

Wetland and Waterways Study

Toowoomba Regional Council Planning Project

Final Report

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1.0 EXECUTIVE SUMMARY

The Wetlands and Waterways Study was completed after the development a number of wetland significance categories and the proposal of a number of wetland planning and management options. The wetland categories are the foundation of 'options' development and are recommended through this report for adoption in future stages of TRC Planning Scheme development and for use in other TRC natural resources management and protection initiatives. The wetland and waterway 'options' are indicated in **Table 4.1** and, in addition to a comprehensive wetland data and mapping package, are a primary outcome of this study. The term "wetland" has been used through this report to refer to both wetlands and waterways (streams and rivers) in line with the Queensland definition of a wetland.

Six (6) wetland categories have been developed and proposed. The categories developed are:

1. High value non-riverine wetlands.
2. Other mapped non-riverine wetlands.
3. High value riverine wetland sub-catchments.
4. Other riverine wetland sub-catchments.
5. Dams and weirs.
6. Artificial wetlands.

Conics recommend that mapped riverine and non-riverine wetlands are recognised through TRC planning frameworks and that development activity and other initiatives are excluded or heavily conditioned. In addition, in most cases, we also recommend that an appropriate buffer (or set-back distance) is applied to each wetland and that the buffer areas are managed appropriately (i.e. buffer restrictions with respect to activity may be variable depending on the associated wetland ecosystem but in all cases the best available technical understanding or buffer guideline requirements should be applied). Wetland category definitions and suggested buffers are provided in **Table 2.1**. Conics recommend that the wetland significance categories (WSGs) (**Section 2.4.3**), the wetland mapping layers (already provided to TRC) and the preferred wetland planning/management options (**Table 4.1**) are adopted and are carried forward into the next stages of TRC Planning Scheme development.

A number of wetland and waterway issues are addressed that are not focussed on planning scheme development. There are many opportunities for the TRC to undertake additional wetland assessment work toward better ecological condition ('health') information, area-wide qualitative assessment of wetland values, accurate wetland boundary definition, finer scale wetland mapping and better understanding of ecological connectivity issues. The most important of these issues are considered through options in **Table 4.1**; however, initiatives and investigation for improved natural aquatic resource management are more extensive than indicated in this document and should be explored in more detail as the need or opportunity arises.

The wetlands and waterways of the TRC area are a valuable natural resource. The use of a structured wetland significance category system in TRC planning instruments will ensure that wetlands of all types, and particularly those with the highest environmental values, are managed appropriately. Importantly, technically rigorous recognition of wetland type, wetland significance and wetland location provides another mechanism that supports sustainable development and that increases the likelihood, through appropriate wetland management or protection, of positive outcomes in a broader landscape context. In the case of riverine wetlands (waterways), for

example, this may mean minimisation of downstream water quality or biodiversity impacts for neighbouring stakeholders and in neighbouring local or state jurisdictions.

Note:

Complete mapping coverage of the wetlands in the TRC area has been created electronically and already supplied to TRC in ESRI format as a project product output. This mapping is referred to in the report in Section 5.0 and, as such, is the partner data package for this report. Wetland maps may be produced from this data as required and for any specific geographic location.

2.0 BACKGROUND

2.1 INTRODUCTION

The Toowoomba Regional Council has undertaken a number of data collation and data assessment projects to provide planning options in preparation for the development of a new regional Planning Scheme. The projects extend across a number of disciplines including natural resources management, infrastructure planning and land-use planning. These projects, or 'studies', are known collectively as the Toowoomba Regional Council Planning Project but have been undertaken through separate consultancy agreements and have been treated separately for the purposes of reporting.

Conics were engaged by Toowoomba Regional Council (TRC) to undertake the Wetlands and Waterways Study, a component of the broader Toowoomba Regional Council Planning Project. The results of this study are intended to inform the development of the new regional Planning Scheme, as discussed above, but they also provide other positive natural resource management options (initiatives) that could be implemented across the TRC area. The Wetlands and Waterways Study had the following key objectives:

- To identify and assess available information to determine future strategic priority policy, planning and management actions for wetlands and waterways throughout the Toowoomba Regional Council area; and,
- To make recommendations for the management of significant wetlands and waterways through the Toowoomba Regional Planning Scheme.

The TRC area contains more than 1000 mapped wetlands (wetland polygons on the Queensland wetland maps) and many kilometers of riverine wetland indicated by the 1:100k Queensland drainage mapping. This provides the TRC with a large number (and area) of wetland ecosystems within their jurisdiction that need to be considered for their ecological value¹, and their significance in a planning context. In addition, the TRC area lies within the headwaters of two major river basins in Queensland – the Condamine River basin, within which the TRC has its largest footprint, and the Brisbane River basin. Draining to coastal south-east Queensland in the east and to the greater Murray-Darling Basin in the west respectively, the Brisbane River and Condamine River catchments provide for a complex mix of aquatic ecological and catchment (water) management issues depending on location.

An early milestone of the Wetlands and Waterways Study was the preparation of an Issues Report to identify wetland and waterway specific issues that needed to be addressed in formulation of a policy framework and a planning scheme. The Issues Report also included early discussion of other issues that are relevant to the successful management and/or protection of wetlands and waterways across the TRC area but that are not necessarily associated with new or existing Planning Scheme arrangements. With the Issues Report as a foundation, the penultimate milestone of the Wetlands and Waterways Study was an Options Report which explored 'options' that are available, including preferred options, to deal with critical wetland and waterways issues in a planning or natural resource management context. These wetland and waterway options are relevant

¹ Environmental 'value' is a concept distinct from, but inclusive of, ecological condition or health. Information about ecosystem condition can inform assessment of its value but condition and value are not necessarily correlated. For this study also, environmental value does not infer social or economic value.

for consultants investigating planning aspects within the TRC area (as part of the development of a new regional Planning Scheme) as well as for the TRC themselves in continued management of their natural resources.

This document is the Final Report for the Wetland and Waterways Study. It combines the Issues and Options Reports and incorporates consideration of additional information requests/clarification received through the course of the project from TRC Councillors and staff. It provides policy and strategic options for dealing with key wetlands and waterways issues in the TRC region, including through the Toowoomba Regional Planning Scheme.

2.2 METHODS

2.2.1 Nomenclature

Wetlands and waterways are defined differently across the different Australian government jurisdictions and depending upon assessment/investigation context. In Queensland, the DERM (formerly the EPA) announced a definition for wetlands through their Wetlands Mapping and Classification Program which includes waterways. This definition has been adopted for the TRC Wetlands and Waterways Study.

Wetlands are areas of permanent or periodic/intermittent inundation, with water that is static or flowing fresh, brackish or salt, including areas of marine water, the depth of which at low tide does not exceed 6 meters. To be classified as a wetland, the area must have one or more of the following attributes:

- 1. At least periodically, the land supports plants or animals that are adapted to and dependent on living in wet conditions for at least part of their life cycle, or*
- 2. The substratum is predominantly undrained soils that are saturated, flooded or ponded long enough to develop anaerobic conditions in the upper layers, or*
- 3. The substratum is not soil and is saturated with water, or covered by water at some time.*

Examples under this definition include:

- *Those areas shown as a river, stream, creek, swamp, lake, marsh, waterhole, wetland, billabong, pool or spring on the latest Sunmap 1:25,000, 1:50,000, 1:100,000 or 1:250,000 topographic map.*
- *Areas defined as wetlands on local or regional maps prepared with the aim of mapping wetlands.*
- *Wetlands Regional Ecosystems (REs) as defined by the Queensland Herbarium (Environmental Protection Agency 2005a).*
- *Areas containing recognised hydrophytes as provided by the Queensland Herbarium.*
- *Saturated parts of the riparian zone.*
- *Artificial wetlands such as farm dams.*
- *Water bodies not connected to rivers or flowing water such as billabongs and rock pools (DERM 2009a)*

Given this wetland definition, the Wetlands and Waterways Study refers to Non-Riverine wetlands (i.e. Palustrine and Lacustrine wetlands) and Riverine wetlands.

2.2.2 Literature Review

Wetlands and waterways are variously understood around Queensland and, in particular, knowledge of their ecological function, aquatic-dependent species compositions, and their environmental 'values' is inconsistent across the TRC area. To provide the most useful current-knowledge platform for the Wetlands and Waterways Study, a review of relevant literature and wetlands mapping was undertaken. The review included, but was not limited to, the following:

- Queensland Department of Environment and Resource Management (DERM) wetland mapping and classification;
- DERM Aquatic Conservation Values Assessments;
- DERM 'drainage layer' mapping at 1:100000 scale;
- Planning Schemes, and relevant environmental overlays, for the eight pre-amalgamation local council areas that now combine to form the TRC;
- More than 25 relevant wetlands and waterways documents/reports/publications including regional natural resource management plans, catchment management strategies and water quality management plans (refer **Appendix A** for a complete list); and
- Local wetlands expert knowledge.

2.2.3 Field Assessment

The Wetlands and Waterways Study relies on a formal assessment, or an expert understanding, of wetland environmental 'values' (or ecological significance) across the TRC area. As indicated in **Section 3.2**, assessments known as Aquatic Conservation Assessments (ACA) have been undertaken by DERM to define relative wetland values within a number of Queensland catchments and these can be relied upon to assist in developing planning options for TRC wetlands. Unfortunately, the entire TRC area is not covered by any current ACA and, for this reason, Conics conducted additional rapid qualitative field assessment of wetland values in parts of the TRC area that lie within the Brisbane River catchment (i.e. areas to the north-east and east of the Great Dividing Range, including escarpment areas and the townships of Yarraman, Cooyar and Crows Nest).

The Conics field assessment was based primarily upon expert opinion because the Wetlands and Waterways Study scope and timelines did not allow the implementation of a full ACA conducted according to DERM guidelines. This rapid wetland 'values' assessment was, however, conducted according to the principles of AquaBAMM² and was focused for both riverine and non-riverine wetlands in the portion of the TRC area outside of the Condamine River catchment. Field assessment of wetland values included the following:

- Use of DERM wetland mapping and classification Version 1.3 (February 2009) to identify riverine and non-riverine wetlands located within the TRC area but outside of the Condamine River catchment.

² AquaBAMM is the methodological heart of an Aquatic Conservation Assessment (ACA). DERM has published full detail of the AquaBAMM method, and ACAs that result from its implementation, at <http://www.epa.qld.gov.au/aquabamm>

- Visit of mapped non-riverine wetlands (Palustrine and Lacustrine wetlands), and survey a majority of riverine wetland sub-catchments to qualitatively assess their ecological and conservation values. Note that, the TRC area has been divided into small, hydrologically sound sub-catchments through work conducted by DERM over the last decade (i.e. DERM State of the Rivers Program). These sub-catchments were adopted as convenient geographic spatial units for treatment of riverine wetlands and are referred to through this document and in the product wetland data layers.
- Collation of known information, species and community records, field observations and expert assessment to develop a draft map wetland values for the portion of the TRC area outside of the Condamine River catchment.
- Combination of the rapid field assessment results with ACA results for the Condamine River catchment to develop a draft map wetland values for the entire TRC area.

Wetland assessment criteria for use in the rapid field survey were developed from a number of sources including local expert opinion. As discussed, however, AquaBAMM principals and criteria/indicators were heavily relied upon to direct the rapid field assessment.

A separate report has been prepared by Conics that summarises the work and results for the supplementary wetland values assessment work conducted in the north and south of the TRC area. This report has been provided to the TRC. The results, however, were used in preparation of this report and in preparation of the wetland and waterway data layers provided to TRC for planning purposes.

2.2.4 Consultation

There were many opportunities for close liaison and consultation with TRC and/or with other TRC Planning Project consultants through the course of the Wetlands and Waterways Study. Meetings and workshops have provided important feedback as the wetland and waterways data was maturing and as planning and management issues were considered. With the exception of direct phone discussions, the following table provides a list of the most relevant interactions. Issues raised and discussed through this consultation have been considered and incorporated in this report.

EVENT	ATTENDEES
Project Inception Meeting (Brisbane)	Conics; TRC staff
Issues Workshop (Toowoomba)	Conics; TRC staff; All other consultant teams
Information Sharing Workshop (Highfields)	Conics; TRC staff; All other consultant teams
Options Workshop (Toowoomba)	Conics; TRC staff; TRC Councillors

2.3 KEY PRINCIPLES

2.3.1 Wetland Values

Wetland 'values' are used as one of the primary tenets for the product mapping layers of the Conics Wetlands and Waterways Study. For the purposes of this study and our proposed planning options development within the broader TRC Planning Project, wetland values are defined to consider ecological or conservation issues only. This includes fauna and flora species specific issues as well as ecological community and aquatic ecosystem issues. Social and economic values of wetlands are not considered.

2.3.2 Wetlands Significance Categories

An objective of the Conics Wetlands and Waterways Study was the development of a number of 'wetland significance categories' (WSC) that are proposed for use in consideration of potential planning options within a new regional Planning Scheme. The WSCs differentiate between the main wetland types in the TRC area (e.g. natural, artificial, riverine wetland, non-riverine wetland, etc) but, most importantly, the WSCs indicate differences in wetland environmental 'values' (or significance) to allow for varied treatment in a planning or natural resource management context. WSCs are important because the wetlands of the TRC area are too numerous to be considered individually when developing planning frameworks.

Note that, WSCs are separate to and different from any categories that might be developed for planning 'constraints modelling' that is conducted as part of other studies in the TRC Planning Project.

2.4 KEY FINDINGS

2.4.1 Management of wetlands

Wetlands within the TRC area are currently managed through a number of disparate mechanisms. In most cases, wetland management occurs through participation by a number of government and community stakeholders including: relevant state authorities (DERM and DEEDI), Natural Resource Management Bodies (Condamine Alliance, Queensland Murray Darling Committee and South East Queensland Catchments), local Landcare groups (such as Toowoomba Landcare) and the TRC. Wetlands in the TRC area are managed under a number of state and federal government laws, initiatives, plans and strategies including:

- Strategy for the Conservation and Management of Queensland's Wetlands (the Wetland Strategy)
- Environmental Protection Policy (Water) 1997
- Environmental Protection of Biodiversity Conservation Act 1999
- Draft Condamine Catchment Natural Resource Management Plan 2008-2011
- Draft SEQ Natural Resource Management Plan
- Nature Conservation Act 1992
- Vegetation Management Act 1999
- Water Act 2000
- Environmental Protection (Water) Policy 1997 (under the Environmental Protection Act 1994)
- Integrated Planning Act 1997 and associated Regional Plans
- National Water Quality Management Strategy
- Queensland Water Quality Guidelines

- National Water Initiative
- Vegetation Management Act

These statutes and documents/guidelines were reviewed or considered as part of the work presented here. The initiatives and obligations therein are implemented broadly but local management of wetlands within the TRC area is less well defined, particularly with respect to planning and development in the region. The results of this study are aimed to assist in this regard.

2.4.2 Local wetland information

A small number of investigations or initiatives/codes were identified that were considered in the development of planning and management options. These are not considered further in this report but are listed for completeness:

- Wetland retention basin development and monitoring - some work and its consequences within TRC area townships including Toowoomba (e.g. retention basins on West Creek)
- Riparian rehabilitation and monitoring by Regional Bodies
- Water quality improvement and monitoring by Regional Bodies
- TRC "Three Dams Strategy".
- Toowoomba City Council 'open space' requirements with respect to wetlands (former Council planning scheme).
- Toowoomba City Council waterways code requirements (former Council planning scheme).
- Toowoomba City Council riparian corridor acquisition program (former Council planning scheme).
- Catchment Management Strategies that have been developed for Spring Creek, Outer Escarpment areas, Gowrie Creek, Westbrook Creek and Outer Northern Areas.

2.4.3 Wetland Categories for Planning and Management

An outcome of the Wetlands and Waterways Study has been the development of wetland significance categories (or wetland planning categories) for the purposes of considering planning and management options (see below). The wetland categories have been developed and mapped across the entire Toowoomba Regional Council (TRC) area. Wetland category maps have been provided to the TRC.

The TRC area contains approximately 1200 mapped wetlands (wetland polygons on the Queensland wetland maps) and almost 10,000 kilometers of riverine wetland indicated by the 1:100,000 Queensland drainage mapping. This provides the TRC with a large number (and area) of wetland ecosystems within their jurisdiction that need to be considered for their ecological value³, and for their significance in a planning context. Conics have used a combination of existing wetland values assessment results and expert opinion to divide and categorise wetlands within the TRC area. Non-riverine wetlands (lacustrine and palustrine) are treated as

³ Environmental 'value' is a concept distinct from, but inclusive of, ecological condition or health. Information about ecosystem condition can inform assessment of its value but condition and value are not necessarily correlated. For this study also, environmental value does not infer social or economic value.

individual geographic spatial units and riverine wetlands are treated by hydrologically sound sub-catchment⁴ within the TRC area. The proposed wetland categories (and their associated mapping layers already provided to TRC) identify wetland location and extent; however, in a planning context, a number of other factors also need incorporation such as appropriateness and size of buffers, impact assessment requirements, etc. These additional considerations are briefly discussed later in this document but their detail will be developed through the code-writing stages of new Planning Scheme development. Code-writing was not within the scope of the Wetlands and Waterways Study.

The Wetlands and Waterways Study originally proposed seven (7) wetland categories based on wetland classification (i.e. wetland type) and their relative environmental values within the TRC area. The categories were:

1. High value non-riverine wetlands.
2. Other mapped non-riverine wetlands.
3. High value riverine wetland sub-catchments.
4. Other riverine wetland sub-catchments.
5. Dams and weirs.
6. Artificial non-riverine wetlands.
7. All other unmapped artificial wetlands.

Mapping for Category 7 wetlands is not available and planning or management with respect to these wetlands is likely to be accommodated through other elements of TRC business. For these reasons, Category 7 wetlands were not considered further.

Treatment of artificial non-riverine wetlands (Category 6) by local government is an issue that is subject to continued debate in most parts of Queensland. TRC will continue to debate the need for treatment of artificial wetlands through the Planning Scheme; however, ahead of a final TRC decision, Category 6 wetlands are retained through this document and considered with respect to management and planning options. Accurate mapping for Category 6 wetlands across the TRC area has been completed (and provided to TRC) so that the data is available for use if necessary.

The final set of wetland categories for consideration in this Final Report is, therefore, slightly smaller than originally proposed. We are proposing the wetland and waterways categories in **Table 2.1** as a framework for consideration in the new TRC planning scheme and for use through other TRC natural resource management mechanisms.

For Category 3 and Category 4 wetlands (waterways) two sets of GIS data layers were prepared showing riverine wetlands by *sub-catchment* within the TRC area for display purposes and riverine wetlands with appropriate buffers for planning purposes respectively. The display of riverine wetlands (waterways) by shaded sub-catchment is for ease of display only and not to indicate that entire sub-catchment areas would be subject to

⁴ The TRC area has been divided into 292 sub-catchments for the purposes of planning and assessment with respect to riverine wetlands.

any proposed wetland conditions or constraints. The mapped riverine wetlands within each sub-catchment, plus any appropriate buffer distances, are the wetland areas relevant for consideration in a planning context.

Table 2.2 provides statistics for the number of individual wetlands (for non-riverine wetlands) and the number of sub-catchments (for riverine wetlands) in each wetland category for the TRC area.

TABLE 2.1 WETLAND PLANNING CATEGORIES BASED ON WETLAND TYPE AND WETLAND VALUES

CATEGORY (WSC)	WETLAND TYPE	DETERMINATION	COMMENTS	BUFFER
Category 1	Non-riverine wetlands with 'High' or 'Very High' environmental values	Membership of this category is determined through formal aquatic values assessment (ACA = the QG method for assessment using AquaBAMM) where they have been undertaken OR highly significant aquatic ecosystem as determined by expert opinion	Includes 'natural' and 'modified natural' wetlands (mapping codes H1, H2M2, H2M3 and H2M4) ⁵	200m from max wetland extent ⁶
Category 2	Mapped non-riverine wetlands not included in Category 1	Wetlands mapped through the Queensland Wetlands Program (DERM)	Includes 'natural' and 'modified natural' wetlands (mapping codes H1, H2M2, H2M3 and H2M4) ⁵	100m from max wetland extent ⁶ Error! Bookmark not defined.
Category 3	Riverine wetlands with 'High' or 'Very High' environmental values	Membership of this category is determined through formal aquatic values assessment (ACA = the QG method for assessment using AquaBAMM) where they have been undertaken OR highly significant aquatic ecosystem as determined by expert opinion	Includes the standard DERM 1:100000 drainage layer divided into hydrologically sound sub-catchments within the TRC area. The values are assigned by whole sub-catchment but may	Varies with stream order (refer Table 5.1)

⁵ The mapping codes are standard codes used for DERM Wetland Mapping and Classification purposes. These codes are available for selection of specific wetland types from the complete DERM wetland maps and they categorise natural, near-natural and artificial wetlands with a number of sub-categories in each case (DERM Wetland Mapping and Classification, version 2.0, October 2009).

⁶ The wetland and waterway buffers recommended have been considered by expert opinion for the TRC area but they are also consistent with buffers required by the Vegetation Management Act 1999 with respect to clearing and other vegetation management activities close to wetlands and waterways. In some cases (shown in Table 5.1) the recommended buffers have also considered wetland and waterway buffers in current local government codes from elsewhere in Queensland (e.g. Gold Coast City Council codes) where they are appropriate.

			not apply on-ground to every reach segment within the sub-catchment.	
Category 4	Mapped riverine wetlands not included in Category 3	Wetlands (waterways) shown on the best available drainage layer for the study area but, as a minimum, the state 1:100000 map	Includes the standard DERM 1:100000 drainage layer divided into hydrologically sound sub-catchments within the TRC area.	Varies with stream order (refer Table 5.1)
Category 5	Dams and weirs	Riverine wetlands (waterways) which are impounded and mapped.	Includes 'modified natural' wetlands (mapping codes H2M1)	Refer to existing Council management plans or 100m from max wetland extent, whichever greater
Category 6	Non-riverine artificial wetlands	Includes all artificial wetlands (mapping codes H2M5, H2M6, H3M1 and H3M2)		

TABLE 2.2 WETLANDS NUMBERS FOR EACH WETLAND CATEGORY

CATEGORY (WSC)	NUMBER
Category 1	34
Category 2	71
Category 3	42
Category 4	250
Category 5	40
Category 6	404

3.0 ISSUES

3.1 KEY ISSUES SUMMARY

The TRC wetland and waterway issues that have been addressed in this Study are shown in the list below. These were the primary wetland and waterway issues identified in early stages of the project that had relevance in the development of the new TRC Planning Scheme and in broader TRC natural resource management. The issues were:

- Treatment of each of the wetland categories (i.e. wetland significance categories);
- Wetland buffers;
- Wetland mapping error;
- Mapping scale;
- Missing wetlands (unmapped wetlands);
- Upstream/downstream issues & Connectivity;
- Virtual 'truthing';
- Stream2 integration – combining results across the studies;
- Existing wetland management or regulatory requirements;
- Translation of proposed options to codes;
- TRC ownership of wetlands; and
- Data gaps – wetland condition, quantitative wetland values assessment, springs and small wetlands.

A small number of wetland and waterway issues were referred to TRC for strategic or policy decision with respect to inclusion or treatment in the Wetlands and Waterways Study. The issues were:

- Missing wetlands (unmapped wetlands);
- Artificial wetlands inclusion;
- Artificial wetland conditions equity if included;
- Dams & weirs treatment (Category 5 wetlands); and
- Detention basins and miscellaneous artificial wetlands inclusion.

The Wetlands and Waterways Study has successfully addressed, and incorporated where necessary, most of these issues through the 'options' development stage and through detailed consultation with the TRC. Some issues have been deferred because they relate to broader ecological understanding (i.e. issues of catchment-wide wetland connectivity and wetland condition and threats) or to more detailed policy development (i.e. wetland code writing, artificial wetland inclusion, dams/weirs and TRC ownership implications). In these cases, the issues would be the subject of research initiatives or future stages of the TRC Planning Project respectively. Priority in addressing these outstanding issues is best placed with issues of policy and TRC interaction, through statutory instruments, with state government departments with respect to river and wetland management. Aquatic ecological research initiatives would provide a more robust technical foundation for decision making but are only achievable with extended timeframes for investigation.

The issues, identified in early stages of the Wetland and Waterways Study, are not specifically considered further in this report.

3.2 STATUTORY CONTEXT

3.2.1 Commonwealth

Wetland management requirements and restrictions are applicable through instruments such as the *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act) for wetlands nominated as significant (e.g. Ramsar wetlands or wetlands nominated in the Directory of Important Wetlands). Currently, there are no wetlands in the TRC area where these provisions would apply on the basis of the wetland's conservation significance designation alone.

Secondarily, however, the same statutes provide wetland management requirements and restrictions based on biodiversity values such as the presence or use of habitat by listed migratory bird species. For this reason, some wetlands in the TRC area may be subject to the provisions of Commonwealth legislation.

3.2.2 State

In Queensland, wetlands and waterways are mapped and classified through the Queensland Wetlands Program (DERM). A "referrable wetlands" map⁷ is produced as a derived-product of the state wetlands map by selecting wetland areas based on their Regional Ecosystem (RE) description. Currently, wetlands that appear on the 'referable wetlands' map have a 100m buffer applied by DERM and proposed activity within that area is referred to DERM as an 'advice agency'. These provisions are applied through the combination of statutes such as the Integrated Planning Act and Environmental Protection Act. Conics have not reviewed the TRC area with respect to the presence of wetlands that appear on the referable map.

Riverine wetland (waterway) management requirements and restrictions are applicable through a number of statutes including the *Water Act 2000* (e.g. for activity within the waterway) and the *Vegetation Management Act 1999* (e.g. wetland buffer requirements with respect to vegetation clearing).

Future wetland specific regulatory arrangements are likely, particularly for high value wetlands, but current arrangements mean that the opportunity for local scale management of significant wetland ecosystems with respect to development activity would need to be accommodated through local government mechanisms.

3.3 DATA ISSUES

3.3.1 Data is Dependent

The Conics Wetlands and Waterways Study has accessed all of the data required, or has collected additional field data, to enable progression to the development of planning options. A number of wetland data elements would benefit from increased scientific rigour or from formal conservation values assessment; however, there are currently no data issues that are significant with respect to production of wetland mapping layers (already

⁷ The Queensland Herbarium (part of DERM) is responsible for developing a list of "wetland REs" which is the basis for creating the referable wetlands map. Wetland Res are those ecosystems that are considered to be wetlands or that contain significant wetland elements.

provided to TRC), the development of WSCs or the identification of planning options for wetlands of the TRC area.

At the time of writing this Final Report, the only data that was outstanding and that may assist in better WSC designation was:

- Species and community records for aquatic and aquatic-dependent species for parts of the TRC area outside of the Condamine River catchment. In particular, records for Rare, Vulnerable or Endangered species and communities.

3.3.2 Data is Independent

Wetland understanding can always be improved. The TRC wetland data could be improved in a number of ways but the completion of the Wetlands and Waterways Study has not been dependent on this further work. There are data gap or data improvement issues which include the following:

- Very little wetland condition assessment information (or ecological “health” information) is available for the TRC area. There are a few isolated examples of detailed wetland inventory investigations that included flora, fauna and water quality assessment.
- Comprehensive and quantitative wetland ‘values’ assessment has only been completed for the Condamine River catchment and is in draft form for the Border Rivers catchment. Wetlands outside of these catchments, but within the TRC area, are mapped but not environmentally valued.
- Wetland mapping scale varies across the TRC area; however, the most consistent and widespread mapping scale is 1:100k from the DERM wetlands mapping and classification program.

4.0 OPTIONS

The Wetlands and Waterways Study progressed to the development of a number of 'Options' for planning and management of wetland ecosystems in the TRC area. These options are proposed in **Table 4.1** against each issue (previously raised) with respect to wetlands and waterways.

In all cases where wetland and/or waterway buffers are proposed as planning/management options, statutory precedent is taken from the *Vegetation Management Act 1999* and considered in combination with expert opinion and similar or related guidelines from other local government codes.

For drafting the new TRC Planning Scheme codes with respect to wetlands and waterways, Conics recommend that the Gold Coast City Council's 'model' for treatment of natural wetland areas and natural waterways could be usefully considered. TRC have, however, a significantly more detailed wetland and waterway data set (and mapping) to enable greater discrimination between wetland types, wetland significance and buffering requirements. Greater detail and more specific management through codes can and should be achieved than through existing code such as for the Gold Coast City Council. Conics have not proposed code through this Final Report but elements in **Table 4.1** can be incorporated at the code-writing stage.

4.1 BUFFER APPLICATION

In a number of places in **Table 4.1**, proposed buffers are provided by wetland category and some guidance is provided to indicate how buffers should be applied in practice (i.e. where to measure buffers from or to with respect to any particular wetland). To further clarify buffer application, the following explanatory text is relevant in interpretation of entries in **Table 4.1**.

For Category 1 and 2 wetlands (non-riverine wetlands), buffers are proposed with reference to a wetland's "maximum extent". Wetland maximum extent is individual wetland specific and is the mapped boundary in the latest version of the DERM wetland mapping. At the time of writing this report, DERM Wetland Mapping and Classification Version 2.0 (October 2009) is current. It is available online at the DERM web site (via an interactive web map server) or DVD copies can be requested directly from DERM.

For Category 3 and 5 wetlands (riverine wetlands), buffers are proposed with reference to the channel "high bank". The "high bank", as a benchmark measurement point for buffers or instream activity, has precedent use through the *Vegetation Management Act 1999* and the *Water Act 2000* and the same use and definition is intended through this report.

For Category 5 wetlands (dams and weirs), buffers are proposed with reference to the mapped boundary in the latest version of the DERM wetland mapping.

TABLE 4.1 WETLANDS AND WATERWAYS OPTIONS

The preferred options in each case are shown on **BLUE** text

ISSUE	OPTIONS	ADVANTAGES (OF PREFERRED OPTION)	DISADVANTAGES (OF PREFERRED OPTION)	"STREAM1" APPLICATION PRINCIPLES (OF PREFERRED OPTION)
Category 1 wetlands – Significant non-riverine wetlands (natural)	Planning Scheme 1. Do not consider 2. Development not preferred within these wetlands. Retain and protect these wetlands. Provide mechanisms to maintain or enhance aquatic ecological function and connectivity. 3. Development not preferred within these wetlands or within a 200m buffer from the wetland's maximum extent. Retain and protect these wetlands with their buffers. Provide mechanisms to maintain or enhance aquatic ecological function and connectivity. 4. Development not preferred within these wetlands or within a buffer determined by application of the Queensland wetland buffer guidelines on a case-by-case basis. Retain and protect these wetlands with their buffers. Provide mechanisms to maintain or enhance aquatic ecological function and connectivity. NB. For Options 2-4, statutory mechanism for protection of this category to be achieved through overlay code or other relevant code (e.g. performance solutions to be drafted reflecting the above intent) Other TRC mechanisms 1. Survey TRC area Category 1 wetlands to confirm maximum extent wetland boundaries 2. Undertake wetland condition assessment to augment current management database	- Ensures that significant non-riverine wetlands are protected - Provides a simple buffer application in all cases - Consistent with Veg Mgmt Act (1999) precedent for buffering - Increased planning accuracy and reduced boundary debate	- Buffer application has less ecological rigour than by use of purpose-built wetland buffer guidelines - Buffers may reduce the area of land available for development in some parts of the TRC jurisdictional area - Nil	- Consider every Category 1 wetland, plus its buffer, as a constraint - Consider options to incorporate significant natural aquatic features as a development feature - Consider options to incorporate significant natural aquatic features in cross-landscape ecological connectivity provisions (e.g. refer vegetation management options)

ISSUE	OPTIONS	ADVANTAGES (OF PREFERRED OPTION)	DISADVANTAGES (OF PREFERRED OPTION)	"STREAM1" APPLICATION PRINCIPLES (OF PREFERRED OPTION)
Category 2 wetlands – Other mapped non-riverine wetlands (natural)	Planning Scheme - Do not consider - Development not preferred within these wetlands. Retain these wetlands and restrict development. - Development not preferred within these wetlands or within a 100m buffer from the wetland's maximum extent. Retain these wetlands with their buffers and restrict development. - Development not preferred within these wetlands or within a buffer determined by application of the Queensland wetland buffer guidelines on a case-by-case basis. Retain these wetlands with their buffers and restrict development. NB. For Options 2-4, statutory mechanism for protection of this category to be achieved through overlay code or other relevant code (e.g. performance solutions to be drafted reflecting the above intent) Other TRC mechanisms - Survey TRC area Category 2 wetlands to confirm maximum extent wetland boundaries and to consider additional management opportunity - Undertake wetland condition assessment to augment current management database	- Ensures that all other mapped non-riverine wetlands recognised and protected - Provides a simple buffer application in all cases - Consistent with Veg Mgmt Act (1999) precedent for buffering - Increased planning accuracy and reduced boundary debate - Opportunity to investigate wetlands with respect to TRC owned land	- Buffer application has less ecological rigour than by use of purpose-built wetland buffer guidelines - Buffers may reduce the area of land available for development in some parts of the TRC jurisdictional area - Nil	- Consider every Category 2 wetland, plus its buffer, as a constraint - Consider options to incorporate natural aquatic features as a development feature - Consider options to incorporate natural aquatic features in cross-landscape ecological connectivity provisions (e.g. refer vegetation management options)
Category 3 wetlands – Significant riverine wetlands	Planning Scheme - Do not consider - Development not preferred within these wetlands for entire TRC sub-catchments marked as potentially containing significant riverine wetland. Retain and protect these wetlands. Provide mechanisms to maintain or enhance aquatic ecological function and connectivity. Consider upstream influences and potential impacts. - Development not preferred within these wetlands, plus a	- Ensures that significant riverine wetlands are protected - Provides a simple buffer application in all cases - Consistent with Veg Mgmt Act (1999) precedent for buffering or other local government guidelines and expert opinion <u>Recommended stream-order buffering1:</u>	Possible extension of strict buffering and riverine wetland management to areas of lower ecological significance within the marked TRC sub-catchments	- Apply the default buffers for constraints analysis for entire marked sub-catchments in the absence of more detailed field assessment - Consider options to incorporate natural aquatic features as a development feature - Consider options to incorporate natural aquatic features in cross-landscape ecological connectivity provisions (e.g. refer vegetation management options)

ISSUE	OPTIONS	ADVANTAGES (OF PREFERRED OPTION)	DISADVANTAGES (OF PREFERRED OPTION)	"STREAM1" APPLICATION PRINCIPLES (OF PREFERRED OPTION)
	buffer according to stream order, for entire TRC sub-catchments marked as potentially containing significant riverine wetland. Retain and protect these wetlands with their buffers. Provide mechanisms to maintain or enhance aquatic ecological function and connectivity. Consider upstream influences and potential impacts. Development restrictions may be targeted or modified within a sub-catchment after assessment and recommendation by suitably qualified person to identify aquatic ecological features and extent of significant riverine wetland. NB. For Options 2-3, statutory mechanism for protection of this category to be achieved through overlay code or other relevant code (e.g. performance solutions to be drafted reflecting the above intent) Other TRC mechanisms 1. Survey TRC area Category 3 wetland sub-catchments to confirm extent of significant riverine wetland and to quantify upstream or downstream impact issues and additional management opportunity	<i>Order 1,2 = 50m from high bank</i> <i>Order 3,4 = 100m from high bank</i> <i>Order 5 or greater = 200m from high bank</i> OR <u>Recommended stream-order buffering2:</u> <i>Order 1,2,3 = 60m from high bank</i> <i>Order 4 or greater = 100m from high bank</i> - Improved natural resource management	- Nil	
Category 4 wetlands – Other 1:100000 mapped riverine wetlands	Planning Scheme 1. Do not consider 2. Development not preferred within these wetlands. Retain these wetlands and restrict development throughout relevant TRC area sub-catchments. Consider upstream influences and potential impacts. 3. Development not preferred within these wetlands, plus a buffer according to stream order, throughout relevant TRC area sub-catchments. Retain these wetlands with their buffers and restrict development. Consider upstream influences and potential impacts. Development restrictions may be targeted or modified within a sub-catchment after assessment and recommendation by	- Ensures that other wetlands are protected - Provides a simple buffer application in all cases - Consistent with Veg Mgmt Act (1999) precedent for buffering or other local government guidelines and expert opinion <u>Recommended stream-order buffering1:</u> <i>Order 1,2 = 50m from high bank</i> <i>Order 3,4 = 100m from high bank</i> <i>Order 5 or greater = 200m from high bank</i> OR	- Possible extension of strict buffering and riverine wetland management to areas of lower ecological significance within each sub-catchments	- Apply the default buffers for constraints analysis for all sub-catchments in the absence of more detailed field assessment - Consider options to incorporate natural aquatic features as a development feature - Consider options to incorporate natural aquatic features in cross-landscape ecological connectivity provisions (e.g. refer vegetation management options)

ISSUE	OPTIONS	ADVANTAGES (OF PREFERRED OPTION)	DISADVANTAGES (OF PREFERRED OPTION)	"STREAM1" APPLICATION PRINCIPLES (OF PREFERRED OPTION)
	suitably qualified person to identify aquatic ecological features. NB. For Options 2-3, statutory mechanism for protection of this category to be achieved through overlay code or other relevant code (e.g. performance solutions to be drafted reflecting the above intent) Other TRC mechanisms 1. Consider riverine wetlands in broader landscape management initiatives, particularly with respect to wildlife and scenic amenity corridor establishment and maintenance	<u>Recommended stream-order buffering²:</u> Order 1,2,3 = 30m from high bank Order 4 or greater = 50m from high bank		
Category 5 wetlands – Dams, weirs and reservoirs	Planning Scheme 1. Do not consider 2. Control development within weir, dam or reservoir areas according to existing TRC management guidelines or policies and/or according to relevant legislative requirements 3. Control development within weir, dam or reservoir areas plus a 100m buffer or according to existing TRC management guidelines or policies and/or according to relevant legislative requirements. Apply greatest development limits or buffers accordingly. Other TRC mechanisms 1. Continue TRC initiatives to better understand all dams, weirs and reservoirs. In particular, continue efforts to implement best-practice catchment management and water quality management in each case 2. Encourage partnership with relevant state and federal government agencies to promote and/or re-establish	- Consistent with existing management instruments and expert opinion	- Need for complex cross-referencing between the TRC Planning Scheme and other planning instruments, guidelines and policies	- Apply the default buffers for constraints analysis for all sub-catchments in the absence of more detailed field assessment - Consider options to incorporate natural aquatic features as a development feature - Consider options to incorporate natural aquatic features in cross-landscape ecological connectivity provisions (e.g. refer vegetation management options)

ISSUE	OPTIONS	ADVANTAGES (OF PREFERRED OPTION)	DISADVANTAGES (OF PREFERRED OPTION)	"STREAM1" APPLICATION PRINCIPLES (OF PREFERRED OPTION)
	native fish passage in the case of all instream barriers			
Category 6 wetlands – Artificial non-riverine wetlands	Planning Scheme 1. Do not consider 2. Restrict development to ensure any dam/weir alteration or removal proceeds without significant environmental impact, without environmental flows impact or without potential impact to downstream wetlands in any other Category.	- allows consideration of artificial wetland modification with respect to other TRC area aquatic ecosystem values	- private ownership issues - potentially influences private commercial activity beyond the development itself such as farming operations	- Consider these wetlands in the lowest planning constraint category
Wetland mapping error and mapping updates	Planning Scheme 1. Updates for all mapping overlays and for wetland category membership must be included at regular intervals through the life of the Planning Scheme or, at least, as a mandatory review element at the end of each statutory planning cycle Other TRC mechanisms 1. Survey all TRC wetlands and re-assess 'values' accordingly	- Mapping accuracy guaranteed to be at least equal to best available state-wide mapping	- Nil	
Wetland mapping scale	Planning Scheme 2. Updates for all mapping overlays and for wetland category membership must be included at regular intervals through the life of the Planning Scheme or, at least, as a mandatory review element at the end of each statutory planning cycle Other TRC mechanisms 1. Survey all TRC wetlands at finer scale and re-assess 'values' accordingly	- Mapping accuracy guaranteed to be at least equal to best available state-wide mapping	- Nil	

ISSUE	OPTIONS	ADVANTAGES (OF PREFERRED OPTION)	DISADVANTAGES (OF PREFERRED OPTION)	"STREAM1" APPLICATION PRINCIPLES (OF PREFERRED OPTION)
Missing wetlands (unmapped wetlands)	Planning Scheme - Do not consider - Require pre-development assessment by suitably qualified person to identify aquatic ecological features. Identify ecologically significant wetland and riparian areas and consider impact mitigation requirements including development exclusion from area and/or appropriate buffer. Other TRC mechanisms - Survey TRC area for wetlands below current mapping scale. In particular, survey for springs and other significant small non-riverine wetlands	- Ensures that significant but unmapped aquatic ecological assets are not ignored. - Provides the best opportunity for sustainable development at all scales. - Provides more accurate and more comprehensive natural resource mapping for future planning and management	- Requires additional pre-development environmental asset identification and impact assessment - Survey expense - Requires TRC mapping updates	
Upstream/downstream issues and connectivity (particularly for riverine wetlands)	Planning Scheme - Allow for consideration of significant aquatic connectivity constraints in development codes where appropriate - Update code as connectivity issues are identified both within aquatic systems and between aquatic and terrestrial systems Other TRC mechanisms - Survey TRC area with respect to aquatic ecosystem connectivity dependencies and implement management strategies accordingly	- Ensures consideration of environmental impact off-site and environmental dependencies on-site rather than just immediate development impacts at the site - Also ensures some consideration of cumulative aquatic ecosystem impact across the TRC region	- Complex assessment issue that requires appropriately qualified person(s) and assessment across wider areas than development footprint	

5.0 CONCLUSIONS AND RECOMMENDATIONS

The TRC Wetlands and Waterways Study has provided a detailed wetland data set for TRC planning and ecosystem management purposes. It has also created a package of wetland mapping layers (already provided to the TRC in ESRI format) that has full coverage for wetlands across the TRC area including their wetland categorisation. With this information as a foundation, Conics have proposed a number of planning and management options that are offered for consideration in the next stages of TRC Planning Scheme development and in broader initiatives for TRC management of natural resources in their region.

The wetlands and waterways of the TRC area are a valuable natural resource. The use of a structured wetland significance category system in TRC planning instruments will ensure that wetlands of all types, and particularly those with the highest environmental values, are managed appropriately. Importantly, technically rigorous recognition of wetland type, wetland significance and wetland location provides another mechanism that supports sustainable development and that increases the likelihood, through appropriate wetland management or protection, of positive outcomes in a broader landscape context. In the case of riverine wetlands (waterways), for example, this may mean minimisation of downstream water quality or biodiversity impacts for neighbouring stakeholders and in neighbouring local or state jurisdictions.

Conics recommend that the wetland significance categories (WSGs) (**Section 2.4.3**), the wetland mapping layers (already provided to TRC) and the preferred wetland planning/management options (**Table 4.1**) are adopted and are carried forward into the next stages of TRC Planning Scheme development. Conics also recommend that the outcomes and data from the Wetlands and Waterways Study are used in TRC natural resource management initiatives not directly associated with the Planning Scheme.

6.0 REFERENCE LIST

Queensland Department of Environment and Resource Management (DERM) 2009a. Wetland mapping and classification for Queensland Version 1.3, State of Queensland, Brisbane.

Queensland Department of Environment and Resource Management (DERM) 2009b. Wetland Summary Information, Accessed online at:

<http://www.epa.qld.gov.au/wetlandinfo/site/MappingFandD/WetlandMapsAndData/SummaryInfo.jsp>

Clayton, P.D., Fielder, D.P., Howell, S. and Hill, C.J. 2006. Aquatic Biodiversity Assessment and Mapping Method (AquaBAMM): a conservation values assessment tool for wetlands with trial application in the Burnett River catchment. Published by the Environmental Protection Agency, Brisbane.

APPENDIX A REVIEWED DATA, LITERATURE AND MAPPING

DATASETS (WHERE AVAILABLE AND WHERE RELEVANT)
Planning Scheme overlay mapping for the following shires: Crows Nest, Rosalie, Jondaryan, Pittsworth, Clifton, Cambooya, Millmerran and Toowoomba City
DERM drainage mapping and land tenure mapping
DERM ACA (wetland values assessment) for the Condamine River catchment and the Border Rivers catchment
Queensland EPA Wetland Mapping and Classification for Queensland (now also DERM)
Literature
Condamine Alliance State of the Catchment Report 2004 – 2008 Natural Solutions 2008
Condamine Catchment Natural Resource Management Plan 2004
Draft South East Queensland Natural Resource Management Plan 2008
Gowrie Creek Catchment Management Strategy 1998
Westbrook Creek Catchment Management Plan 2000
Spring Creek Catchment Management Strategy 1998
State of the Environment Report Toowoomba – Creeks 2003
Healthy Land – Our livelihood – Our future. A project focusing on ecosystem services in Crowns Nest Shire 2005
Lake Cooby Rangers Manual for Toowoomba City Council January 1996
Lakes Cooby, Perseverance and Cressbrook Landscape Master Plan for Toowoomba City Council (Nov 1995)
Lakes Cooby, Perseverance and Cressbrook Management Plan for Toowoomba City Council (Jan 1996)
Regional Land Use Study EDROC Volume 2 Planning Study 1996
State of the Environment Toowoomba City Council 2001 (Summary)
Water Quality Management Strategy for Cooby, Perseverance and Cressbrook Catchments (Toowoomba City Council and Crows Nest Shire Council) 2003
Crows Nest Shire Council Conservation Agreement Policy
2005–2006 Water Audit Monitoring Program Report of the Murray Darling Basin Commission of the cap on diversions 2007
Condamine Alliance Strategic Salinity Risk Information System 2006

3D Groundwater Model Pilot Project Condamine Alliance 2007
DEM Scoping Study Condamine Catchment 2007
Draft Resource Operations Plan – Condamine Catchment 2007
An Overview of Methods for Estimating Climate Change Impact on Runoff 2006
Cooby Ecotender: Implementation of Targeted MBI Program in Improving Land Management Practices to Benefit Water Quality in the Cooby Catchment 2008
QMDB Water Resource Condition and Trend Report 2003
Condamine Alliance Wetlands Project 2005
Strategic Salinity Risk Assessment in the Condamine Catchment 2007

APPENDIX B GLOSSARY OF TECHNICAL TERMS

Buffer	The area between the wetland ecosystem and human activities and developments in the surrounding landscape that threaten the wetland's values. It is not necessarily a development free area and may include some activities that do not threaten the wetland's values.
Environmental Value	Environmental 'value' is a concept distinct from, but inclusive of, ecological condition or health. Information about ecosystem condition can inform assessment of its value but condition and value are not necessarily correlated. For this study also, environmental value does not infer social or economic value
Lacustrine	This refers to lakes, dams and other wetlands where open water dominates the wetland's areal extent.
Palustrine	This refers vegetation dominated wetlands and is most easily conceptualised with older terms such as swamp or marsh. Areas of open water may still occur but the greatest percentage area of these wetlands will be dominated, when full, with vegetation. This includes, in some case, emergent trees and shrubs as well as aquatic or semi-aquatic plants.
Riverine	This refers to river, creek or stream channels and their associated riparian ecosystems.
Wetland	<i>defined in Section 2.2.1</i>