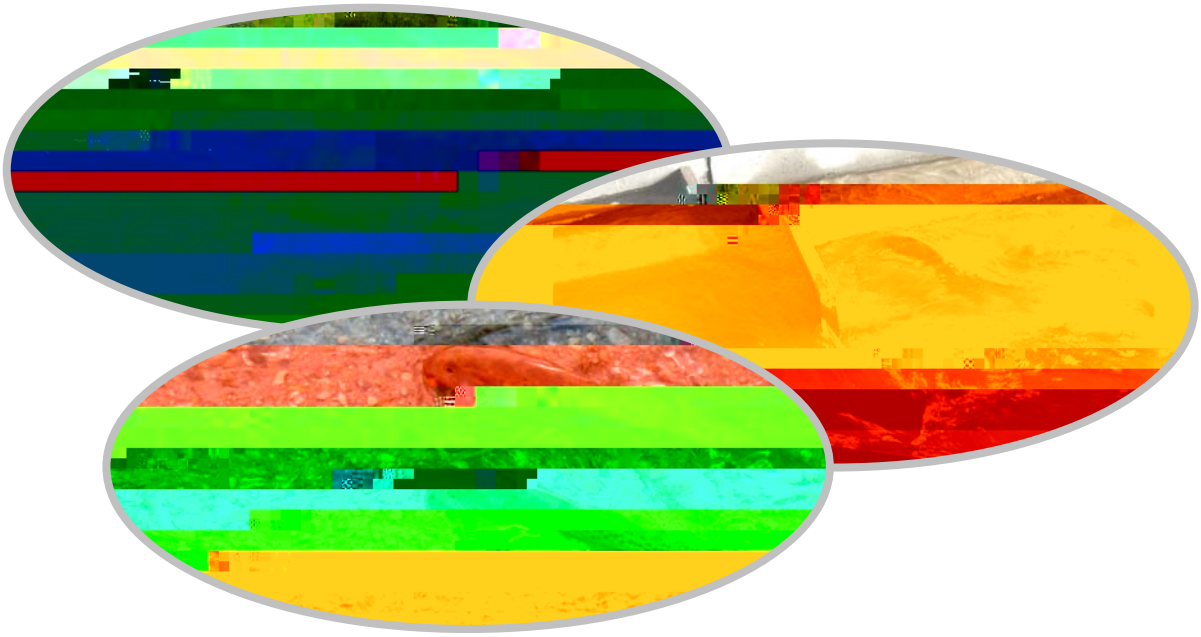
Culvert Fishway
Planning and Design Guidelines



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PREFACE

These Culvert Fishway Planning and Design Guidelines, which have been supported by the Queensland Department of Transport and Main Roads, are an important step toward improving aquatic fauna connectivity at road culverts and other waterway structures in Queensland and Australian streams. Migration of fish and other aquatic fauna is often obstructed at these structures by adverse hydraulic conditions such as high velocities, water surface drops and shallow water depth. Recent emphasis in system management and sustainable design solutions for road and waterway infrastructure has created much interest in planning and design for migration of aquatic, terrestrial and arboreal fauna. Provisions for fish passage are now being made through mitigation designs to overcome migration barriers in many new road and waterway projects and through remediation of migration barriers at existing drainage infrastructure.

As natural resource managers, environmental scientists and design engineers increase their interest in aquatic fauna connectivity and take account of fish passage requirements at road crossings and other waterway structures, they face the challenge of how best to incorporate fish passage provisions with other multipurpose design requirements relating to transport, drainage function, amenity and environmental values. Important questions posed by design practitioners and managers in these projects often include:

- how to integrate fish passage planning and design within other project activities
- which mitigation measures are appropriate to provide for fish passage in particular situations
- and how these measures are performing over time

These Guidelines address aquatic fauna connectivity actions and requirements for road and waterway projects, and present a framework for incorporating fish passage provisions within planning and design protocols for these projects. Solutions to fish migration barrier problems at road crossings and other waterway structures are examined using an ecohydraulics approach (founded on hydraulic laboratory testing, prototype facilities and field installations). Anticipated fish movement behaviour for the site and the hydraulic characteristics of the waterway structure and fish passage devices are considered in an integrated manner, and other multipurpose requirements are accounted for in design of a facility. Design solutions are conceptualised for Australian conditions, which are different in many respects to northern hemisphere conditions where many conventional culvert fishway practices have been developed.

The approach taken in the Guidelines is applicable to mitigation design, to address potential fish migration barrier impacts in new projects; and to remediation design, where fish passage provisions are made through retrofit of existing structures. A range of measures are outlined. Whilst bridges or arches are often recognised as best solutions for aquatic fauna connectivity at road crossings, culverts equipped with appropriate fish passage devices can also offer many benefits. Depending on aquatic habitat and fish movement corridor values and other site characteristics, use of culvert fishways may preclude the need to adopt over-conservative and unnecessarily expensive designs using bridges. The suitability of culvert fishway facilities in meeting fish passage and other multipurpose design requirements can be demonstrated for numerous waterway types and structure configurations, and particularly for retrofit facilities.

The Guidelines recognise the need for ongoing design development and evaluation of fish passage facilities for road crossings and other waterway structures and for innovative solutions to address aquatic fauna connectivity barriers. The Guidelines do however caution against overly speculative attempts that may be unsubstantiated and potentially counterproductive. Unless grounded on sound theory and the practical application of hydraulic and ecological principles, these innovative approaches will not provide robust solutions to fish passage requirements.

At this point in the environmental "journey" towards sustainable infrastructure design and provisions for aquatic fauna connectivity at road crossings and other waterway structures, very few dead ends and blind gullies have so far been encountered, and enthusiasm for success has not been dulled by the burden of failure. Culvert fishway "technology" for Australian waterways is still in an embryonic stage, and it is hoped that these Culvert Fishway Planning and Design Guidelines will enthuse and greatly assist road designers, waterway managers, environmental officers and scientists in identifying and meeting the needs for aquatic fauna connectivity, and in providing successful mitigation measures to address fish passage for road and waterway projects.

DISCLAIMER

These Guidelines are intended for use in linear infrastructure projects (e.g. roads, railways), and waterway and drainage projects involving road and other small waterway structures in Queensland and other parts of Australia. This encompasses projects undertaken by or for the Queensland Department of Transport and Main Roads (DTMR), and by other transport agencies, local authorities, government agencies, consultants and contractors. The Guidelines Guidelines 2011 ... requires ... purposes ...
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ACKNOWLEDGEMENTS

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