

Assessment of Water Resource Plans under the *Water Act 2000* (Qld): With Consideration of Ecological Outcomes and Environmental Flow Objectives in the context of the Precautionary Principle and Sustainable Management¹

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The Water Act 2000 (Qld) provides for the sustainable management of Queensland's water resources. A principal mechanism to achieve this outcome is the development of water resource plans. These plans may define the availability of water for any purpose and may provide a framework for reversing degradation. They must include ecological outcomes and, if transferable water allocations are envisaged, environmental flow objectives. It is suggested that the Water Act intends that the decision making process leading to the assignment of ecological outcomes and environmental flow objectives (and implicitly the volume of water marked for possible allocation to consumptive uses) in water resource plans should comply with the purpose to advance sustainable management and should incorporate the precautionary principle. Ecological outcomes from the Boyne River Basin water resource plan are considered and selected environmental flow objectives assigned in the Burnett Basin water resource plan are evaluated against identified limits to flow regime change.

Introduction

Queensland's new *Water Act 2000*² was introduced into Parliament on 22 June 2000, passed on 7 September and assented to on 13 September 2000. The Act was developed to fulfil Queensland's responsibilities under the Council of Australian Governments' (COAG) 1994 Water Resources Policy and under National Competition Policy guidelines.

The *Water Act 2000* (Qld) is apportioned into chapters. Chapter 2 establishes a system for the planning, allocation and use of water in order to advance sustainable management and efficient use of water and other resources³. Important aspects of this chapter include: water planning; the provision of mechanisms for creating transferable and tradeable water entitlements; providing water for maintaining river health; increasing the reliability of supply to water users; and opportunities for managing overland flow water, when required⁴.

Chapter 3 provides for: a regulatory framework for providing water and sewerage services; the functions and powers of service providers; the protection of the interests of customers of service providers; the regulation of referable dams; and for flood mitigation responsibilities⁵. Chapter 4 provides a framework for the establishment and operation of water authorities⁶.

¹ This paper is a greatly expanded version of the paper presented at the 3rd Australasian Natural Resources Law and Policy Conference – Focus on Water, 22-23 March 2001 Adelaide, South Australia titled 'Allocation and Sustainable Management of Water in Queensland'.

² Act No 34 of 2000. References in this paper to the *Water Act 2000* (Qld) refer to the Act as assented to on 13 September 2000.

³ *Water Act 2000* (Qld), s 10(1).

⁴ *Ibid*, s 38(3-5).

⁵ *Ibid*, s 361.

⁶ *Ibid*, s 542.

This paper will consider a number of issues addressed in Chapter 2, in particular, water resource plans, ecological outcomes and environmental flow objectives in the context of sustainable management and the precautionary principle. Consideration of these issues is very important because a number of water resource plans under the *Water Act 2000* (Qld), including the very controversial Condamine-Balonne water resource plan⁷, will be finalised in the near future. In addition, the *Water Infrastructure Development (Burnett Basin) Act 2001*(Qld) was introduced into Parliament on 15 May 2001 and assented to on 7 June 2001. The *Water Infrastructure Development (Burnett Basin) Act 2001* is an Act to facilitate investigations into the feasibility of developing water infrastructure in the Burnett Basin⁸. The Explanatory Notes to this Act stated that "the objective of the legislation is to allow for the rapid investigation of the feasibility of water infrastructure development in the Burnett Basin ..."⁹. Before environmental impact assessments take place for proposed developments it is important that the appropriateness of the environmental outcomes and environmental flow objectives in existing water resource plans are evaluated.

It is emphasised that this paper is not concerned with assessing the merits of a particular water allocation scenario implicitly provided for in a water resource plan. The assessment considers the decision making process leading to the assignment of ecological outcomes and environmental flow objectives and whether the decision making process incorporated the precautionary principle and advanced sustainable management.

Queensland water law relating to water planning and allocation

Purpose

According to s 10(1) of the *Water Act 2000* (Qld) (the Act) the purpose of Chapter 2 is "to advance sustainable management and efficient use of water and other resources by establishing a system for the planning, allocation and use of water". The term 'sustainable management' is defined in s 10(2) of the Act as management that:

- (a) "allows for the allocation and use of water for the physical, economic and social well being of the people of Queensland and Australia within limits that can be sustained indefinitely; and
- (b) protects the biological diversity and health of natural ecosystems; and
- (c) contributes to the following-
 - (i) improving planning confidence of water users now and in the future regarding availability and security of water entitlements;
 - (ii) the economic development of Queensland in accordance with the principles of ecologically sustainable development¹⁰ [ESD];
 - (iii) maintaining or improving the quality of naturally occurring water and other resources that benefit the natural resources of the State;
 - (iv) protecting water, watercourses, lakes, springs, aquifers, natural ecosystems and other resources from degradation and, if practicable, reversing degradation that has occurred;
 - (v) recognising the interests of Aboriginal people and Torres Strait Islanders and their connection with the landscape in water planning;

⁷ For a very interesting history and analysis of water allocation and management in the Lower Balonne, Queensland, see P-L Tan, "Conflict over Water Resources in Queensland: all Eyes on the Lower Balonne" (2000) 17 *EPLJ* 545.

⁸ Long title to the *Water Infrastructure Development (Burnett Basin) Act 2001* (Qld).

⁹ Explanatory Notes to the *Water Infrastructure Development (Burnett Basin) Bill 2001* (Qld) p 1. Text can be found under Bills introduced to the 50th Parliament 2001 on the Internet site: <<http://www.legislation.qld.gov.au/Bills.htm>>

¹⁰ 'Principles of ecologically sustainable development' (ESD) are defined in the *Water Act 2000* (Qld), s 11.

- (vi) providing for the fair, orderly and efficient allocation of water to meet community needs;"
- (vii) etc.

The principles of ecological sustainable development as defined in the Act include the precautionary principle¹¹.

Water Resource Plans

The Act states that "For advancing the purposes of this chapter - the Minister must plan for the allocation and sustainable management of water to meet Queensland's future water requirements, including, for example, for the protection of natural ecosystems and security of supply to water users ..."¹². Thus "the Minister may prepare a water resource plan for any part of Queensland to advance the sustainable management of water"¹³.

If and when the Governor in Council approves the final draft water resource plan the plan becomes subordinate legislation¹⁴. In general, subordinate legislation in Queensland expires on 1 September first occurring after the 10th anniversary of the day of its making¹⁵. Thus, water resource plans have a maximum life of 10 years. The Minister must prepare a new water resource plan to replace an existing water resource plan before the existing water resource plan expires¹⁶. However, a water resource plan may be amended¹⁷ and must be amended if the Minister is satisfied that a report on the water resource plan made under the Act¹⁸ shows that a water resource plan's environmental flow objectives or water allocation security objectives are no longer appropriate for the plan area or not being met¹⁹. Note that there are no provisions whereby the public can initiate a revision of a water resource plan.

The *Water Resource (Burnett Basin) Plan* 2000 (Qld)²⁰ (Burnett Basin Plan) and the *Water Resource (Boyne River Basin) Plan* 2000 (Qld)²¹ (Boyne River Basin Plan) were approved by the Governor in Council on 14 December 2000 and notified in the Government Gazette on 15 December 2000. The administering agency is the Queensland Department of Natural Resources and Mines, formerly the Department of Natural Resources (the Department). Table 1 lists the purposes that a water resource plan may have and also lists the specific purposes of the Burnett Basin and Boyne River Basin Plans. Note that in the Burnett Basin and Boyne River Basin Plans there are no additional purposes other than those suggested in the Act and that no provisions have been created to manage overland flow water in these basins.

As shown in Table 1, two important purposes of the Burnett Basin and Boyne River Basin Plans are: to define the availability of water in the plan area; and to provide a framework for sustainably managing water and the taking of water. These two purposes will be evaluated below.

¹¹ *Water Act* 2000 (Qld), s 11(b).

¹² *Ibid*, s 35(a).

¹³ *Ibid*, s 38(1).

¹⁴ *Ibid*, s 50 (2) & (3)(a).

¹⁵ *Statutory Instruments Act* 1992 (Qld), as in force 2 March 2001, s 54(1).

¹⁶ *Water Act* 2000 (Qld), s 55(1)(b) & (3).

¹⁷ *Ibid*, s 55(1)(a).

¹⁸ *Ibid*, s 53.

¹⁹ *Ibid*, s 55(2).

²⁰ *Water Resource (Burnett Basin) Plan* 2000 (Qld), SL No 359/2000.

²¹ *Water Resource (Boyne River Basin) Plan* 2000 (Qld), SL No 358/2000.

A further purpose of water resource plans can be to provide a framework for establishing 'water allocations'. In approved circumstances, the Act enables the conversion of water licences²² to, or the granting of²³, water allocations. A water allocation is an authority to take water²⁴ subject to the resource operations plan (described below) for the plan area where the water is taken²⁵ and subject to the elements and conditions prescribed on the entitlement, such as volume of water, location from which water may be taken, the flow conditions under which the water may be taken and priority (or reliability) group to which the allocation belongs²⁶. Water allocations may be 'changed' (eg change the location from which the water may be taken under the allocation)²⁷ or 'transferred'²⁸ (the passing of the legal or beneficial interest²⁹) if permitted under the water allocation transfer rules³⁰ and if approved by the responsible chief executive³¹. That is, water allocations may, when approved, be traded and/or used at another location.

A water resource plan must state 'outcomes', including 'ecological outcomes', "for the sustainable management of the water and strategies proposed to achieve the outcomes to the extent possible from the best scientific information available"³². An ecological outcome is defined in the Act as "a consequence for an ecosystem in its component parts specified for aquifers, drainage basins, catchments, subcatchments and watercourses"³³.

If a water resource plan has the purpose to provide a framework for establishing water allocations then the draft plan must also state the following³⁴:

- environmental flow objectives;
- water allocation security objectives³⁵;
- performance indicators for environmental flow objectives and water allocation security objectives;
- priority areas for the conversion to or granting of water allocations.

An environmental flow objective (EFO) is defined in the Act as a "flow objective for the protection of the health of natural ecosystems for the achievement of ecological outcomes"³⁶. A 'performance indicator' is defined in the Act as a "measure that can be calculated and is stated in a water resource plan to assess the impact of an allocation and management decision or proposal on water entitlements and natural ecosystems"³⁷.

²² *Water Act* 2000 (Qld), s 121.

²³ *Ibid*, s 122.

²⁴ *Ibid*, Schedule 4 Dictionary 'water allocation'.

²⁵ *Ibid*, s 123(1).

²⁶ *Ibid*, s 128(1).

²⁷ *Ibid*, s 128(1)(b).

²⁸ *Ibid*, s 129.

²⁹ *Ibid*, Schedule 4 Dictionary 'Transfer'. 'Transfer' of a resource operations licence, an interim resource operations licence or a water allocation, means the passing of the legal or beneficial interest in the licence or allocation.

³⁰ *Ibid*, s 129(1) & (2).

³¹ *Ibid*, s 134(1).

³² *Ibid*, s 46(1)(e).

³³ *Ibid*, Schedule 4 Dictionary 'ecological outcome'.

³⁴ *Ibid*, s 46(3).

³⁵ *Ibid*, Schedule 4. A 'water allocation security objective' is defined as "an objective that may be expressed as a performance indicator and is stated in a water resource plan for the protection of the probability of being able to obtain water in accordance with a water allocation".

³⁶ *Ibid*, Schedule 4 Dictionary 'environmental flow objective'.

³⁷ *Ibid*, Schedule 4 Dictionary 'performance indicators'.

Resource operations plans

A resource operations plan (ROP) is a plan developed to implement a water resource plan for any water in the plan area in all or part of the plan area³⁸. Only one resource operations plan may have effect for each water resource plan at any time³⁹. Draft resource operations plans must include the following⁴⁰:

- the identification of any water infrastructure to which the draft plan is intended to apply and how it will be operated;
- how the chief executive will sustainably manage water to which the resource operations plan is intended to apply;
- the water and natural ecosystem monitoring practices that will apply in the proposed area;
- how the draft resource operations plan addresses water resource plan outcomes.

If the draft resource operations plan provides for water allocations (transferable and tradeable entitlements), the resource operations plan must state the conversion rules for converting existing water licences to water allocations⁴¹ and "the environmental management rules, water sharing rules, water allocation transfer rules and seasonal water assignment rules for water to which the draft plan is intended to apply"⁴². In addition, the draft resource operations plan may include "a process for granting, reserving or otherwise dealing with unallocated water to which the draft resource operations plan is intended to apply and a process for meeting future water requirements in the plan area"⁴³.

Naturally, an important requirement of a resource operations plan is that the plan must be consistent with the relevant water resource plan⁴⁴.

Purpose of the *Water Act* 2000 and water resource plans

As Fisher (2000a)⁴⁵ highlighted, some statements of objects in Australian legislation describe the process for decision making and some describe "... the substance of the outcomes anticipated for the decision making process created by the Act"⁴⁶. With reference to Australian water legislation Fisher, in his text *Water Law* (2000b), stated "What has emerged during the 1990's and is continuing to emerge are statutory systems that comprise not only traditional regulatory mechanisms for controlling the use and development of water resources but statutory structures that direct the achievement of specific outcomes, indicate the strategies for achieving these outcomes, require the formulation of plans for supporting these strategies and prescribe systems for the regulation and enforcement of this regime"⁴⁷.

The *Water Act* 2000 (Qld) is very clear in defining specific outcomes anticipated for the decision making process and in directing the achievement of these outcomes. For example, the long title to the Act is "An Act to provide for the sustainable management of water ...". Chapter 2 of the Act is titled 'Allocation and sustainable management' and has the purpose "to advance

³⁸ Ibid, s 95(1).

³⁹ Ibid, s 95(2).

⁴⁰ Ibid, s 98(1).

⁴¹ Ibid, s 98(4)(a).

⁴² Ibid, s 98(4)(b).

⁴³ Ibid, s 98(2)(c) & (d).

⁴⁴ Ibid, s 103(2). "If the final draft resource operations plan is not inconsistent with the water resource plan the Governor in Council may approve the final draft resource operations plan".

⁴⁵ DE Fisher, "Considerations, Principles and Objectives in Environmental Management in Australia" (2000a) 17 EPLJ 487.

⁴⁶ Ibid at 488.

⁴⁷ DE Fisher, *Water Law* (1st ed, The Law Book Co Ltd, Sydney, 2000b), Ch 1, p 7.

sustainable management and efficient use of water and other resources by establishing a system for the planning, allocation and use of water"⁴⁸ (emphasis added).

In addition, s 35 of the Act states that: "For advancing the purposes of this chapter [Chapter 2] the Minister must plan for the allocation and sustainable management of water to meet Queensland's future water requirements, including, for example, for the protection of natural ecosystems and security of supply to water users". Further, s 38(1) provides that the Minister may prepare a water resource plan for any part of Queensland to advance the sustainable management of water" (emphasis added).

There are sixteen matters that the Minister must consider when preparing water resource plans⁴⁹. These include: the State's water rights and the volume and quality of water; national, State and regional objectives and priorities for promoting sustainable development; the duration, frequency, size and timing of water flows necessary to support natural ecosystems as assessed using the best scientific information available; the State's future water requirements, including cultural, economic, environmental and social requirements; cultural, economic and social values; advice from the community reference panel; technical assessments for the draft plan; and so on.

Fisher (2000a), referring to the comments made by Chief Justice Black in the *Tickner v Bropho* case⁵⁰ regarding the application of the purposes of the relevant Act, stated "The Full Court thus determined that the Minister was under an obligation not stated in the Act. The existence of the obligation was implied largely by reference to the purposes of the Act ..."⁵¹. Applying this judicial principle to the *Water Act* 2000, the Minister, when preparing a water resource plan, must, in addition to the consideration of the sixteen matters, consider the advancement of sustainable management, the purpose of the Act.

To emphasise this the Act sets out a specific obligation, namely, "If under this chapter [Chapter 2], a function or power is conferred on an entity, the entity must perform the function or exercise the power in a way that advances this chapter's purpose"⁵². Following the reasoning in Fisher (2000a)⁵³ it is submitted that the Act places a duty upon those responsible for administering the Act to develop water resource plans that will advance, or progress towards, the sustainable management of Queensland's water resources.

Bates (1994)⁵⁴ (also quoted in Stein (2000)⁵⁵) noted the obligation placed by the Tasmanian resource management and planning legislation on "... any person performing functions or exercising powers under the legislation to do so in accordance with the stated objectives of 'sustainable development' ". Bates suggested that "... decision making processes in relation to planning and environment protection covered by the new package of legislation may be challenged in law as not having been based on, or having failed to reasonably consider, principles of sustainable development"⁵⁶.

⁴⁸ *Water Act* 2000 (Qld), s 10(1).

⁴⁹ *Ibid*, s 47.

⁵⁰ (1993) 114 ALR 409.

⁵¹ Fisher, *op cit* n 45, at 489.

⁵² *Water Act* 2000 (Qld) s 12.

⁵³ Fisher, *op cit* n 45, at 494.

⁵⁴ G Bates, "Implementing ESD" Editorial (1994) 11 EPLJ 251.

⁵⁵ PL Stein, "Are Decision-makers too Cautious with the Precautionary Principle?" (2000) 17 EPLJ 3 at 12

⁵⁶ Bates, *op cit* n 54, at 253.

There can be no uncertainty as to the intent and obligations of Chapter 2 in the Act with respect to water resource plans. Water resource plans created under the Act are intended to advance sustainable management of water. When consideration is given to a matter, such as, the State's future water requirements, this matter would need to be considered within the specific obligation to exercise the power of decision making in a way that advances sustainable management of water resources.

Hence, it is submitted that the Act intends that the decision making process leading to the assignment of ecological outcomes and environmental flow objectives (and implicitly the volume of water marked for possible allocation to consumptive uses) in water resource plans should comply with the purpose of advancing sustainable management of water and should incorporate the precautionary principle. The following will evaluate selected ecological outcomes and environmental flow objectives listed in the Boyne River Basin Plan and the Burnett Basin Plan with respect to the specific obligation.

Ecological outcomes – positive and negative?

An ecological outcome is defined in the Act as "a consequence for an ecosystem in its component parts specified for aquifers, drainage basins, catchments, subcatchments and watercourses"⁵⁷. An important question arises as to whether the 'consequence' can be negative as well as positive. Tables 2 and 3 list the ecological outcomes for the Boyne River Basin Plan and the Burnett Basin Plan, respectively.

The ecological outcomes listed for the Boyne River Basin Plan⁵⁸ (see Table 2) include the following major ecological outcome: "River flows are to be managed ... to allow for an increase in the frequency and duration of marine conditions in the estuarine reach downstream of Awoonga Dam leading to a shift towards plant and animal species that favour or tolerate the increase"⁵⁹. This ecological outcome refers to a change in the ecology downstream of the dam due to the proposed raising of Awoonga Dam (and the associated reduced flows of freshwater). Thus this ecological outcome is arguably a negative outcome. An important question is whether ecological outcomes, in general, can be negative under the Act, given the purpose of Chapter 2 for sustainable management of water, including the requirement that the allocation of water is within limits that can be sustained indefinitely⁶⁰. Considering the definition of an environmental flow objective: "a flow objective for the protection of the health of natural ecosystems for the achievement of ecological outcomes"⁶¹, it appears that ecological outcomes are not envisaged by the Act to be negative outcomes (emphasis added).

An important related issue is the assessment of the achievement of ecological outcomes. In both the Boyne River Basin Plan and the Burnett Basin Plan baseline data or references to technical documents containing baseline data are not included in the plans.

Under the Act water resource plans may include a map or maps showing water information for the area and may include other information⁶². It is suggested that the existing ecological conditions and species lists relevant to each node (reference sites within the plan area) be provided in water resource plans and be made a requirement under the Act.

⁵⁷ *Water Act* 2000 (Qld) Schedule 4 Dictionary 'ecological outcome'.

⁵⁸ *Water Resource (Boyne River Basin) Plan* 2000 SL No. 358 of 2000, s 7.

⁵⁹ *Ibid*, s 7(g).

⁶⁰ *Water Act* 2000 (Qld), s 10(2)(a).

⁶¹ *Ibid*, Schedule 4 Dictionary 'environmental flow objective'.

⁶² *Ibid*, s 46(2)(a).

Environmental flow objectives, levels of impact and identified limits to flow regime change

The term 'environmental flows' has been described by Arthington (2000) as "features of a river's natural flow regime needed to maintain the physical integrity of watercourses, the species and communities living in rivers and floodplains and essential ecosystem processes"⁶³. As natural flow regimes have a number of key features or flow events, such as base flows, seasonality, dry season low flows, flushes and timing and duration of peak flows of floods⁶⁴, a set of 'key flow indicators' was identified to describe these important flow events by the Technical Advisory Panels (TAPs) to the Queensland Government. Note that TAPs are not legislated for in the Act.

In the Act the key flow indicators have two applications with respect to water resource plans. One application is in assigning objectives for each key flow indicator for the protection of the health of natural ecosystems (environmental flow objectives) and the other application is performance evaluation. Seven key flow indicators (called performance indicators in the Act) for medium to high flows and nine key flow indicators for low flows were identified for the Burnett Basin Plan⁶⁵ (see Table 4). Further information on these indicators can be obtained from Brizga (2000)⁶⁶. An environmental flow objective is defined in the Act as a "flow objective for the protection of the health of natural ecosystems for the achievement of ecological outcomes"⁶⁷. In the Burnett Basin Plan environmental flow objectives were assigned to the sixteen key flow indicators at most nodes in the plan area.

To determine the level of environmental flows needed to maintain the health of aquatic ecosystems the TAP developed the concept of 'levels of departure from modelled natural flow regimes' (levels of flow regime change). Two important levels were identified. Level 1 was defined as "the level above which assessed sites are more likely to have no/minor impacts of water resource development on geomorphological and/or ecological conditions". Level 2 was defined as "the level below which assessed sites are more likely to have major/very major impacts of water resource development on geomorphological and/or ecological conditions"⁶⁸. In association with the concept of levels of departure from modelled natural flow regimes, the TAP developed risk assessment diagrams to relate key flow indicators for medium to high flows to the ecological condition of the waterway at each node. These diagrams were coloured to grade from green to yellow towards red with increasing risk of degradation due to changes in the flow regime. On each risk diagram for a key flow indicator two values representing Level 1 and Level 2 could be plotted⁶⁹.

To assess the impacts of existing water resource development on the key flow indicators the Burnett Basin was hydrologically modelled using the Integrated Quantity and Quality

⁶³ AH Arthington, "Environmental flow objectives" (2000) Proceedings Water Act 2000 Symposium, 14 October 2000, The University of Queensland, Brisbane, Queensland Environmental Law Association, p 9.

⁶⁴ Ibid, p 11.

⁶⁵ *Water Resource (Burnett Basin) Plan* 2000 (Qld) SL No. 359 of 2000, s 20(b).

⁶⁶ SO Brizga, *Burnett Basin WAMP Proposed Environmental Flow Performance Measures* (Prepared for and published by the Queensland Department of Natural Resources, 2000).

⁶⁷ *Water Act* 2000 (Qld), Schedule 4.

⁶⁸ Brizga, op cit n 66, p 35.

⁶⁹ Risk assessment diagrams for selected nodes within the Burnett Basin were plotted for 7 key flow indicators for medium to high flows (mean annual flow, annual proportional flow deviation, flow regime class, 1.5 year average recurrence interval (ARI) daily flow, 5 year ARI daily flow, 20 year ARI daily flow and mean wet season flow). See Queensland Department of Natural Resources, *Draft Water Allocation and Management Plan (Burnett Basin) June 2000 (Draft WAMP)* (Queensland Government 2000).

Modelling (IQQM) computer program⁷⁰. The hydrological model can also be used to simulate changes in the flow regime due to changes in water use, such as building dams and/or extracting water. Different water use scenarios may result in different values for key flow indicators. The simulated values for the key flow indicators under existing water allocations and licences and for possible future water use scenarios can be plotted on the risk assessment diagrams and compared with the Level 2 values.

An important question that arises when assigning environmental flow objectives is 'what should the maximum level of departure from natural flow regimes be'? That is, 'what should the basin-wide 'limit of flow regime change' be'?

Due to uncertainties in the benchmarking models⁷¹ and differences in response of natural stream characteristics to changes in flow regime, the TAP recommended a conservative approach in setting a basin-wide limit to flow regime change (called environmental flow limits by the TAP and by the Department). For medium to high flows the TAP suggested "... adding a safety margin of at least 2% in the setting of any efl [environmental flow limit] based on Level 2 (the level below which major/very major impacts are more likely to occur)"⁷² (emphasis added). The TAP also recommended reach-specific limits in reaches of high conservation values that were higher than the basin-wide limits of flow regime change – "In the case of reaches which have high conservation values which are susceptible to impact as a result of flow regime change, it may be appropriate to set a higher efl than the basin-wide efl"⁷³.

The draft Burnett Basin plan did propose a basin-wide limit level. The term used was 'environmental flow limits'. Environmental flow limits "represent the levels of change beyond which there is considered to be an increased risk of unacceptable environmental degradation. ... [T]he draft Plan proposes that the environmental flow limits be set at 2% above the Level 2 values"⁷⁴ (emphasis added). That is, the draft Burnett Basin plan proposed a level representing a limit of flow regime change that used the minimum safety margin suggested by the TAP.

Following the recommendations presented by the TAP in Brigza (2000)⁷⁵ and the concept of environmental flow limits proposed in the draft Burnett Basin plan⁷⁶, the premise of this paper is that a cautious basin-wide limit of flow regime change should be identified that represents the 'maximum allowable divergence' of flows from their natural regime (to retain healthy watercourses) and that all environmental flow objectives should be assigned within this level or, if a specific reach is over allocated, towards this level, if ecologically appropriate⁷⁷. Reach-specific limit levels should also be identified for reaches with high conservation values.

Thus the precautionary principle can be incorporated into the decision making process for assigning environmental flow objectives by:

⁷⁰ See *Water Resource (Burnett Basin) Plan* 2000 (Qld) SL No. 359 of 2000, s 14.

⁷¹ Level 1 and Level 2 are based on a process of benchmarking undertaken by the TAP at selected reference sites throughout the Burnett Basin (reference sites are called nodes in water resource plans) "The benchmarking methodology is based on comparisons between the river reaches under consideration and a set of reference reaches subject to varying levels of impact resulting from existing water resource development". "Relationships of flow regime change to geomorphological and ecological impacts were examined graphically, the graphs becoming benchmarking models ..." Brizga, op cit n 66, p 6 & p 25.

⁷² Brizga, op cit n 66, p 51.

⁷³ Brizga, op cit n 66, pp 51 - 52.

⁷⁴ Queensland Department of Natural Resources, *Draft Water Allocation and Management Plan (Burnett Basin) June 2000 (Draft WAMP)* (Queensland Government 2000), p 18.

⁷⁵ Brizga, op cit n 66, p 51.

⁷⁶ Queensland Department of Natural Resources op cit n 74, see page 18.

⁷⁷ See the Section 'Should the clock be turned back' Brizga op cit n 66, p 52.

- (i) identifying a limit to flow regime change that is cautious based on the best scientific information available; and
- (ii) assigning environmental flow objectives within this limit of flow regime change or, if the reach is over allocated, towards this limit, if ecologically appropriate.

This procedure could have general application to other water resource plans within Queensland and elsewhere.

Complying with the purpose of the Act: ESD and the precautionary principle

Recall the obligations of the Act⁷⁸, namely to advance sustainable management of water resources. Recall also, that the "The Minister may prepare a water resource plan for any part of Queensland to advance the sustainable management of water"⁷⁹ where sustainable management includes contributing to, among other matters, the economic development of Queensland in accordance with the principles of ecologically sustainable development⁸⁰.

The precautionary principle is one of six principles of ecologically sustainable development given in the Act. It is defined as follows "if there are threats of serious or irreversible environmental damage, lack of full scientific certainty should not be used as a reason for postponing measures to prevent environmental degradation"⁸¹. An important question arises with respect to the Burnett Basin Plan regarding the application of the precautionary principle. 'Was the precautionary principle incorporated into the decision making process of assigning environmental flow objectives'?

Table 5 lists the assigned environmental flow objectives for the Burnett Basin as listed in Table 6 Schedule 5 of the Burnett Basin Plan. As can be seen in Table 5 of this paper, no other information is provided in Table 6 Schedule 5 of the Burnett Basin Plan to assist interpretation of the environmental flow objectives.

Table 6 (Burnett River catchment within the Burnett Basin) and Table 7 (Kolan River catchment within the Burnett Basin) list five key flow indicators for medium to high flows with the assigned environmental flow objectives. To provide more information, Tables 6 and 7 list the values of the five key flow indicators under existing allocations and licences (full utilisation) that were provided in the draft Burnett Basin plan. In addition, Tables 6 and 7 list the values for the key flow indicators for the following impact levels: Level 1 (level above which sites are more likely to have no/minor impacts); the environmental flow limits given in the draft Burnett Basin plan; and Level 2 (level below which sites are more likely to have major/very major impacts)⁸². Note that a column was provided for the identified limit of flow regime change used in the final Burnett Basin Plan. Unfortunately, this column is empty as the Burnett Basin Plan did not provide a basin-wide limit of flow regime change (nor reach-specific limits). The values for the key flow indicators at the existing allocations and licences (full utilisation) and for the environmental flow objectives that are beyond the draft plan's proposed environmental flow limits are highlighted in bold.

Note that the values given in Tables 6 and 7 for the key flow indicators under existing allocations and licences (full utilisation) are approximate and estimated from the plots found in

⁷⁸ *Water Act* 2000 (Qld), ss 10 & 11.

⁷⁹ *Ibid*, s 38(1).

⁸⁰ *Ibid*, s 10(2).

⁸¹ *Ibid*, s 11(b).

⁸² The key flow indicator values for Level 1 and Level 2 were given in Brizga op cit n 66, p 35 & Table 6 pp 40 & 41.

the draft Burnett Basin plan⁸³. A table listing the key flow indicator values under existing allocations and licences (full utilisation) was not provided in the draft Burnett Basin plan⁸⁴.

Table 6 shows that a number of environmental flow objectives have values that fall beyond the draft Burnett Basin plan's proposed environmental flow limits. In Table 6 the values for Node 1 (mouth of the Burnett River, downstream of the Bundaberg water project area⁸⁵) show that the level of current water use (existing allocations and licences at full utilisation) are within the environmental flow limits proposed in the draft Burnett Basin plan. As the environmental flow objectives are beyond the key flow indicator values under existing allocations and licences (full utilisation) it may be speculated that the Burnett Basin Plan provides for future increases in water allocated to consumptive uses. Note that three of the five environmental flow objectives have values that are beyond the environmental flow limits proposed in the draft Burnett Basin plan. The other two environmental flow objectives are equal to the environmental flow limits. Recall that the environmental flow limits proposed in the draft Burnett Basin plan were set at 2% above the Level 2 values⁸⁶ where the TAP suggested adding a safety margin of at least 2% in the setting of any environmental flow limits based on Level 2⁸⁷.

From considering the environmental flow objectives assigned to Node 1 in Table 6 the question arises. 'Why are three of the five environmental flow objectives allowed to be set beyond the draft Burnett Basin plan's environmental flow limits'? If a systematic and rigorous approach was taken and if the precautionary principle was applied then all five of the environmental flow objectives would be within or equal to the environmental flow limits.

Recall the question posed above: 'Was the precautionary principle incorporated into the decision making process of assigning environmental flow objectives'? In response, it is suggested that, for some of the nodes in the Burnett Basin Plan, the precautionary principle could not have been incorporated into the final decision assigning the environmental flow objectives for medium to high flows since, in some cases, the environmental flow objectives are beyond the draft plan's proposed environmental flow limits.

Complying with the purpose of the Act and purpose of the plan: sustainable management

Recall that environmental flow objectives are values or objectives assigned for each key flow indicator for each node for the protection of the health of natural ecosystems for the achievement of ecological outcomes.

The environmental flow objectives for Node 1, listed in Table 6 and discussed above, highlight another important question. 'Does the setting of environmental flow objectives to values beyond the environmental flow limits in the situation where the key flow indicator values under existing allocations and licences (full utilisation) are within the environmental flow limits comply with the purpose of advancing sustainable management in the Act and in the purpose of the plan'?

⁸³ Queensland Department of Natural Resources op cit n 74, Figures 2-7.

⁸⁴ The actual values in tabular form for the key flow indicators under existing allocations and licences (full utilisation) were requested from the Qld Department of Natural Resources. The Department responded by stating that the information is best obtained by reading off the graphs in the draft plan and that there are no other publications outlining the information in the format requested. (Pers comm Tom Vanderbyl Manager Water Planning, Queensland Department of Natural Resources, email 18 June 2001.)

⁸⁵ See *Water Resource (Burnett Basin) Plan* 2000 (Qld) SL No. 359 of 2000 Schedule 2 s 3.

⁸⁶ Queensland Department of Natural Resources op cit n 74, see page 18.

⁸⁷ See Brizga op cit n 66, pp 9- 10.

Note that two of the five environmental flow objectives for Node 1 are beyond Level 2 values (recall that Level 2 "is the level below which assessed sites are more likely to have major/very major impacts of water resource development on geomorphological and/or ecological conditions"⁸⁸). If water is allocated to the level where the simulated key flow indicator values reached these environmental flow objectives, then it would be likely that there would be major/very major impacts of the water resource development on the aquatic environment. Consider also the environmental flow objectives assigned for Node 9 (near Eidsvold, downstream of the upper part of the Upper Burnett water project area⁸⁹) where two of the five environmental flow objectives are beyond Level 2. It is interesting to note, that under the *Water Infrastructure Development (Burnett Basin) Act* 2001 (Qld), feasibility investigations are proposed concerning (among other projects), a new weir at Eidsvold⁹⁰ which may be upstream of Node 9 and a significant new and upgraded water storage⁹¹ in the Burnett Basin which would be upstream of Node 1.

Recall that the definition of sustainable management given in the Act includes management that allows for the allocation and use of water within limits that can be sustained indefinitely⁹²; protects the biological diversity and health of natural ecosystems and contributes among other matters, to the economic development of Queensland in accordance with the principles of ecologically sustainable development. These principles include the principle that "the conservation of biological diversity and ecological integrity should be a fundamental consideration in decision making"⁹³ (emphasis added). From this definition, it is submitted that the setting of environmental flow objectives to values beyond the environmental flow limits, when, under existing allocations and licences (full utilisation), the key flow indicator values are within the environmental flow limits (see Node 1 Table 6), does not comply with the purpose of advancing sustainable management in the Act and in the plan .

If the increases in allocations of water for consumptive uses are realised and result in future environmental degradation then a following water resource plan could determine that water use levels will need to be reduced. As Beaumont (2001) stated "A licence holder who had committed him or her self to a program of development in reliance upon an existing water allocation has a legitimate expectation that they will not be prevented from developing irrigation at the level planned for and invested in"^{94, 95, 96}. Thus, in order that irrigators and other consumptive water users can have realistic expectations of future water availability, the Minister has a responsibility and an obligation under the Act⁹⁷ to allocate water to a level that is sustainable and that will not need to be reduced in a following water resource plan.

⁸⁸ Brizga op cit n 66, p 35.

⁸⁹ See *Water Resource (Burnett Basin) Plan* 2000 (Qld) SL No. 359 of 2000, Schedule 2 s 5.

⁹⁰ *Water Infrastructure Development (Burnett Basin) Act* 2001 (Qld), s 4(c).

⁹¹ *Ibid*, s 5.

⁹² *Water Act* 2000 (Qld), s 10(2)(a).

⁹³ *Ibid*, s 11(d).

⁹⁴ M Beaumont, "The Approach of the South Australian Courts to Variations of Existing Water Licences in Particular Reductions to Water Allocations" (2001) Conference Proceedings 3rd Australasian Natural Resources Law and Policy Conference – Focus on Water, 22-23 March 2001 Adelaide, South Australia, p 254.

⁹⁵ See also P-L Tan "Irrigators come first: Conversion of existing allocations to Bulk Entitlements in the Goulburn and Murray catchments, Victoria" (2001) 18 EPLJ 154 at 180.

⁹⁶ In the recent publication: National Land and Water Resources Audit, *Australian Water Resources Assessment 2000. Surface water and groundwater – availability and quality* (Commonwealth Government, 2001), quantitative data were given for water availability using the variables 'divertible yield', 'developed yield' and 'developed use'. It is noted that 'divertible yield' was defined as "average annual volume (ML) that could be diverted using both existing and potential infrastructure and under an ultimate level of infrastructure development scenario – making *no allowance for environmental water requirements*" (emphasis added) p 21.

⁹⁷ *Water Act* 2000 (Qld), s 10(2)(c)(i).

Complying with the purpose of the Act: protecting water resources and reversing degradation

The definition of sustainable management also includes the following: management that contributes to "protecting water, watercourses, lakes, springs, aquifers, natural ecosystems and other resources from degradation and, if practicable, reversing degradation that has occurred"⁹⁸.

This aspect of the definition of sustainable management raises the question: 'Does the setting of environmental flow objectives to values that are the same as the values under existing allocations and licences (full utilisation) when these values are already beyond the environmental flow limits comply with the purpose of the Act to provide a framework for reversing, where practicable, degradation that has occurred in natural ecosystems, including, for example, stressed rivers'⁹⁹? The term 'stressed rivers' is not defined in the Act. One interpretation of the term could be that any river reach that has existing allocations and licences (full utilisation) that result in key flow indicator values, for a node downstream of that reach, that are beyond the identified limit to flow regime change (environmental flow limits) must be over allocated and therefore stressed.

From Table 6 (for medium to high flows) it can be seen that Node 6 (downstream of the Boyne River¹⁰⁰ water project area¹⁰¹), under existing allocations and licences (full utilisation), has five key flow indicators that appear to be well beyond Level 2 (estimated from the plots in the draft Burnett Basin plan). Thus the reach above Node 6 can be considered to be stressed. To gain some understanding of the intention of the Burnett Basin Plan with respect to future water use levels, consider the environmental flow objectives. It can be seen that five out of five environmental flow objectives are well beyond Level 2. In addition, the values for the five key flow indicators under existing allocation and licences (full utilisation) and the five environmental flow objectives are the same. This indicates that the Burnett Basin Plan does not provide for a reduction in water use levels in the stressed reach above Node 6.

Similarly under medium to high flows, Node 10 (downstream end of the Three Moon Creek water project area¹⁰²) has four out of five environmental flow objectives that are beyond Level 2 (the fifth is assigned to Level 2) and Node 5 (downstream end of the Barker-Barambah water project area¹⁰³) has five out of five environmental flow objectives that are well beyond Level 2. Values for the key flow indicators under existing allocations and licences (full utilisation) for Nodes 10 and 5 were not given in the draft Burnett Basin plan so a comparison is not able to be made to determine if the plan retains the status quo of water use levels, provides for an increase in water use levels or provides for a reduction in water use levels.

If water is allocated to the levels provided for by the environmental flow objectives for Nodes 6, 10 and 5 environmental degradation is likely to occur and the purpose of the Act to advance the protection of water resources and reverse degradation if practicable is unlikely to be achieved.

⁹⁸ Ibid, s 10(2)(c)(iv).

⁹⁹ *Water Resource (Burnett Basin) Plan* 2000 (Qld) SL No. 359 of 2000, s 2(e).

¹⁰⁰ There are, at least, two rivers with the name 'Boyne River' in Queensland. One of the rivers, Boyne River, is located in the Burnett Basin and the other river, Boyne River, is located, as the name suggests, in the Boyne River Basin.

¹⁰¹ See *Water Resource (Burnett Basin) Plan* 2000 (Qld) SL No. 359 of 2000, Schedule 2 s 2.

¹⁰² Ibid, see Schedule 2 s 4.

¹⁰³ Ibid, see Schedule 2 s 1.

Table 8 lists the environmental flow objectives assigned for low flows in the Burnett Basin. It can be seen that some environmental flow objectives are beyond Level 2 values. Evaluation of Table 8 is left to the reader.

Defining the availability of water in the plan area

Under the Act one of the purposes of a water resource plan may be to "define the availability of water for any purpose"¹⁰⁴. Thus, if the Minister is planning to allocate water, he or she needs to make a decision on an appropriate future water allocation scenario (that is, should less water be allocated or can more water be allocated to consumptive water uses and where, within the basin, should the water be clawed back or released).

The Burnett Basin Plan has the purpose "to define the availability of water in the plan area"¹⁰⁵. However, the water available for consumptive uses is not explicitly given in the plan. Available water could be estimated by running the hydrological model and checking that the simulated flow regimes under a proposed water allocation and infrastructure scenario have values for each key flow indicator that lie within the environmental flow objectives prescribed in the plan (if a person had access to the hydrological model).

When discussing Node 1 above it was speculated that the Burnett Basin Plan provides for an increase in water allocated to consumptive uses in reaches above Node 1 since the values of the environmental flow objectives are beyond the key flow indicator values under existing allocations and licences (full utilisation). In addition, it is known that the draft Burnett Basin plan provided three water allocation scenarios for public comment. Thus, it is likely that the environmental flow objectives in the Burnett Basin Plan actually reflect the choice made by the Government on future water use levels and infrastructure configurations for that basin.

The environmental flow objectives (and implicitly the volume of water marked for possible allocation to consumptive uses) assigned for the Burnett Basin Plan are listed in Schedule 5 of the Plan. Table 6 Schedule 5 of the Burnett Basin Plan (and reproduced in Table 5 in this paper) lists the environmental flow objectives for medium to high flows for each node in the Burnett Basin Plan. However, because the environmental flow objectives are listed with no supporting information, the Minister's objectives for the water resource plan (eg to retain the current level of water usage or to increase or decrease consumptive use) may be unclear to many people. To the trained eye the environmental flow objectives may indicate the location and extent of water interference and extraction and the identification of water for future consumptive uses. However, to the untrained eye, a list of environmental flow objectives with no other information for comparison is likely to be meaningless.

To improve transparency and comprehensibility it is submitted that a table of environmental flow objectives in a water resource plan should include further information. For example, the table should include key flow indicator values: for the identified basin-wide limit of flow regime change plus any reach-specific limit levels (environmental flow limits); for Level 2; and under existing allocations and licences (full utilisation). Thus, the positive or negative divergence from the current values of the key flow indicators and their relationship to their respective limits and impact levels would be transparent.

Note that even though the sections in the Act dealing with the allocation of water are outcomes-based the Department would have used, as inputs to the hydrological model, the volume of

¹⁰⁴ *Water Act* 2000 (Qld), s 38(3)(a).

¹⁰⁵ *Water Resource (Burnett Basin) Plan* 2000 (Qld) SL No. 359 of 2000, s 2(a).

water currently managed for consumptive uses and various options of water resource development. This information would have been necessary in order to obtain the environmental flow objectives. Thus the Minister would have at hand, and be able to provide in the final water resource plan, the volume of water allocated to existing allocations and licences (full utilisation) and the volume of water identified for possible future allocations and/or return to the aquatic environment for the whole basin and for catchments and subcatchments. Thus, in addition to the suggested expanded table described above, it is suggested that water resource plans include the current annual volume of water extracted under full utilisation for the entire basin and for catchments and subcatchments. Similarly, the volume of water identified for possible future consumptive uses and/or the volume of water that will be reduced from existing water allocations and licences should be given, for the entire basin and for catchments and subcatchments.

Turning briefly to the draft Condamine-Balonne water resource plan. In addition to the term environmental flow limits, the Government developed the concept of 'planned development limits' (PDLs). A 'planned development limit' was defined as "the level of impact against environmental flow indicators to accommodate existing and future water development"¹⁰⁶. The term planned development limit could be thought of as a proposed development level or the level of divergence from the natural flow condition (impact) proposed by the draft water resource plan for each key flow indicator for each node in the river system. Provision of planned development limits in a draft water resource plan enables the public to comment on the given set of future water allocation scenarios. Note that the term planned development limit is not used in the Act.

Table 9 shows the use of planned development limits in the Condamine-Balonne Basin draft water resource plan¹⁰⁷. The planned development limits can be compared to the environmental flow limits. It can be seen that the three water allocation scenarios (PDL_A, PDL_B, PDL_C) result in values for the two key flow indicators that lie beyond the environmental flow limits. It is hoped that in the final Condamine-Balonne water resource plan information, such as values of the key flow indicators: under existing allocations and licences (full utilisation); at Level 2; and at an identified cautious limit to flow regime change (plus any reach-specific limit levels) will be provided for comparison and comprehension. It is also hoped that current annual volumes of water extraction under full utilisation for the entire basin and for the catchments and subcatchments will be provided and that the volume of water identified for possible future consumptive uses and/or volume of water proposed to be reduced from current allocations and licences (returned to the aquatic environment) will also be given, for the entire basin and for the catchments and subcatchments.

The much publicised appeal by Anchorage Farming Pty Ltd, ID and RM Todd and Wagabilla Pty Ltd (appellants) against the decision (dated 21 August 2000) of the Chief Executive, Department of Natural Resources and Mines (respondent) to refuse the appellant's application to amend licences for water harvesting from the Balonne River, St George highlighted some important issues. The appeal, commenced in the Land Court of Queensland on 25 June 2001, concluded with the agreement of both parties (made without admission by the respondent) and with the Land Court issuing consent orders to allow the appeal.

¹⁰⁶ Queensland Department of Natural Resources, op cit n 74, Schedule 1 and Qld Dept Natural Resources *Draft Water Allocation & Management Plan (Condamine-Balonne Basin) June 2000* (Queensland Government 2000), Schedule 1.

¹⁰⁷ Queensland Department of Natural Resources *Draft Water Allocation & Management Plan (Condamine-Balonne Basin) June 2000* (Queensland Government 2000), Table 3 p 21 and Tables 1 and 2, pp 87-90.

Although the appeal was made under the *Water Resources Act* 1989 (Qld) reference was made during the hearing to the Department's *Condamine-Balonne Environmental Flows Technical Report* 1999. Questions were raised regarding the soundness of the science and the objectivity of the process. The hearing highlighted important requirements for all water resource planning, namely: the science underlying water resource plans must be sound, supported by empirical data and well documented; the identification of environmental flow limits must be clearly described and substantiated; and the assignment of environmental flow objectives must be objective and well documented. Applying the purpose of the *Water Act* 2000 of advancing sustainable management to decisions concerned with water allocation it is submitted that the precautionary principle must be applied where there is uncertainty in data, modelling or ecological outcomes.

Conclusion

In the *Water Act* 2000 the Queensland Government has legislated for the important goal of advancing sustainable management of water resources. The Queensland Government has produced and is producing a number of water resource plans for entire river basins. The Burnett Basin and the Boyne River Basin water resource plans are the first plans of the type for their plan area to come under this new legislation. Within 10 years both plans have to be reviewed.

Considering the definition of an environmental flow objective, namely, "a flow objective for the protection of the health of natural ecosystems for the achievement of ecological outcomes"¹⁰⁸ it appears that ecological outcomes are not envisaged by the Act to be negative outcomes (i.e. a decline in health of natural ecosystems). Thus, it is submitted that all ecological outcomes should be positive with respect to the aquatic environment.

As the purpose of the Act is to advance sustainable management of water resources that:

- allows for the allocation and use of water within limits that can be sustained indefinitely;
- protects the biological diversity and health of natural ecosystems; and
- contributes to, among other matters, the economic development of Queensland in accordance with the principles of ecologically sustainable development (which includes the precautionary principle)

it would appear that a scientifically rigorous and systematic approach to assigning environmental flow objectives is required.

Following the recommendations presented by the TAP in Brizga (2000)¹⁰⁹ and the concept of environmental flow limits proposed in the draft Burnett Basin plan¹¹⁰, it is proposed that a cautious basin-wide limit to flow regime change should be identified that represents the 'maximum allowable divergence' of flows from their natural regime (to retain healthy watercourses) and that all environmental flow objectives should be assigned within this level or, if a specific reach is over allocated, towards this level, if ecologically appropriate¹¹¹. Reach-specific limit levels should also be identified for reaches with high conservation values.

A number of questions need to be considered when assessing water resource plans under the Act:

¹⁰⁸ *Water Act* 2000 (Qld), Schedule 4 Dictionary 'environmental flow objective'.

¹⁰⁹ Brizga, op cit n 66, p 51.

¹¹⁰ Queensland Department of Natural Resources, op cit n 74, see page 18.

¹¹¹ See the Section 'Should the clock be turned back' Brizga, op cit n 66, p 52.

1. 'Was the precautionary principle incorporated into the decision making process of assigning environmental flow objectives'? With respect to the Burnett Basin Plan it is suggested that, for some of the nodes in the plan area, the precautionary principle could not have been incorporated into the final decision assigning the environmental flow objectives under medium to high flows since the environmental flow objectives have values that, in some cases, are set beyond the draft plan's proposed environmental flow limits.

2. 'Does the setting of environmental flow objectives to values beyond the environmental flow limits in the situation where the key flow indicator values under existing allocations and licences (full utilisation) are within the environmental flow limits comply with the purpose of advancing sustainable management in the Act and in the purpose of the plan'? It is submitted that the setting of environmental flow objectives to values beyond the environmental flow limits, when under existing allocations and licences (full utilisation) the key flow indicator values are within the environmental flow limits, does not comply with the purpose of advancing sustainable management in the Act and in the plan.

3. 'Does the setting of environmental flow objectives to values that are the same as the values under existing allocations and licences (full utilisation) when these values are already beyond the environmental flow limits, comply with a purpose of the Act to provide a framework for reversing, where practicable, degradation that has occurred in natural ecosystems, including, for example, stressed rivers'¹¹²? In response it is suggested that the setting of environmental flow objectives to values that are the same as the values under existing allocations and licences (full utilisation) when these values are already beyond the environmental flow limits does not comply with the purpose of the Act to advance the protection of water resources and reverse degradation if practicable. It is likely that, with increasing water efficiency, new crops and commitment to sustainable management, some water should be able to be returned to the aquatic environment.

The following recommendations are proposed for all future water resource plans.

- (1) That the precautionary principle be incorporated into the decision making process for assigning environmental flow objectives by:
 - (i) identifying a limit to flow regime change that is cautious based on the best scientific information available; and
 - (ii) assigning environmental flow objectives within this limit of flow regime change or, if the reach is over allocated, towards this limit, if ecologically appropriate.
- (2) That the following be included in the same table as the proposed environmental flow objectives:
 - (i) the values of the key flow indicators at the identified cautious limit to flow regime change (environmental flow limits);
 - (ii) the values of the key flow indicators for Level 2 (level below which sites are more likely to have major/very major impacts);
 - (iii) the values of the key flow indicators under existing allocations and licences (full utilisation)
- (3) That the following be included:
 - (i) the current annual volume of water extraction (for the whole basin and for each catchment and subcatchment);
 - (ii) the proposed annual volume of water extraction (for the whole basin and for each catchment or subcatchment);
 - (iii) reference data describing existing ecological conditions and species lists relevant to each node for future assessments of the achievement of ecological outcomes.

¹¹² *Water Resource (Burnett Basin) Plan* 2000 (Qld) SL No. 359 of 2000, s 2(e).

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Table 1: Possible purposes for water resource plans suggested by the *Water Act 2000* (Qld) and purposes given in the *Water Resource (Burnett Basin) Plan 2000* (Qld) and the *Water Resource (Boyne River Basin) Plan 2000* (Qld)

<i>Water Act 2000</i> (Qld)	<i>Water Resource (Burnett Basin) Plan 2000</i> (Qld)	<i>Water Resource (Boyne River Basin) Plan 2000</i> (Qld)
Water resource plans <u>may</u> have the following purposes¹¹³ (as well as other purposes):	Purposes of plan¹¹⁴	Purposes of plan¹¹⁵
. To define the availability of water for any purpose . To provide a framework for sustainably managing water and the taking of water . To identify priorities and mechanisms for dealing with future water requirements . To provide a framework for establishing water allocations . To provide a framework for reversing, where practicable, degradation that has occurred in natural ecosystems, including, for example, stressed rivers	. To define the availability of water in the plan area . To provide a framework for sustainably managing water and the taking of water . To identify priorities and mechanisms for dealing with future water requirements . To provide a framework for establishing water allocations . To provide a framework for reversing, where practicable, degradation that has occurred in natural ecosystems, including, for example, stressed rivers	. To define the availability of water in the plan area . To provide a framework for sustainably managing water and the taking of water . To identify priorities and mechanisms for dealing with future water requirements . To provide a framework for establishing water allocations . To provide a framework for reversing, where practicable, degradation that has occurred in natural ecosystems, including, for example, stressed rivers
. regulating the taking of overland flow water	-	-
. regulating the taking of subartesian water	-	-

Table 2: Ecological outcomes listed in the *Water Resource (Boyne River Basin) Plan 2000* (Qld)

Ecological outcomes provided for in the Boyne River Basin water resource plan
<p>Ecological outcomes¹¹⁶ River flows are to be managed - (a) to maintain existing habitats that sustain native plants and animals - (i) associated with watercourses, waterholes and riparian zones upstream of Awoonga Dam full supply level; or (ii) dependant on pool and associated riparian habitat in the freshwater reach downstream of Awoonga Dam; (b) to provide water for fine sediment removal and long term water quality suitable for - (i) riverine ecosystems upstream of Awoonga Dam full supply level; and (ii) ecosystems downstream of Awoonga Dam; (c) to allow movement by marine and estuarine fish over or around the weir at Boyne River AMTD 17.2km; (d) to provide water to stimulate reproductive processes for estuarine animals downstream of Awoonga Dam; (e) to provide water for delivery of catchment based nutrients from upstream of Awoonga Dam to the riverine and estuarine reaches downstream of the dam; (f) to allow river forming flows upstream of Awoonga Dam full supply level and in the riverine and estuarine reaches downstream of the dam; (g) to allow for an increase in the frequency and duration of marine conditions in the estuarine reach downstream of Awoonga Dam leading to a shift towards plant and animal species that favour or tolerate the increase.</p>

¹¹³ *Water Act 2000* (Qld), s 38(3) - (5).

¹¹⁴ *Water Resource (Burnett Basin) Plan 2000* (Qld) SL No 359 2000, s 2.

¹¹⁵ *Water Resource (Boyne River Basin) Plan 2000* (Qld) SL No 358 2000, s 2.

Table 3: Ecological outcomes listed in the *Water Resource (Burnett Basin) Plan 2000 (Qld)*. Note that the maintenance of key wetland areas¹¹⁷ has been explicitly omitted

Ecological outcomes provided for in the Burnett Basin water resource plan
<p>Ecological outcomes for the plan area¹¹⁸ Water is to be managed and allocated -</p> <ul style="list-style-type: none">- to maintain pool habitats, and native plants and animals associated with the habitats, in watercourses;- to maintain long term water quality suitable for riverine and estuarine ecosystems;- to provide flow regimes that favour native plants and animals associated with watercourses and riparian zones;- to reduce saltwater intrusion in -<ul style="list-style-type: none">. the Gooburrum area groundwater system near Moore Park; and. the Woongarra area groundwater system near Elliot Heads;- to provide wet season flow to benefit native plants and animals, including, for example, fish and prawns, in estuaries;- to improve stream flow conditions to assist the movement of fish along watercourses.
<p>Ecological outcomes for the Auburn River catchment¹¹⁹ Water in the Auburn River catchment is to be managed and allocated -</p> <ul style="list-style-type: none">(a) to maintain existing riverine habitats upstream of AMTD 6.0km that sustain native plants and animals; and(b) to maintain near-natural river forming processes upstream of AMTD 6.0 km.
<p>Ecological outcomes for the Barambah Creek and Stuart River catchments¹²⁰ Water in the Barambah Creek and Stuart River catchments is to be managed and allocated to maintain and <u>improve</u> existing riverine habitats, that sustain native plants and animals, in the catchment.</p>
<p>Ecological outcomes for the Boyne River catchment¹²¹ Water in the Boyne River catchment is to be managed and allocated -</p> <ul style="list-style-type: none">(a) to maintain existing riverine habitats upstream of AMTD 5.0km that sustain native plants and animals; and(b) to maintain and improve existing river forming processes upstream of AMTD 5.0km.
<p>Ecological outcomes for the Burnett River basin and Burnett River¹²²</p> <ul style="list-style-type: none">(i) Water in the Burnett River basin is to be managed and allocated to, if practicable, minimise the frequency and duration of marine conditions in the estuary of the Burnett River.(ii) Water in the Burnett River is to be managed and allocated to maintain lungfish habitat in the river particularly lungfish habitat downstream of Gayndah at AMTD 200km.
<p>Ecological outcomes for the Elliot, Gregory and Isis river basins¹²³ Water in the Elliot, Gregory and Isis river basins is to be managed and allocated -</p> <ul style="list-style-type: none">(a) to maintain existing riverine habitats, that sustain native plants and animals, in the basins;(b) to maintain existing estuarine habitats, particularly in fish habitat areas, that -<ul style="list-style-type: none">(i) sustain native plants and animals; and(ii) are dependant on estuarine processes;(c) to maintain near-natural river forming processes in the basins.
<p>Ecological outcomes for the Kolan River basin¹²⁴ Water in the Kolan River basin is to be managed and allocated -</p> <ul style="list-style-type: none">(a) to maintain and improve existing riverine habitats, that sustain native plants and animals, in the basin;(b) to maintain and improve existing estuarine habitats, particularly in fish habitat areas, that-<ul style="list-style-type: none">(i) sustain native plants and animals; and(ii) are dependent on estuarine processes;(c) to maintain and improve river forming processes in the basin.

¹¹⁶ Ibid, s 7.

¹¹⁷ Technical Advisory Panel, *Burnett Basin WAMP Current Environmental Conditions and Impacts of Existing Water Resource Development* (Prepared for and published by the Queensland Department of Natural Resources, 2000), Vol 1, Table 2.3, p 32.

¹¹⁸ *Water Resource (Burnett Basin) Plan 2000* SL No. 359 of 2000, s 7.

¹¹⁹ Ibid, s 8.

¹²⁰ Ibid, s 9.

¹²¹ Ibid, s 10.

¹²² Ibid, s 11.

¹²³ Ibid, s 12.

¹²⁴ Ibid, s 13.

Table 4: Key flow indicators for medium to high flows and for low flows as used in the *Water Resource (Burnett Basin) Plan 2000 (Qld)* with definitions from the dictionary in the water resource plan¹²⁵

Key flow indicators (performance indicators) for medium to high flows	
Annual proportional flow deviation (APFD)	"means the statistical measure of changes to flow season and volume in the simulation period calculated using the formula for annual proportional flow deviation described in Technical Report 5 'Fitzroy Basin Water Allocation and Management Planning Technical Reports' published by the department".
Flow regime class	"means the measure of flow regime seasonality worked out using the method stated in Haines, AT, Finlayson BL and McMahon TA 'A global classification of river regimes. Applied Geography, 1988' ".
Mean annual flow	"means the total volume of flow in the simulation period divided by the number of years in the simulation period".
Mean wet season flow	"means the total volume of flow during the months of January to March in the simulation period divided by the number of years in the simulation period".
1.5 year average recurrence interval daily flow volume	"means the daily flow volume that has a 67% probability of being reached at least once a year".
5 year average recurrence interval daily flow volume	"means the daily flow volume that has a 20% probability of being reached at least once a year".
20 year average recurrence interval daily flow volume	"means the daily flow volume that has a 5% probability of being reached at least once a year".
Key flow indicators (performance indicators) for low flows	
Daily flow less than 2ML	-
50% daily flow exceedence;	"for a month, means the flow, in megalitres, that is equalled or exceeded on 50% of days in the month in the simulation period".
90% daily flow exceedence	"for a month, means the flow, in megalitres, that is equalled or exceeded on 90% of days in the month in the simulation period".
Low flow exceedence duration (10cm above cease-to-flow)	"for a watercourse, means the percentage of the total number of days in the simulation period that the watercourse's daily flow is at least 10cm above the cease-to-flow level in the watercourse".
Low flow exceedence duration (30cm above cease-to-flow)	"for a watercourse, means the percentage of the total number of days in the simulation period that the watercourse's daily flow is at least 30cm above the cease-to-flow level in the watercourse".
Number of periods of no flow of at least 1 month	-
Number of periods of no flow of at least 3 months	-
Number of periods of no flow of at least 6 months	-
Number of periods of no flow of at least 9 months	-

¹²⁵ *Water Resource (Burnett Basin) Plan 2000 (Qld)* SL No 359 of 2000, Schedule 9 Dictionary.

Table 5: Burnett Basin water resource plan: Environmental flow objectives for medium to high flows prescribed in Table 6, Schedule 5 of the *Water Resource (Burnett Basin) Plan 2000* (Qld). The provision of environmental flow objectives without further information means that the reader is not able to compare the environmental flow objectives with, for example, values of the key flow indicators: under existing allocations and licences (full utilisation); at the basin-wide environmental flow limits; and at Level 2. From this table the reader cannot determine if the water resource plan provides for the retention of existing levels of water use, increases in water allocations for consumptive uses or decreases in water allocations for consumptive uses (water to be returned to the aquatic environment).

Environmental Flow Objectives for Medium to High Flows <i>Water Resource (Burnett Basin) Plan 2000</i> (Qld)					
Node	Annual Proportional Flow Deviation	Mean Annual Flow %	1.5 Year Average Recurrence Interval %	5 Year Average Recurrence Interval %	20 Year Average Recurrence Interval %
1	2.0	75	69	71	82
2	2.0	81	74	71	82
3	2.0	81	74	71	82
4	2.0	79	74	71	82
5	2.7	62	51	62	71
6	2.9	69	37	52	63
7	2.0	81	69	71	82
8	0.1	99	99	100	100
9	2.3	81	66	71	82
10	2.3	75	66	56	80
11	2.0	76	72	70	58
12	2.1	78	67	69	66
13	1.1	85	74	100	100
14	1.0	87	85	100	100
15	0.4	96	95	100	100
16	0.1	99	99	100	100
17	0.2	98	99	100	100
18	0.1	99	99	100	100
19	2.0	81	74	71	82
20	?	?	?	?	?

Table 8: Burnett Basin water resource plan. Environmental flow objectives for low flows for selected nodes prescribed in Schedule 5 Part 1 – Low Flow Objectives, ss 1-5 and Tables 1-5, *Water Resource (Burnett Basin) Plan 2000 (Qld)*. Environmental flow objectives shown in bold have been assigned beyond Level 2

Key flow indicators (KFI) (performance indicators) for low flows	Natural (pre-devt) values for each KFI	2 key levels of departure from natural flow regimes ¹²⁶		Plan's limit of flow regime change	Value of KFIs under existing water use levels	Environmental flow objectives for each key flow indicator in final plan ¹²⁷			
		Level 1 Level above which sites are more likely to have no/minor impacts	Level 2 Level below which sites are more likely to have major/ very major impacts			Node 9	Node 3	Node 2	Node 1
Daily flow less than 2 ML (min – max %)	No change 0%	+/- 10% from natural	+/- 20% from natural	Not given	Not given	10- 46%	2- 26%	2-20%	2-18%
50% daily flow exceedence (ML/day)	0%	+/- 10% from natural	+/- 20% from natural	Not given	Not given	32-68% ¹²⁸	32-68%	32-68%	32-68%
90% daily flow exceedence (ML/day)	0%	+/- 10% from natural	+/- 20% from natural	Not given	Not given	72-100% ¹²⁹	72-100%	72-100%	72-100%
Low flow exceedence duration (10cm above cease-to-flow) (min - max %)	0%	+/- 10% from natural	+/- 20% from natural	Not given	Not given	48-84%	64-98%	76-98%	Not given
Low flow exceedence duration (30cm above cease-to-flow) (min - max %)	0%	+/- 10% from natural	+/- 20% from natural	Not given	Not given	22-58%	35-71%	52-88%	Not given
No. of periods of no flow of at least 1 month (min-max)	0%	+/- 10% of natural	+/- 20% of natural	Not given	Not given	50-145%	11- 33%	0-5%	0-2%
No. of periods of no flow of at least 3 months (min-max)	0%	+/- 10% of natural	+/- 50% of natural	Not given	Not given	3-9%	0-3%	0-2%	0-0%
No. of periods of no flow of at least 6 months (min-max)	0%	+/- 10% of natural	+/- 50% of natural	Not given	Not given	0-2%	0-0%	0-0%	0-0%
No. of periods of no flow of at least 9 months (min-max)	0%	+/- 10% of natural	+/- 50% of natural	Not given	Not given	0-0%	0-0%	0-0%	0-0%

¹²⁶ SO Brizga, *Burnett Basin WAMP Proposed Environmental Flow Performance Measures* (Prepared for and published by the Queensland Department of Natural Resources, 2000), p 35 and Table 7 p 48. Level 1: Level above which assessed sites are more likely to have no/minor impacts of water resource development on geomorphological and/or ecological conditions. Level 2: Level below which assessed sites are more likely to have major/very major impacts of water resource development on geomorphological and/or ecological conditions.

¹²⁷ *Water Resource (Burnett Basin) Plan 2000 (Qld)* SL No. 359 of 2000, Schedule 5 Part 1 – Low flow objectives.

¹²⁸ *Ibid*, Schedule 5. At each node the 50% daily flow exceedence stated for each month for the node should be equalled or exceeded between 32% and 68% of the total number of days in the month in the simulation period, see Table 2 in Schedule 5 for the specified number of days per month per node.

¹²⁹ *Ibid*, Schedule 5. At each node the 90% daily flow exceedence stated for each month for the node should be equalled or exceeded between 72% and 100% of the total number of days in the month in the simulation period, see Table 3 in Schedule 5 for the specified number of days per month per node.

Table 9: Draft Condamine-Balonne water allocation and management plan: Planned development limits (PDL) and environmental flow limits (EFL) for selected nodes and two key flow indicators as given in the *Draft Water Allocation and Management Plan (Condamine-Balonne Basin) June 2000 (Draft WAMP)*. PDL_A, PDL_B and PDL_C represent three water allocation scenarios. PDL values shown in bold have key flow indicator values that are beyond the environmental flow limits

Nodes	Level of water diversion	Two key flow indicators (performance indicators)	
		Median Annual Flow % change in the median annual streamflow from the natural median annual streamflow (pre-development)	Annual Proportional Flow Deviation Change in overall pattern of flow regime
Culgoa River at Node 01 (at end of system NSW)	Natural	100 % = natural (ie 0 % change)	0 change
	EFL	62 % of natural (ie 38 % change from natural)	1.70
	PDL _C	45 % of natural (ie 55 % change)	2.68
	PDL _B	39 % of natural (ie 61 % change)	2.84
	PDL _A	28 % of natural (ie 72 % change)	3.06
Bokhara River at Node 04 (at end of system NSW)	Natural	100 % = natural (ie 0 % change)	0 change
	EFL	62 % of natural (ie 38 % change from natural)	1.70
	PDL _C	54 % of natural (ie 46 % change)	3.05
	PDL _B	48 % of natural (ie 52 % change)	3.15
	PDL _A	40 % of natural (ie 60 % change)	3.23
* Inflows to Narran Lakes at Node 06 (NSW)	Natural	100 % = natural (ie 0 % change)	0 change
	EFL	62 % of natural (ie 38 % change from natural)	1.70
	PDL _C	42 % of natural (ie 58 % change)	3.26
	PDL _B	35 % of natural (ie 65 % change)	3.47
	PDL _A	24 % of natural (ie 76 % change)	3.78
* Culgoa River at Node 02 (at Woolerbilla Qld)	Natural	100 % = natural (ie 0 % change)	0 change
	EFL	62 % of natural (ie 38 % change from natural)	1.70
	PDL _C	40 % of natural (ie 60 % change)	3.02
	PDL _B	36 % of natural (ie 64 % change)	3.23
	PDL _A	27 % of natural (ie 73 % change)	3.48
Briarie Creek at Node 0A (at Woolerbilla-Hebel Road, Hebel Qld)	Natural	100 % = natural (ie 0 % change)	0 change
	EFL	62 % of natural (ie 38 % change from natural)	1.70
	PDL _C	20 % of natural (ie 80 % change)	3.16
	PDL _B	16 % of natural (ie 84 % change)	3.32
	PDL _A	14 % of natural (ie 86 % change)	3.50
Narran River at Node 07 (at Dirranbandi-Hebel Road)	Natural	100 % = natural (ie 0 % change)	0 change
	EFL	62 % of natural (ie 38 % change from natural)	1.70
	PDL _C	47 % of natural (ie 53 % change)	3.20
	PDL _B	43 % of natural (ie 57 % change)	3.36
	PDL _A	36 % of natural (ie 64 % change)	3.59

Scenario A has planned development limits (PDL_A) that are no lower than those associated with the mid-1999 level of water resource development throughout the basin. Scenario A would effectively set a basin-wide cap on long-term average diversions based on the mid-1999 level of development. Under Scenario A, further deterioration in riverine health and ecological outcomes is considered likely, as current conditions are unlikely to reflect the long-term ecological response to the recent increases in the levels of basin-wide water diversions.

Scenario B has partially improved planned development limits (PDL_B). Scenario B is based on reductions in current levels of long-term annual and monthly reliabilities for water project areas in the order of: 2.5% reduction for the St George Irrigation Area and; 5% reduction for other water project areas. In addition, Scenario B is based on reductions in current levels of long-term average diversion opportunities for 'hectare licences' and 'water harvesting' in the order of: 15% reduction for the Beardmore Dam to Qld/NSW border area and; 10% reduction elsewhere.

Scenario C has improved planned development limits (PDL_C) throughout the basin towards levels associated with the 1997 level of water resource development. Scenario C is based on similar reductions in current levels of long-term annual and monthly reliabilities for water project areas to that of Scenario B. In addition, Scenario C is based on reductions in current levels of long-term average diversion opportunities for 'hectare licences' and 'water-harvesting' in the order of 27% reduction for the Beardmore Dam to Qld/NSW border area and; 10% reduction elsewhere (same as Scenario B).

(Source: Queensland Department of Natural Resources *Draft Water Allocation & Management Plan (Condamine-Balonne Basin) June 2000* (Queensland Government 2000), Table 3 p 21 and Schedule 4 Tables 1 and 2, pp 87-90.)

Table 6: Burnett Basin water resource plan - Burnett River catchment: Five key flow indicators (KFIs) for medium to high flows are listed with their corresponding values: at Level 1; at the environmental flow limits (EFLs) proposed by the draft Burnett Basin plan; and at Level 2. Values for the key flow indicators under existing allocations and licences (full utilisation) (Exis) and the environmental flow objectives (EFOs) prescribed in Table 6 Schedule 5 in the *Water Resource (Burnett Basin) Plan 2000 (Qld)* for selected nodes are also listed. Note, that the performance indicators: flow regime class and mean wet season flow have not been included. Values shown in bold fall beyond the environmental flow limits proposed in the draft Burnett Basin plan

Key Flow Indicators (KFIs) (performance indicators for medium to high flows ¹³⁰)	Natural (pre-devt) values for each KFI	Level 1 ¹³¹ values for each KFI.	Water resource plan's ¹³² limit of flow regime change	Draft plan's ¹³³ EFLs. Set at 2% above Level 2 values	Level 2 values for each KFI.	Values for each key flow indicator for selected nodes within the Burnett River Catchment under existing allocations and licences (full utilisation) and the assigned environmental flow objectives															
						10		9		6		3		5		2		20		1	
						Exis	EFO	Exis	EFO	Exis	EFO	Exis	EFO	Exis	EFO	Exis	EFO	Exis	EFO	Exis	EFO
APFD	0 change	1.2	Not provided	1.96	2.0	?	2.3	~ 1.2	2.3	~ 2.9	2.9	~1.2	2.0	?	2.7	~1.0	2.0	?	?	~1.3	2.0
Mean Annual Flow (% of natural)	0	84% of natural (ie 16% change from natural)	Not provided	81	79% of natural (ie 21% change from natural)	?	75	~ 89	81	~ 69	69	~ 85	81	?	62	~ 87	81	?	?	~ 83	75
1.5yr av RIDFV (% of natural)	0	86	Not provided	74	72	?	66	~ 66	66	~ 37	37	~ 75	74	?	51	~ 85	74	?	?	~ 76	69
5 yr av RIDFV(% of natural)	0	89	Not provided	71	69	?	56	~ 95	71	~ 52	52	~ 89	71	?	62	~ 90	71	?	?	~ 94	71
20 yr av RIDFV(% of natural)	0	91	Not provided	82	80	?	80	~ 95	82	~ 63	63	~ 89	82	?	71	~ 93	82	?	?	~ 97	82

¹³⁰ *Water Resource (Burnett Basin) Plan 2000 (Qld)* SL No 359 of 2000, s 20(b).

¹³¹ SO Brizga, *Burnett Basin WAMP Proposed Environmental Flow Performance Measures* (Prepared for and published by the Queensland Department of Natural Resources, 2000), p 35 & Table 6 pp 40 & 41. Two key levels of departure from natural flow regimes. Level 1: Level above which assessed sites are more likely to have no/minor impacts of water resource development on geomorphological and/or ecological conditions. Level 2: Level below which assessed sites are more likely to have major/very major impacts of water resource development on geomorphological and/or ecological conditions.

¹³² *Water Resource (Burnett Basin) Plan 2000 (Qld)* SL No 359 of 2000.

¹³³ Queensland Department of Natural Resources, *Draft Water Allocation and Management Plan (Burnett Basin) June 2000 (Draft WAMP)* (Queensland Government 2000), p 18 & Table S5.1 p 77. In the draft plan the proposed limit to flow regime change is called the 'environmental flow limit' (EFL).

- Node 10** [downstream end of the Three Moon Creek water project area¹³⁴, see Burnett Basin Water Resource Plan [Burnett Basin Plan]¹³⁵ Schedule 2 s 4]: Neither the legislated Burnett Basin water resource plan or the draft plan provides the values of the key flow indicators under existing allocations and licences (full utilisation). Thus the reader is unable to determine the current level of water allocated to consumptive uses. Five out of five environmental flow objectives have values that are beyond the environmental flow limits proposed in the draft Burnett Basin plan¹³⁶.
- Node 9** [near Eidsvold, downstream of the upper part of the Upper Burnett water project area, see Burnett Basin Plan Schedule 2 s 5]: shows that, under existing allocations and licences (full utilisation), one out of five key flow indicators is beyond the environmental flow limits proposed in the draft Burnett Basin plan. Two out of five environmental flow objectives are beyond the environmental flow limits. The environmental flow objectives indicate that the Burnett Basin Plan is implicitly providing for increases in allocations of water for consumptive uses.
- Node 6** [downstream of the Boyne River water project area, see Burnett Basin Plan Schedule 2 s 2]: shows that the reach under existing allocations and licences (full utilisation) is over allocated as all five key flow indicators for the current situation of allocations and licences (full utilisation) are beyond the environmental flow limits proposed in the draft Burnett Basin plan. The environmental flow objectives indicate that the Burnett Basin Plan does not provide for reductions in water allocations for consumptive uses, even though there is a likelihood that sites will experience major/very major impacts.
- Node 3** [near Gayndah, downstream of the mid section of the Upper Burnett water project area, see Burnett Basin Plan Schedule 2 s 5]: shows that the values for the key flow indicators under existing allocations and licences (full utilisation) are within the environmental flow limits proposed in the draft Burnett Basin plan. The environmental flow objectives indicate that the Burnett Basin Plan is implicitly providing for increases in allocations of water for consumptive uses – although the process of reading the key flow indicator values for existing allocations and licences (full utilisation) from the plots in the draft plan makes it difficult to ascertain the plan’s intentions.
- Node 5** [downstream end of the Barker-Barambah water project area, see Burnett Basin Plan Schedule 2 s 1]: Neither the legislated Burnett Basin Plan or the draft plan provides the values of the key flow indicators under existing allocations and licences (full utilisation). Thus the reader is unable to determine the current level of water allocated to consumptive uses. Five out of five environmental flow objectives have values that are beyond the environmental flow limits proposed in the draft plan.
- Node 2** [downstream of the lower part of the Upper Burnett water project area, see Burnett Basin Plan Schedule 2 s 5]: shows that the values for the key flow indicators under existing allocations and licences (full utilisation) are within the environmental flow limits proposed in the draft Burnett Basin plan. The environmental flow objectives indicate that the Burnett Basin Plan is implicitly providing for increases in allocations of water for consumptive uses.
- Node 20** [possibly above or below Walla Weir]: Neither the legislated Burnett Basin Plan or the draft plan provides the values of the key flow indicators under existing allocations and licences (full utilisation). Similarly, the legislated Burnett Basin water resource plan does not provide environmental flow objectives for this location.
- Node 1** [mouth of the Burnett River, downstream of the Bundaberg water project area, see Burnett Basin Plan Schedule 2 s 3]: shows that the values for the key flow indicators under existing allocations and licences (full utilisation) are within the environmental flow limits proposed in the draft plan. The environmental flow objectives indicate that the Burnett Basin Plan is implicitly providing for increases in allocations of water for consumptive uses. Three of the five environmental flow objectives have values that are beyond the environmental flow limits proposed in the draft plan. The other two environmental flow objectives have values equal to the environmental flow limits.

¹³⁴ *Water Resource (Burnett Basin) Plan* 2000, SL No 359 of 2000, s 16(2). “A water project area” “is a priority area for the conversion to or granting of water allocations to take water in the plan area”.

¹³⁵ *Water Resource (Burnett Basin) Plan* 2000 (Qld), SL No 359 of 2000.

¹³⁶ Queensland Department of Natural Resources, *Draft Water Allocation and Management Plan (Burnett Basin) June 2000 (Draft WAMP)* (Queensland Government 2000), p 18.

Table 7: Burnett Basin water resource plan - Kolan River catchment: Five key flow indicators (KFIs) for medium to high flows are listed with their corresponding values: at Level 1; at the environmental flow limits (EFLs) proposed by the draft Burnett Basin plan; and at Level 2. Values for the key flow indicators under existing allocations and licences (full utilisation) (Exis) and the environmental flow objectives (EFOs) prescribed in Table 6 Schedule 5 in the *Water Resource (Burnett Basin) Plan 2000 (Qld)* for selected nodes are also listed. Note, that the performance indicators: flow regime class and mean wet season flow have not been included. Values shown in bold fall beyond the environmental flow limits proposed in the draft Burnett Basin plan

Key Flow Indicators (KFIs) (performance indicators) for medium to high flows ¹³⁷	Natural (pre-devt) values for each KFI	Level 1 values for each KFI. Level above which sites are more likely to have no/minor impacts	Water resource plan's ¹³⁸ limit of flow regime change	Draft plan's ¹³⁹ EFLs Set at 2% above Level 2 values	Level 2 values for each KFI. Level below which sites are more likely to have major/very major impacts	Values for each key flow indicator for selected nodes within the Kolan River Catchment under existing allocations and licences (full utilisation) and the assigned environmental flow objectives			
						Node 12		Node 11	
						Existing	EFO	Existing	EFO
APFD	0 change	1.2	Not provided	1.96	2.0	?	2.1	~ 1.96	2.0
Mean Annual Flow (% of natural)	0	84% of natural (ie 16% change from natural)	Not provided	81	79% of natural (ie 21% change from natural)	?	78	~ 76	76
1.5yr av RIDFV (% of natural)	0	86	Not provided	74	72	?	67	~ 72	72
5 yr av RIDFV (% of natural)	0	89	Not provided	71	69	?	69	~ 70	70
20 yr av RIDFV (% of natural)	0	91	Not provided	82	80	?	66	~ 58	58

¹³⁷ *Water Resource (Burnett Basin) Plan 2000 (Qld)* SL No 359 of 2000 s 20(b).

¹³⁸ *Water Resource (Burnett Basin) Plan 2000 (Qld)* SL No 359 of 2000.

¹³⁹ Queensland Department of Natural Resources, *Draft Water Allocation and Management Plan (Burnett Basin) June 2000 (Draft WAMP)* (Queensland Government 2000), p 18. In the draft plan the proposed limit to flow regime change is called the 'environmental flow limit' (EFL).

Node 12 [Within the Kolan section of the Bundaberg water project area¹⁴⁰, see Burnett Basin Water Resource Plan [Burnett Basin Plan]¹⁴¹ Schedule 2 s 3]: Neither the legislated Burnett Basin Plan or the draft plan provides the values of the key flow indicators under existing allocations and licences (full utilisation). Thus the reader is unable to determine the current level of water allocated to consumptive uses. Five out of five environmental flow objectives have values that are beyond the environmental flow limits proposed in the draft Burnett Basin plan..

Node 11[mouth of Kolan River and well downstream of the Kolan section of the Bundaberg water project area, see Burnett Basin Plan Schedule 2 s 3]: shows that four out of five key flow indicators under existing allocations and licences (full utilisation) are beyond the environmental flow limits proposed in the draft plan. Five out of five environmental flow objectives are beyond the environmental flow limits proposed in the draft Burnett Basin plan. The environmental flow objectives indicate that the Burnett Basin Plan does not provide for a reduction in water allocations for consumptive uses, even though there is a likelihood that sites will experience major/very major impacts.

¹⁴⁰ *Water Resource (Burnett Basin) Plan* 2000, SL No 359 of 2000, s 16(2). "A water project area" "is a priority area for the conversion to or granting of water allocations to take water in the plan area".

¹⁴¹ *Water Resource (Burnett Basin) Plan* 2000 (Qld), SL No 359 of 2000.