5.2 How Were the Options Developed?

5.2.1 Overview

The upgrade was to be generally by duplication however a review of the existing highway has shown that duplication may not be appropriate in sections of the study area. A duplicated alignment would still require considerable reconstruction of the existing highway and:

- Have potential impacts on the community including severance and access issues;
- Cause delays and access difficulties during construction; and
- May not be cost effective when compared to a new alignment.

Therefore, the approach adopted is a Class M standard being developed in the first instance to ensure the ultimate suitability of the design. Consideration of possible deviations and the use of the existing highway as a local access road was undertaken to maximise the use of the existing asset and to aid rationalising accesses. The benefits of this philosophy are improved safety and better operations. Once Class M corridors were developed, condensed Class A layouts were developed for comparison purposes to determine the option that provides for an upgrade with minimal impact and maximum cost effectiveness.

To aid in this process, the Infrastructure Corridor Analysis (INCA) model was utilised which was developed specifically for corridor selection studies (refer to Section 5.2.2 for more detail on INCA). INCA is run in a Geographical Information System (GIS) environment and assisted in the identification of viable corridor options to upgrade the highway that minimised both social and environmental impacts.

The process to identify these corridors can be divided into five main stages:

- Identification of issues;
- Collection of data on environmental and social issues that are sensitive to the construction and operation of a road and constraint mapping;
- Assigning sensitivity values for each environmental and social issue;
- Selection of the least impact corridor option derived from the constraint mapping; and
- Field investigation to verify broad suitability of corridors.

Once viable corridor options were developed, engineering alignments were fitted to these corridors. Further assessment would then be undertaken within the GIS software to rate the alignments in the options assessment phase. This rating would be done in conjunction with the assessment criteria rating, value management workshop and the community displays.

5.2.2 Infrastructure Corridor Analysis (INCA)

INCA is a route planning software package that quantitatively assesses and evaluates the complex environmental and social issues that are associated with locating linear infrastructure.

The INCA software uses standard overlay techniques to prepare the constraint mapping. Models available in INCA have been used to assist with the identification of viable corridor options based on the environmental, economic and social data collected during the study.

Essential features of the INCA modelling include:

- A systematic, multidisciplinary approach;
- A rational and documented method of decision analysis;
- A quantitative assessment of impacts; and
- An approach that is flexible enough to allow regional and site specific analysis.

Selection of the optimum route takes into account all constraints while keeping the road to a reasonable length.

The benefit of this approach is that weightings for each factor can easily be changed. In this case placing different weightings on a variety of issues identified several route alignments, many of which were common to others.

INCA provides output mapping showing areas of least resistance and viable corridor options for use in developing engineering alignments.

5.2.3 Engineering Route Development

Following the development of constraint mapping and viable corridor options, further work was undertaken to develop viable route corridor options. The viable corridors must be able to fit a road with an alignment suitable for 110 km/h travel speed.

The broad alignments were initially developed by hand using large-scale topographic maps and scale drawing implements. The broad alignments were developed considering the INCA output, community and stakeholder input and all the known constraints.

Once an alignment was developed horizontally, the viability of the option was assessed vertically using MX road design software. This enabled the study team to check grades, particularly with respect to heavy vehicle performance and estimate earthworks volumes for cost estimating purposes.

It should be noted that these initial investigations have not completely fixed an alignment but simply ensured the feasibility prior to further assessment. Within the route option corridors there is flexibility for refinement after further investigations and consultation in the subsequent stages of the project development process.

5.2.4 Issues and Constraints

The initial investigations and community involvement identified that the social, built environment and environmental issues associated with the construction and operation of the highway include impacts on:

- Visual and landscape domains;
- Native vegetation and flora;
- National parks and wetlands;
- Surface waters and flooding;
- Existing land uses;
- Existing infrastructure; and
- Indigenous and non-indigenous heritage areas.

The key constraints identified within the study area include:

- Access from private property, businesses and local roads;
- Blueberry Farms Australia – it is a significant operation with considerable capital investment;
- Dirty Creek Range – the topography of this part of the study area presents some significant challenges in meeting the project design criteria;
- Halfway Creek duplication – this recently completed piece of the Pacific Highway Upgrade Program should be incorporated into the new route;
- Corindi floodplain – the floodplain would provide challenges in overcoming flooding issues and would dictate the form of the upgrade in this area;
- Heritage sites – the various cultural heritage sites that have been identified should be avoided where possible;
- National parks / conservation areas – these reserves should be avoided;
- SEPP 14 designated areas – these reserves should be avoided; and
- Project start and end points and the study area – these are key constraints for all route options.

Analysis of these issues and constraints was initially undertaken using INCA.

5.3 Summary of Characteristics of Route Options

A broad summary of the key characteristics of each route option in each of the sections of the study area is contained in Tables 5.2 to 5.5.

The characteristics include:

- Engineering and Operational;
- Economic;
- Community; and
- Environmental.