Department of Science, Information Technology, Innovation and the Arts

Review of Water Resource (Warrego, Paroo, Bulloo and Nebine) Plan 2003 and Resource Operations Plan

Response to independent science review

October 2013

Great state. Great opportunity.

Queensland Government

Prepared by

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Contents

1 Introduction

This report presents the results of an independent science review of the Environmental Assessment of Warrego, Paroo, Bulloo, Nebine Water Resource Plan (WRP) area. The report includes the terms of reference, the results of the review and the response to those results by DSITIA.

1.1 Background

Purpose of the Water Resource Plan

The Queensland Government, through the Department of Natural Resources and Mines (DNRM), develops and reviews water resource plans in key river basins throughout Queensland. Water resource planning is a statutory process administered under the Water Act 2000 and is part of the State's commitment to the national water reform agenda signed by the Council of Australian Governments (COAG) in 1994 and the National Water Initiative (NWI) of 2004. The objective of these agreements is to ensure resource availability is properly assessed, with supplies sustainably allocated to support economic, social and environmental needs. A water resource plan provides the framework for sharing water equitably and sustainably between urban, rural, industrial, social and indigenous uses as well as providing water necessary to sustain the aquatic environment, including both surface water and groundwater dependent ecosystems. The framework defines water availability, priority of water use, management strategies, performance indicators and monitoring and reporting requirements that apply over the ten year life of the plan.

Purpose of the environmental assessment

An environmental assessment was conducted by DSITIA examining the impact of water resource development associated with the Water Resource (Warrego, Paroo, Bulloo and Nebine) Plan 2003 and Resource Operations Plan on the ecological assets identified in the Environmental Assessment–Stage 1, Appendix A–Ecological Asset Selection Report (DSITIA 2013a). A comprehensive review of information and knowledge relating to the critical flow requirements of ecological assets (expressed in terms of facets of the flow regime) formed the basis for the assessment. The analysis used an ecological risk assessment approach based on daily time series flow outputs from the Integrated Quantity Quality Model (IQQM) for different water resource development scenarios.

The environmental assessment was undertaken by DSITIA and conducted primarily as a desktop study based on best available knowledge. Additional consultation with scientists and water managers was used to further inform the regional ecological content of the data. The environmental assessment report describes the critical flow requirements, assessment and measurement end-points, and thresholds of concern identified for each of the prioritised ecological assets in the plan area, along with the methods and supporting information used to derive these. For each catchment, results of the ecological risk assessment, identifying changes in the provision of critical flow requirements under pre-development and full development flow scenarios, are presented.

1.2 Reports produced by DSITIA

Report 1–Environmental assessment report–stage 1

This is the first report in a two stage environmental assessment that, along with similar hydrologic, socioeconomic, and cultural assessments, is designed to inform the review of the water resource plan. It includes the following tasks:

1. identify surface water and groundwater dependent ecological assets in the plan area that:
    a. are vulnerable to water resource development and linked to both the ecological outcomes and objectives in the water resource plan and Warrego, Paroo, Bulloo and Nebine Resource Operations Plan 2006 (the resource operations plan)
    b. reflect the proposed Murray-Darling Basin Plan (consistent with the proposed Basin Plan criteria and principles);
2. summarise monitoring outcomes relevant to the plan;
3. assess the effectiveness of the plan (over its life) in relation to its stated outcomes, strategies and objectives based on an analysis of item 3 above;
4. identify significant risks and issues from the assessment of items 2 and 3 above; and
5. provide recommendations for scenario testing and critical flow requirement assessments to form part of the stage 2 assessment.

Report 2–Environmental risk assessment for selected ecological assets

This report examines the impact of water resource development associated with the Water Resource (Warrego, Paroo, Bulloo and Nebine) Plan 2003 and Resource Operations Plan on the ecological assets identified in the Environmental Assessment–Stage 1, Appendix A–Ecological Asset Selection Report (DSITIA 2013a). A comprehensive review of information and knowledge relating to the critical flow requirements of ecological assets (expressed in terms of facets of the flow regime) forms the basis for the assessment. The analysis uses an ecological risk assessment approach based on daily time series flow outputs from the Integrated Quantity Quality Model (IQQM) for different water resource development scenarios.

This document describes the critical flow requirements, assessment and measurement end-points, and thresholds of concern identified for each of the prioritised ecological assets in the plan area, along with the methods and supporting information used to derive these. For each catchment, results of the ecological risk assessment, identifying changes in the provision of critical flow requirements under pre-development and full development flow scenarios, are presented.

Report 3–Environmental assessment report–stage 2

The environmental assessment results are summarised in this report, and are supported by a series of technical reports (see above). The environmental assessment report synthesises the information in the Stage 1 assessment and results from the Stage 2 environmental risk assessment report and makes recommendations on mitigation strategies to minimise identified risks, in order to inform the development of a new WRP.

1.3 Purpose of the independent science review

The terms of reference for the independent science review were to:

- Conduct an independent peer review of the environmental assessment of the environmental assessment reports and provide comments and recommendations to DSITIA.
- Consider the science underpinning the environmental assessment and advise DSITIA whether the best available scientific knowledge has been used, the data has been interpreted correctly and conclusions are valid.

1.4 Independent scientist

An independent scientist with extensive knowledge and experience in the areas of aquatic ecology, fluvial geomorphology and environmental flows, and the Queensland Murray-Darling basin catchments was chosen:

- Professor Martin Thoms, School of Behavioural, Cognitive and Social Sciences, University of New England.

1.5 Review process

The reviewer was provided with the reports outlined in section 1.2 along with a template to record their comments. They were asked to review the reports against the following criteria:

1. To the knowledge of the reviewer, the best available knowledge and scientific understanding has been considered in the assessment;
2. The most appropriate methodology has been applied; and
3. The data has been interpreted correctly and conclusions are valid.

The comments were collated in the provided template and DSITIA's response to each comment made by the reviewer is included in section 2.

2 Reviewer comments and DSITIA responses

Environmental Assessment Report–Stage 1		
Report section (i.e. page no, paragraph	**Reviewer's comments**	**DSITIA response to reviewer's comments**
Page 4–Surface water ecological assets	This report should separate out those assets that relate to different hydrological scales - these being the scale of the flow regime, flow history and flow pulse. Then demonstrate how the plan relates to each of scale related assets. There is some confusion in the text - there is reference to hydraulic variables like water depth etc., which is essentially dictated by the flow pulse. The reference to the frequency of floods implies this control or influences the hydraulics of events - which is technically incorrect. What ecological assets are driven by what hydrological component is critical here and should be explicitly stated.	Ecological assets have been classified according to their critical links to aspects of the hydrology (i.e. low flow, medium flow, flood flows) and their life history and process requirements implicitly linked to these aspects including the antecedent conditions and flood pulse events. The eco-hydraulic rules relate to the flow history, flood pulse or both depending on the life history or process requirement of the asset. The ToC relates to the flow regime and how they provide these opportunities over time. These concepts are embedded in the process used for the assessment, but using slightly different terminology.
Page 6–Results	More explanation as to how the filtering was undertaken is required - especially the principles upon which the filtering is based.	First paragraph of section 3.1 is expanded to provide additional detail on the asset filtering process.
Page 10–section 4.1.1	More explanation on why the work concentrated on these four aspects of flow	Section 4.1 expanded to further explain how the WRP influences the hydrology of the four catchments to support the selection of the threats and the assets which represent them.
Page 10–sections 4.1.2 and 4.1.3	In these sections and throughout all reports - comment is required on the quality of the data and the quality of the results provided.	It is a major assumption of the assessment that the IQQM scenario is an adequate representation of the flow regime at those nodes used in the environmental assessment.
Pages 10 and 11–section 4.1.3	Three threats to the condition of ecosystems in the regions are provided - what is the basis of these - more explanation required	see comments on section 4.1.1
Page 12–Summary	This summary is relatively weak. Are the indicators used from other studies pertinent to this plan and this specific region? Also will the indicators used provide you want you want them to indicate?	The selected ecological assets represent all of the plan outcomes, basin plan outcomes and threats from the WRP. Therefore at this stage of the process they are considered appropriate. This section was

	Appropriateness of the indicators needs some clarification.	intended to be brief. Reflection on the adequacy of the indicators is further discussed in the stage 2 analyses and issue related to their use and key knowledge gaps documented.
Page 13, Table 2–Tannock Weir	Why not include a flow to ensure fish passage - this would be an important flow threshold. I do not agree with the statement that the weir is not influencing in-channel processes. Weirs do influence in channel processes and they do influence channel morphology both upstream and downstream of the structure. There are many examples of this in the MD Basin.	No data collected throughout the life of the current plan suggests that Allan Tannock Weir has influenced in channel processes upstream or downstream of the structure. Current monitoring however is limited to observations of bank slumping by the operator. Recommendations on additional monitoring advice on how future improvements to this regime maybe implemented would be welcome
Page 13 Table 2–SRA Fluvial geomorphology	I agree with this statement - the fluvial geomorphology of the SRA is very weak and these data cannot be relied upon at all	Noted
Page 14–Recommendations	Given the level of confidence you have in the data and initial surveys this statement may be a little strong. You cannot say substantively that there are no further ecological issues that need to be considered - this just closes the door on potentially bringing others later	The recommendations state that there are no issues which require a *significant alteration* to the WRP or ROP. Opportunities for further improvement have been identified throughout the stage 2 process and maybe implemented in the future plans.
Overall comments	The report as it stands meets the criteria noted above. There are several areas in which it could be improved through the following: 1) More explanation on how certain aspects of the study were undertaken; 2) Why was the broader floodplain vegetation not included as an asset - explanation required.	Vegetation species with specific eco-hydraulic requirements which represent the broader suite of floodplain vegetation were chosen. It is not possible to model eco-hydraulic rules for a vegetation assemblage if they do not share the same water requirements.
Did the report meet the review criteria?	**Overall, the report does meet the criteria noted above**	
Environmental Assessment Report–Stage 2		
Page 15-Fluvial geomorphology	This section presents a very simplistic view of low gradient dryland rivers - as just many of the assumptions about these types of river systems are incorrect. For example they do not have classic riffle-pools features. The authors are encouraged to consult	The work of Nanson and others was revisited and this section updated to include a more balanced discussion on the nature of low gradient dryland rivers.

	material that provides detail about low gradient dryland rivers. In particular Nanson does provide an excellent overview of the processes of water hole formation.	
Page 16–Waterholes as refugia	Suggest the Sheldon et al review on refugia be consulted	Sheldon reference consulted and the section updated accordingly
Page 21–Defining assessment endpoints	While the majority of this is fine and should some commentary as the confidence in the knowledge being used should be provided	Issues around confidence in data and assumptions are documented throughout. However the reviewer's reference to assessment endpoints is unclear. Measurement endpoints are indicators of the attributes which represent the flow related values. This is not a data driven attribute.
Page 22–Thresholds of concern	The working definition of Thresholds of concern is incorrect - consult Rogers who defines TOC	ToC is a definition modified from the original concepts of Rogers & Biggs 1999 (as referenced) to meet the specific needs of this assessment. It has been widely applied in similar environmental assessments conducted across the state over the past five years.
Page 23–Eco-hydraulic modelling	Some comment on the use of actual vs. simulated flow should be made and the QA/QC of using simulated flow data.	Details of the hydrological modelling and reports containing QA/QC processes has been added to the document
Page 24–Assessing risk	I like the approach taken here - it is sound, has a degree of novelty - especially the risk based	Noted
Page 25–Table 2	Low flows are missing from this table - why?? Low flows have valuable associated habitat.	Low flows are represented by waterholes by refugia (see second page of table 2) and migratory fish movements - this error will be corrected. There is currently no knowledge on the physical habitat structures and their dependencies on low flows. Advice on potential indicators from the reviewer is welcome.
Page 28–Table 3	Details to support the statements in this Table are required	Details of how ToCs and risk thresholds were derived are contained in the supporting Risk Assessment Report.
Page 29–1st paragraph	There is no mention of the timing of flows - how come - they should be included	There was no alteration to the timing of migration opportunities under the full development scenario. The report discusses changes to those aspects

		affected by the WRP scenario i.e. number and duration of events. The ToC for this indicator incorporates aspects of timing.
Page 32–Floodplain vegetation	What aspect of floodplain vegetation are you targeting	Additional detail provided in the report to make it clear which aspect of floodplain vegetation we are assessing–maintenance and vigour of existing floodplain vegetation communities
Page 34–2nd paragraph	What is a small - medium and large flood - needs to be defined	Empirically defined using frequency of flood events as determined by satellite image analysis.
Page 35–Ecosystem processes	Why not have a ToC for waterhole isolation	The persistence time of these waterholes are not yet defined as they have not been mapped and studied.
Page 35–waterhole pumping	It appears that pumping from waterholes does have a significant change on water hole hydrology contracting your earlier statement	Unclear what the reviewer is referring to in this comment.
Page 36–Fluvial geomorphology	The estimated discharge required for waterhole formation is under estimated - this can occur at sub bankfull flows	It is recognised that there may be many significant hydrological thresholds relating to geomorphic processes. However the knowledge to support the derivation of these thresholds is currently insufficient and this has been highlighted in the knowledge gaps section. The selection of bankfull height was based on a precautionary approach focussing on maximum hydraulic forces on the stream bed.
Page 37–Table 5	Suggest the confidence of these estimated be noted	Aspects of uncertainty and confidence in the attributes contributing to the calculation of the risk scores are discussed in the ERA report. Currently there is no process for propagating error measures through the stages of the assessment. This is an aspect of the process which DSITIA intends to explore in the future development of environmental assessment methodology. Advice from the reviewer on this process is welcome.
Page 49–Floodplain vegetation	The summary provided is incorrect - as it stands it cannot be substantiated	These summary results and statements are consistent the with assessment results provided in the report. There was no change in spells

		between flood events at either of the thresholds we modelled for either of the modelled development scenarios.
Page 53–1st paragraph	So what is the implication of the ROP not being aligned to flow outcomes??	The implication is that is may be difficult to assess the effeteness of strategies in supporting the WRP ecological outcomes. Recommendations have highlighted this issue with a view to achieve more effective alignment for the next plan.
Page 55-Recommendations 1st paragraph	There appears to be a flaw in your logic here - that water developments will have low impact, especially respect to low flows - low flows have not really been considered in this report with any detail	Refer to comments relating to page 25 tables 2 comment. Low flow indicators were used in the assessment.
Page 55-Warrego	The pumping thresholds within water holes are critical - this needs to be strengthened	Justification for this recommendation has been strengthened.
Page 56-point 2	A simple water balance model would assist with determining the commence to pump thresholds	Noted
Page 57-Recommendation 1	Knowledge of floodplain vegetation and their water requirements is essential	Noted
Page 57-river forming processes	Currently our knowledge of water hole formation processes is very limited and this knowledge gap must be filled	Noted. This will inform the knowledge gap prioritisation and projects to be conducted throughout the life of the next WRP/ROP.
Did the report meet the review criteria?	**This does meet the overall criteria.**	