



Source: Zoning - CHCC LEP2000



FIGURE 2.6
ZONING MAP (LEP 2000)

- key habitats and wildlife corridors
- National Park estate

2.2 Biophysical environment

2.2.1 Landform and topography

The existing highway is located almost wholly on the coastal lowland and broad alluvial flats with the eastern ends of Macauleys Ridge and Roberts Hill ridge being the only hillslopes of any note.

The topography of the study area is shown on the ground elevation map presented as Figure 2.1. The hillside areas (areas above the 50m contour) are characterised by an initial steep slope which rises to approximately 150-200m AHD in the northern section and 150-250m in the southern section.

Major ridge lines project from the Coastal Range such as the prominent ridge to the south of Coramba that ends as Roberts Hill. The majority of the steep slopes and ridges are either forested or used for banana cultivation, the latter favouring the north-facing slopes that are more sheltered from the often-strong southerly winds.

2.2.2 Geology and soils

Regional geological maps indicate that the Coffs Harbour (Dorrigo area) is subdivided into three geological units. The two primary units comprise Coramba Beds, consisting of metamorphosed sedimentary rocks, Brooklana Formation comprising mudstone and siltstone and finally alluvial deposits.

The geology and soils generally provide suitable building foundations, but are limited by the substantial erosive potential of the area and its steepness in many parts of the local government area. Areas of risk are anticipated with bypass options that pass through variable and undeveloped terrain, requiring cuttings, tunnels and embankments.

The Acid Sulphate Soils (ASS) mapping shows there to be a low risk of ASS within the study area with the exception of minor areas north of Korora and adjacent to the North Coast Railway line which are noted as high risk (Connell Wagner 2004f).

Detailed subsurface investigations would be required to provide further information on the underlying conditions. In locations where deep cuttings or tunnels are required, it is anticipated that variable geological structure would be present that would require detailed targeted investigation. Introduction of cuttings also has the potential to introduce soil stability issues. Fill embankments up to 30m high could be required in places, the foundations of which may require treatment depending on the compressibility of material beneath.

Dieldrin and other chlorinated hydrocarbons were used until the early 1980s on banana plantations for disease and pest (borer) control. Given the long history of the industry in the area, it is possible that pockets of residue may exist particularly at old spray filling points (Connell Wagner 2002h). However the Department of Environment and Conservation (DEC), CHCC and the Department of Agriculture confirmed that no contaminated soil or groundwater sites have been identified within the study area, and there are no known occurrences of soil contamination as a result of banana plantations (Connell Wagner 2004f). Although cattle tick dip sites are present within the study area, none would be affected by the options under investigation.

2.2.3 Surface water

The existing highway is located almost wholly on the coastal lowland with the eastern ends of Macauleys Ridge and Roberts Hill ridge being the only hillslopes of any note. The topography of the lowland areas (areas below the 50m contour) is characterised by low undulating residual hills with gentle gradients and alluvial floodplains including back-swamps and dunes. From south to north, the main creeks crossing the study area from the upland area in the west to the sea are Coffs, Newports, Skinners, Moonee, Double Crossing and Woolgoolga Creeks.

Numerous drainage channels incise the hillside area and typically flow east from the mountain range to the lowland area in the coastal plain. A few minor creeks on the western side of the ridge flow to the west to join Bucca Creek. Bucca Creek itself flows through the centre of the Bucca Valley northwards to join the Orara River near the western edge of the study area. In terms of water resources, the Orara River is of vital importance in supplying town, agriculture and domestic water to Coffs Harbour. This water resource, like others in the study area, is subject to pollution pressures from the surrounding land use. The major activities potentially contributing to water pollution are agricultural practices, in particular livestock and pesticide use, and on site sewage management systems.

A preliminary catchment analysis carried out by Connell Wagner identified major waterways and catchments in the northern section of the study area and it examined the locations and condition of all existing road crossings. The 41 contributing catchments identified along that length of the existing highway were found to be predominantly rural with relatively short flow lengths and steep gradients.

In accordance with the *Australian Rainfall and Runoff Volume 1: Books 4 and 6* (Institute of Engineers Australia 1988) preliminary and peak discharges were calculated for catchments with areas less than 400ha. Similarly preliminary estimates of catchment runoff from the Probably Maximum Precipitation (PMP) event were made for the five larger catchments. For these larger catchments with contributing catchments in excess of 400ha, single-node hydrologic models (using RAFTS modelling system) were constructed to calculate the runoff and additional detail will be included in these models during the refinement of the concept design for the preferred option.

2.2.4 Biodiversity

A review of the route options in relation to biodiversity was carried out for both the southern and northern sections of the study area (Connell Wagner 2004a and 2002e). Both assessments involved foot traverses searching for threatened flora species, ecological communities and habitats of threatened fauna.

The working papers describe the plant and animal species and vegetation types that occur on each of the road corridors and contain an assessment of the likely ecological impact of each of the options. The options were compared based on their impact on flora and fauna, with a focus on threatened species and ecological communities. Native vegetation and wildlife habitats and corridors are illustrated in Figures 2.4 and 2.5.

2.2.5 Air quality

Given that the study area is in a non-metropolitan, coastal location, air quality issues are unlikely to be a significant assessment factor at the route options development stage. Nonetheless, an Air Quality Constraints report was prepared by Holmes Air Sciences (Appendix C to the Strategy Report – Connell Wagner 2004a). The report outlined the different air pollutants contained in motor vehicle emissions and the potential health impacts associated from these emissions.

Once the preferred route option has been selected, a detailed assessment of air quality expected during construction and operation of the proposal will be carried out. This will include computer-based dispersion modelling to predict roadside air quality for the first and tenth years of operation.

2.3 Socio-economic profile

2.3.1 Statutory and strategic planning

The upgrade options are subject to the provisions of the Coffs Harbour Local Environmental Plan (LEP) 2000. The route options traverse or are in the vicinity of numerous land-use zones including rural, State Forests, residential, business, special uses, open space, environmental protection and National Parks and Reserves (refer Figure 2.6). Except for the Rural 1F State Forest zone and the National Park and Reserves 8 zone, roads are permissible with development consent in accordance with the LEP in all zones traversed by the upgrade options. However, under the savings provisions of clause 7 of the LEP, roadworks can be undertaken without the need for development consent. Development for the purpose of roadworks that do not require consent is subject to the provisions of Part 5 of the *Environmental Planning and Assessment Act* (EP&A Act). In the case of the State Forest and National Park and Reserves zones, development is prohibited unless it can be authorised by or under the *Forestry Act 1916* or the *National Parks and Wildlife Act 1974* respectively, which usually requires an Act of Parliament or a notice by the Governor of NSW.

A full account of relevant legislation and applicable environmental planning instruments is contained in previous working papers (Connell Wagner 2002d and 2004c). These reports reviewed the provisions of other statutory and strategic documents / instruments in terms of relevance to the options. These included:

- NSW Government Action for Transport 2010, Action for Air, Road Safety 2010
- State Environmental Planning Policies (SEPPs)
- North Coast Regional Environmental Plan (NCREP)
- North Coast Urban Planning Strategy – Into the 21st Century (1995)
- North Coast Road Strategy (1993)
- Upgrading the Pacific Highway Discussion Paper
- Coffs Harbour Urban Development Strategy (1996)
- Coffs Harbour Council Rural Residential Strategy (1999)
- Draft Rural Lands Strategic Plan (November 2001)
- Korora Draft Local Environmental Plan (2001)
- North Boambee Valley Development Control Plan (1996)
- Coffs Harbour Koala Plan of Management (1998)

Related legislation potentially applicable to the planning and assessment of highway proposals at the detailed planning stage includes:

- Environment Protection and Biodiversity Conservation (EPBC) Act 1999 (Commonwealth)
- Protection of the Environment Operations Act 1997
- Threatened Species Conservation Act 1995
- Fisheries Management Act 1994
- Native Vegetation Conservation Act 1997
- Heritage Act 1977
- National Parks and Wildlife Act 1974
- Water Management Act 2000
- Contaminated Land Management Act 1995

There are potentially significant planning and land use implications from some of the route options in relation to current and future urban and rural residential release areas. This is discussed further in the assessment and evaluation of corridor and route options in sections 4 and 5.

2.3.2 Socio-economic characteristics

Socio-economic characteristics of the study area are detailed in the *Sapphire to Woolgoolga Route Options - Working Paper No 7: Socio-economic Assessment* (Connell Wagner, 2002e) and the *Coffs Harbour Section Socio-Economic Assessment - Working Paper No 6* (Connell Wagner, 2004d) and summarised below.

As part of the mid-north coast region of NSW, Coffs Harbour is a major regional centre and one of the fastest growing areas in NSW. Important characteristics of the mid-north coast include its popularity as a tourist destination, its growing attraction for retirees and others migrating from large urban areas in NSW, Victoria and Queensland, its historic reliance on agriculture as a mainstay of the regional economy and its sensitive biophysical environment.

The Coffs Harbour LGA is located 510km north of Sydney and covers an area of 959km². The estimated resident population of the LGA in 2001 was 61,770 people, with the great majority of the population (approximately 90%) located east of the Great Dividing Range along the coast. Major urban centres include Coffs Harbour, Sawtell and Woolgoolga. Major industries in the LGA include tourism, primary production, manufacturing, government, commercial and retail services. A large proportion (approximately 43%) of the LGA is State Forest land and 2% is National Park (CHCC, 1999a).

The study area comprises a number of discrete urban settlements, rural residential development and rural/agricultural development. Key features of the community structure of the study area are as follows:

- Coffs Harbour urban area and Sawtell / Toormina / East Boambee have the highest proportion of resident population in the LGA comprising 37% and 22% respectively.
- Tourism is the most important industry in the LGA in terms of income and employment generated (CHCC, 1996). This is most noticeable with the high concentration of tourist accommodation in the Park Beach / Korora / Sapphire areas, the restaurant strip in the Jetty area and the city centre.
- As a tourist destination, Coffs Harbour experiences a substantial increase in population during peak holiday periods. Maximum use of facilities and resources is reached during these periods. Wholesale and retail businesses in Coffs Harbour are highly dependent on the seasonal tourist trade.
- Sapphire and Moonee are two discrete, but proximate, coastal settlements located to the north of Coffs Harbour with the population located predominantly on the eastern side of the highway.
- Between Moonee and Woolgoolga, the coastal settlements of Sandy Beach and Emerald Beach support 6% of the total population of the LGA.
- Woolgoolga is the third largest urban settlement after the Sawtell / Toormina / East Boambee area with approximately 7% of the population. It has been recognised as a Major District Centre to serve as support to Coffs Harbour and Grafton (CHCC, 1996).

- Arrawarra, Mullaway and Safety Beach are three discrete, but proximate coastal settlements located north of Woolgoolga on the eastern side of the Pacific Highway. In 2001, the combined population represented approximately 4% of the LGA total.

Table 2.1 indicates the population numbers residing in the study area according to the Census in both 1996 and 2001. It also shows the percentage population increase in the two inter-censal periods since 1991.

Table 2.1 Coffs Harbour LGA population by locality¹

Locality	1996 Census		2001 Census		% Increase 1991-1996 ²	% Increase 1996-2001
	No	%	No	%		
West Boambee	1,547	2.7	1,689	2.7	NA	9.2
Sawtell / Toormina / East Boambee	13,240	22.7	13,831	22.0	34.2	4.5
Coffs Urban	22,728	39.0	23,547	37.4	2.7	3.6
Korora	2,367	4.1	2,701	4.3	NA	14.1
Moonee / Sapphire	2,910	5.0	3,456	5.5	33.1	18.8
Sandy Beach / Emerald Beach	3,373	5.8	3,651	5.8	27.9	8.2
Woolgoolga	4,493	7.7	4,526	7.2	7.9	0.7
Arrawarra / Mullaway / Safety Beach	2,333	4.0	2,430	3.9	14.8	4.2
Total LGA	58,337	100.0	62,902	100.0	12.3	7.8

1. Localities to the south and west of the study area not included

2. Source: CHCC Community Profile 1999

Table 2.1 shows that the rate of population growth between 1996 and 2001 was markedly lower in all areas except Coffs urban area than for the previous period between 1991 and 1996. This is most noticeable in the northern beaches areas of Sapphire / Moonee / Sandy Beach / Emerald Beach and north of Woolgoolga at Safety Beach / Mullaway / Arrawarra. Despite this apparent steadying in the rate of growth, the population of Coffs Harbour is anticipated to continue to grow, with a population of 93,700 projected by the year 2021. Table 2.2 shows the rate of population increase in the Coffs Harbour LGA since 1966.

Table 2.2 LGA population increase since 1966

Year	Census	Estimated resident population	Annual growth rate (preceding 5 years)
1966	15,067	14,625	
1971	19,100	18,633	4.96%
1976	25,550	24,500	5.62%
1981	35,154	34,000	6.78%
1986	43,010	42,113	4.42%
1991	51,520	50,877	4.37%
1996	58,337	57,283	2.40%
2001	62,902	61,770	1.6%

Source: CHCC Population Profile 2004 (Preliminary Draft)

Coffs Harbour has a greater proportion of older people than the State average with more than one quarter of the population aged 55 and over, compared to approximately one fifth for the State, but almost one third for the mid-North Coast. In 2001, the median age was 39 years. The greatest population change has occurred in the 50 to 54 age bracket which shows an increase of 79%. By comparison, the 2001 Census shows a decline of 20-25% in the 10 and 20 year age group.

2.3.3 Visual and acoustic amenity

The existing visual environment is a combination of natural and cultural attributes that make up the landscape setting. The Urban Design and Visual Assessment Working Papers prepared by Hassell (2002 and 2004) nominated four main components of the existing visual environment as land form, vegetation types, land use and urban structure. Categories identified within each component are listed in Table 2.3.

Table 2.3 Classification of visual environment

Landform	Vegetation type	Land use	Urban structure
Coastal flats	Coastal wetland	Natural (forested)	Coastline
Coastal footslopes	Open woodland	Urban (residential / industrial / commercial)	Base of upper ranges and valleys
Upper ranges and valleys	Forest	Rural area (farmland)	Existing highway
	Cleared land (recreational)	Recreation and conservation	CBD
	Cleared land (pasture)		
	Cultivated land		Coffs Harbour urban area
Urban land			

Within these categories, the likely implications of each option were assessed in terms of visual impact, road user experience and urban design impact.

The acoustic amenity of the study area is dominated by the Pacific Highway where existing traffic noise levels at the closest residential receivers already exceed DEC base criteria for Redeveloped Roads.

2.3.4 Urban land use and property

Land use in the southern section of the study area is predominantly urban and residential. Further north and west of the existing highway beyond the main Coffs Harbour urban area, key urban land uses are residential and rural residential development. Along the existing highway corridor, land uses are predominantly lower density industrial and commercial up to Korora where the pattern changes to rural residential and tourist uses. Urban development is progressively replacing the less built-up areas, especially along the coastal strip east of the highway.

Key features of urban land use between Englands Road and Arrawarra are shown in Figure 2.2 and include:

- Industrial development features adjacent to the existing highway at the southern extent of the study area with the Isles Industrial Estate and the CHCC waste depot located at the intersection of Englands Road and the highway. A few kilometres further north along the highway, industrial development gives way to residential, commercial, tourist and open space land uses.
- The urban area of Coffs Harbour is predominantly residential with development extending westwards towards the foothills of the Coastal Range. The CBD precinct has slightly higher density residential and commercial land uses before becoming sparser north of Arthur Street as the pattern changes to rural residential / tourist uses. Urban development is gradually replacing these less built-up areas, especially along the eastern side of the highway.
- Subdivision for residential development has progressed rapidly in recent months around the North Boambee Valley and West Coffs areas with Council's release of development control plans for the areas.

- There are several rural residential areas within the study area including at Korora, Forest Glen, Heritage Park, Emerald Heights, Avocado Heights, Country Club Estate and other scattered development. Rural residential development is predominantly located to the west of the highway.
- Development at Sapphire, Moonee, Emerald Beach and Sandy Beach is predominantly residential and tourist with limited commercial development. A key characteristic of the structure of Sandy Beach is that there is no direct access from the highway to the township. Access is provided by Graham Drive South or Graham Drive North and along the overbridge crossing the highway at Diamond Head Drive. The existing highway effectively bisects the settlement with residential development on both the eastern and western sides of the highway.
- The majority of urban development within Woolgoolga is located on the eastern side of the Pacific Highway, however some residential and limited commercial development is located on the western side of the highway. Significant rural residential development associated with the Woolgoolga township (primarily in the Country Club Estate) is located on the western side of the highway and along Woolgoolga Creek, Newmans and Bark Hut Roads.
- Development within the settlements of Arrawarra, Mullaway and Safety Beach is predominantly residential with a scattering of commercial development.

2.3.5 Agricultural land use and property

Development associated with rural and agricultural enterprises (eg. banana growing) exists mainly to the west of the highway throughout the study area. Large areas of forestry land extend along the north-western boundary of the study area within Wedding Bells and Orara East State Forests. Agricultural and forestry land classification is illustrated in Figure 2.3.

The Agricultural Land Use Assessments conducted by Wilkie Fleming (Connell Wagner, 2004a and Wilkie Fleming 2002) identified the main agricultural activities as forestry, bananas, cultivation and grazing, or combinations of these with banana growing being the major enterprise likely to be affected by the route options. Bananas in the area were generally healthy, being grown on the steeply sloping lands.

The land around the Coffs Harbour urban area is steep to very steep above small valley basins. Bananas have been grown successfully on the most protected slopes to avoid strong cold winds and frost. Management of the crop is favoured where neighbouring properties are also involved in banana growing so that cooperative contracts for essential disease control spraying can be negotiated, and interface effects with non-compatible land uses are minimised. Quarantine is an important facet of banana management since major diseases can be transmitted on infected plant material and can be transported by vehicle or on foot.

The area of consolidated banana growing lands immediately around Coffs Harbour has been contracting as urban development has expanded along the main roads. There is evidence of bananas no longer being grown on upper slopes above western Coramba Road and inland from Korora beach.

Avocados are grown on very steep orchards but production from this immediate catchment is very small. The areas of other horticultural crops such as mango, vines, citrus and berries are also very small.

Agricultural properties along the existing highway are used mainly for grazing, but there has been extensive incursion by subdivision for industrial and residential development to the point

where the agricultural significance of the land has been largely overtaken by other forms of land use.

At Woolgoolga, banana growing is a long-established industry with farms in the area under continuous bananas (with spell periods) for over 30 years. The success of the crop has been due largely to high levels of management, maintaining strict levels of hygiene and disease control and maintaining a complete cover of mulch on slopes that would otherwise erode severely. The industry is particularly cohesive in the region, partly because many of the farms are family run and have been held through generations, and partly through a cooperative approach to disease control based on aerial spraying of fungicides for leaf spot control and leaf speckle. For these reasons, the preliminary assessment also took into account plant hygiene and disease control, particularly leaf diseases, which are critical for profitable production.

The banana industry is the most important rural industry for the Woolgoolga district and has an estimated gross direct return to growers exceeding \$20M, with a flow-on effect to light industry and trading. The banana industry in Woolgoolga appears to have a more cohesive and higher management profile (based on better and more consistent returns) than in other growing areas.

2.3.6 Indigenous and non-indigenous heritage

Indigenous heritage

The study area lies in an area administered by the Coffs Harbour and District Local Aboriginal Land Council. An assessment of indigenous heritage issues carried out by Jackie Collins (Collins, 2004 and 2002) found only one area of potential concern in relation to Aboriginal heritage constraints in the southern section of the study area. This was in the vicinity of Coffs Creek and the Wongala Estate where a large Aboriginal camp existed in the vicinity of the Fitzroy Oval approximately 150m east of the present highway. Aborigines also camped on the northern side of Coffs Creek where the showground is now located.

To the west of the main Coffs Harbour urban area, the landscape is highly disturbed and offers little potential for the preservation of *in situ* Aboriginal archaeological sites. However, there are a number of specific areas where archaeological potential was identified as moderate or high. While the areas of predicted archaeological sensitivity would require field testing at the environmental assessment stage, no permanent Aboriginal heritage constraints were found.

The northern section of the study area lies within the area of interest of the Gumbala Julipi and Mudjay Elders groups based in Coffs Harbour and the Yarrowarra Aboriginal Corporation of Corindi Beach. The area north of Moonee Beach is within the traditional country of the north-eastern Gumbaingirr people, who are represented by the Garby Elders.

The ridgelines on the western boundary of the Sapphire to Woolgoolga section provide a culturally sensitive landscape which is well known and highly valued by the Aboriginal community. The ridgelines are known to have been used as travelling routes through the forests. At least two natural sacred sites, an historic camping place and stone artefact scatters are located in the vicinity. All of these sites and features are of high Aboriginal social significance.

Along Moonee Creek there is potential for significant subsurface evidence of Aboriginal occupation. The spur occupied by the Coffs Harbour Gun Club on the eastern side of the highway reserve is of high cultural heritage significance as one of the last known traditional camping places of the Moonee people. A range of important wild plant resources were identified by Aboriginal Sites Officers along the densely vegetated creek lines. These included Native asparagus, Cordyline, Sarsaparilla vine, Native ginger, Lilly pilly, Native grape and Walking stick palm.

Within and along the eastern edge of the existing highway reserve north of Poundyard Creek lies Poundyard Creek flats which is a known corroboree area. This includes land now covered by the Woolgoolga High School sports oval and is considered to have a high level of Aboriginal social significance.

Non-indigenous heritage

The majority of heritage places or items listed in the LEP, REP and National Trust Register are located within the urban area of Coffs Harbour and Woolgoolga to the east of the Pacific Highway. However, the results of the database search and literature review and consultation with stakeholders revealed that there are a number of items of non-indigenous heritage significance located within the study area. A number of the identified items, such as the areas listed on the Register of the National Estate, derive their value from their natural heritage characteristics. In addition, there are a number of items of built heritage associated with developed areas.

In the southern section, two areas of cultural heritage significance listed on the *Register of the National Estate* lie in close proximity to the Inner Bypass corridor and the existing Pacific Highway corridor. These are the Korora Nature Reserve (registered place) located on the western side of the Highway at Korora and the Orara Ornithological Area which is listed as an indicative place (currently being assessed) by the Australian Heritage Commission. Located along Bruxner Park Road, this area is approximately 5,755ha in size and is located approximately 5km north-west of Coffs Harbour. The nominated area is a moist hardwood forest supporting high bird diversity.

Another relevant literature source reviewed was the *Coffs Harbour Coastal Landscape Heritage Study* (CHCC 1995) in which a community values assessment process identified fourteen places of landscape heritage value likely to be sufficient to warrant inclusion in the Register of the National Estate. Those in the vicinity of the Inner Bypass include Sealy Lookout and all lookouts giving views of Coffs Harbour and its setting, including viewing points at Red Hill and Roberts Hill.

In the Sapphire to Woolgoolga section, Wedding Bells State Forest was identified in the Coffs Harbour Heritage Landscape Study as being valued by the local community.

It is quite possible that as yet unidentified sites of non-indigenous heritage significance could exist in the study area in the form of relics associated with past occupation and land use. Under the provisions of the *NSW Heritage Act 1977*, items which are related to the settlement of NSW which are greater than 50 years of age are defined as 'relics' and a permit is required from the NSW Heritage Office before disturbance of such items can take place.

2.4 Movement systems and access

2.4.1 Regional road network

The road network in the strategy area consists of a hierarchy of roads, with the highest function being performed by the Pacific Highway as the major north-south spine, connecting Coffs Harbour to Woolgoolga (and ultimately Grafton) in the north and Bonville in the south. Coramba Road acts as a sub-arterial road and links the main Coffs Harbour urban area to western areas of the LGA including the Orara Valley and then to Grafton. The other major roads are the Lyons Road and Hogbin Drive route, which provides for connection between the Pacific Highway south of Coffs Harbour, the airport, the Sawtell / Toormina area, the educational precinct and the Coffs Harbour CBD.

Other key roads in the Coffs Harbour urban area include Stadium Drive (provides access to the sports stadium and a link between Hogbin Drive and the highway) and the Orlando Street, Harbour Drive, Gordon Street, Coff Street circuit to the east of the Pacific Highway which

provides a loop from the Orlando Street industrial area through the Jetty area and back to the city centre. Bray Street / Mackays Road / Don Patterson Drive, Park Beach Road, Albany Street, Arthur Street and Mastrocolas Road also variously provide access to major facilities, services or residential areas.

Key collector roads along the highway between Coffs Harbour and Woolgoolga include Englands Road, North Boambee Road, Bruxner Park Road, James Small Drive, Headland Road, Split Solitary Road, Gaudrons Road, Moonee Beach Road, Bucca Road, Smiths Road, Fiddaman Road and Graham Drive (north and south).

To the north, Clarence Street, River Street, Pullen Street and Newmans Road are the main access roads for Woolgoolga and residential areas west of the Pacific Highway, while Safety Beach Drive, Mullaway Drive and Arrawarra Beach Road run east off the highway to the beach areas.

The overall road network is illustrated in Figure 2.7. A more detailed schematic road network plan for the Sapphire to Woolgoolga section is presented in Appendix A of Working Paper No 8 - Traffic and Transport Assessment (*Route Options Development Report, Dec 2004*) and a network map for the Coffs Harbour section is included in Figure 3.2 of the *Strategy Report (Feb, 2004)*.

2.4.2 General traffic characteristics

Over the past few years, the Pacific Highway in the Coffs Harbour area has been extensively upgraded and is now dual carriageways between Sawtell and Sapphire. Between Sapphire and Woolgoolga, the Pacific Highway is a two-way, two-lane road with a number of passing lanes. The Pacific Highway is the only arterial road available to serve the existing residential settlements located at Sapphire, Moonee, Emerald Beach, Sandy Beach and Mullaway and to access the town centres at Coffs Harbour and Woolgoolga. A single access road is provided to most of the settlements along the highway.

The following summary of existing traffic characteristics is based on surveys carried out in 2001, and previously reported in the traffic assessments published in December 2002 and February 2004 (Connell Wagner, 2002a, 2002b, 2004).

- In the southern section, modelled traffic volumes on the existing Pacific Highway between Englands Road and the end of the existing dual carriageway at Sapphire ranged between approximately 21,000 vehicles per day (vpd) north of James Small Drive (south) and 34,000vpd north of Bray Street for the base case (ie. without any new highway corridor) in 2001 (Connell Wagner, 2004a).
- Based on output from the TRACKS model used by CHCC, it was estimated that the levels of through traffic currently using the highway constitute 5-25% of the total traffic volumes between Englands Road and the end of the existing dual carriageway at Sapphire. They range from approximately 1,400vpd north of Coff Street to 4,000vpd north of James Small Drive (south) (Connell Wagner, 2004a).
- In the northern section, the estimated existing average daily traffic volumes within the study area range in magnitude from 17,118 vehicles per day at a point on the Pacific Highway south of Headland Road at Sapphire, to 8,121 vehicles per day between River Street and Clarence Street in Woolgoolga based on surveys undertaken in 2001. These estimates are intended to indicate the typical level of traffic using each section of road on an average day. In practice, considerable variation in traffic volumes occurs due to the recreational nature of the route, with traffic volumes substantially higher during school holidays and on long weekends (Connell Wagner, 2002b).

- The existing level of through traffic between Opal Cove and Mullaway based on the 2001 OD survey is estimated to be in the range of approximately 3,700-4,260 vpd, depending on the level of night-time through traffic that occurs between these survey locations and the trip duration that is adopted (Connell Wagner, 2002b).

2.4.3 Heavy vehicle characteristics

Southern (Coffs Harbour) section

The TRACKS model used by CHCC is a strategic transport model developed to examine the effects of land use, population and network changes at a relatively broad level. As such, the CHCC model in its current form does not provide estimates of heavy vehicle movements, and how these might change with the addition of bypass options.

In March 2002, the volume of heavy vehicles in the Coffs Harbour section of the study area reported from the automatic vehicle classification surveys carried out in May / June 2001 was 10-11% of average daily traffic (Connell Wagner, 2002c).

Northern (Sapphire to Woolgoolga) section

Heavy vehicle movements at a number of mid-block locations between Headlands Road and north of Mullaway were counted over a one-week period in May / June 2001. From this survey, it is evident that while the percentage of heavy vehicles in the traffic stream gradually increases from Sapphire to Woolgoolga for both the daytime and night-time periods, the number of heavy vehicles actually decreases. The data also indicates that heavy vehicles make up a significantly higher proportion of the total night-time traffic when compared to the equivalent proportions for the daytime traffic (Connell Wagner, 2002b).

Since the opening of the Yelgun to Chinderah project in August 2002, there have been community concerns as well as anecdotal information indicating substantial increases in the number of heavy vehicles in the study area. In order to examine this matter, a comparison was done of the 2006 vehicle numbers north of Graham Drive North predicted by traffic modelling carried out in 2002 and two single week long traffic surveys conducted north of Graham Drive North in July and August 2003. The survey found that total traffic volumes were similar to the predicted volumes but that heavy vehicle volumes were up to 100 vehicles (or 7%) higher than those predicted to occur in 2006 (Connell Wagner, 2004b).

Interpretation of this information tends to support the perception of recent growth due to the completion of highway improvements including the Yelgun to Chinderah project. However, until longer-term survey information is available, it is not possible to confirm the long-term trends of heavy vehicle traffic increases.

2.4.4 Performance of existing road network

Southern (Coffs Harbour) section

Within the Coffs Harbour urban area, the capacity of the highway is governed by the capacity of intersections, most of which are currently at-grade junctions and result in delays to all traffic as it passes through and across the area. The critical intersections are within the CBD at Coff Street / Elbow Street, north of the CBD at the Orlando Street / Bray Street and Park Beach Road intersections and south of the CBD at Cook Drive / North Boambee Road. These intersections are all controlled by traffic signals and delays are now experienced at these locations in peak periods, particularly during the summer holiday period.

With the substantial growth in local traffic in future years arising from developments in areas such as the North Boambee Valley and also further to the north in the Moonee Urban Release areas, a considerable strain will be placed on the existing infrastructure. This will require improvements to be made to a number of the intersections.

The capacity of the Park Beach Road and Orlando / Bray Streets intersections has been increased in recent times with the provision of extra right-turn lanes for traffic leaving the highway. Completion of the eastern distributor by extending Hogbin Drive from Harbour Drive (formerly High Street) to Orlando Street would redirect a substantial volume of local traffic off the Pacific Highway. Together with the extension of Mastrocolas Road to link through to Don Patterson Drive, Coramba Road and Combine Street (the western distributor) and other localised improvements, these measures would defer for some years the need for further major improvements to the Pacific Highway in the main Coffs Harbour urban area.

Northern (Sapphire to Woolgoolga) section

The traffic and transport assessment carried out in 2002 found that all sections of the highway north of Sapphire are operating at a Level of Service (LOS) D or E on an average day, with volumes on the Sapphire to Moonee section in particular approaching capacity levels (Connell Wagner, 2002b).

Based on the RTA Crash Database, a total of 193 crashes occurred on the Pacific Highway between Sapphire and Mullaway in the five year period between October 1995 and December 2000. These included 5 fatal crashes, 89 injury crashes and 99 tow-away crashes. Of the total number of crashes that occurred along this section of the highway, 16 (8%) were attributed as being speed-related and 27 (14%) as being fatigue-related.

2.4.5 Future traffic volumes

Southern (Coffs Harbour) section

Traffic models were run for the base year of 2001 and the future year of 2021 only, corresponding to those years for which CHCC currently has estimates of land use data. For each of these years, road models were developed for the base case and for each of the options under consideration. The base case road networks included the present-day road network together with other planned improvement works expected to be completed within the modelling timeframe. For 2021, this included all of the works proposed in the Coffs Harbour Future Road Network Plan (ie. the extension of Hogbin Drive across Coffs Creek and its upgrading to 4 lanes between Stadium Drive and Arthur Street, the Mastrocolas Road extension and the North Boambee Valley link road system).

By 2021, traffic volumes on the existing highway without a bypass are predicted to range between 28,000 vpd south of Halls Road and 45,000 vpd north of Bray Street. Estimated future traffic volumes for the preferred option are reported in detail in the Strategy Report (Connell Wagner, 2004a).

Northern (Sapphire to Woolgoolga) section

It is predicted that a large proportion of the total traffic growth between Sapphire and Woolgoolga up to 2021 will be associated with new urban development within the study area. While through traffic will continue to grow, local traffic generation from planned urban developments such as at Moonee and West Woolgoolga will contribute significantly to the growth in trips on the highway.

Traffic volumes on the existing highway vary considerably along its length with the highest volumes occurring on the section south of Headland Road. Future traffic volumes were estimated using the existing volumes at selected key intersections and expected growth in through traffic as well as the significant additional traffic generated by future land-use developments along the route. The existing highway traffic volumes were factored in using the historical growth rate of 3% per annum and estimates of future volumes were prepared for 2006, 2016 and 2021.

Intersection analyses carried out for selected key intersections for the existing highway upgrade found that the level of service for most intersections is predicted to be good during the morning and afternoon peak hour periods in 2006 and would also be acceptable in 2021. However, for the intersections south of and including Moonee Beach Road, the performance would be unacceptable during the morning peak hour period in 2021. This finding highlighted the need for grade-separated interchanges at Sapphire and Moonee to ensure safe and efficient access to and from the highway.

The traffic analysis shows that the close bypass option of Woolgoolga would potentially attract the most traffic (approximately 66% higher than the widest option (Option A) by 2006, increasing to 71% by the year 2021).

The close bypass options are all predicted to provide savings in travel time for heavy vehicles relative to the existing highway, while maintaining similar levels of vehicle operating costs. Therefore heavy vehicles may be attracted away from the existing highway to these options. The closer bypass options provide greater travel time and transport efficiency savings than the wider bypass options.