3. Route options development and assessment

3.1 Key characteristics of the study area

3.1.1 Local community

The study area is located between the two main regional centres of Port Macquarie and Kempsey. Residential areas are restricted to the villages of Telegraph Point and Kundabung through both of which the existing highway passes, with scattered rural residential development occurring elsewhere.

In 2001, the study area and immediate surrounds had a population of approximately 3,800 people. Population densities are higher towards the southern part of the study area in the Port Macquarie - Hastings Local Government Area.

The study area has a relatively high proportion of its workforce in agriculture, forestry, fishing and construction compared with the mid north coast. Cattle grazing, orchards and aquaculture enterprises are important rural economic activities in the study area.

Key features of the study area are shown in Figure 3.1.

3.1.2 Existing transport network

Existing highway condition

Investigations of the existing highway indicate that:

- Approximately 26 per cent of the existing highway contains horizontal and vertical curves that do not meet the Pacific Highway desirable design standards for 110 km/h;
- Considerable work would need to be done to flatten batters and clear roadside obstacles on the existing alignment to achieve desirable clear zone requirements and substantially reduce crashes;
- A number of intersections do not comply with 100 km/h visibility standards and do not perform satisfactorily in respect of vehicle movements;
- Many of the existing bridges may not comply with new loading requirements; and
- There are numerous private and other accesses onto the existing highway presenting an increased risk of crashes.

Existing traffic characteristics

The annual average daily traffic (AADT) range for the highway is 8,280 to 12,030 vehicles per day. Heavy vehicles comprise approximately 20 per cent of the highway traffic (13 per cent during the day and 43 per cent during the night). Traffic is greatest between Hastings River Drive and Telegraph Point.

Traffic hierarchy

The traffic data indicates that a mix of local, regional and interstate traffic use the highway. The mix of local and through traffic reduces the capacity of the highway for other users. Investigations indicate that only 18 per cent of northbound traffic that enters the study area continues through to the northern end and only 26 per cent of the southbound vehicles south of Kempsey continue past the southern end of the study area. The percentage of through traffic increases substantially at night.

Crash history

A total of 146 crashes have occurred in the study area between 2000 and 2005 including nine fatalities, 66 serious crashes and 74 other crashes. The majority of crashes occur within the vicinity of Telegraph Point, Kundabung and in the vicinity of the Dennis Bridge at the Hastings River. The main crash type (44 per cent) in the study area involves vehicles leaving the highway on straights, while head on collisions account for 12 per cent of all crashes.

Other transport infrastructure

The North Coast Railway runs between Sydney and Brisbane. It crosses the study area at Telegraph Point and then runs parallel and to the east of the study area boundary.

3.1.3 Land use

Rural land uses, state forests and conservation areas dominate the study area. Existing land uses within the study area generally consist of the following broad categories residential, rural, state forests and reserves and various commercial enterprises. Key existing businesses include Cassegrain Wines, Expressway Spares, Hanson Construction Materials, Birdon Marine, Cairncross Waste Management Facility and Stoney Park Watersports and Recreation.

Large areas of land generally between the Oxley Highway and Fernbank Creek Road to the east of the existing highway have been identified for future urban and industrial development known as Area 13. Existing land use is depicted in Figure 3.2.

3.1.4 Heritage

Indigenous heritage

The study area lies within the boundaries of the Birpai Local Aboriginal Land Council (LALC) and Kempsey LALC, and within an area of interest to the Dunghutti Elders Aboriginal Corporation.

Eighteen Aboriginal heritage sites listed on the NSW Department of Environment and Climate Change Aboriginal Heritage Information Management System Register are located within the study area. These include twelve artefact scatters, five isolated artefacts and a scarred tree. The predictive model of site location indicates that additional Indigenous heritage resources are likely to occur throughout the study area. A number of areas of cultural sensitivity to the local Aboriginal community, inclusive of both registered and unregistered sites, are also reported to occur within or in close proximity to the study area.

Sites of indigenous heritage significance are depicted on Figure 3.3.

Non-indigenous heritage

The study area has a long history with European settlement commencing in the early 1800's. The first towns were located on rivers, particularly in areas with access to the sea, and inland towns were established.

A recent study of the heritage significance of RTA controlled bridges in NSW has identified the low level timber bridge (northbound) over the Maria River at the northern end of the study area as a heritage item of state significance. This bridge will be retained and incorporated into the service road strategy.

A number of non-Indigenous heritage items, located within or near the study area, are listed in the Hastings Local Environmental Plan, predominantly in the vicinity of Telegraph Point.

Historical records indicate that a range of industries and activities were carried out in the study area. There is potential for evidence of these activities, in the form of historical relics, to occur within the study area.

Sites of non-indigenous heritage significance are depicted on Figure 3.4.

3.1.5 Visual amenity

The study area is characterised by a variety of landscape settings, within a predominantly rural environment. The southern part of the study area is flat to gently undulating, reflecting its location in the Hastings River valley. The Hastings River is crossed by a steel truss bridge with a concrete deck. The bridge offers views upstream (towards the Great Dividing Range) and downstream (views of coastal plains). The Hastings River is listed in the RTA's *Pacific Highway Urban and Regional Design Framework* as one of 16 key landmarks along the highway.

The highway continues north through Cairncross State Forest, crosses the Wilson River floodplain and passes through the raised topography around Telegraph Point and the forested landscape of Cooperabung Hill. Expansive views are available from the Wilson River Bridge and Cooperabung Hill. In the northern part of the study area the highway passes through the village of Kundabung and the surrounding mix of forested land and pastureland prior to entering the forested country associated with the Maria River State Forest.

3.1.6 Noise

Preliminary noise assessments indicate that the existing highway dominates the acoustic environment of the study area. The assessment indicates a number of residences already experience highway noise in exceedance of the Department of Environment and Climate Change criteria for a "redeveloped highway". The majority of these receivers are located in Telegraph Point. Additional isolated receivers are distributed along the remainder of the highway.

3.1.7 Ecology

Terrestrial ecology

The natural environment within the study area is relatively uniform from south to north. Variations occur mainly in the vicinity of river and creek crossings and their floodplains, and in deep gullies. The dominant vegetation type throughout the study area is blackbutt / stringybark dry sclerophyll forest. Areas of wet sclerophyll forest with rainforest elements occur in the Barrys Creek gully area, while remnant mature trees occur within cleared pastoral lands. Many of the forested areas have been heavily logged, but some mature trees occur.

Key areas of terrestrial ecological characteristics are depicted in Figures 3.5 to 3.10.

Investigations to date have identified the following key ecological values:

- The study area supports, or potentially supports a number of threatened and rare flora species, and threatened and migratory fauna species;
- There are a number of vegetation communities, which provide variable habitat value for fauna and flora;
- Four endangered ecological communities within the study area (freshwater wetlands, swamp sclerophyll forest, swamp oak floodplain forest and subtropical coastal floodplain forest);
- One endangered fauna population (emu) could occur; and
- Seven wildlife corridors and a number of areas of key habitat areas mapped by Department of Environment and Climate Change occur within the study area.

Aquatic ecology

The main aquatic habitat features within the study area are the tidal Hastings and Wilson Rivers, which support interrupted riparian bands of mangroves, swamp oak and estuarine wetlands. Most of the streams in the study area are intermittent and comprise a well-defined channel with ponds and riffles. The ponds may retain water for weeks or months, and are therefore important aquatic habitats.

There are no known threatened species within the study area although the oxleyan pygmy perch could potentially occur. One rare plant (*Hydrocharis dubia*) could also occur in small shallow freshwater bodies or swamps.

There are two SEPP 14 wetlands located within the study area. These are located on Dalhunty Island in the Wilson River, and on the northern bank of the Wilson River to the northeast of Dalhunty Island.

Key areas of aquatic ecological characteristics are depicted in Figure 3.10.

3.2 Route options development process

The route options development process (Figure 3.11) included the following key stages:

- Preliminary environmental, cultural, engineering, economic and social investigations of the study area to identify key constraints and opportunities;
- Commencement of a comprehensive program of community and stakeholder consultation (Section 1.4);

- Identification and preliminary design of feasible route options; and
- Conduct further targeted investigations and identification of the potential impacts and key characteristics of the feasible route options.

The feasible route options (Blue, Green, Purple and Orange) (Figure 3.11) were placed on public display between 21 October 2005 and 2 December 2005. Notification of the display of the route options was undertaken via radio and newspaper announcements, individual landowners and businesses identified as being potentially affected were contacted via letter, telephone and meetings, and flyers were also distributed to raised awareness of the display. Both static and staffed displays were provided and submissions were invited from the community and stakeholders.

3.3 Preferred route selection process

3.3.1 Overview

Key stages in the preferred route selection process (Figure 3.12) were:

- Consideration of submissions raised by the community and other stakeholders during the route options display (Section 1.4);
- Meetings with affected landowners and stakeholders (Section 1.4);
- Consideration of preliminary reports and on-going field investigations;
- Value management workshop;
- Further investigations and option refinement;
- Project team route selection workshop;
- Consideration of the preferred route by the NSW Minister for Roads; and
- Announcement by the minister of the preferred route.

3.3.2 Value management workshop

A two-day value management workshop was held on 12 and 13 December 2005. Workshop participants included representatives from local councils, government agencies, community liaison group, ecological focus group, local Aboriginal community and the project team.

The value management workshop was used to review and assess the displayed route options to help decide on a preferred direction for further investigation to progress the planning phase of the project.

During the value management workshop, participants developed assessment criteria under three key categories (functional, social and economic and natural and cultural environment), based on what participants considered to be the most important issues for assessing the route options. Workshop participants then separately assessed the options against the criteria to reach a value for money decision. Weighting of criteria across each category was not undertaken.

The value management workshop recommended that the preferred corridor option was comprised of a combination of the Orange option (southern project limit to Cooperabung Drive, Telegraph Point), the common Blue / Green / Purple options (Cooperabung Drive to Mingaletta Road), and the common Green / Purple / Orange option (Mingaletta Road to northern project limit), subject to resolution of a number of issues (Table 3.1).

3.3.3 Further investigation and option refinement

Following the completion of the value management workshop, further investigations and option refinement was undertaken to address the issues raised at the value management workshop (Table 3.1). This included refinement of the Orange option in the southern half of the project with the aim of minimising impacts on Cairncross State Forest, Rawdon Creek Nature Reserve, koala habitat, tea tree farming and key agricultural land. As a result, a Refined Orange option was developed from Fernbank Creek to Wilson River (Figure 3.13).

Table 3.1 Issues raised at the value management workshop with responses

Issue	Response
Southern project limit to Blackmans Point Road	
Considering the potential for realignment at the northern end to minimise impacts on the Cairncross State Forest and Rawdon Creek Nature Reserve (ie. move the corridor to the east and parallel to the highway).	A modification to the Orange option, known as the Refined Orange option was developed to minimise intrusion into Cairncross State Forest and Rawdon Creek Nature Reserve. The alignment of this option is located closer to the existing highway.
Access for existing residents along the south bank of the Hastings River being maintained.	Access arrangements will be developed during the concept design of the preferred route. Final access arrangements will depend upon the location of the grade separated interchange, which will also be determined during concept design. Generally accesses will be rationalised and/or modified in a Class A scenario, and provided via local access roads in the Class M scenario.
Resolving a suitable “gateway” presentation for Port Macquarie from the north.	To be finalised as part of the concept design phase. Subject to the final location of a grade separated interchange either south of Fernbank Creek or in the vicinity of Blackmans Point Road.
Blackmans Point Road to Cooperabung Drive	
Appreciation that the mitigation measures are likely to involve substantial costs (possibly above any “averaging” costs employed in the estimates).	Preliminary cost estimates for all options have been developed to date using industry standard methodology. These estimates currently provide for substantial contingencies due to the preliminary nature of the design, and will be refined during the concept design of the preferred route. The estimates allow for environmental and social mitigation measures, and are based on the extensive experience of the RTA with previous highway upgrade projects.

Issue	Response
Undertaking the feasibility of realigning the Orange option to enable joining the corridor recommendations in the vicinity of Cairncross State Forest (ie. moving the corridor further to the east) and avoiding / minimising the impacts on environmental considerations, farms and the state forests.	A modification to the Orange option, known as the Refined Orange option was developed to minimise intrusion into Cairncross State Forest and Rawdon Creek Nature Reserve. The alignment of this option is located closer to the existing highway.
Completion of detailed environmental studies in Cairncross State Forest and north of Wilson River (near Wilmaria Drive) to determine the impacts.	Following the value management workshop, a Refined Orange option was developed that resulted in less severance of Cairncross State Forest. This alignment was subject to a similar level of ecological field investigations as undertaken for the four original options. The results of these investigations indicate that there is a similar level of impact relative to the Orange option in terms of habitats impacted. Following the announcement of the preferred route further detailed ecological investigations will be undertaken. At this stage the potential impacts will be identified and feasible mitigation measures will be developed in consultation with relevant stakeholders including Department of Environment and Climate Change.
An Aboriginal cultural heritage assessment (based on engagement with the local Aboriginal people).	A preliminary Aboriginal heritage assessment and additional consultations with the local Aboriginal community has been undertaken to date to ascertain the presence of listed and unlisted sites and areas of cultural sensitivity within the study area. Following the announcement of the preferred route further detailed Aboriginal heritage investigations and consultation will be undertaken.
A better understanding of impacts on businesses and properties in the area.	Following the announcement of the preferred route further investigations and consultation will be undertaken with the all affected parties and the general community to ensure the impacts are identified and feasible mitigation measures developed.
Cooperabung Drive to Mingaletta Road	
Ensuring the developed design has minimal impacts on the Cooperabung Hill climb track.	To be investigated further in the concept design phase.

Issue	Response
Mingaletta Road to northern project limit	
Having more detail and a better appreciation of the impacts on the flora and fauna for this option.	Following the announcement of the preferred route further detailed ecological investigations will be undertaken. At this stage the potential impacts will be identified and feasible mitigation measures will be developed in consultation with relevant stakeholders including Department of Environment and Climate Change.
Detail of the mitigation measures for fauna being practical and feasible to avoid the east to west segregation / severance.	
Refining the option to minimise incursion into the Maria River State Forest (ie. move closer to existing highway) whilst balancing the separation of the corridor from the existing highway during construction (ie. safety issues during construction).	The two option corridors developed for this section are located in close proximity to one another. The Blue option corridor is located closer to the existing highway alignment, thus minimising intrusion within the state forest.
Clarification of the cost difference between this corridor option and the Blue option.	Strategic cost estimates were used at the value management workshop and these will be refined further during the concept design phase.

3.3.4 Project team route selection workshop

Following the value management workshop, the project team undertook the assessment and selection of the preferred option based upon the performance of each option against agreed assessment criteria using three key categories (functional, community and environment) encompassing the program objectives. The key aim of the assessment was to differentiate between the options. Therefore, criteria that did not differ between options were not assessed.

The assessment considered the four publicly displayed options (Blue, Green, Purple and Orange) plus the Refined Orange option, which was developed to address issues raised at the value management workshop. The comparison assessed which option, on balance, would provide best value for money. Issues arising from the community consultation, value management workshop outcomes and results of further investigations were used to inform participants.

The workshop recommended that the preferred corridor option was comprised of the Orange option (southern project limit to Blackmans Point Road), Refined Orange option (Blackmans Point Road to Cooperabung Drive), the common Blue / Green / Purple options (Cooperabung Drive to Mingaletta Road), and the Blue option (Mingaletta Road to northern project limit).

3.3.5 Preferred route report and display

Following completion of the project team route selection workshop the minister considered the recommended preliminary preferred route and announced the preferred route on 28 August 2006, which was followed by a six-week static and staffed display period. See the appendices for display locations. The preferred route for the project was conveyed to the public via updates to the website, media releases, public displays and community updates.

3.3.6 Corridor refinement process and workshop

The preferred route was released and displayed showing a widened corridor of approximately 800 metres in the vicinity of Cairncross State Forest. This wide corridor section was subject of further ecological investigations and refinement in order to resolve some localised issues and conditions and to further refine the route to meet community, design and environmental criteria.

During and following the display of the preferred route in September, October and November 2006, a series of meetings and conversations were held with key stakeholders, including affected property owners and government agencies, and a number of submissions were received.

A project team workshop was convened in order to refine the route in this section based on the consultation activities and further investigations and included consideration of:

- Required vegetation clearing, including endangered ecological communities;
- Impact on vegetation and habitat values;
- Impact to wildlife corridors;
- Impacts to potential threatened flora and fauna species;
- Noise impacts to residents on Moorside Drive; and
- Minimising impacts on productive lands (private agriculture and public forestry).

In November 2006, the corridor refinement process was concluded and the refined corridor in this section of the project determined. The preferred route is shown in Figures 1.1 and 3.11.

3.3.7 Reasons why the preferred route was selected

The preferred route was selected based on the best overall balance between functional, ecological, heritage, social, and economic considerations as summarised below and shown on Figure 1.1.

Southern project limit to Blackmans Point Road

The Orange option was selected because it avoids the proposed marine precinct adjacent to Dennis Bridge, traffic delays would be minimised during construction, the existing highway between Fernbank Creek and Telegraph Point would be retained as a local access road and it would minimise impacts to rural residences in Glen Ewan Road.

Blackmans Point Road to Cooperabung Drive

A refinement of the Refined Orange and Orange options, known as the Modified Refined Orange option has been identified as the preferred route in this section after further investigations. This route was chosen in order to minimise the impacts to Cairncross State Forest, flora and fauna (including koalas), agricultural lands, rural residential properties and public utilities. The Modified Refined Orange option was selected because it has the least overall noise impact on communities, bypasses the village of Telegraph Point, and affects the least number of privately owned properties.

Cooperabung Drive to Mingaletta Road

The Blue, Green and Purple options were all identical in this section and were selected because of the minor impact on the Cooperabung Creek Nature Reserve and Ballengarra State Forest. This corridor allows for the duplication of the existing highway, reduces the grade through Cooperabung Range and the northbound carriageway can be constructed clear of the southbound carriageway, thus minimising construction delays.

Mingaletta Road to northern project limit

The Blue option was selected because it has less intrusion on the Maria River State Forest and existing accesses to the highway can be modified to improve safety. The duplication of the existing alignment continues through this section on the eastern side past the village of Kundabung taking advantage of the available road reserve and minimising property acquisition.

3.4 Design development process

The concept design of the upgrade is progressing, with further input from field surveys contributing to the refinement of the design. Preliminary field investigations have provided valuable data and shaped the concept design of the corridor to date.

As concept design progresses it will include input from detailed field survey, geotechnical investigations, aquatic and terrestrial ecological surveys, Aboriginal and non-indigenous fieldwork, and noise and vibration assessments.