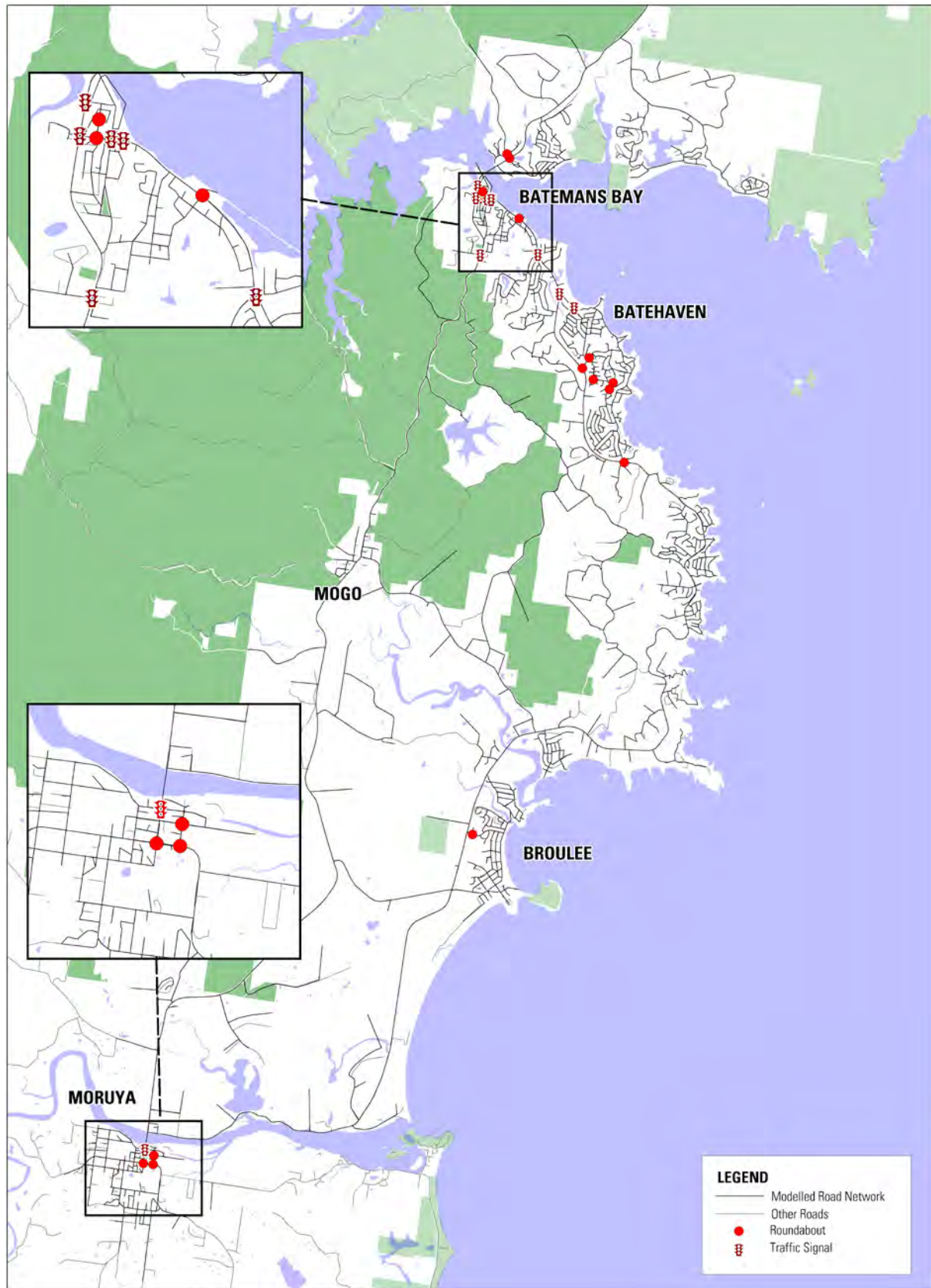


Figure 1.13 Intersection Controls



Roundabouts are provided at the following key intersections:

- Kings Highway/Old Punt Road, North Batemans Bay.
- Princes Highway/Kings Highway/Peninsula Drive, North Batemans Bay.
- Beach Road/Perry Street, Batemans Bay.
- Beach Road/Bavarde Avenue, Batemans Bay.
- George Bass Drive/Sunshine Bay Road, Sunshine Bay.
- Sunshine Bay Road/Edward Avenue, Sunshine Bay.
- George Bass Drive/Beach Road, Surf Beach.
- Princes Highway/Vulcan Street/Campbell Street, Moruya.
- Princes Highway/Ford Street, Moruya.
- Ford Street/Queen Street, Moruya.

### **Planned Improvements**

The following improvements to the road network within the study area are planned for implementation in the near future:

- Batemans Bay Link Road – extension of George Bass Drive from Glenella Road west to Princes Highway near the junction with Ridge Road. This project is intended for commencing in 2010/2011 financial year.
- Extension of Ridge Road, Malua Bay.
- A Bulky Goods precinct and the associated road network off the roundabout located at the intersection of George Bass Drive & Beach Road, Surf Beach.
- Intersection upgrades within Batemans Bay Town Centre highlighted in Batemans Bay Traffic and Transport Study (Bitzios Consulting, September 2010).

These improvements are shown on Figure 1.14.



**Figure 1.14 Planned Improvements**





### 1.4.2 ROAD SAFETY

RTA crash data was supplied by Council for the study area for the five year period from 2004 to 2008. This data was used in a crash investigation of the existing road network. Generally crash data is categorised as; tow-away, injury and fatality.

The tow-away, injury and fatal crashes for the period 2004 to 2008 (inclusive) are presented in Figure 1.15, Figure 1.16, and Figure 1.17. Figure 1.18 shows all crashes.

These crash statistics along with traffic volume counts (where available) were used to calculate crash rates, casualty rates and fatality rates. The following definitions were used in these calculations:

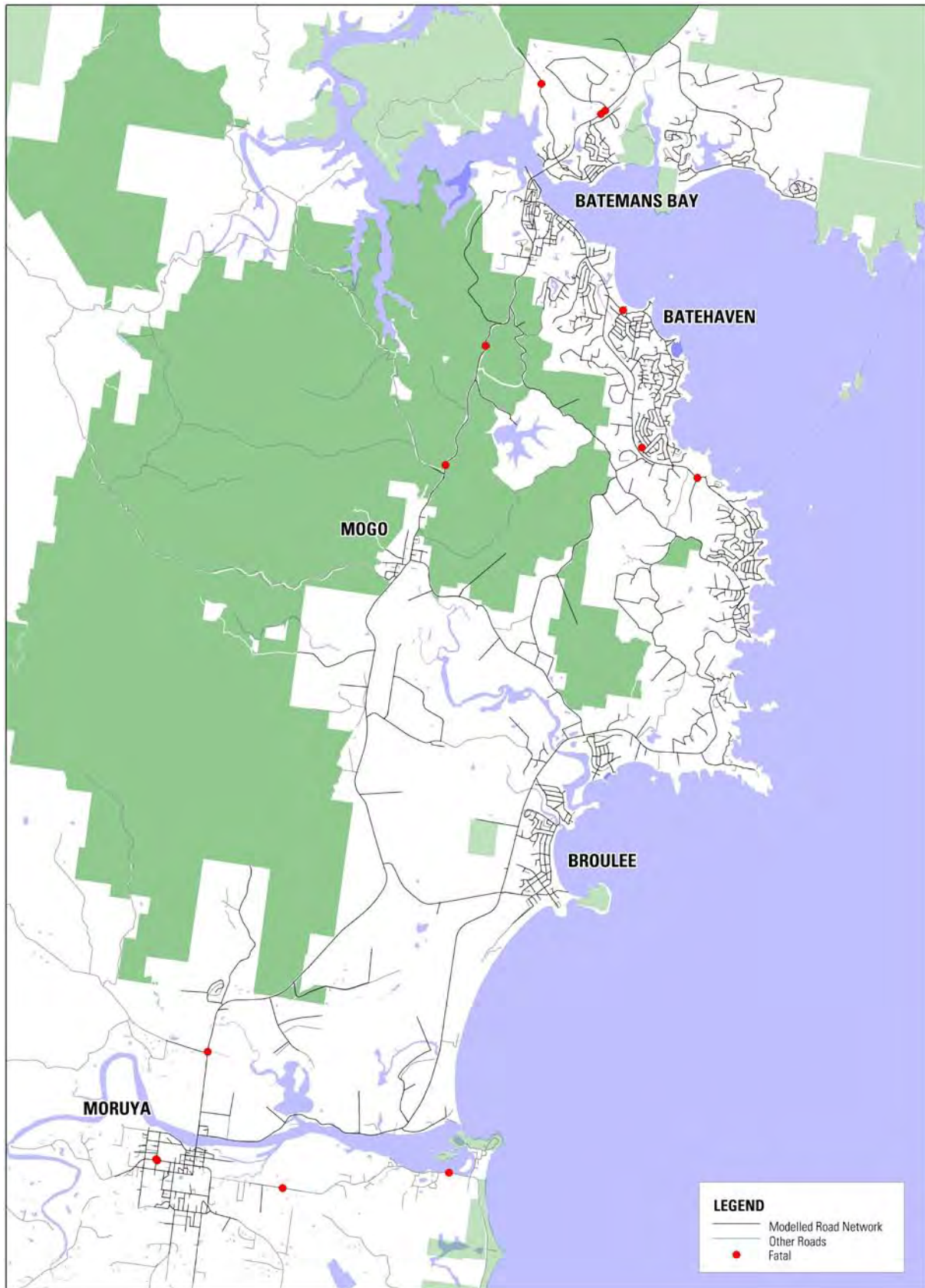
- **Road Crash:** An apparent, unpremeditated event which results in death or injury to a person, or vehicle or property damage and is attributable to the movement of a road vehicle(s) on a public road.
- **Crash Rate:** The number of crashes per 100 million vehicle kilometres travelled (MVKT).
- **Casualty Crash:** A crash involving either an injury or a fatality.
- **Casualty Rate:** The number of casualties (number of people injured or killed) per 100 MVKT.
- **Fatality Rate:** The number of fatalities (number of people killed) per 100 MKVT.
- **Severity Index:** An index value relating the severity of crashes to their respective amounts. The following weightings are used for each crash type:
  - Tow-away crashes 1.0
  - Injury crashes 1.5
  - Fatality crashes 3.0
- **Critical Crash Rate:** A statistically derived number based on the sample data for each section of road. It provides a 95 per cent confidence limit crash rate to compare against the crash rates for each sub-section. Any casualty crash rate above this limit suggests a high priority road length. The following formula was used to calculate the limit:

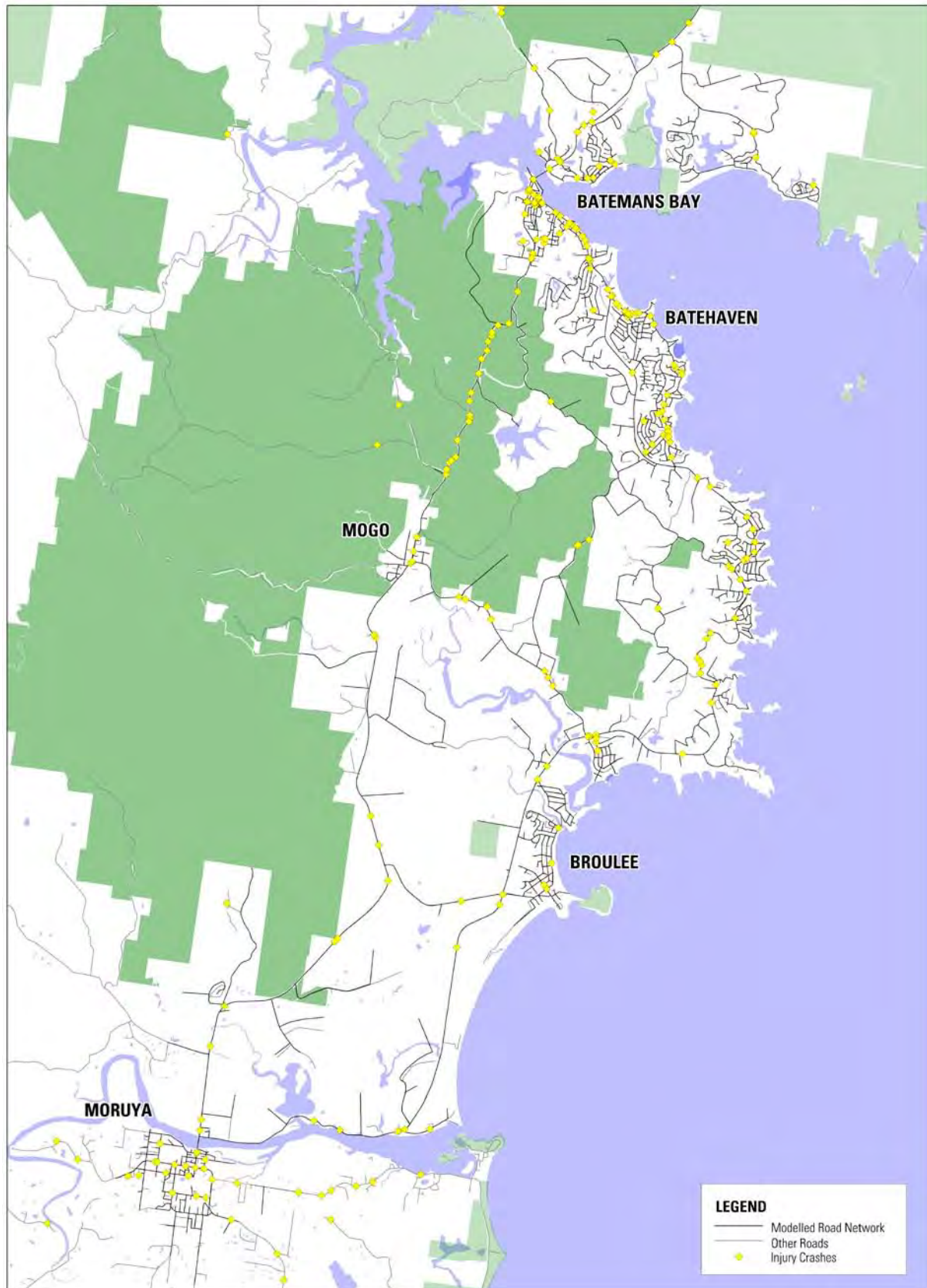
$$CR = A + 1.645\sqrt{\frac{A}{M}} + \frac{1}{2M}$$

Where:

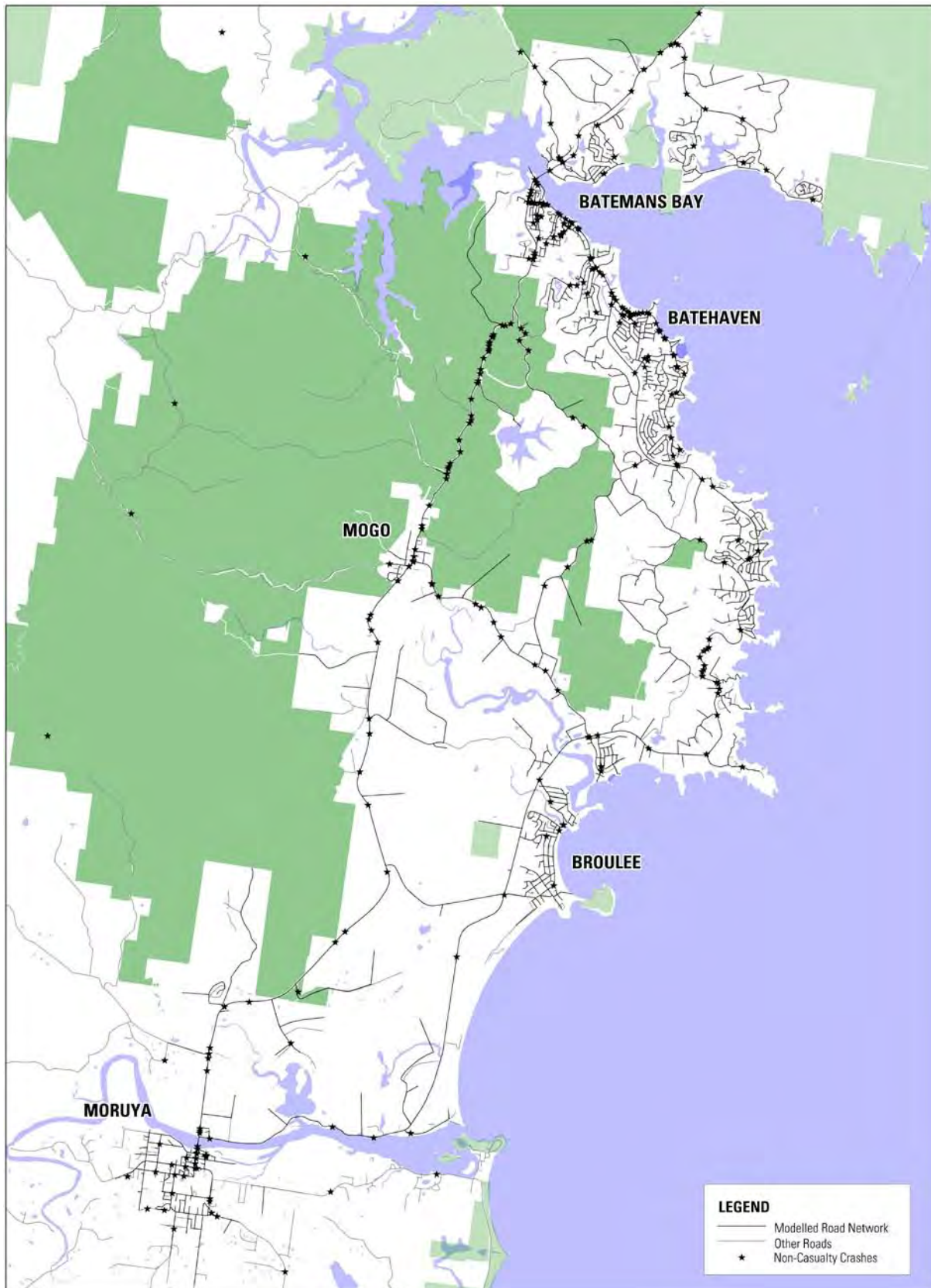
- A is the average casualty crash rate for the length of road.
- M is the 100 MVKT for the length of road.

**Figure 1.15 Fatal crashes 2004 to 2008**

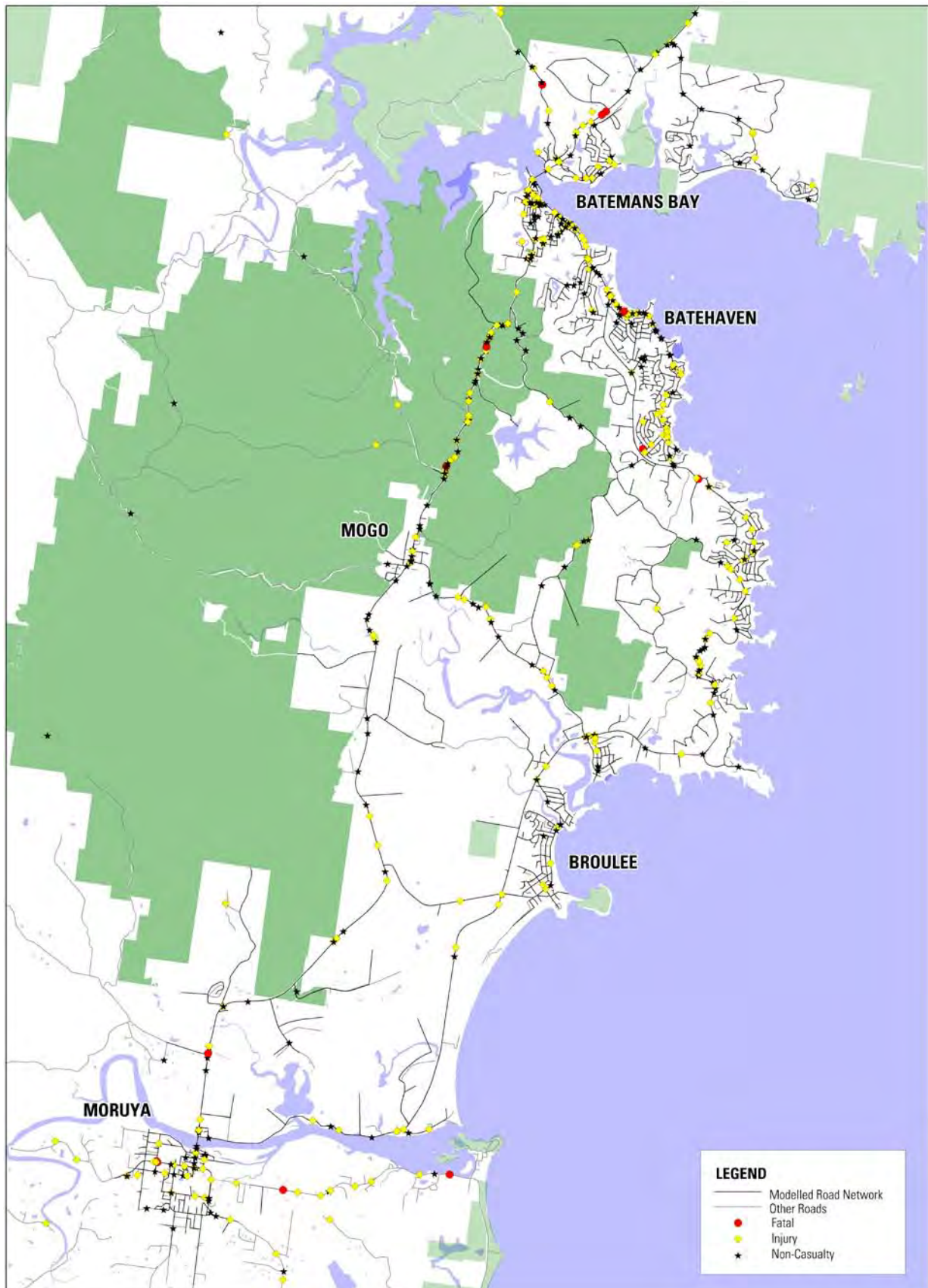


**Figure 1.16 Injury crashes 2004 to 2008**



**Figure 1.17 Non-casualty crashes 2004 to 2008**



**Figure 1.18 All crashes 2004 to 2008**

## Overview

A brief overview of crash statistics for the LGA is provided below:

- There were a total of 655 crashes, 44% (289) resulted in injuries and 2% (15) resulted in fatalities with an overall severity index of 1.3. The 289 injury crashes resulted in 406 injuries and the 15 fatal crashes resulted in 16 fatalities.
- Of the 655 crashes:
  - 589 crashes (89%) involved cars.
  - 110 crashes (17%) involved heavy vehicles.
  - Light Truck (80%).
  - Heavy Rigid Truck (7%).
  - Articulated Truck (6%).
  - Bus (6%).
  - 47 crashes (7%) involved motorcycles.
  - 14 crashes (2%) involved bicycles resulting in 14 bicyclist injured.
  - 27 crashes (4%) involved pedestrians resulting in 22 pedestrians injured and 7 pedestrians killed.

## Key Sections

A more detailed summary of the key crash information such as number of crashes, type of vehicles involved and number casualties, is provided for each road in the study area in Appendix 1-E. An overview of crashes along roads that had 10 or more crashes is provided in Table 1.5.

**Table 1.5 Road crash summary – roads with >10 crashes (2004-2008)**

Road Name	No Crashes by Crash Type						No Casualties					
	Tow (T)	Injury (I)	Fatality (F)	Total	Severity Index	No of HV Crashes	Total Injured	Total Fatalities	Pedestrians Killed	Pedestrians Injured	Bicyclists Killed	Bicyclists Injured
Beach Road	76	71	1	148	1.3	19	86	1	1	11	0	3
George Bass Drive	29	26	1	56	1.3	9	36	1	0	1	0	0
Princes Highway	108	79	7	194	1.3	44	117	8	2	1	0	4
Kings Highway	7	8	1	16	1.4	3	14	1	0	0	0	0
South Head Road	2	6	2	10	1.7	0	8	2	2	2	0	1
Tomakin Road	10	7	0	17	1.2	2	7	0	0	0	0	1

Whilst Princes Highway had the highest number of crashes, South Head Road had the highest severity index. A detailed crash investigation was undertaken for the roads listed in Table 1.5. Beach Road, George Bass Drive and Princes Highway were separated into separate sub-sections based on similar road attributes. The sections considered in the analysis are shown on Figure 1.19.

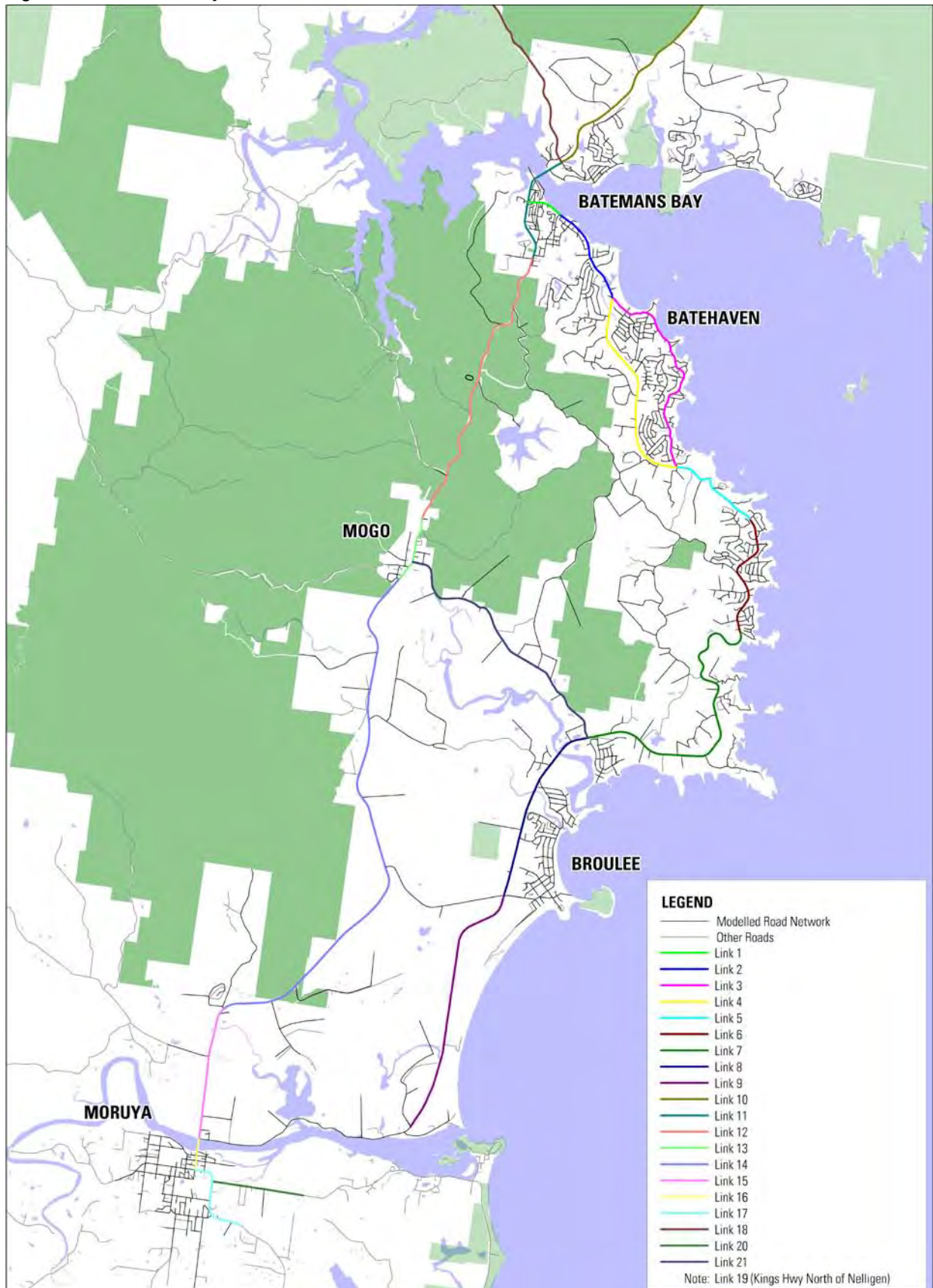
**Figure 1.19 Crash analysis Sections**



Table 1.6 shows each sub-section of road along with their carriageway type, length, average weekday traffic volume (AWD), percentage heavy vehicle traffic (%HV) and MVKT.

**Table 1.6 Key Road Section Summaries**

No.	Road	From	To	Length (km)	ADT	% HV	100 MVKT
1	Beach Road	Princes Hwy	Mara Mia Wkwy	0.83	13833	6.9%	0.042
2	Beach Road	Mara Mia Wkwy	Glenella Rd	2.41	16535	6.9%	0.145
3	Beach Road	Glenella Rd	George Bass Dr	5.23	9828	6.9%	0.188
	Sub-Total			8.47	12127	6.9%	0.375
4	George Bass Drive	Glenella Rd	Beach Rd	4.90	6311	13.1%	0.113
5	George Bass Drive	Beach Rd	Carramar Dr	1.90	4333	13.1%	0.030
6	George Bass Drive	Carramar Dr	Illabunda Dr	2.12	3189	13.1%	0.025
7	George Bass Drive	Illabunda Dr	Tomakin Rd	7.45	2045	13.1%	0.056
8	George Bass Drive	Tomakin Rd	Broulee Rd	3.45	5472	13.1%	0.069
9	George Bass Drive	Broulee Rd	North Head Dr	6.38	3006	13.1%	0.070
	Sub-Total			26.20	3787	13.1%	0.362
10	Princes Highway	LGA Boundary	Kings Highway	6.14	13366	7.9%	0.299
11	Princes Highway	Kings Highway	Cranbrook Road	2.74	14125	8.4%	0.141
12	Princes Highway	Cranbrook Road	Burkes Ln	7.12	8265	10.0%	0.215
13	Princes Highway	Burkes Ln	Buckenbowra Rd	1.57	7521	8.0%	0.043
14	Princes Highway	Buckenbowra Rd	Shelley Rd	12.82	6039	8.0%	0.283
15	Princes Highway	Shelley Rd	North Head Dr	3.20	7513	11.2%	0.088
16	Princes Highway	North Head Dr	Campbell St	0.74	8783	11.2%	0.024
17	Princes Highway	Campbell St	Noggarula Dr	6.86	11489	11.2%	0.288
	Sub-Total			41.18	9181	9.2%	1.380
18	Kings Highway	Princes Highway	Nelligen	16.93	5138		0.318
19	Kings Highway	Nelligen	LGA Boundary	17.27	4610		0.291
20	South Head Road	Princes Hwy	Moruya Heads	6.03	3172		0.070
21	Tomakin Road	Princes Hwy	George Bass Dr	3.29	1574	8.1%	0.019

The crash data received from the RTA was applied to the appropriate length of road to allow for a detailed crash investigation.

### Severity Index and Crash Rates

The number of incidents and their severities were assessed along with a severity index and the number of casualties for each sub-section of road. The proportion of heavy vehicle crashes per sub-section was compared to the corresponding percentage of heavy vehicle movements. The sub-sections where the percentage of crashes involving heavy vehicles relative to the total volume of crashes were greater than the percentage of heavy vehicles relative to AADT volumes were considered to be 'black spots' for heavy vehicle traffic. These values are presented in Table 1.7.



**Table 1.7 Crash Data on Key Road Sections (2004 to 2008)**

Section	No Crashes by Crash Type				Severity Index*	No. Casualties by Crash Type		%HV Crashes^
	Tow (T)	Injury (I)	Fatality (F)	Total		Injury (I)	Fatality (F)	
1	14	8	0	22	1.18	9	0	14%
2	23	26	0	49	1.27	34	0	16%
3	39	37	1	77	1.27	43	1	10%
Sub-Tot	76	71	1	148	1.25	86	1	13%
4	1	0	0	1	1.00	0	0	0%
5	4	2	1	7	1.43	3	1	14%
6	3	8	0	11	1.36	13	0	27%
7	18	13	0	31	1.21	17	0	13%
8	3	2	0	5	1.20	2	0	20%
9	0	1	0	1	1.50	1	0	0%
Sub-Tot	29	26	1	56	1.27	36	1	16%
10	6	5	1	12	1.38	7	1	33%
11	29	18	1	48	1.23	21	1	21%
12	28	26	3	57	1.33	44	4	18%
13	8	5	0	13	1.19	8	0	31%
14	12	7	0	19	1.18	13	0	26%
15	8	3	1	12	1.29	6	1	25%
16	8	6	0	14	1.21	7	0	21%
17	9	9	1	19	1.34	11	1	26%
Sub-Tot	108	79	7	194	1.28	117	8	23%
18	7	8	1	16	1.29	110	4	16%
19	14	18	2	34	1.38	27	2	15%
20	2	6	2	10	1.70	8	2	0%
21	10	7	0	17	1.21	7	0	12%

\* Weightings for Severity Index (T = 1.0, I = 1.5, F = 3.0)

^ Sites where proportion of crashes involving heavy vehicles exceeds overall proportion of heavy vehicles by volume.

The calculations showed that following road sections (section identifiers are in Table 1.6) all experience a high percentage of heavy vehicle crashes compared with the proportion of heavy vehicle traffic by volume:

- Sections 1—3 along Beach Road.
- Sections 5—6 and 8 along George Bass Drive.
- All sections along the Princes Highway.
- Section 18 – 19 along Kings Highway.

The crash statistics in Table 1.7 were used to calculate the casualty rates, fatality rates and crash rates for each sub-section of road. These values are presented in Table 1.8. Comparisons between the critical crash rates and crash rates for each length of road and the respective sub-sections emphasise which areas include crash clusters.

**Table 1.8 Crash Rates on Key Road Sections (2004 to 2008)**

Section	Casualty Rate (per 100MVKT)	Fatality Rate (per 100MVKT)	Crash Rates (per 100MVKT)					Critical Crash Rates (per 100MVKT)
			T	I	F	Total	Casualty <sup>^</sup>	
1	1.8	0.00	66.6	38.0	0.0	104.6	38.0	
2	6.8	0.00	31.7	35.8	0.0	67.5	35.8	
3	8.6	1.07	41.6	39.4	1.1	82.1	40.5	
Sub-Tot	17.2	0.53	40.5	37.9	0.5	79.0	38.4	56.4
4	0.0	0.00	1.8	0.0	0.0	1.8	0.0	
5	0.6	6.66	26.6	13.3	6.7	46.6	20.0	
6	2.6	0.00	24.3	64.8	0.0	89.1	64.8	
7	3.4	0.00	64.7	46.8	0.0	111.5	46.8	
8	0.4	0.00	8.7	5.8	0.0	14.5	5.8	
9	0.2	0.00	0.0	2.9	0.0	2.9	2.9	
Sub-Tot	7.2	0.55	16.0	14.4	0.6	30.9	14.9	26.8
10	1.4	0.67	4.0	3.3	0.7	8.0	4.0	
11	4.2	1.42	41.1	25.5	1.4	68.1	26.9	
12	8.8	3.72	26.1	24.2	2.8	53.1	27.0	
13	1.6	0.00	37.1	23.2	0.0	60.3	23.2	
14	2.6	0.00	8.5	5.0	0.0	13.4	5.0	
15	1.2	2.28	18.2	6.8	2.3	27.3	9.1	
16	1.4	0.00	67.4	50.6	0.0	118.0	50.6	
17	2.2	0.70	6.3	6.3	0.7	13.2	7.0	
Sub-Tot	23.4	1.16	15.7	11.4	1.0	28.1	12.5	17.8
18	22.0	2.52	49.8	47.2	2.5	99.5	49.8	
19	5.4	1.38	9.6	12.4	1.4	23.4	13.8	
20	1.6	5.73	5.7	17.2	5.7	28.6	22.9	
21	1.4	0.00	105.8	74.1	0.0	179.9	74.1	

<sup>^</sup> Sites where the individual casualty crash rate exceeds the critical crash rate for the section are highlighted in red.

The sections of road with casualty crash rates exceeding the critical crash rates were:

- George Bass Drive from Beach Road to Illabunda Drive.
- Princes Highway:
  - From Kings Highway to Buckenbowra Road.
  - From North Head Drive to Campbell Street.

The RTA's State Plan has a target of "reducing road fatalities to 0.7 per 100 million vehicle kilometres travelled by 2016". The whole length of Princes Highway, from the northern LGA boundary to south of Moruya **has a fatality rate of 1.2 per 100 million vehicle kilometres travelled – almost double the target figure**. However, individual sections have rates much higher than this:

- Kings Highway to Cranbrook Road (1.4 per 100 million vehicle kilometres travelled).
- Cranbrook Road to Buckenbowra Road (3.7 per 100 million vehicle kilometres travelled).
- Shelly Road to North Head Drive (2.3 per 100 million vehicle kilometres travelled).

The overall crash rate (fatal, injury and tow-away) for the Princes Highway, from the northern LGA boundary to south of Moruya, over the same period is 12.5 per 100 million vehicle kilometres travelled.

In 2004 the RTA published typical rural crash rates by road stereotypes based on data for the period 1997 to 2001 collected from a sample of 10,000 km of main road across NSW – a sample considered to be an adequate representation of all rural roads in NSW. In the category 'two lane non-divided carriageway, with auxiliary lanes':

- The stereotypical fatal crash rate for major roads was calculated to be 1.3 per 100 million vehicle kilometres travelled, 30 per cent higher than the overall crash rate for the Princes Highway through the study area (1.0 per 100 million vehicle kilometres travelled). However individual sections exceed this rate significantly:
  - Princes Highway - Cranbrook Road to Burkes Lane (2.8 per 100 million vehicle kilometres travelled).
  - Princes Highway - Shelley Road to North Head Drive (2.3 per 100 million vehicle kilometres travelled).
  - Kings Highway – Princes Highway to Nelligen (2.5 per 100 million vehicle kilometres travelled).
  - South Head Road - Princes Highway to Moruya Heads (5.7 per 100 million vehicle kilometres travelled).
- The stereotypical overall crash rate (fatal, injury and tow-away) in this category is 30.4 per 100 million vehicle kilometres travelled, 8 per cent higher than the overall crash rate for the Princes Highway through the study area (28.1 per 100 million vehicle kilometres travelled).

#### 1.4.3 ROAD NETWORK PERFORMANCE CRITERIA

LoS is an index of the operational efficiency of a roadway or intersection. The analysis is essential in planning and design of the transport network and can influence the number of lanes provided or the arrangement of a traffic control system under study.

LoS can be measured at mid-block or at intersections. As a mid block measure, LoS is a qualitative measure describing the operational conditions on a road and their perception by a driver. At intersections, LoS is considered in terms of average delay experienced by drivers.

#### Mid-Block Carriageway Capacity

The capacity of major streets within an urban area can be based on an assessment of their operating LoS. LoS is defined by AUSTROADS *Guide to Traffic Engineering Practice – Part 2 Roadway Capacity* 1988) as a qualitative measure of the effects of a number of features, which include speed and travel time, traffic interruptions, freedom to manoeuvre, safety, driving comfort and convenience, and operating costs. LoS is designated from A to F from best (free flow conditions) to worst (forced flow with stop start operation, long queues and delays) as follows:

- A - Free flow (almost no delays).
- B - Stable flow (slight delays).
- C - Stable flow (acceptable delays).
- D - Approaching unstable flow (tolerable delays).
- E - Unstable flow (congestion; intolerable delays).
- F - Forced flow (jammed).

A detailed explanation of Carriageway LoS for urban and rural roads is located in Appendix 1-G.

#### Intersection Performance Criteria

The capacity of an urban road network is controlled by the capacity of the intersections within that network. Average delay is commonly used to assess the actual performance of intersections, with LoS used as an index. The operating

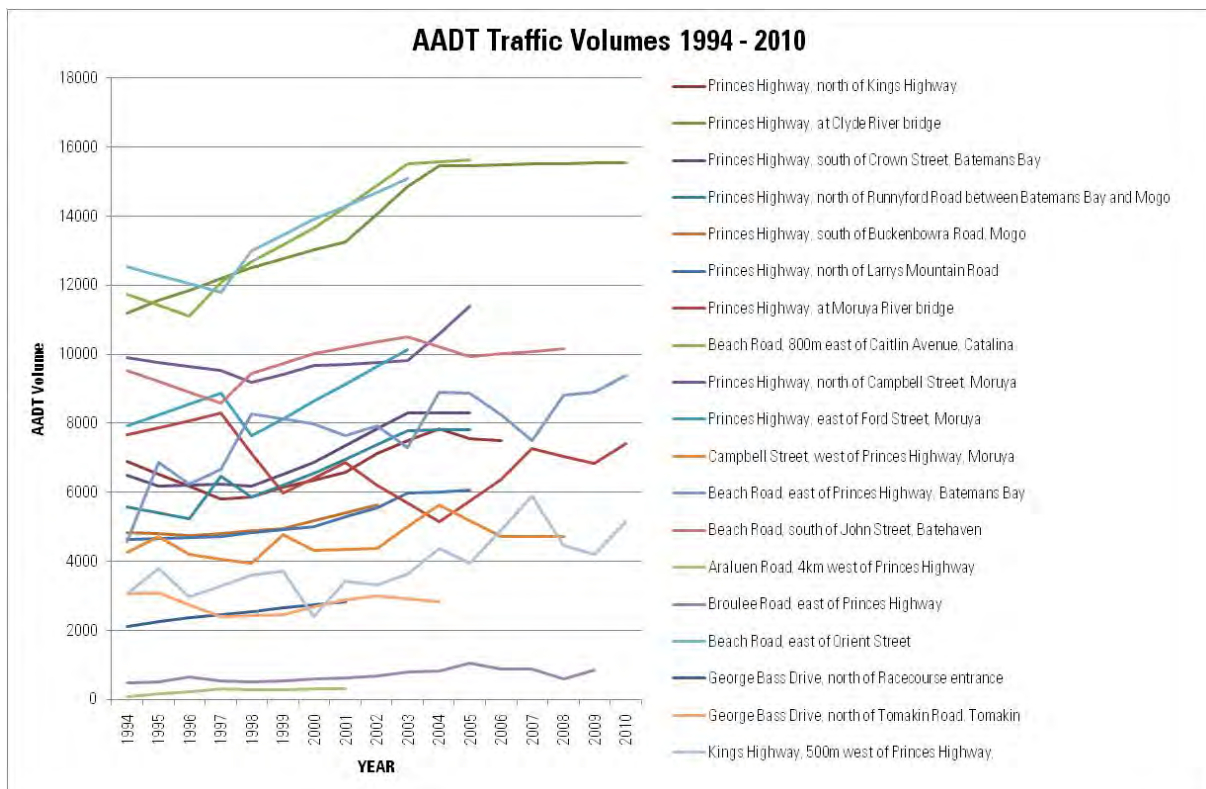
performance of intersections has been assessed using the SIDRA software package to determine the Degree of Saturation (DS), Average Vehicle Delay (AVD in seconds) and LoS at each intersection. The SIDRA program provides LoS Criteria Tables for various intersection types. The key indicator of intersection performance is LoS, where results are placed on a continuum from 'A' to 'F'. A detailed explanation of intersection performance criteria is provided in Appendix 1-H.

#### 1.4.4 EXISTING TRAFFIC DEMANDS

##### Historical AADT

Figure 1.21 shows the locations of AADT counting stations, within the northern part of the LGA, with the corresponding 2005 AADT (2003 is provided where 2005 is unavailable) volumes. The 17 year historical AADT data is presented in Table 1.9, along with historical growth rates. Figure 1.20 illustrates the historic growth trends over the previous ten years' data.

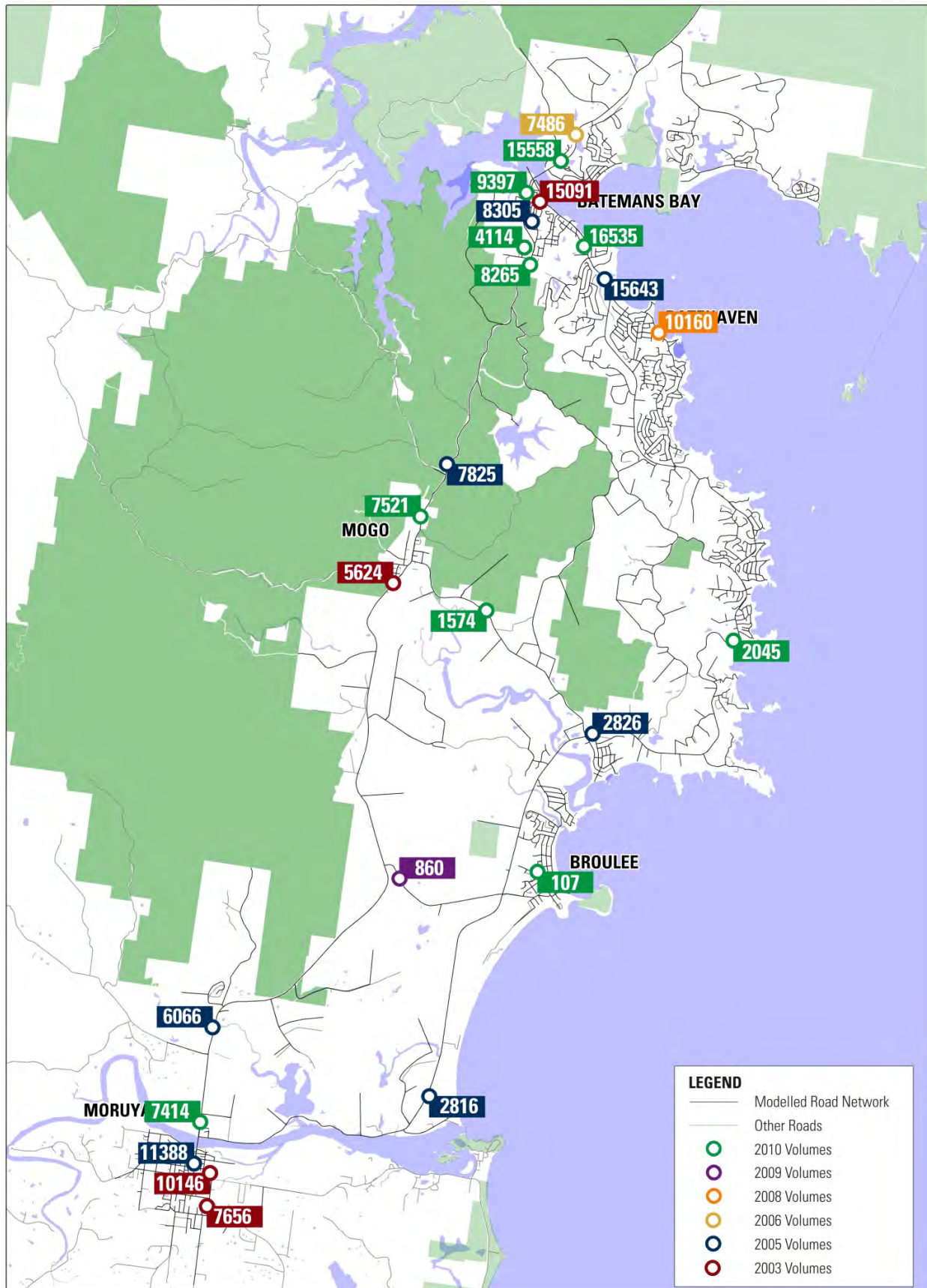
**Figure 1.20 AADT Historic Growth**



The AADT data shows consistent growth in traffic along both corridors, with linear growth rates of approximately 2.3% per annum for Princes Highway, 3.9% per annum for the Beach Road, 4.7% per annum for George Bass Drive and 4.3% per annum for Kings Highway.



Figure 1.21 AADT and ADT Volumes



2005 and 2003 Volumes are AADT, 2010 Volumes are five day average weekday volumes (ADT)

**Table 1.9 AADT Data 1994 – 2010\***

	AADT Traffic Volumes by Year																	Historical Growth	
	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	Period	% p.a
<b>Princes Highway</b>																			
North of Kings Highway	6892	6534	6176	5818	5872	6148	6352	6591	7117	7491	7833	7543	7486					1994-2006	0.8%
At Clyde River bridge	11204	11563	11859	12200	12500	12756	13013	13269	14063	14857	15455	15472	15489	15507	15524	15541	15558	1994-2010	2.4%
South of Crown St, Batemans Bay	6508	6176	6213	6249	6180	6530	6880	7358	7835	8313	8309	8305						1994-2005	2.5%
North of Runnyford Road	5576	5410	5244	6455	5867	6208	6549	6966	7383	7775	7800	7825						1994-2005	3.7%
South of Buckenbowra Road, Mogo		4825	4790	4754	4818	4882	4946	5172	5398	5624								1995-2003	2.1%
North of Larrys Mountain Road	4645	4670	4694	4719	4843	4927	5011	5283	5555	5969	6018	6066						1994-2005	2.8%
At Moruya River bridge	7679	7882	8084	8287	7130	5972	6415	6858	6219	5679	5138	5757	6376	7268	7049	6829	7414	1994-2010	-0.3%
North of Campbell Street, Moruya	9896	9771	9646	9521	9182	9422	9662	9710	9759	9807	10598	11388						1994-2005	1.4%
East of Ford Street, Moruya	7928	8246	8564	8882	7647	8142	8637	9140	9643	10146								1994-2003	3.5%
South of Albert Street, Moruya	5893	6122	6352	6581	6031	6268	6504	6888	7272	7656								1994-2003	3.7%
<b>Beach Road</b>																			
800m east of Caitlin Avenue, Catalina	11745	11427	11108	12091	12671	13161	13650	14272	14893	15515	15579	15643						1994-2005	3.0%
East of Princes Highway, Batemans Bay	4258	4711	4193	4064	3935	4767	4331	4356	4380	5009	5637	5175	4712	4716	4720			1994-2003	0.8%
South of John Street, Batehaven	4572	6873	6242	6663	8265	8124	7982	7642	7923	7299	8894	8871	8232	7487	8816	8910	9397	1994-2010	9.6%
East of Orient Street	9522	9205	8889	8572	9432	9726	10020	10185	10351	10516	10227	9938	10012	10086	10160			1994-2008	0.5%
<b>Campbell Street</b>																			
West of Princes Highway, Moruya	12530	12287	12045	11802	12998	13450	13901	14298	14694	15091								1994-2003	2.6%
<b>Araluen Road</b>																			
4km west of Princes Highway	86	157	229	300	268	290	292	293										1994-2001	40.1%
<b>Broulee Road</b>																			
East of Princes Highway	479	498	658	536	495	541	587	629	670	792	824	1037	887	878	585	860		1994-2009	8.0%
<b>George Bass Drive</b>																			
North of Tomakin Road, Tomakin		3044	3082	2736	2389	2429	2468	2682	2896	2986	2906	2826						1995-2005	-0.7%
North of Racecourse entrance					2122	2249	2375	2465	2554	2644	2730	2816						1998-2005	4.7%

\* Figures shown in italics are interpolated results not actual AADT figures

## Traffic Surveys

In order to assess the performance of the existing road network and to validate the strategic model good quality traffic data was required. Council provided historical data and undertook some new counts at key mid-block locations. Additional peak period traffic data was obtained for use in this study. A specialist traffic counting firm, SkyHigh, was appointed to undertake a number of different surveys. The following survey data was collated/collected for use in this study:

- Mid-block classification counts.
- Number plate surveys used for.
- Origin-Destination Surveys.
- Travel Time Surveys.
- Intersection turning volume counts.

Details of each of the above surveys is provided in the following sections. Locations where counts were undertaken are shown on Figure 1.22.

### Classification Traffic Counts

Full classification tube traffic counts were required to establish daily vehicle profiles, vehicle mix and speeds. Automatic traffic counters record classified vehicle volumes (passenger cars and heavy vehicle movements) and speeds by direction for a one week period, with 15-minute data. Heavy vehicle movements are recorded by number of axle pairs. The vehicles are classified as per AustRoads vehicle classifications. Generally classes 1—2 are light vehicles, classes 3—5 are considered heavy rigid vehicles (HRV), and classes 6—13 are considered articulated vehicles (AV).

Council provided data for the following locations:

- Princes Highway, South of Cranbrook (15-21 March 2010).
- Princes Highway, South of Clyde Bridge (15-21 March 2010).
- Beach Road, North of Country Club Drive (15-21 March 2010).
- Cranbrook Road, West of Princes Highway (15-21 March 2010).

A preliminary review of this data was undertaken to establish the peak day of the week and peak periods within a day to undertake additional peak period surveys. It was agreed with Council to undertake surveys during the following periods:

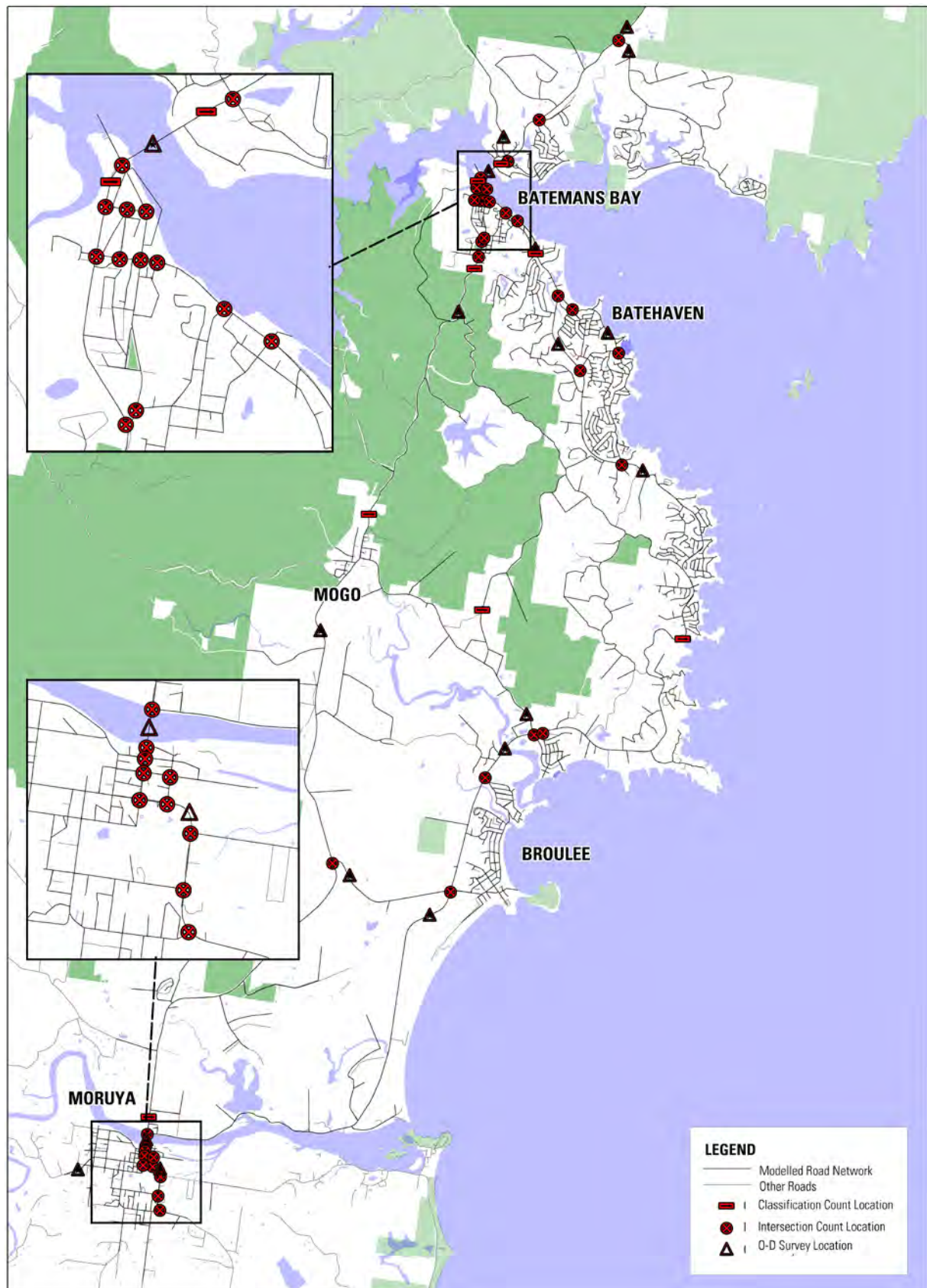
- Thursday 8-10 AM.
- Thursday 3-5 PM.

Council undertook additional classification counts at the following locations:

- Princes Highway, at Burkes Lane Mogo (12-19 May 2010).
- Princes Highway, North of North Head Drive (12-19 May 2010).
- Princes Highway, South of Peninsula Drive North Batemans Bay (12-19 May 2010).
- Dunns Creek Road, at Woodlands Drive (12-19 May 2010).
- George Bass Drive, South of Illabunda Drive (12-19 May 2010).
- Banksia Village, May Parade (28 May – 3 June 2010).
- Ruth Place, North of Dalmeny Drive (1-7 June 2010).



Figure 1.22 Survey Locations





## OD and Travel Time Surveys

Origin-Destination (O-D) surveys were undertaken as part of the study to determine existing travel patterns. The O-D surveys were conducted using video data collection technology with traffic recorded in both directions at each site. Data reduction was undertaken by SkyHigh.

The north south dimension of the study area is approximately 30km, with a roughly estimated travel time of 40 minutes (+/-10mins); this requires a survey period of about 2.5 hours to derive reasonable estimates of 2 hour demands. The survey used video methods for the duration of the survey, with 2.5 hours of video recorded in the AM peak and 2.5 hours of video recorded in the PM peak. All vehicles were included in the sample, with the first four character positions of each number plate recorded; this was by vehicle class – light vehicle, rigid truck and articulated truck. This provided an origin destination travel demand matrix by three grouped vehicle classes:

- Light vehicles.
- Heavy Rigid Trucks.
- Heavy Articulated Trucks.

Number plates were recorded and classified into the above vehicle classes. The survey also identified travel times by vehicle class along key route sections. The data sets produced by this process recorded all vehicles' number plates by vehicle class, with one-minute timestamps (HH:MM). This approach uses the number plate data collection to also produce control counts.

The survey locations were identified to facilitate the development of a robust trip matrix to identify route choice. ESC and Cardno reviewed and agreed the survey locations at the inception meeting. Surveys were conducted on Thursday 20 May 2010 during the following periods:

- 8-10.30 AM.
- 2.30-5 PM.

The O-D count survey locations can be seen in Figure 1.22 and are detailed below:

- Princes Highway, north of Cullendulla Drive.
- Kings Highway, west of Old Punt Road.
- Princes Highway at Clyde River Bridge.
- Princes Highway, between Ridge Road and Mills Fishing Road.
- Princes Highway at Jeremadra Creek Bridge.
- Princes Highway at Moruya River Bridge.
- Princes Highway north of Murray Street, Moruya.
- Beach Road, south of Hanging Rock Place.
- Beach Road, north of Sunshine Bay Road.
- George Bass Drive, between Calga Crescent and Glenella Road.
- George Bass Drive, between Beach Road and Old Grandfathers Point Road.
- George Bass Drive at Tomaga River Bridge.
- George Bass Drive south of Broulee Road.
- Tomakin Road, north of George Bass Drive.
- Broulee Road, east of Princes Highway.
- Luck Street north of Emmett Street.
- Cullendulla Drive, east of Princes Highway.

## Intersection Traffic Surveys

The locations identified for intersection turning counts were selected to provide sufficient detail of circulation in the town centres. These surveys were undertaken to improve the reliability and accuracy of the models. The use of video survey techniques at the intersection locations would also enable the derivation of:

- Intersection turning counts.
- Vehicle classes by light, heavy rigid, articulated and buses.
- Pedestrian and Cyclist movements.

Intersection traffic survey data was collected on Thursday 20 May 2010 during the following periods:

- 8-10 AM.
- 3-5 PM.

Intersection counts were conducted at the following locations (shown in Figure 1.22):

- |   |  |
|---|--|
| ➤ Princes Highway/Cullendulla Drive.              | ➤ North Street/Perry Street.                           |
| ➤ Princes Highway/Berrima Parade.                 | ➤ Old Princes Highway/South Street.                    |
| ➤ Princes Highway/Kings Highway/Peninsula Drive.  | ➤ Clyde Street/North Street.                           |
| ➤ Princes Highway/Clyde Street.                   | ➤ Beach Road/Clyde Street/Orient Street.               |
| ➤ Princes Highway/North Street.                   | ➤ Beach Road/Perry Street.                             |
| ➤ Princes Highway/Beach Road.                     | ➤ Beach Road/Flora Crescent.                           |
| ➤ Princes Highway/Old Princes Highway.            | ➤ Beach Road/Pacific Street.                           |
| ➤ Princes Highway/Cranbrook Road.                 | ➤ Beach Road/Bavarde Avenue.                           |
| ➤ Princes Highway/Tomakin Road.                   | ➤ Beach Road/Glenella Road.                            |
| ➤ Princes Highway/Broulee Road.                   | ➤ Beach Road/Edward Street                             |
| ➤ Princes Highway/Pollwombra Road (Shelley Road). | ➤ Beach Road/Sunshine Bay Road.                        |
| ➤ Princes Highway/Larrys Mountain Road.           | ➤ Beach Road/George Bass Drive.                        |
| ➤ Princes Highway/North Head Drive.               | ➤ George Bass Drive/Sunshine Bay Road.                 |
| ➤ Princes Highway/Church Street.                  | ➤ George Bass Drive/Ainslie Parade.                    |
| ➤ Princes Highway/Queen Street.                   | ➤ George Bass Drive/Tomakin Road.                      |
| ➤ Princes Highway/Campbell Street/Vulcan Street.  | ➤ George Bass Drive/Annetts Parade/Clearwater Terrace. |
| ➤ Princes Highway/Ford Street.                    | ➤ George Bass Drive/Broulee Road.                      |
| ➤ Princes Highway/Murray Street.                  | ➤ Queen Street/Ford Street.                            |
| ➤ Princes Highway/Albert Street.                  |  |
| ➤ Princes Highway/Bergalia Street.                |  |

## Traffic Flows and Composition

### Daily traffic flows

A summary of the average daily traffic volumes is presented in Table 1.10. The average daily volumes represent the five day average of weekday daily traffic volumes.

**Table 1.10 2008 Average Weekday Daily Traffic volumes (AWD)**

Name	Location	Average Weekday Volumes (vehicles per day)		
		Eastbound/ Northbound	Westbound/ Southbound	Total
Princes Highway	South of Peninsula Drive	6,947	6,419	13,366
Princes Highway	South of Clyde Bridge	7,490	6,634	14,125
Princes Highway	South of Cranbrook Road	4,103	4,162	8,265
Princes Highway	at Burkes Lane Mogo	3682	3839	7,521
Princes Highway	North of North Head Drive	-	-	7,513
Beach Road	North of Country Club Drive	8,943	7,593	16,535
George Bass Drive	South of Illabunda Drive	-	-	2,045
Cranbrook Road	West of Princes Highway	-	-	4,114
Dunns Creek	at Woodlands Road	-	-	1,574
Banksia Village	May Parade	-	-	107
Ruth Place	North of Dalmeny Drive	-	-	381

Traffic volumes along the Princes Highway vary significantly between Batemans Bay and Moruya. The highest average daily traffic (ADT) volumes (14,125 vpd) were observed south of the Clyde Bridge. South of Batemans Bay volumes ranged from approximately 7,500 to 8,300 vpd. Beach Road carries over 16,000 vpd around Catalina. Other routes considered in the area carry lower daily traffic volumes up to 5,000 vpd.

### Proportion of heavy vehicles

A summary of the proportion of heavy vehicles during an average weekday is presented in Table 1.11. The heavy vehicle proportions are shown as a percentage of total volumes for two-way average weekday daily traffic volumes.

**Table 1.11 Average weekday daily heavy vehicle proportions (AWD)**

Name	Location	Average Weekday*		
		%HRV	%AV	Tot %HV
Princes Highway	South of Peninsula Drive	6%	2%	8%
Princes Highway	South of Clyde Bridge	7%	2%	8%
Princes Highway	South of Cranbrook Road	7%	3%	10%
Princes Highway	at Burkes Lane Mogo	6%	2%	8%
Princes Highway	North of North Head Drive	9%	2%	11%
Beach Road	North of Country Club Drive	5%	2%	7%
George Bass Drive	South of Illabunda Drive	12%	1%	13%
Cranbrook Road	West of Princes Highway	8%	2%	10%
Dunns Creek	at Woodlands Road	7%	1%	8%
Banksia Village	May Parade	4%	0%	4%
Ruth Place	North of Dalmeny Drive	5%	0%	5%

\* HRV = Heavy Rigid Vehicles, AV = Articulated Vehicles, HV = Total Heavy Vehicles

The routes within the study area carrying the highest proportions of heavy vehicles were shown to be:

- Princes Highway, where south of Batemans Bay and north of Moruya some 10-11 per cent of the daily traffic consisted of heavy vehicles.
- George Bass Drive carries around 13 per cent heavy vehicles.
- Cranbrook Road carries around 10 per cent heavy vehicles.

Other routes carry less than 8 per cent heavy vehicles.

## Peak traffic flows

The daily distribution of traffic is summarised in Figure 1.23 to

Figure 1.27 for four sites along the Princes Highway and one site on Beach Road. This data shows relatively consistent volumes across the morning with marginally higher volumes in the afternoon with a peak. Volumes remained relatively consistent throughout the day with very little difference between the peak and the middle of the day. Heavy vehicle volumes had slightly more noticeable peaks.

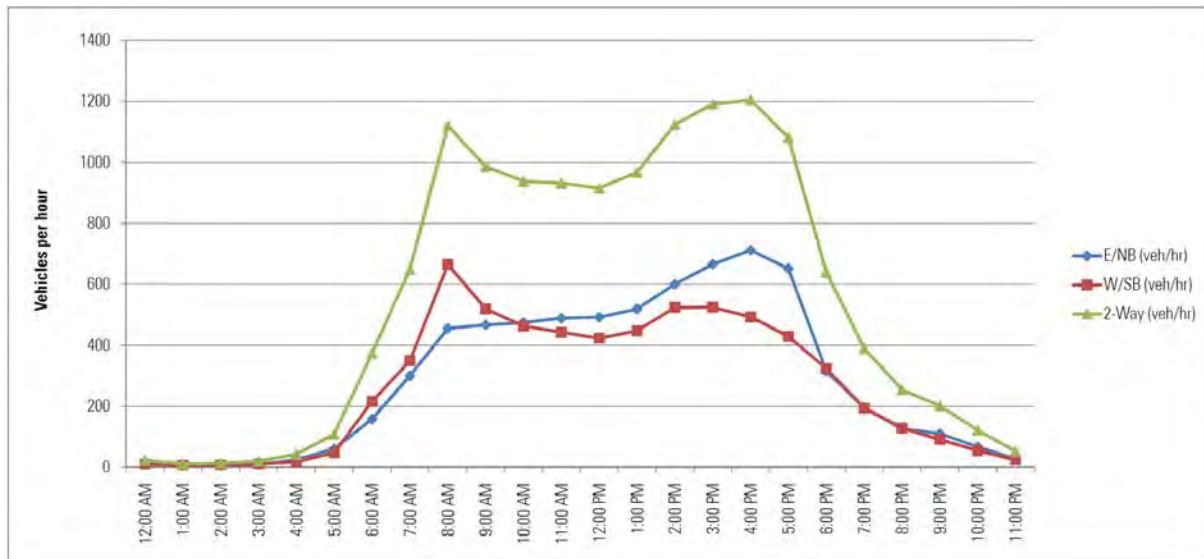
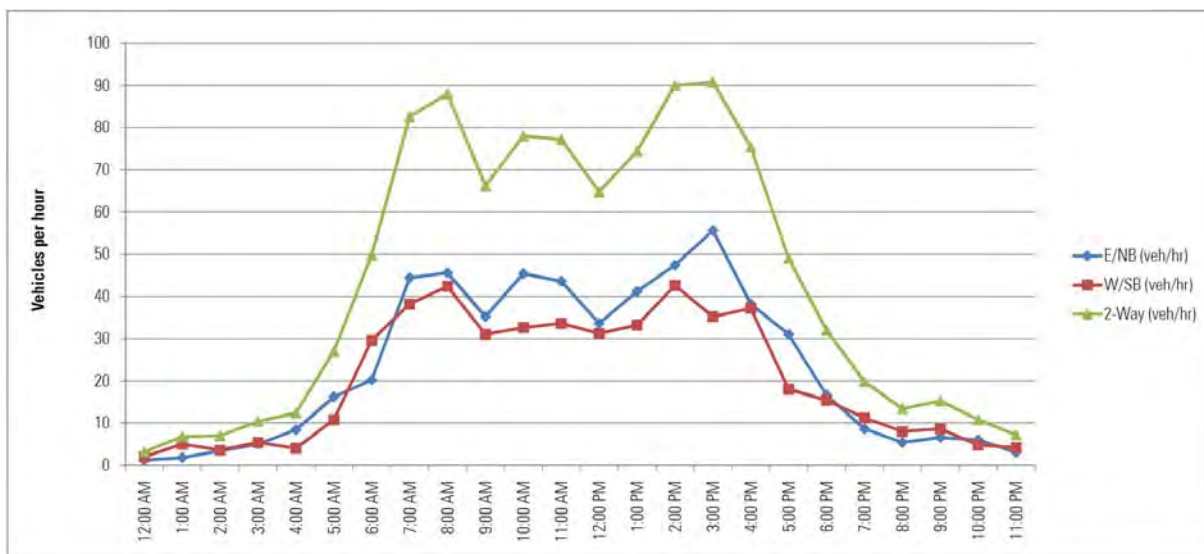
A summary of the average morning and afternoon peak traffic volumes is presented in Table 1.12. The afternoon peak was generally found to be between 3 and 5pm across most routes. The morning peak was generally found to be between 8 and 9am.

**Table 1.12 Average weekday peak volumes**

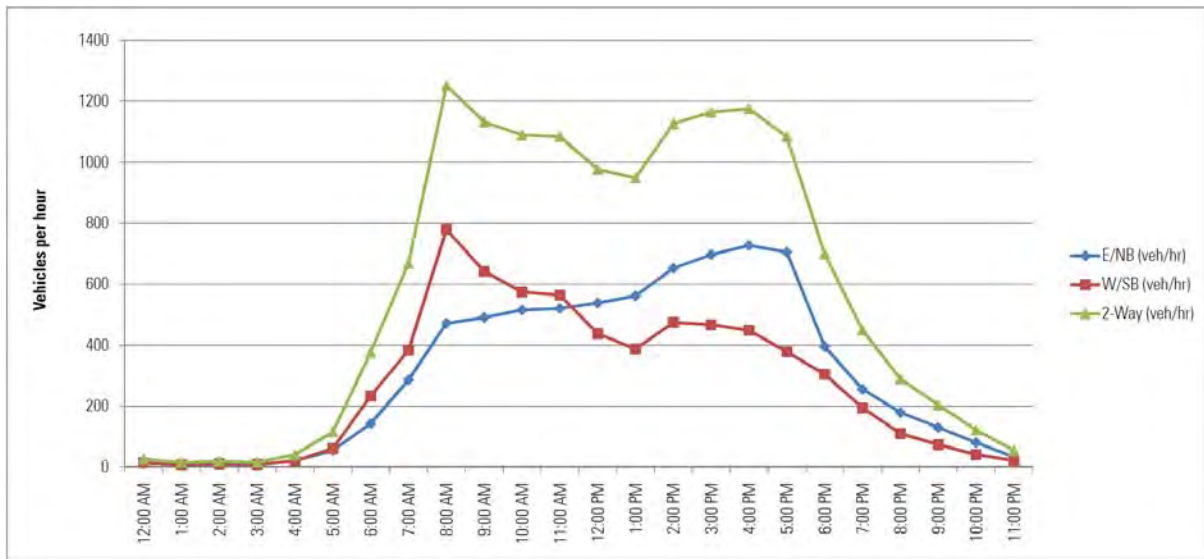
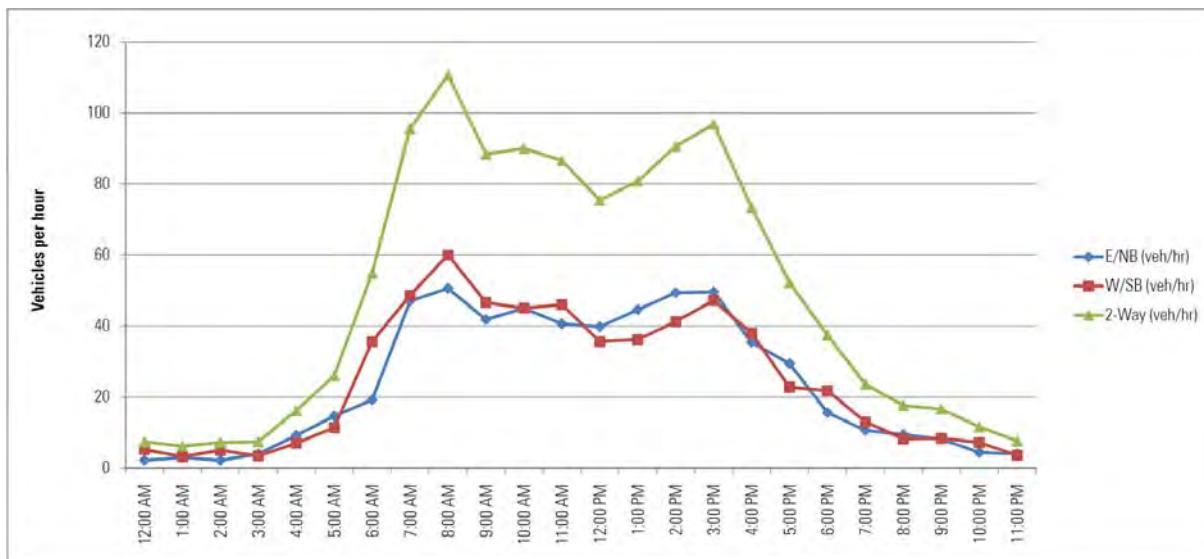
Name	Location	AM Peak (veh/h)			PM Peak (veh/h)		
		Time	Two-Way (veh/hr)	Peak Split*	Time	Two-Way (veh/hr)	Peak Split*
Princes Highway	South of Peninsula Drive	8-9am	1,121	59% S/B	4-5pm	1,205	59% N/B
Princes Highway	South of Clyde Bridge	8-9am	1,251	62% S/B	4-5pm	1,175	62% N/B
Princes Highway	South of Cranbrook Road	8-9am	657	59% N/B	3-4pm	720	50% N/B
Princes Highway	at Burkes Lane Mogo	8-9am	601	62% N/B	3-4pm	684	53% S/B
Princes Highway	North of North Head Drive	8-9am	675	-	3-4pm	719	-
Beach Road	North of Country Club Drive	8-9am	1,365	72% E/B	3-4pm	1,420	52% N/B
George Bass Drive	South of Illabunda Drive	11am-12noon	158	-	3-4pm	204	-
Cranbrook Road	West of Princes Highway	8-9am	403	-	3-4pm	357	-
Dunns Creek	at Bridge	8-9am	189	-	3-4pm	176	-
Banksia Village	May Parade	11am-12noon	14	-	3-4pm	12	-
Ruth Place	North of Dalmeny Drive	9-10am	27	-	3-4pm	49	-

\* E/B = Eastbound W/B = Westbound N/B = Northbound S/B Southbound



**Figure 1.23 Daily traffic distribution – Princes Highway, South of Peninsula Drive****All vehicles (veh/hour)****Heavy vehicles (veh/hour)**

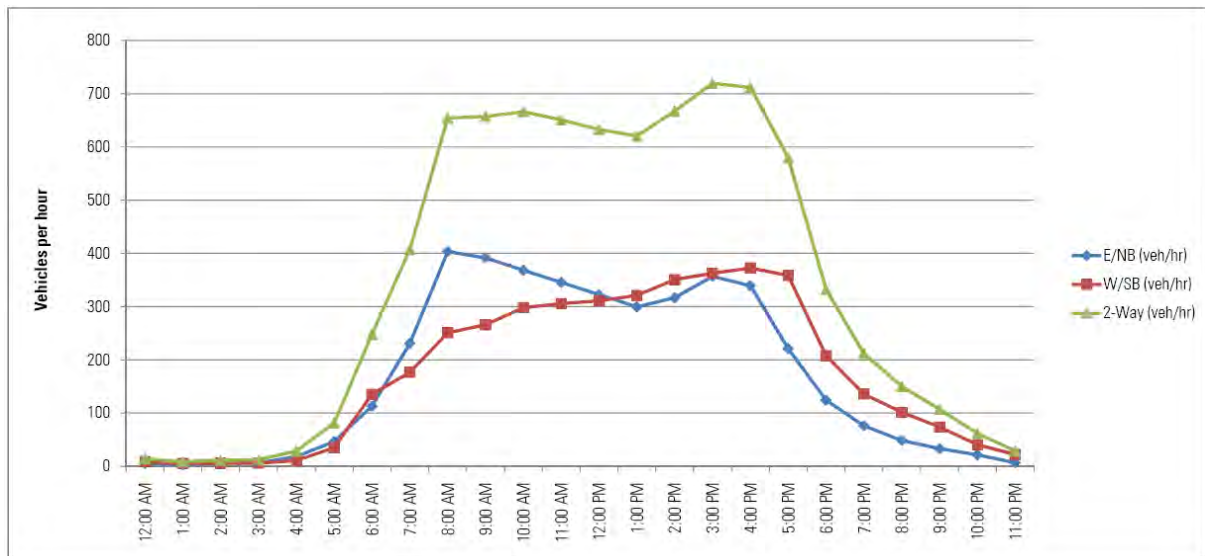
E/NB: East or North Bound, W/SB: West or South Bound

**Figure 1.24 Daily traffic distribution – Princes Highway, at Clyde Bridge****All vehicles (veh/hour)****Heavy vehicles (veh/hour)**

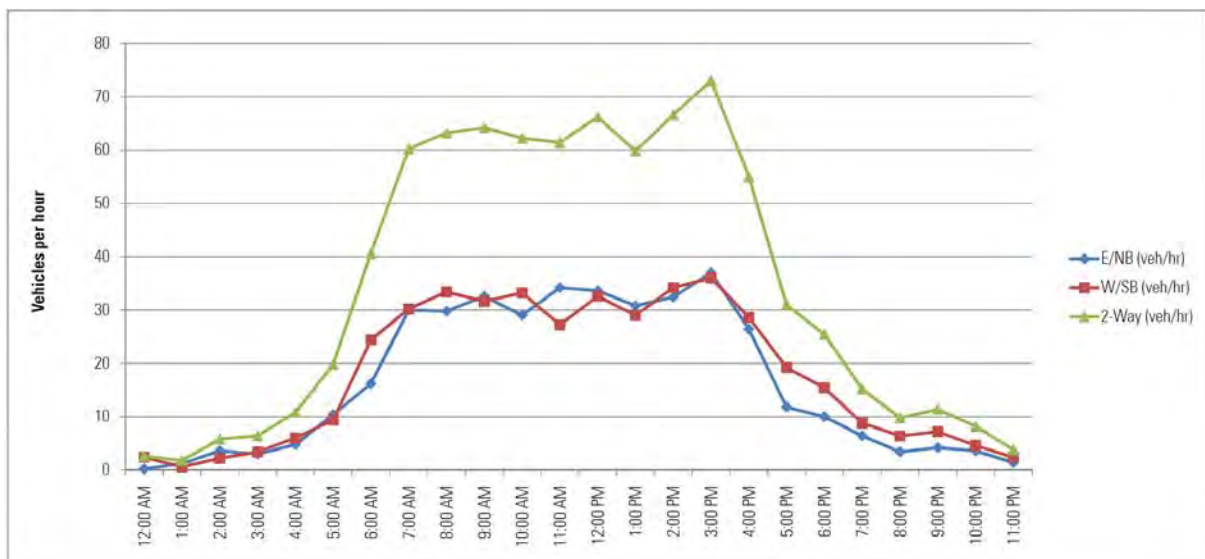
E/NB: East or North Bound, W/SB: West or South Bound

**Figure 1.25 Daily traffic distribution – Princes Highway, South of Cranbrook Road**

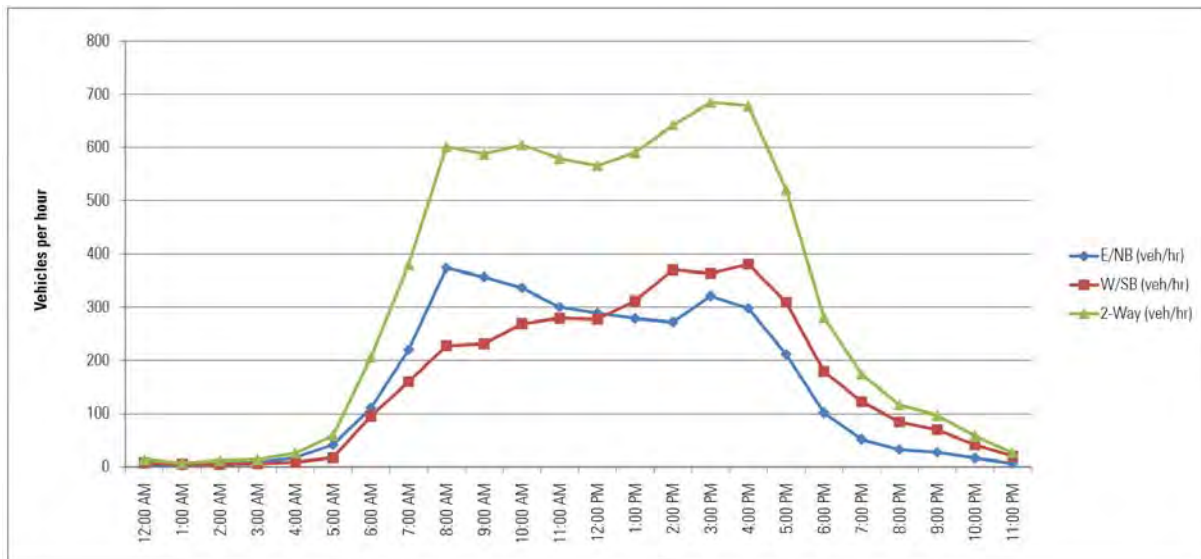
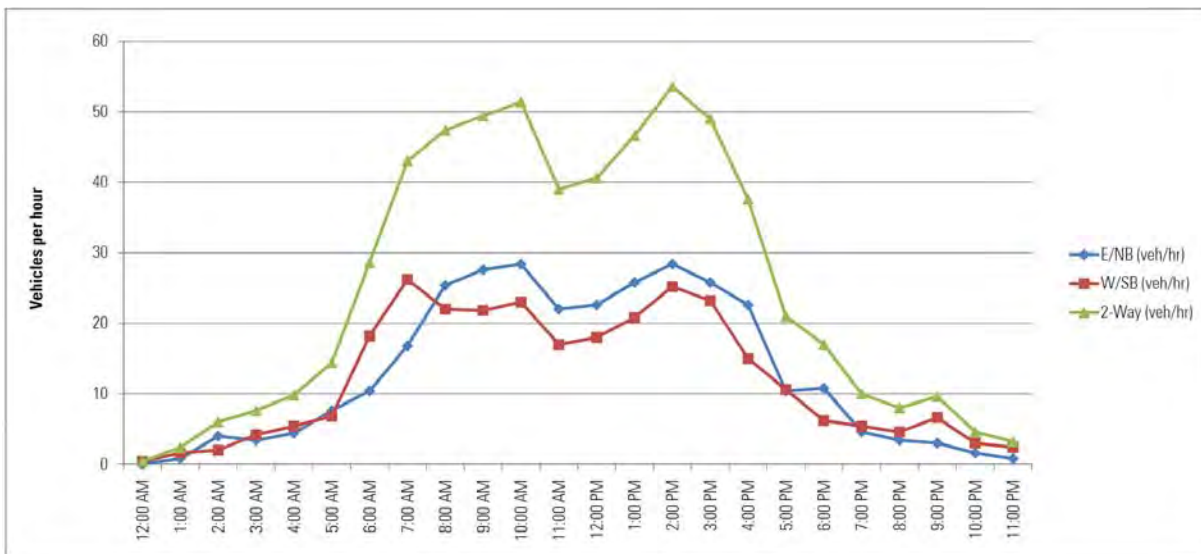
**All vehicles (veh/hour)**



**Heavy vehicles (veh/hour)**



E/NB: East or North Bound, W/SB: West or South Bound

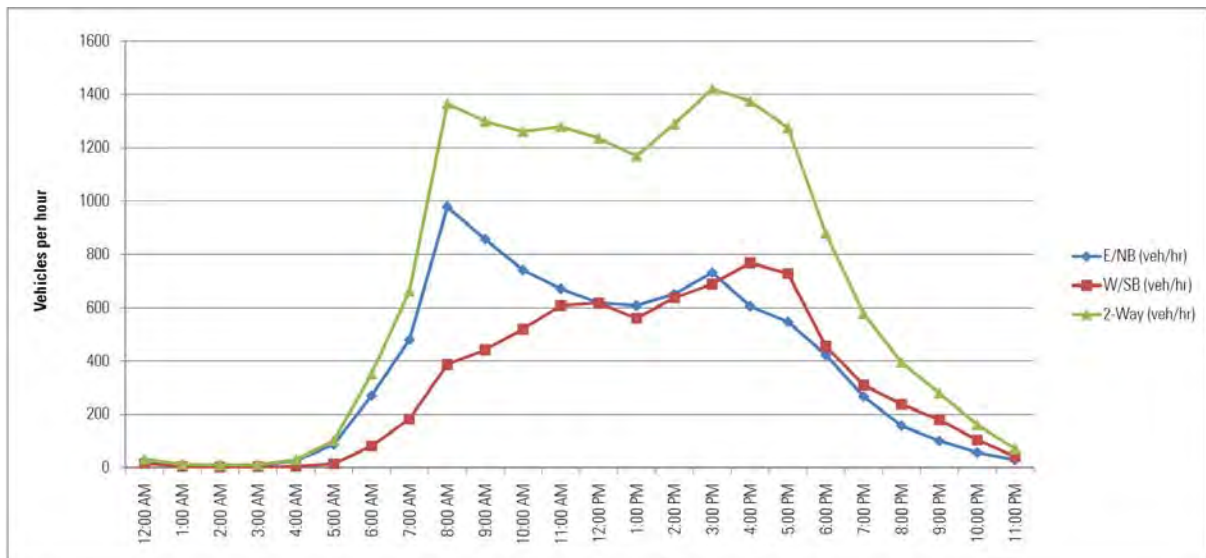
**Figure 1.26 Daily distribution of traffic – Princes Highway, at Burkes Lane Mogo****All vehicles (veh/hour)****Heavy vehicles (veh/hour)**

E/NB: East or North Bound, W/SB: West or South Bound

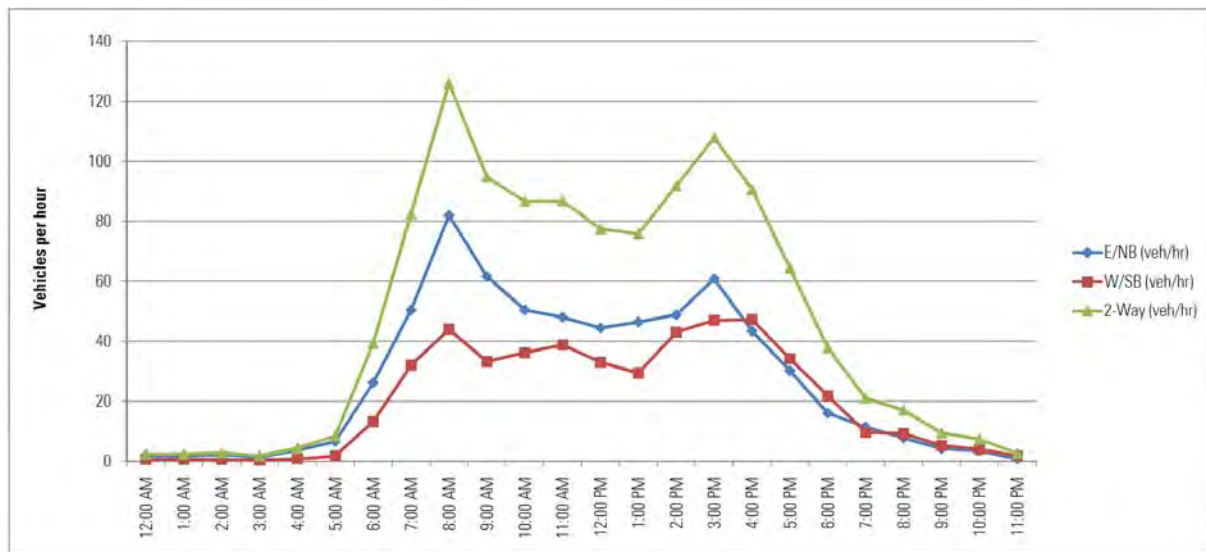


**Figure 1.27 Daily distribution of traffic – Beach Road, south of Illabunda Drive**

**All vehicles (veh/hour)**



**Heavy vehicles (veh/hour)**



E/NB: East or North Bound, W/SB: West or South Bound

## Intersection Turning Volumes

Surveys of intersection turning counts were undertaken to improve the reliability and accuracy of the models. Summaries of the intersection turning counts for the peak hours are provided within Appendix 1-J and Appendix 1-K for the AM and PM peak hours respectively.

## Existing Travel Patterns

The results of the number plate and travel time assessments enabled the identification of vehicles that were making 'through' trips and those with an origin or destination within the study area. A 'through' trip for a vehicle is defined as a trip where the vehicle was observed entering and leaving the study area within a certain time period. This time was dependent on the separation of the stations and the time at which the vehicle was recorded as it passed each of the stations.

A summary of the resulting trip matrices for each vehicle class and time period derived from the number plate survey data is provided in Table 1.13 and Table 1.14.

**Table 1.13 2010 AM Peak summary trip matrix (8-9am)**

FROM (Origin)		TO (Destination)								
Location	Site No.	INT	E1	E2	E3	E4	E5	E6	Total	%
Internal to Study Area	INT	6100	182	94	92	4	9	8	6489	85.8%
Princes Highway – North of Batemans Bay	E1	134	0	10	35	6	0	8	193	2.6%
Kings Highway	E2	96	2	0	11	1	0	5	115	1.5%
Princes Highway – South of Moruya	E3	357	0	13	0	0	3	10	383	5.1%
Francis Street	E4	38	5	2	0	0	0	5	50	0.7%
Dwyers Creek Road	E5	52	7	4	0	0	0	8	71	0.9%
South Head Road	E6	235	6	4	8	3	4	0	260	3.4%
Total	Tot	7012	202	127	146	14	16	44	7561	100%
Proportion of Total Trips		92.7%	2.7%	1.7%	1.9%	0.2%	0.2%	0.6%	100%	

	INT	EXT
INT	81%	5%
EXT	12%	2%

In the morning peak period (8—9am) only 2 per cent of total vehicle trips are through traffic (passing through the study area) whilst 81 per cent are internal traffic (starting and finishing their journeys within the study area). The balance of trips (17 per cent) are entering or exiting the study area.

**Table 1.14 2010 PM Peak summary trip matrix (4-5pm)**

FROM (Origin)		TO (Destination)								
Location	Site No.	INT	E1	E2	E3	E4	E5	E6	Total	%
Internal to Study Area	INT	5789	244	156	188	26	32	125	6561	92.5%
Princes Highway – North of Batemans Bay	E1	126	0	4	6	3	2	7	146	2.1%
Kings Highway	E2	76	11	0	11	0	1	1	100	1.4%
Princes Highway – South of Moruya	E3	180	17	5	0	2	2	2	206	2.9%
Francis Street	E4	6	3	2	1	0	0	2	13	0.2%
Dwyers Creek Road	E5	12	2	1	3	0	0	3	20	0.3%
South Head Road	E6	32	5	2	3	0	2	0	43	0.6%
Total	Tot	6220	282	170	211	30	38	139	7091	100%
Proportion of Total Trips		87.7%	4.0%	2.4%	3.0%	0.4%	0.5%	2.0%	100%	

	INT	EXT
INT	82%	11%
EXT	6%	1%

In the afternoon period (4—5pm) only 1 per cent of total vehicle trips are through traffic (passing through the study area) whilst 82 per cent are internal traffic (starting and finishing their journeys within the study area). The balance of trips (17 per cent) are entering or exiting the study area.

#### 1.4.5 ROAD NETWORK PERFORMANCE ASSESSMENT

##### Mid-block Carriageway Performance

An assessment of the mid-block traffic volumes and carriageway LoS for key links within the study area was undertaken. Table 1.18 presents a summary of mid-block traffic volumes and carriageway LoS for key links within vicinity of the site. The overall existing LoS on key route sections is presented in detail in Table 1.15 for the AM and PM peak periods.

**Table 1.15 2010 Peak Mid-block LoS**

Location	AM Peak						PM Peak				
	Peak Flow (veh/hr)			LoS			Peak Flow (veh/hr)			LoS	
Princes Highway	N/B	S/B	Total	N/B	S/B		N/B	S/B	Total	N/B	S/B
North of Cullendulla Drive	162	189	351	B	B		249	184	433	B	B
Cullendulla Drive to Clyde Road	198	407	605	B	C		412	262	674	C	B
Clyde Road to Berrima Parade	208	435	643	B	C		439	283	722	C	B
Berrima Parade to Kings Highway	270	562	832	B	C		539	366	905	C	B
Kings Highway to Clyde Street	481	764	1,245	A	B		769	534	1,303	B	A
Clyde Street to North Street	493	572	1,065	A	A		793	411	1,204	B	A
North Street to Beach Road	474	505	979	A	A		661	393	1,054	A	A
Princes Highway	N/B	S/B	Total	N/B	S/B		N/B	S/B	Total	N/B	S/B
Beach Road to Old Princes Highway	286	281	567	A	A		424	258	682	A	A
Old Princes Hwy to Cranbrook Rd	479	476	955	A	A		616	432	1,048	A	A
Cranbrook Road to Ridge Road	393	277	670	C	B		383	344	727	C	B

Ridge Road to Tomakin Road	429	263	692	C	B	356	346	702	B	B
Tomakin Road to Broulee Road	292	226	518	B	B	305	264	569	B	B
Broulee Road to Pollwombra Road	305	262	567	B	B	303	241	544	B	B
Pollwombra Rd to Larry M'tains Dr	325	286	611	B	B	302	286	588	B	B
Larry M'tains Dr to North Head Rd	314	334	648	B	B	330	294	624	B	B
North Head Road to Shore Street	415	553	968	A	A	515	379	894	A	A
Shore Street to Church Street	444	475	919	A	A	559	358	917	A	A
Church Street to Queen Street	460	359	819	A	A	335	423	758	A	A
Queen Street to Vulcan Street	470	339	809	A	A	350	422	772	A	A
Vulcan Street to Ford Street	600	291	891	A	A	439	455	894	A	A
Ford Street to South Head Road	708	336	1,044	A	A	421	603	1,024	A	A
South Head Road to Albert Street	529	340	869	C	B	362	472	834	B	C
Albert Street to Bergalia Street	449	265	714	C	B	305	428	733	B	C
<b>Beach Road</b>	<b>N/B</b>	<b>S/B</b>	<b>Total</b>	<b>N/B</b>	<b>S/B</b>	<b>N/B</b>	<b>S/B</b>	<b>Total</b>	<b>N/B</b>	<b>S/B</b>
Princes Highway to Perry Street	350	240	590	A	A	395	301	696	A	A
Perry Street to Orient Street	708	303	1,021	A	A	680	476	1,156	A	A
Orient Street to Flora Crescent	769	185	954	A	A	651	476	1,127	A	A
Flora Crescent to Bavarde Avenue	824	312	1,136	A	A	526	774	1,300	A	A
Bavarde Avenue to Country Club Dr	1,022	424	1,446	A	A	617	1,021	1,638	A	A
Country Club Dr to George Bass Dr	900	370	1,270	A	A	529	799	1,328	A	A
George Bass Dr to Edward Rd	514	278	792	A	A	343	500	843	A	A
Edward Rd to Sunshine Bay Rd	343	140	473	A	A	163	334	497	A	A
Sunshine Bay Rd to George Bass Dr	370	136	506	A	A	193	269	462	A	A
<b>George Bass Drive</b>	<b>N/B</b>	<b>S/B</b>	<b>Total</b>	<b>N/B</b>	<b>S/B</b>	<b>N/B</b>	<b>S/B</b>	<b>Total</b>	<b>N/B</b>	<b>S/B</b>
Beach Road to Glenella Road	436	158	594	A	A	226	316	542	A	A
Glenella Road to Sunshine Bay Rd	436	158	594	A	A	226	316	542	A	A
Sunshine Bay Rd to Surf Beach Ave	370	136	506	A	A	193	269	462	A	A
Surf Beach Road to Beach Road	299	94	393	A	A	138	207	345	A	A
Beach Road to Ridge Road	265	120	385	B	B	140	238	378	B	B
Ridge Road to Tomakin Road	116	266	382	B	B	163	148	311	B	B
Tomakin Road to Annetts Parade	269	327	596	B	B	182	207	389	B	B
Annetts Parade to Broulee Road	141	204	345	B	B	131	116	247	B	B
Broulee Road to Donnellys Drive	81	208	289	A	B	150	102	252	B	B
<b>North Head Drive</b>	<b>E/B</b>	<b>W/B</b>	<b>Total</b>	<b>E/B</b>	<b>W/B</b>	<b>E/B</b>	<b>W/B</b>	<b>Total</b>	<b>E/B</b>	<b>W/B</b>
Donnellys Drive to Princes Highway	89	239	328	B	B	163	124	287	B	B
<b>Dunns Creek Road</b>	<b>E/B</b>	<b>W/B</b>	<b>Total</b>	<b>E/B</b>	<b>W/B</b>	<b>E/B</b>	<b>W/B</b>	<b>Total</b>	<b>E/B</b>	<b>W/B</b>
Ridge Road to Tomakin Road	76	110	186	A	B	100	78	178	A	A
<b>Tomakin Road</b>	<b>E/B</b>	<b>W/B</b>	<b>Total</b>	<b>E/B</b>	<b>W/B</b>	<b>E/B</b>	<b>W/B</b>	<b>Total</b>	<b>E/B</b>	<b>W/B</b>
Princes Highway to Dunns Creek Rd	105	205	310	B	B	139	108	247	B	B
Dunns Creek Rd to George Bass Dr	154	246	400	B	B	175	135	310	B	B
<b>Broulee Road</b>	<b>E/B</b>	<b>W/B</b>	<b>Total</b>	<b>E/B</b>	<b>W/B</b>	<b>E/B</b>	<b>W/B</b>	<b>Total</b>	<b>E/B</b>	<b>W/B</b>
Princes Highway to George Bass Dr	70	52	122	A	A	43	76	119	A	A

The mid-block carriageway assessment shows that the majority of routes operate at LoS A or B with some sections of the Princes Highway operating at LoS C:

- Cullendulla Road to Kings Highway - southbound in the AM peak and northbound in the PM peak.
- Cranbrook Road to Tomakin Road - northbound in the AM peak and southbound in the PM peak.
- South Head Road to Bergalia Street - northbound in the AM peak and southbound in the PM peak.



## Intersection Performance

The operating performance of 37 intersections within the LGA has been assessed using the SIDRA software package to determine the Degree of Saturation (DoS), Average Vehicle Delay (AVD in seconds) and LoS at each intersection. A summary of the operating performance of critical intersections within the study area is provided in Table 1.19 for the AM and PM peak periods.

A summary of the operating performance of critical intersections within the study area is provided in Table 1.16. Currently all the major intersections within the Eurobodalla Shire operate at a satisfactory level with delays not exceeding 35 seconds with LoS C or better.

**Table 1.16 Summary of existing intersection performance**

Intersection	AM Peak			PM Peak		
	DoS	Delay	LoS	DoS	Delay	LoS
Princes Hwy/Berrima Pde	0.131	14.7	B	0.213	15.1	B
Princes Hwy/Kings Hwy/Peninsula Dr	0.158	13.8	A	0.111	13.3	A
Princes Hwy/Clyde St	0.154	25.1	B	0.152	25.3	B
Princes Hwy/North St	0.469	15.4	B	0.543	19.0	B
Princes Hwy/Beach Rd	0.672	31.0	C	0.509	29.0	C
Princes Hwy/Old Princes Hwy	0.333	12.9	A	0.484	17.9	B
Princes Hwy/Cranbrook Rd	0.665	31.2	C	0.475	29.6	C
Princes Hwy/ Tomakin St	0.321	12.7	A	0.218	12.5	A
Princes Hwy/Broulee Rd	0.086	11.4	A	0.051	13.7	A
Princes Hwy/ Shelley Rd	0.177	16.0	B	0.013	10.1	A
Princes Hwy/Larry's Mountain Rd	0.167	13.7	A	0.062	12.4	A
Princes Hwy/North Head Dr	0.307	11.3	A	0.161	10.5	A
Princes Hwy/Church St	0.788	34.6	C	0.733	29.8	C
Princes Hwy/Queen St	0.214	27.7	B	0.188	21.8	B
Princes Hwy/Campbell St/Vulcan St	0.128	14.6	B	0.137	14.6	B
Princes Hwy/Ford St	0.183	12.5	A	0.399	13.3	A
Princes Hwy/South Head Rd	0.462	18.2	B	0.376	23.0	B
Princes Hwy/Albert St	0.121	13.0	A	0.163	11.5	A
Princes Hwy/Bergalia St	0.171	12.4	A	0.158	11.4	A
Princes Hwy/Cullendulla Dr	0.265	9.9	A	0.151	10.3	A
North St/Perry St	0.281	9.3	A	0.351	9.3	A
Old Princes Hwy/South St	0.247	10.1	A	0.236	11.0	A
Clyde St/North St	0.138	10.4	A	0.184	10.3	A
Beach Rd/ Orient St	0.775	30.6	C	0.774	30.8	C
Beach Rd/Flora Cres	0.527	14.0	A	0.557	13.9	A
Beach Rd/Bavarde Ave	0.160	13.6	A	0.011	15.2	B
Beach Rd/George Bass Dr	0.684	34.6	C	0.597	31.9	C
Beach Rd/Sunshine Rd	0.177	11.4	A	0.051	10.2	A
George Bass Dr/Sunshine Bay Rd	0.149	11.8	A	0.059	11.9	A
Beach Rd/George Bass Dr/Progress Way	0.064	14.7	B	0.116	14.0	A
George Bass Dr/Ainslie Pde	0.122	11.3	A	0.095	9.9	A
George Bass Dr/Tomakin Rd	0.280	12.8	A	0.317	13.7	A
George Bass Dr/Annetts Pde	0.154	12.6	A	0.222	15.8	B
George Bass Dr/Broulee Rd	0.078	10.1	A	0.067	11.1	A
Beach Rd/Perry St	0.016	16.2	B	0.006	14.7	B
Beach Rd/Pacific St	0.160	20.3	B	0.136	12.4	A
Beach Rd/Edward Rd	0.620	19.6	B	0.671	21.5	B

Intersection	AM Peak			PM Peak		
	DoS	Delay	LoS	DoS	Delay	LoS
Queen St/Ford St	0.043	11.9	A	0.076	12.4	A
Princes Hwy/Shore St	0.058	15.4	B	0.037	12.8	A

### Road Network Deficiencies

Overall, 37 junctions were assessed using SIDRA for LoS and the regional and state roads inside the study areas were also assessed at mid-block points for operational performance. In addition, the TRACKS model which was built and validated to existing conditions, was examined for evidence of road network performance issues; none was found in the above tests.

### Mid-block performance

- Generally mid-block performance is LoS A with some locations at LoS B or C, with zero having LoS D or lower.
- All evidence from the modelling and SIDRA checks are consistent with survey examinations and site visits, whereby the road network is broadly performing well at an operations level, with some additional spare capacity throughout the study network.

### Intersection performance

- Similarly, intersection performances are also LoS A, LoS B and LoS C, with none lower than that.
- As was the case with the mid-block performances, the evidence and assessments for intersections clearly show well performing junctions with spare capacities available.

### Rural Roads

- Rural roads also have a LoS A to C, again with spare capacity and zero locations with LoS D or lower.

As is clear from these results, the current traffic conditions, from an operations perspective, are solid with minimal congestion and capacity to spare.

## 1.4.6 PUBLIC TRANSPORT PROVISION

Public transport in the study area consists of:

- Local bus services provided by Prior's Scenic Express.
- Long-distance coach services provided by operators which include Greyhound, Murrays, Premier Motor Services, Prior's Scenic Express and V/Line.
- Taxi services provided by Eurobodalla Shire Taxis.
- Community Transport Services provided by Eurobodalla Shire Council.

The local bus services consists generally of a spine service, running from Batemans Bay to Moruya via Batehaven and George Bass Drive; and two local services serving Surferside/Batemans Bay/Catalina and Long Beach/Maloney's Beach. The network is illustrated in Figure 1.28.

Services are irregular and infrequent, and operate only during daylight hours on Weekdays, Saturdays and Public Holidays. No Sunday services are provided. Some routes are merged to operate as a single route for certain services which reduces the legibility of the network for passengers. The network is designed to fulfil community service obligations, such as providing access for non-drivers to essential services. The network, in its present form, is not attractive for commuter journeys. A summary of bus services is provided in Table 1.17.

**Table 1.17 Summary of Bus Services**

Route No.	Areas Served	Services Per Day		
		Weekdays	Saturdays	Sundays
757	Batemans Bay, Long Beach, Maloneys Beach	5	-	-
757/761	Batemans Bay, Surfside, Long Beach, Maloneys Beach	4	1	-
760	Batemans Bay, Batehaven, Surf Beach, Malua Bay, Broulee, Moruya	4	2	-
760/761	Batemans Bay, Batehaven, Surf Beach, Malua Bay, Broulee, Moruya	5	1	-
761	Batemans Bay, Catalina, Surfside	7	2	-

The long distance services generally consist of routes running between Sydney and Melbourne via the Princes Highway, with most services operating once or twice daily. Surfboarder Express also provides a daily service linking Canberra with Ulladulla via Batemans Bay. These services are generally used for long distance trips to/from destinations outside of the study area, rather than for inter-town journeys within the study area.

Eurobodalla Shire Taxis provides a limited taxi service through the study area. Phone bookings are recommended, however there are taxi ranks located in both Batemans Bay and Moruya town centres.

#### 1.4.7 ACTIVE TRANSPORT FACILITIES

Active transport facilities, such as footpaths, shared paths and bicycle parking are generally limited to the urban parts of the study area.

**Figure 1.28 Existing Bus Network**

