

17. Aquatic ecology

The preferred route for the highway traverses a number of different aquatic environments. The Corindi River and its floodplain are located towards the southern end of the route. The route also crosses a number of smaller streams and Halfway Creek towards the northern end. The route bypasses two areas identified under State Environmental Planning Policy Number 14 in the Corindi Beach area, but does not directly impact them.

The concept design of the highway has been developed with the goal of minimising the impacts on the aquatic habitats of the area.

The Aquatic Ecology Report working paper contains further details regarding the investigations and impacts on the Aquatic Ecology.

17.1 Field investigations

A series of field investigations have been undertaken to ascertain the ecological constraints of the proposed highway upgrade in relation to the requirements of the *Fisheries Management Act 1994*, and to ascertain constraints and opportunities for the concept design.

Field investigations have been undertaken at different stages of the project development. Initial preliminary surveys were undertaken at the route development stage, and further targeted surveys were undertaken where the developed route options deviated from the existing highway alignment.

Following the announcement of the Preferred Route by the Minister of Roads on 28 August 2006, advanced aquatic ecology field investigations were undertaken. The findings from the aquatic ecology field investigations have been incorporated into the Advanced Aquatic Ecology Survey Report and data collected has been mapped into the Geographical Information System platform to inform the concept design process.

17.2 Impacts during construction

The construction of the upgraded highway has the potential to impact the aquatic ecological values and integrity of the area both in the short and long term if appropriate environmental management measures are not incorporated into the concept and detailed designs and employed during construction.

The construction of the highway has the potential to impose impacts on:

- Endangered Ecological Communities in terms of degraded or polluted water entering the ecosystem and affecting ecological health.
- Aquatic and amphibian fauna where waterway crossings are blocked, impeded or significantly altered.
- Populations of threatened aquatic species being disturbed. No threatened aquatic species were found during the fieldwork, however the habitat has the potential to support threatened aquatic species.
- Aquatic fauna habitat in the form of water degradation together with degradation of water quality downstream of the highway.
- Dislocation of aquatic and amphibian fauna populations due to impediment of aquatic fauna passage.

17.3 Impacts during operation

The route selection process was undertaken with the aim of minimising the impact on the environment by making informed decisions with information gathered during initial fieldwork and through an environmentally sensitive approach to selecting the ultimate alignment. The effectiveness of the measures proposed during the concept and detailed designs will determine the level and nature of ongoing impacts of the operation of the highway. The concept design strategy has been to formulate design measures aimed at further minimising the highway upgrade's impact on the ecological integrity and environmental characteristics of the area.

Management measures developed for the concept design may require revision post-construction if it is found that impacts to the area's biodiversity, ecology and natural environment are unacceptable.

17.4 Recommended aquatic flora and fauna mitigation measures during construction

The major potential construction impacts identified at the concept design stage, and those that will require management and mitigation are:

- Avoidable loss of riparian vegetation.
- Siltation of adjoining waterways from exposed soils.
- Contamination of adjoining waterways by fuels and chemicals from construction plant and equipment.
- Death or injury to aquatic fauna from construction equipment and habitat disruption.
- Scouring or erosion of river and creek banks as a result of improper placement of construction equipment.
- Obstruction to aquatic and amphibian fauna movement during construction resulting in the isolation and fragmentation of populations, which may result in long-term detrimental impacts.

Management and mitigation measures to be implemented during construction are to be developed during the detailed design stage and further developed by the construction contractor to be incorporated into the Construction Environmental Management Plan. A number of sub-plans addressing construction impacts on aquatic flora and fauna will be required.

17.5 Recommended aquatic flora and fauna mitigation measures during operation

The primary mitigation and management measures that will be in place for the operational phase of the project will be those that have been developed in the concept design, and those that will be further expanded and refined during the detailed design phase. These measures include:

- Fish-friendly and amphibian-friendly culvert designs meeting Department of Primary Industries – Fisheries requirements.
- Water quality and sedimentation ponds.

Based on the information gathered from the advanced aquatic ecology field surveys and the information provided by stakeholders such as the Department of Environment and Climate Change, the Community Liaison Group and the Ecological Focus Group forums, the management and mitigation provisions developed during the concept design stage have considered the following:

- Known locations of threatened and/or endangered species.
- Vicinity of key aquatic fauna habitat.
- Adequate provision of fish and amphibian-friendly culverts and waterway crossings.

Where bridges and culverts are to be installed in waterways, the guidelines developed by the Department of Primary Industries (Fisheries) and recommendations from the Department of Environment and Climate Change are to be addressed in finalising the structure design at the detailed design stage.

Fish and amphibian friendly culvert designs, developed in accordance with the above guidelines and recommendations, would be required in order to limit the potential long-term impacts on the viability of aquatic and amphibian populations in the areas impacted by the highway upgrade project.