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Ballina Roads Contributions Plan

Technical Background Report – Volume 1

Prepared for
Ballina Shire Council

December 2009

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1.0 INTRODUCTION

This document forms part of the *2009 Ballina Shire Roads Contributions Plan* (referred to as the **Roads Plan** in this report) and is intended to provide the technical background in relation to the traffic modelling undertaken and the road network augmentation works identified from that process, from which the level of contributions required from new development has then been determined. The Roads Plan applies to the whole of the Ballina Shire as shown in Figure 1.1.

The Roads Plan relies on the traffic model developed by Cardno Eppell Olsen in the *Ballina Road Network Study Update 2007 (BRNSU-2007)*, which evolved out of the 2000 traffic model that underpinned the *2002 Ballina Road Contributions Plan*. The model developed in that study included further calibration of traffic data and changes to demographic and population projections. More recently some further changes were made to the model to incorporate the population projections adopted by Council in the preparation of the *Ballina Shire Contributions Plan 2008*, thereby ensuring consistency with other documents recently released. Further details of the modelling process are provided in section 4 of this report.

Based on the population projections adopted in the *Ballina Shire Contributions Plan 2008*, it is anticipated that the population of Ballina Shire will increase from an estimated level of approximately 43,000 persons in 2007 to over 60,000 persons by 2026. Ballina Shire Council's strategic growth management framework anticipates that the projected level of demand can be accommodated through progressive infill development and via staged rezoning and development of strategic urban release areas. The major new release areas in the Shire are located in the Lennox Head, Wollongbar and Cumbalum Ridge localities. Rates of population growth and development activity will be monitored and the local growth management framework reviewed on a regular basis.

The model divides the Shire into 10 geographically distinctive sectors and uses landuse trip generation associated with future growth to model future traffic impacts. The outcome of this mathematical model is the best prediction Council can obtain of the volume and distribution of traffic growth in the years to come.

The model has used the population projections to identify the impacts on the existing road network over the study period. The model has also been used to assist in determining the required upgrading works to the road network to cater for the future growth.

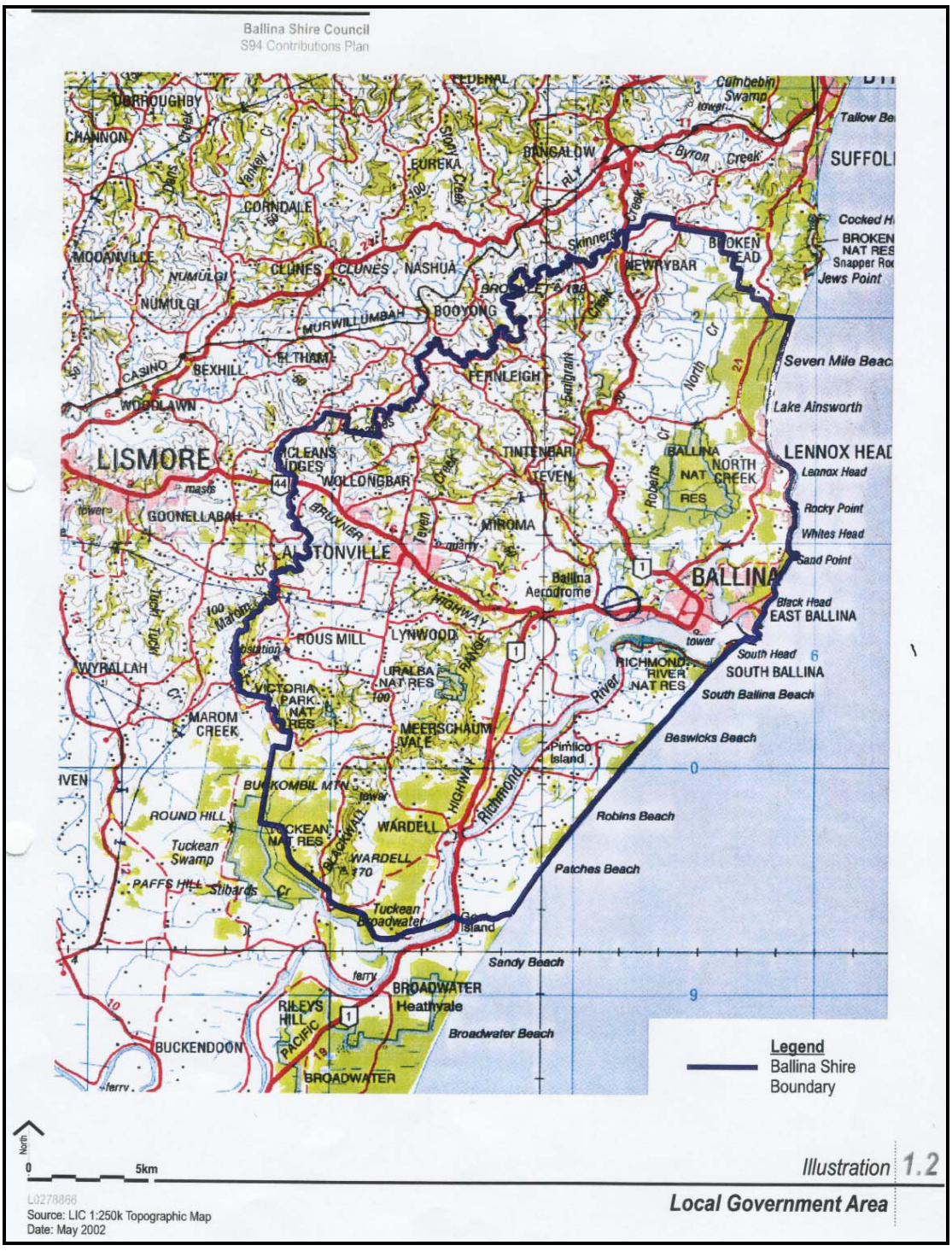
The current traffic modelling concludes that the existing road network within the Ballina LGA is generally adequate to cater for existing traffic demands and for the most part conforms with widely adopted design standards promulgated by Austroads, the recognised Australian authority in relation to road design.

The modelling, however, predicts that the Ballina LGA road network will experience considerable traffic growth, especially around Ballina and Lennox Head as anticipated urban development occurs. Most major urban road corridors will be required to carry more traffic and some of these corridors will be overloaded unless additional capacity is provided. In some areas new road corridors will need to be established to service specific development.

The Roads Plan proposes the construction of approximately 30 individual road improvement projects over the period from now to 2030. The total cost to complete all of the works identified in the works program amounts to almost $140M in current dollars, representing an average expenditure of about $7M per year.

This report is presented in two volumes. Volume 1 outlines the traffic modelling and analysis undertaken and the works program identified from this process. Volume 2 provides the detailed cost estimates for each item of works in the program.

Figure 1.1 ***Local Government Areas***



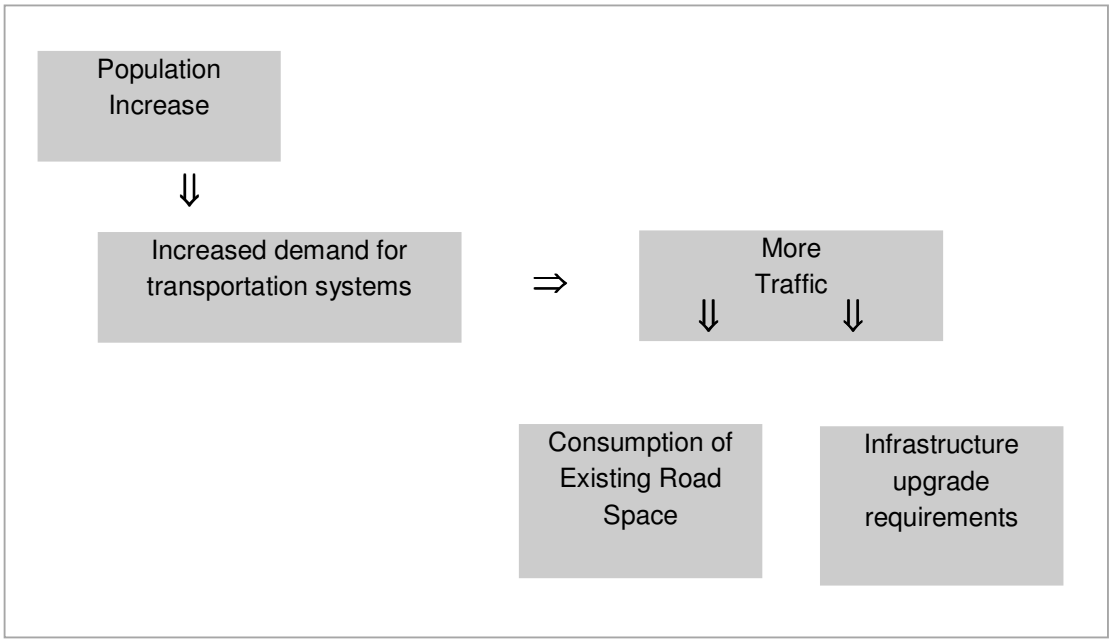
(Source Ballina's S94 Contributions Plan)

2.0 TRAFFIC GROWTH OVERVIEW

Population growth is known through experience to generate additional traffic, creating the need for improved roads or sometimes more roads. The actual volume and characteristics of traffic demand is directly related to land-use. Field surveys and manuals on the subject, amongst them the New South Wales Roads and Traffic Authority (RTA) Guide to Traffic Generating Developments (Issue 2.0 - December 1993), demonstrate that the increase in traffic is dependent on the type of development. The actual increases vary considerably with the extreme being the increase in traffic generation due to new shopping centres, fast food stores and the like.

Figure 2.1 set out schematically the theoretical results of increased population on road networks.

Figure 2.1 ***Nexus***



Extra traffic can impact upon:

- traffic facility efficiency;
- amenity;
- safety;
- pavement life; and
- public finances.

Traffic facility efficiency is traditionally concerned with the performance of major roads, however, in high growth areas like Ballina Shire, the effect may extend to local roads which were never designed nor envisaged to be significant traffic corridors. Safety is arguably the most important consideration, however, amenity can also be a concern for residents fronting collector and arterial roads. Remedies to these issues may be provided through construction works that provide for augmentation, replication, and diversion of road infrastructure.

The BRNSU-2007 and associated traffic model prepared by Cardno Eppell Olsen, in conjunction with recent amendments to incorporate the latest population projections adopted by Council as previously mentioned, has been used to identify the additional demand for road infrastructure generated by new development.

Using the results from the BRNSU-2007 and traffic model, the Roads Plan undertakes to do the following:

- to ensure that an adequate level of public road infrastructure is provided throughout the Ballina LGA;
- to ensure that the existing community is not burdened by the provision of public roads required as a result of future development;
- to provide a comprehensive strategy for the assessment, collection, expenditure, accounting and review of development contributions on an equitable basis throughout the Ballina Shire; and
- to identify those works that are required exclusively by new development.

3.0 POPULATION PROJECTIONS

3.1 Local Growth Management

The framework for the strategic local growth management in Ballina Shire has to date been provided by the Ballina Urban Land Release Strategy (ULRS-2000). With the adoption of the Far North Coast Regional Strategy (FNCRS-2006) by the NSW State Government, local councils have been directed to prepare 'Local Growth Management Strategies' as a basis for strategic management of population and employment growth in their respective local government areas. The local growth management strategy will replace the ULRS-2000 contemporaneous with the adoption of a new Local Environmental Plan (LEP) for the Shire, anticipated by 2010.

3.2 Population Projections

The population projections adopted in the *Ballina Shire Contributions Plan 2008* have been used in the traffic modelling undertaken to inform the development of the Roads Plan. These projections are different from those used in the modelling that accompanied the BRNSU-2007 traffic report, which were based on projections developed in 2005. Some changes to the sector boundaries used in the model (refer Figure 4.3 in section 4.4 of this report) have also been made since the preparation of the BRNSU-2007 and its associated traffic model, in order to make them more consistent with those used in the *Ballina Shire Contributions Plan 2008.* This has resulted in some changes in the distribution of forecast population levels between the various sectors. The population forecasts on a per-sector basis are summarised in Table 3.1 below:

Table 3.1 ***Residential Population Projections 2007 to 2026***

Sector	2007	2026
1 - Ballina Island	8,088	8,457
2 - East Ballina & Skennars Head	6,345	7,419
3 - Lennox Head	8,486	12,416
4 - North & West Ballina*	4,599	6,117
5 – Cumbalum**	470	10,250
6 - Alstonville	5,216	5,220
7 - Wollongbar	2,381	5,029
8 - Wardell	531	602
9 - Rural North	7,337	7,337
10 - Rural South		
Overall	**43,453**	**62,847**

Source: Ballina Shire Contributions Plan 2008

** includes River Oaks Estate future population estimate of 940 persons at 2026*

*** includes Ballina Heights population estimates of 240 persons (2007) and 2,250 persons (2026)*

Based on the forecasts it is anticipated that the population of Ballina Shire will increase from an estimated level of approximately 43,000 persons in 2007 to over 60,000 persons by 2026. Ballina Shire Council's strategic growth management framework anticipates that the projected level of demand can be accommodated through progressive infill development and via staged rezoning and development of strategic urban release areas. The major new release areas in the Shire are located in the Lennox Head, Wollongbar and Cumbalum Ridge localities. Rates of population growth and development activity will be monitored and the local growth management framework reviewed on a regular basis.

4.0 TRAFFIC MODELLING

4.1 Ballina Road Network Study 2000 (BRNS-2000)

In the year 2000 Cardno Eppell Olsen (then Eppell Olsen & Partners) undertook the Ballina Road Network Study for Council (BRNS-2000). That study involved the development of a strategic traffic model, in association with Gabites Porter Consultants, for the whole of the Ballina Shire based on the TRACKS model platform.

The model was used to assess future transport demands and identify the future infrastructure needs for the Shire. The results of this work were then used to identify the funding requirements and level of developer contributions which were documented separately in Council's *2002 Ballina Road Contributions Plan*.

The planning horizons adopted in the BRNS-2000 were 2000 (base year), 2010 and 2033.

The work undertaken for the BRNS-2000 is reported separately in the following documents:

- Ballina Road Network Study – Model Development (2000), Eppell Olsen & Partners in association with Gabites Porter;
- Ballina Road Network Study – Network Analysis (2000), Eppell Olsen & Partners;
- Ballina Road Network Study – Network Analysis Appendix: Model Results (2000),Eppell Olsen & Partners.

4.2 Ballina Road Network Study Update 2007 (BRNSU-2007)

Cardno Eppell Olsen was subsequently engaged to update the work undertaken in the BRNS-2000 to incorporate changes to the demographic and population projections that had been identified since the original study was prepared, culminating in the release of the *Ballina Road Network Study Update 2007 (BRNSU-2007)* in 2007. Recalibration of the model to a base year of 2005 based on more recent traffic count data was also incorporated into the study.

The BRNSU-2007 study:

- Divided the LGA into ten sectors. Each sector represents a discrete precinct that has been found from traffic surveys and traffic analysis to exhibit specific traffic movement patterns. Another sector, encompassing those traffic sources that lie outside the LGA, was also included in the analysis;
- provided a detailed analysis of the existing road networks (shown on Figure 4.1) and traffic demands;
- projected future traffic demands for the years 2016 and 2026 from population growth rates, demographics and development trends determined with reference to ULRS-2000, Australian Bureau of Statistics census data and advice from Council;
- analysed options for developing the Shire's road network to satisfy the projected traffic demands;

- recommended a preferred strategy for upgrading the road network as shown on Figure 4.2; and
- provided a computerised model of the network to allow the volumes and distributions of traffic numbers to be projected for each of the ten discrete localities identified within the Shire.

4.3 Recent (2009) Amendments to Model

Further amendments to the model developed as part of the BRNSU-2007 have been made more recently as part of the work associated with developing Council's shire-wide forward works program for the Roads Plan. The latest amendments to the model have focussed on updating the residential population projections to align with those used in the *Ballina Shire Contributions Plan 2008.*

The current traffic modelling concludes that the existing road network within the Ballina LGA is generally adequate to cater for existing traffic demands and for the most part conforms with widely adopted design standards promulgated by Austroads, the recognised Australian authority in relation to road design.

The modelling, however, confirms the findings of the BRNSU-2007, in particular the fact that the Ballina LGA road network will experience considerable traffic growth in the future, especially around Ballina and Lennox Head as anticipated urban development occurs. Most major urban road corridors will be required to carry more traffic and some of these corridors will be overloaded unless additional capacity is provided. In some areas new road corridors will need to be established to service specific development.

While recent changes to the model have not materially changed the nature and scale of the strategic road improvements and augmentation works indicated in the BRNSU-2007 as being required to address future capacity constraints associated with new development, some changes in the timing of works is anticipated to occur as a result of the different underlying growth rates reflected in the latest population projections.

Figure 4.1 *Existing Ballina Road Hierarchy*

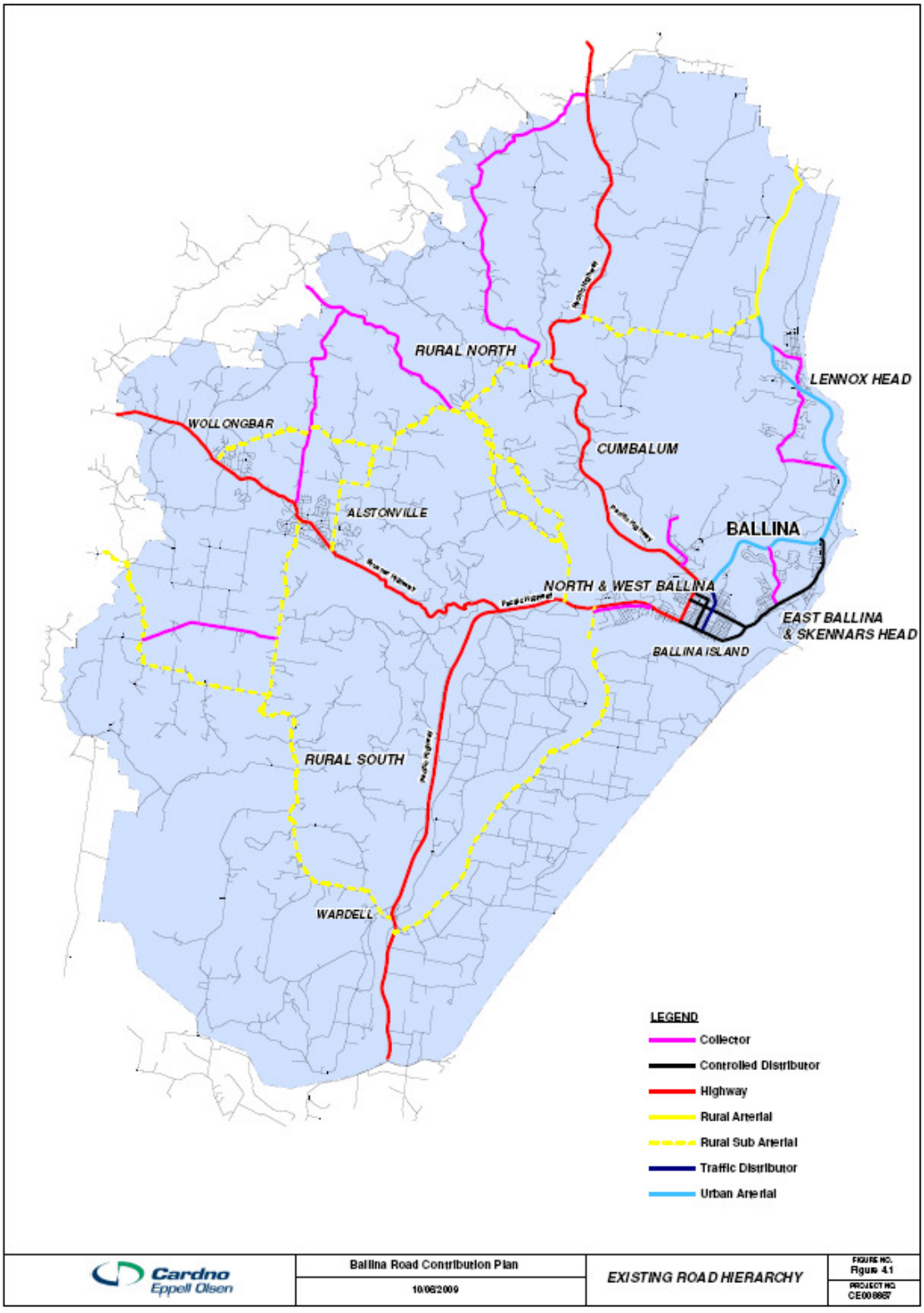
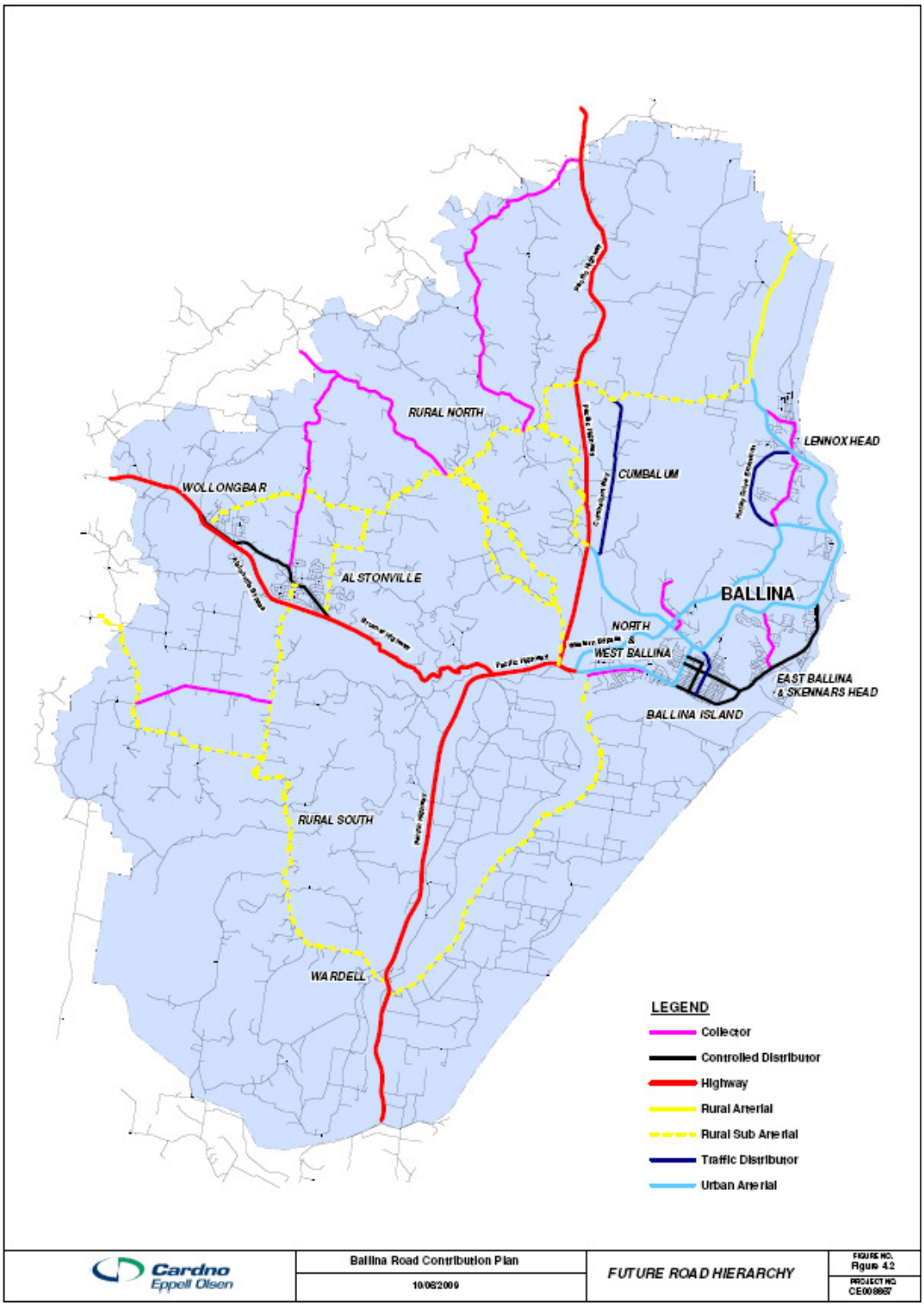


Figure 4.2 ***Future Ballina Road Hierarchy***



4.4 Sectors

As indicated in Section 4.2, the Ballina Shire LGA was divided into a number of discrete sectors for modelling purposes to assess the impact of future traffic on the shire road network.

The definition of the discrete sectors is best related to infrastructure provision rather than being tied to particular developments. However, when a catchment forms a part of a larger urban area, there are boundary issues arising between adjacent catchments. Further, there are often requirements to discriminate between sub-sections of a sector when a large area is covered. The sectors have therefore been developed on the basis that:

- Sector boundaries conform to a physical barrier (river, rail line, etc); or
- The sector comprises a complete urban area; and
- Sub-sections be separated by physical separators such that variation between adjacent sub-sectors can be tied to infrastructure (eg an interchange for highway access).

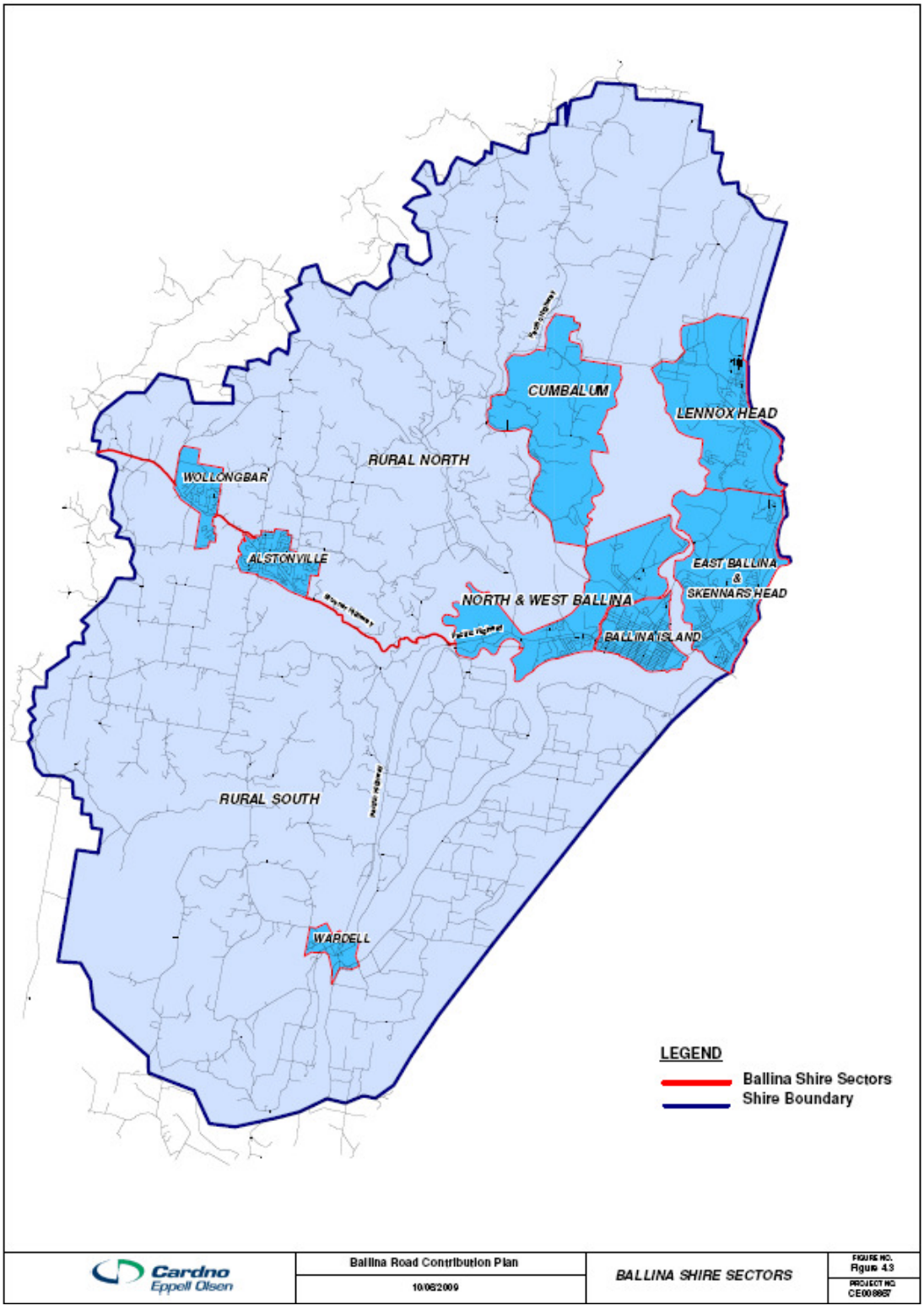
Based on all of the above, the Shire has been divided into ten sectors as follows:

- Ballina Island;
- East Ballina & Skennars Head;
- Lennox Head;
- North & West Ballina;
- Cumbalum Ridge;
- Wollongbar;
- Alstonville;
- Wardell;
- Rural North;
- Rural South.

The above sectors are shown on Figure 4.3.

Another “sector”, broadly representing development areas that lie outside the Ballina Local Government Area, is also a source of some traffic within Ballina’s road network and has been included in the traffic modelling study.

Figure 4.3 *Ballina Shire Sectors*



4.5 Traffic Generation

Contributions in the Roads Plan are calculated using 'trip ends' which are a basic measure of traffic generation. Travelling between two locations, a trip has two end points, a beginning point or 'origin' and a 'destination'. The 'destination' point is also known as an 'attraction'. For example, someone leaves home to go shopping. There is one origin trip end at the house and one destination trip end at the shopping centre. On the journey home though, the shopping centre becomes the start point or origin and the house the destination. Some journeys may involve a number of 'stops' and this too is accounted for with a concept called 'diverted' trips.

Therefore if one is able to ascertain the reason why trips are made and where trips are made to and from, then one may be able to predict travel habits and consequently the patronage of transportation infrastructure.

The prediction of travel habits in Ballina LGA involved a very detailed analysis of growth, land use (residential and commercial areas), and travel habits - a 'trip matrix'. This information was assembled by Cardno Eppell Olsen into a mathematical transportation model that is referred to as the TRACKS suite of transportation modelling programs. The suite is a land use based package that can generate travel demand from land use within the study area.

The model was calibrated to reproduce the 2005 traffic loading for Ballina LGA road network and was subsequently used to predict the likely 2016 and 2026 road network traffic loadings. These traffic loadings were then examined against the available capacity on the road network to identify the suite of future infrastructure improvements (the "works program") required to accommodate new development in the future.

4.6 Works Program

The works program presented in this section is the result of a functional road analysis conducted by Cardno Eppell Olsen in response to the growth needs of the Shire.

The works comprise approximately 30 items (including sub-items within each works package), estimated to cost in total around $140M in current dollars. Detailed costings are included in Volume 2 of this report.

A brief description of each of the works items follows, while Table 4.1 provides a schedule summarising the new road works required, the associated construction costs, and an indicative timing for construction of each of the works items based on a combination of factors including the operational requirements identified from the traffic modelling, cashflow considerations and other matters considered by Council in the preparation of the Roads Plan.

Description of Works

Items 1 to 4 - Construction of Western Arterial Road

The Western Arterial is a new 80km/h, 2-lane road link proposed to be constructed in the West Ballina area to provide a local bypass for traffic that is otherwise required to use the Ballina Island area to obtain access to/from points further to the north and east, thereby reducing traffic on key roads such as Kerr Street. The Western Arterial generally follows a south-westerly alignment from the northern section of the Pacific Highway at North Creek Road to the southern section of the Pacific Highway near Burns Point Ferry Road. The works included in the S94 Plan allow for the construction of a 2 lane roundabout at the southern end of the Western Arterial to connect to the Pacific Highway, while other 2 lane roundabouts at the northern connection of the Western Arterial to the Pacific Highway and at an intermediate point to provide a connection to the proposed River Oaks estate are to be funded by private entities. Included in the works is an allowance for the construction of a shared footpath/cycleway.

Item 5 - Signalisation of River Street/Kerr Street – additional future works

Signalisation works at the River Street/Kerr Street intersection are currently in progress (2009). This works item allows for additional road widening works proposed along the eastern side of Kerr Street to the north of the intersection, as well as on the northern side of River Street west of the intersection, to be constructed to provide additional turning capacity required in the future.

Item 6 - 4 laning of existing Pacific Highway from Fisheries Creek Bridge to Tweed Street

This item provides for the upgrade of the southern section of the existing Pacific Highway between Fisheries Creek Bridge and Tweed Street to provide a 4-lane section along this length of the highway. The proposed upgrade requires that the existing on-street parking be removed to provide an additional lane in each direction, thereby limiting the extent of any road widening required. These works, in conjunction with the works proposed at items 9 and 11, will provide a continuous length of dual carriageway between the southern interchange of the new Ballina Bypass currently under construction and Kerr Street on Ballina Island, and are required to provide sufficient capacity to accommodate future growth in local traffic arising from future development in the Ballina LGA.

Item 7 - 4 laning of existing Pacific Highway from North Creek Road to Kerr Street

This item provides for the upgrade of the northern section of the Pacific Highway between North Creek Road and Kerr Street (but excluding the duplication of the North Creek Bridge which is a separate works item) to provide a 4-lane section along this length of the highway. The works generally provide for widening on the southern side between North Creek Road and the North Creek Bridge, switching over to the northern side on the eastbound approach to the bridge and continuing through to Kerr Street. These works are required to provide sufficient capacity to accommodate future growth in local traffic arising from future development in the Ballina LGA.

Item 8 - 4 laning of Kerr Street from Holden Lane to Fox Street

This item provides for the upgrade of Kerr Street between Holden Lane and Fox Street to provide 4-lanes along this section, tying into the existing 4 lane sections to the north and south of these points and thereby providing a continuous length of 4-lane highway along the entire length of Kerr Street. The proposed upgrade requires that the existing on-street parking be removed to provide an additional lane in each direction, thereby limiting the extent of any road widening required (although it is anticipated that some widening will be required in the localised area around Bentinck Street). These works are required to provide sufficient capacity to accommodate future growth in local traffic arising from future development in the Ballina LGA.

Item 9 - Duplication of Fisheries Creek Bridge (separate 2 lane structure)

Duplication of the existing Fisheries Creek Bridge connecting Ballina Island to the southern leg of the existing Pacific Highway is proposed through the provision of a separate 2 lane structure identical in form to the existing bridge structure and located to the south of the existing bridge. Additional capacity is required at this location to remove the bottleneck that otherwise occurs in the future based on the detailed modelling undertaken for the Ballina Island area. The new bridge will provide 2 lanes for westbound traffic while the existing bridge would cater for eastbound traffic only. These works, in conjunction with the works proposed at items 6 and 11, will provide a continuous length of dual carriageway between the southern interchange of the new Ballina Bypass currently under construction and Kerr Street on Ballina Island.

Item 10 - Duplication of North Creek Bridge (separate 2 lane structure)

Duplication of the existing North Creek Bridge connecting Ballina Island to the northern leg of the existing Pacific Highway is proposed through the provision of a separate 2 lane structure identical in form to the existing bridge structure and located to the north of the existing bridge. Additional capacity is required at this location to remove the bottleneck that otherwise occurs in the future based on the detailed modelling undertaken for the Ballina Island area. The new bridge will provide 2 lanes for eastbound traffic while the existing bridge would cater for westbound traffic only.

Item 11 - 4 laning of existing Pacific Highway from Fisheries Creek Bridge to southern interchange of Ballina Bypass

This item provides for the upgrade of various sections of the southern leg of the existing Pacific Highway between Fisheries Creek Bridge and the southern interchange of the new Ballina Bypass to provide a continuous 4-lane section along this length of the highway. The work is divided into three sections covering the following areas:

- Section A – from Fisheries Creek Bridge to start of existing 4 lane carriageway;
- Section B – from Barlows Road roundabout to Riverbend Drive roundabout;
- Section C – from Riverbend Drive roundabout to southern interchange of Ballina Bypass.

The proposed upgrade requires that the existing on-street parking be removed where applicable to provide an additional lane in each direction, thereby reducing the extent of road widening required. These works, in conjunction with the works proposed at items 6 and 9, will provide a continuous length of dual carriageway between the southern interchange of the new Ballina Bypass currently under construction and Kerr Street on Ballina Island, and are required to provide sufficient capacity to accommodate future growth in local traffic arising from future development in the Ballina LGA.

Items 12 to 14 - Hutley Drive upgrade and extensions

The Hutley Drive upgrade and extensions encompass modifications to the existing section of Hutley Drive (essentially a line re-marking exercise) and its extension to the north and south in a westerly arc parallel to North Creek Road to provide a continuous 2 lane road that connects to The Coast Road at its northern end and Skennars Head Road at its southern end. The work is divided into five sections (including the existing section) and additionally includes the construction of a new 2 lane roundabout at the southern connection to Skennars Head Road, and modifications to the existing roundabout at The Coast Road/North Creek Road/Ballina Street to provide additional capacity and a tie-in to the northern extension of Hutley Drive.

Different cross-sections are required along each of the five works sections to accommodate the local constraints along each section of the corridor, with parking provided at some locations and not at others. A footpath is provided along the entire length of works on the eastern side.

While the proposed works will attract traffic from existing development in its locality, the works are essentially proposed and required to service the traffic generated by the new developments in the Lennox Head catchment area and reduce the impacts of this additional traffic on other roads in the catchment area including the section of North Creek Road to the north of Skennars Head Road

Item 15 - Bangalow Road/Hogan Street intersection – construction of new left-in/left-out lanes

This item provides for the conversion of the existing access at the intersection of Bangalow Road/Hogan Street to a left-in/left-out facility to address existing capacity and safety issues at this location. It is envisaged that these works would occur in conjunction with those proposed at item 16 to provide additional access options for traffic accessing this light industrial area and further reduce traffic loads on the adjacent section of Bangalow Road.

Item 16 - Angels Beach Drive/Sheather Street intersection – construction of new left-in/left-out lanes

This item provides for the construction of a new left-in/left-out intersection between Sheather Street and Angels Beach Drive to allow vehicular access between Angels Beach Drive and the adjacent light industrial area, thereby improving accessibility to this area.

Item 17 - Skennars Head Road upgrade from The Coast Road to North Creek Road

The upgrade of Skennars Head Road between The Coast Road and North Creek Road is required in the future to accommodate the additional traffic generated by future development in the Lennox Head area as well as the additional traffic potentially attracted by the construction of a new 'inland route' in the future along either the existing alignment of North Creek Road further to the south (refer item 18), or alternatively along a new corridor (Skennars Head Distributor, refer to discussion under item 18 below also). The works included in this item allow for the widening of the existing two lane road to achieve a 13m carriageway width complete with shoulders and kerb, which is a more appropriate cross-section for its future level of use. A cycleway is also allowed for along the length of the road on its southern side. No provision within this works item is made for the proposed roundabouts with North Creek Road at its western end and The Coast Road at its eastern end, which are instead included as part of works items 12-14 and item 26 respectively.

Item 18 - North Creek Road upgrade including construction of new bridge

The North Creek Road upgrade includes the realignment of existing substandard bends and the widening and reconstruction of the existing road pavement along North Creek Road from 450m NE of Corks Lane to Skennars Head Road, to provide an alignment and cross-section suitable for the use of this route as an alternative inland route to the existing coastal route along The Coast Road. The works include the construction of a concrete bridge across the creek at the location of the old timber bridge that once existed at this location. The proposed upgrade will provide for a 2 lane road with shoulders and a posted speed limit of 80km/h, with provision also included for a cycleway along the entire length of the works located nominally along the eastern side. The northern end of the works will connect to the new two lane roundabout proposed to be constructed at Skennars Head Road as part of the Hutley Drive upgrade and extension works (refer items 12-14).

The North Creek Road upgrade is one of two longer term options considered to reduce the volume of through traffic passing through Ballina Island and East Ballina and in so doing preserve future capacity along The Coast Road corridor. The other option considered was a new link called the Skennars Head Distributor (works item 19) extending along a dedicated corridor from Angels Beach Drive east of Links Avenue to North Creek Road south of Skennars Head Road, and including the construction of a new 2 lane roundabout at its southern connection to Angels Beach Drive. The cross-section assumed for the Skennars Head Distributor was identical to that adopted for the North Creek Road upgrade, including the cycleway, and for costing purposes was assumed to include the northern section of the North Creek Road upgrade from its connection at North Creek Road up to Skennars Head Road (with similar assumptions regarding the new roundabout proposed at the latter location as discussed above).

Both the North Creek Road upgrade and the Skennars Head Distributor are potentially viable options to address the longer term needs of the Shire and provide an alternative inland corridor for traffic, subject to more detailed design and environmental assessment. However, for the purposes of this S94 Plan the North Creek Road upgrade option has been selected since this is the higher cost item to construct and therefore provides a conservative approach for Council's budgeting purposes. Notwithstanding this, the detailed cost estimates prepared for both works items are included in Volume 2 of this report for comparative purposes.

Item 20 - Ross Lane improvements

The Ross Lane improvements provide for the upgrading of the existing sections of Ross Lane to the west and east of the proposed Cumbalum North-South link to address alignment issues and future capacity issues and to cater for the additional traffic generated by future development in the Cumbalum Ridge area. The timing of the works would depend on the rate at which future development proceeds in the Cumbalum Ridge area.

West of the Cumbalum North-South link through to the Pacific Highway, the improvements allow for the widening of the existing 2 lane road to 4 lanes with sealed shoulders, while east of the new link road through to The Coast Road the improvements retain 2 lanes but incorporate widening of the cross section to provide sealed shoulders and the realignment of substandard bends to the desireable minimum radius (where possible). The proposed 2 lane roundabout at the intersection of Ross Lane and the Cumbalum North-South link is excluded from this works item, since this would be constructed as part of future works associated with the Cumbalum North-South link which are to be funded by developers (refer also to discussion under Items 31-33).

Item 21 - Construction of Tintenbar Road/Teven Road climbing lanes

This item provides for the construction of two climbing lanes, the first along Tintenbar Road to the west of Fernleigh Road and the second along Teven Road starting 1km west of the Teven Road/Tintenbar Road intersection. The latter includes a realignment of the existing road at the location of the proposed climbing lane to remove an existing substandard S-bend. In both cases the proposed works are required to provide additional capacity by providing opportunities for traffic to pass slow moving vehicles (there are a relatively high number of heavy vehicles using these routes), and in so-doing also potentially improve safety along these sections of road.

Item 23 - Southern Cross Precinct – construction of right turn ban from Pacific Highway to Southern Cross Drive

This item provides for the construction of a kerbed central median across the existing Pacific Highway/Southern Cross Drive intersection to prevent right turn movements at this location, thereby addressing capacity constraints associated with the increased traffic demands from the airport and industrial uses in this area. It is anticipated that alternative access to cater for the banned movements will be available via the new 2 lane roundabout at the intersection of the Pacific Highway/North Creek Road (which would also connect to the Western Arterial as discussed under items 1 to 4 - Western Arterial). The timing for implementation of these works is likely to be tied to the rate of development in the Southern Cross precinct.

Item 24 - Construction of Links Avenue/Angels Beach Drive roundabout

This item provides for the construction of a new 2 lane roundabout at the intersection of Angels Beach Drive/Links Avenue to address capacity issues at this location. The timing for implementation has been estimated and would be subject to more detailed analysis in the future.

Item 26 - Construction of Skennars Head Road/The Coast Road/Rocky Point Road roundabout

This item provides for the construction of a new 2 lane roundabout at the intersection of Skennars Head Road/The Coast Road/Rocky Point Road to address capacity issues associated with further development in the Lennox Head area in the future.

Item 27 - Traffic calming along North Creek Road/Reservoir Road/Hutley Drive

This item incorporates a number of traffic calming devices along the existing and proposed sections of Hutley Drive, the new Reservoir Road link servicing the development area southwest of the existing intersection at The Coast Road/North Creek Road/Ballina Street, and the existing North Creek Road alignment to the north of Skennars Head Road. These devices include threshold treatments accompanied by directional signage at the entry points to this part of the road network (i.e. at the aforementioned roundabout as well as the proposed Skennnars Head Road/North Creek Road/Hutley Drive roundabout), slow points or blister treatments, raised pavements and painted medians.

The traffic calming scheme has been developed with the primary objective of discouraging through traffic from using the subject road network in the event that either the North Creek Road upgrade or the new Skennars Head Distributor link road are constructed. Instead this traffic would be directed to use the upgraded Skennars Head Road (item 17) and thence The Coast Road to travel through the south Lennox Head precinct area. A secondary objective is to seek to ensure that the proposed scheme maintains and enhances road safety in the area.

It is not anticipated that the traffic calming scheme would need to be implemented in the absence of the North Creek Road upgrade or Skennars Head Distributor, and the timing for construction has therefore been set to coincide with the implementation of these other works. However, the traffic calming scheme could be implemented earlier to coincide with the construction of the Hutley Drive upgrade and extensions if required.

The proposed scheme is conceptual only and is considered to represent a likely worst case for S94 budgeting purposes in terms of the level of treatment that might be required along the subject roads. The final scheme will be subject to detailed design and consultation with the local community at a later stage.

Item 28 - Construction of River Street/Moon Street plus River Street/Cherry Street roundabouts

This item allows for the installation of permanent roundabouts at River Street/Moon Street and River Street/Cherry Street as a follow-up to the works already undertaken as part of a beautification project between the two intersections. Included in this item are pavement replacement works along a section of Cherry Street to tie in to the proposed upgrade at the Tamar Street/Cherry Street intersection. The timing for implementation has been estimated and would be subject to more detailed analysis in the future.

Item 29 - Construction of Tamar Street/Cherry Street roundabout

This item allows for the installation of a permanent roundabout at Tamar Street/Cherry Street and associated pavement replacement works along a section of Cherry Street to tie in to the proposed upgrade at the River Street/Cherry Street intersection. The timing for implementation has been estimated and would be subject to more detailed analysis in the future.

Item 30 - Signalisation of Angels Beach Drive/Bangalow Road intersection plus 4-laning Bangalow Road to Kerr Street

The works proposed at this location allow for the signalisation of the Angels Beach Drive/Bangalow Road intersection to replace the existing roundabout and the 4 laning of Bangalow Road between this intersection and Kerr Street to provide additional capacity to accommodate future growth in the Ballina LGA. The timing for the implementation of these works has been estimated to coincide with the timing of the other works in Ballina Island and is subject to more detailed analysis in the future.

Items 31 to 33 - Construction of Cumbalum North-South Link (Stage 1 only)

The Cumbalum North-South link is a new 2-lane link road proposed primarily to service future development in the Cumbalum Ridge area, although the proposed works will also attract some traffic from existing development in its locality. The proposed alignment is still the subject of investigation in certain parts, however, at its southern end the new link road will tie into the new Ballina Bypass currently under construction via its Cumbalum interchange, while the connection at the northern end will be provided at Ross Lane to the east of the Pacific Highway via a new 2 lane roundabout.

The cost estimate included in the Roads Plan for this item was developed by Ardill Payne and Partners and includes only Stage 1 of the new link road within the vicinity of the Ballina Heights Estate, representing that portion of the link on which work has already effectively commenced. A plan showing the approximate length of the link road included in Stage 1 is provided at the relevant cost item in Volume 2 of this report.

It is understood that future sections of the Cumbalum North-South Link will be funded by developers as part of the rezoning applications. The timing for implementation of future sections of the link road will be tied to the rate of development in the Cumbalum Ridge area, with construction of the link road needing to occur prior to substantial completion of development in the area.

Item 34 – Cumbalum Interchange

This item allows for the construction of the new roundabout exit from the Pacific Highway at the Ballina Bypass Cumbalum Interchange. The cost estimate for this item has been prepared by the Ballina Bypass Alliance. An illustration of the proposed works is provided at the relevant cost item in Volume 2 of this report.

Table 4.1 ***Schedule of Required New Roadworks***

Item	Description of Works	$ Total Cost	Approximate Timing for Construction
1 - 4	Construction of Western Arterial Road	$42,350,000	2026-2030
5	Signalisation of River Street/Kerr Street – additional future works	$420,000	2026-2030
6	4 laning of existing Pacific Highway from Fisheries Creek Bridge to Tweed Street	$3,200,000	2016-2020
7	4 laning of existing Pacific Highway from North Creek Road to Kerr Street	$5,900,000	2016-2020
8	4 laning of Kerr Street from Holden Lane to Fox Street	$5,000,000	2021-2025
9	Duplication of Fisheries Creek Bridge (separate 2 lane structure)	$4,400,000	2021-2025
10	Duplication of North Creek Bridge (separate 2 lane structure)	$3,300,000	2016-2020
11	4 laning of existing Pacific Highway from Fisheries Creek Bridge to southern interchange of Ballina Bypass	$8,000,000	2021-2025
12 - 14	Hutley Drive upgrade and extensions	$12,600,000	2011-2015
15	Bangalow Road/Hogan Street intersection – construction of new left-in/left-out lanes	$550,000	2016-2020
16	Angels Beach Drive/Sheather Street intersection – construction of new left-in/left-out lanes	$590,000	2016-2020
17	Skennars Head Road upgrade from The Coast Road to North Creek Road	$5,200,000	2021-2025
18	North Creek Road upgrade including construction of new bridge	$16,010,000	2026-2030

Table 4.1 ***Schedule of Required New Roadworks (Cont.)***

Item	Description of Works	$ Total Cost	Approximate Timing for Construction
20(a)	Ross Lane improvements - west	$2,900,000	2021-2025
20(b)	Ross Lane improvements - east	$8,800,000	2021-2025
21(a)	Construction of Tintenbar Road climbing lane	$1,600,000	2011-2015
21(b)	Construction of Teven Road climbing lane	$1,601,000	2011-2015
23	Southern Cross Precinct – construction of right turn ban from Pacific Highway to Southern Cross Drive	$130,000	2016-2020
24	Construction of Links Avenue/Angels Beach Drive roundabout	$900,000	2011-2015
26	Construction of Skennars Head Road/The Coast Road/Rocky Point Road roundabout	$1,400,000	2011-2015
27	Traffic calming along North Creek Road/Reservoir Road/Hutley Drive	$2,300,000	2026-2030
28(a)	Construction of River Street/Cherry Street roundabout	$960,000	2011-2015
28(b)	Construction of River Street/Moon Street roundabout	$960,000	2011-2015
29	Construction of Tamar Street/Cherry Street roundabout	$530,000	2011-2015
30	Signalisation of Angels Beach Drive/Bangalow Road intersection plus 4-laning Bangalow Road to Kerr Street	$3,100,000	2016-2020
31 - 33	Construction of Cumbalum North-South Link (Stage 1 only)	$4,000,000	2011-2015
34	Construction of roundabout at Cumbalum Interchange	$2,600,000	2011-2015
	TOTAL	**$139,301,000**	

Note: 1. Item Nos. 22 and 25 are not included as they were previously assigned to works that no longer form part of this plan.

2. Items 18 (North Creek Road upgrade) and 19 (Skennars Head Distributor) are mutually exclusive items (i.e. it is anticipated that only one of these works items would need to be constructed) and, since Item 18 has a higher cost than Item 19, it is included instead of item 19 to provide a conservative estimate of the cost of new works.

3. Cost estimate for Item Nos. 31-33 (Stage 1) developed by Ardill Payne and Partners. Cost estimate for Item 34 produced by Ballina Bypass Alliance.

4. All values have been rounded.

4.7 Calculation of Contributions

Based on the works program to upgrade the existing road network to accommodate growth and the apportionment of those works to new development, traffic generating developments will be required to contribute to the development of Ballina Council's road network in accordance with the additional vehicle movements (or 'trip ends') that they generate.

The Roads Plan uses the trip end generation rates outlined in Table 4.2 below, which have been adopted primarily from the BRNS-2000. These generation rates are NOT to be used for the design of traffic facilities since Council adopts specific design codes for these works.

Table 4.2 ***Trip Generation Rates by Land Use***

No	Land Use	Daily Trip Rate	Unit Per
1	Dwelling/tourist units (3 bedrooms or more)	6.45	Dwelling or Unit
2	Dwelling/tourist units (1 & 2 bedrooms)	3.9	Dwelling or Unit
3	Residential Allotment	6.45	Allotment
4	Child Minding Facility	3.7	Enrolment
5	Primary School	1.4	Enrolment
6	High School	1.4	Enrolment
7	Service station	200	Pump
8	TAFE College	1.8	Enrolment
9	Shopping Centre (SC) < 100m²	2.8 (A)	A = m² GLA
10	101m² < SC < 6,000m²	200 + 0.8 (A)	A = m² GLA
11	6,001m² < SC < 10,000m²	500 + 0.75 (A)	A = m² GLA
12	Shopping Centre > 10,001m²	3200 + 0.48 (A)	A = m² GLA
13	Garden centre not included in Shopping Centre	40	100 m² retail area
14	Hardware not included in shopping centre	80	100 m² GLA
15	Mixed Retail Showroom	40	100 m² GLA
16	Furniture Showroom	10	100 m² GLA
17	Office (Professional Centre)	16	100 m² GLA
18	Major Offices (including government)	12	100 m² GLA
19	Medical Centres & Dentists	50	100 m² GLA
20	GP Surgery	50	100 m² GLA
21	Retail Tyre Outlets	10	100 m² GLA
22	Motels	5	100 m² GLA

Table 4.2 ***Trip Generation Rates by Land Use (Cont.)***

No	Land Use	Daily Trip Rate	Unit Per
23	Taverns, Hotels	110	100 m² GLA
24	Restaurant	60	100 m² GLA
25	Retail Market	20	100 m² GLA
26	Recreation - Squash	40	Court
27	- Tennis	40	Court
28	- Gymnasium	50	100 m² GLA
29	Factories covered by light industry	5	100 m² GLA
30	Warehouses	4	100 m² GLA
31	Hospitality Facilities	50	100 m² GLA
32	Licensed Clubs	100	100 m² GLA
33	Motor Showrooms	5	100 m² GLA
34	General Heavy Industry	1.5	100 m² GLA
35	Mixed Industrial Park	7.0	100 m² GLA

Notes: a) "A" denotes area of floor space in m² Gross Lease Area (GLA).
b) GLA for motor showrooms includes any external display areas.
c) For other developments, the trip rate will be determined from a traffic assessment of the peak daily trip generation.

In determining the level of contributions for specific redevelopment proposals, such development will generally be entitled to a credit for any 'existing right'. Applicants may need to show how the 'existing right' reflects contributions to the funding of major works in this Roads Plan. Vacant land will normally be recognised as having an existing right entitlement of 1 ERA.

References

Ballina Shire Council
Heavy Haulage Contributions Plan

Tweed Shire Council (2000)
"Tweed Road Contribution Plan"

Yoder, E S (1959)
"Principles of Pavement Design"
John Wiley & Sons

Supporting Documents

Ballina Shire Council
"Urban Land Release Strategy 2000"

Ballina Shire Council
"Ballina Road Contribution Plan 2002"

Eppell Olsen & Partners (2000)
Design Note

Eppell Olsen & Partners (2000)
"Ballina Road Network Study"

Cardno Eppell Olsen (2007)
"Ballina Road Network Study Update"