

Northern Victoria Irrigation Renewal Project
Waterways Short-listing Report



Advice from the
NVIRP Expert Review Panel
to the
Secretary of the Department of Sustainability &
Environment

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Contents

1. INTRODUCTION	- 3 -
1.1 This Advice	- 3 -
1.2 Context	- 3 -
1.3 Role of the Expert Review Panel	- 3 -
1.4 Purpose of the Waterways Short-listing Report	- 4 -
1.5 Process used by the Expert Review Panel	- 5 -
1.6 Criteria Used by the Expert Review Panel	- 5 -
2. ADVICE ON THE ADEQUACY OF REPORT	- 5 -
2.1 Adherence to the WCMF process	- 5 -
2.2 Adequacy of the Technical Assessments	- 7 -
2.2.1 Environmental values	- 7 -
2.2.2 Incidental irrigation water and outfalls	- 7 -
2.2.3 Likely environmental effects of NVIRP	- 8 -
2.3 Soundness and Reliability of Conclusions and Recommendations	- 9 -
3. CONCLUDING ADVICE	- 10 -

1. INTRODUCTION

1.1 This Advice

This advice relates to the Waterways Short-listing Report.

1.2 Context

Although our knowledge of the water cycle across northern Victoria is far from complete, it is clear that several factors have recently contributed to creating a much drier landscape than the region has otherwise experienced in modern times. They include:

- on-farm improvements in water application and drainage generation;
- improvements in infrastructure and water delivery management;
- current extended drought conditions.

Climate change and further infrastructure and service modernisation, in particular roll-out of the Northern Victoria Irrigation Renewal Project (NVIRP), are likely to result in further loss of water in the landscape and in particular to the regional waterways and wetlands. Not all of this loss is detrimental. Removal of unseasonable incidental irrigation water to the environment can result in a more 'natural' hydrological regime.

1.3 Role of the Expert Review Panel

The Expert Review Panel (ERP) was appointed by the Northern Victoria Irrigation Renewal Project (NVIRP) and endorsed by the Minister for Environment and Climate Change to provide advice to NVIRP, the Minister for Water, and the Secretary, Department of Sustainability and Environment (DSE) in relation to the relevant conditions of the decision of the Minister for Planning that an Environmental Effects Statement (EES) is not required for the NVIRP.

Condition 2 of the decision determined that:

"NVIRP must appoint an Expert Review Panel, the membership and terms of reference of which are to be endorsed by the Minister for Environment and Climate Change, to provide advice on hydrological and related ecological changes due to the implementation of NVIRP".

The ERP was established in late June 2009 and met on several occasions since the beginning of July 2009 to review the matters required as set out in the conditions specified by the Minister for Planning in his decision regarding EES. Table 1 lists the documents that the ERP is required to review and for which it is engaged to provide advice at this time. Other documents and matters are scheduled for later consideration, and the ERP will, in due course, provide written advice on these.

Table 1: Documents for ERP Review

Condition	Document	Expert Review Panel role	Approval	Timing
3	Water Change Management Framework.	Review of draft NVIRP documentation and written advice to NVIRP and relevant agencies.	Minister for Water, following review and written advice from the Expert Review Panel and following consultation with the Minister for Environment and Climate Change.	Before operations of relevant works commences.
3	Environmental Commitments – WCMF	Final advice to Minister for Water to be made publicly available.		
3	Processes, methodologies and procedures – WCMF			
5	Short-listing Reports for waterways and wetlands.	Review of draft NVIRP documentation and written advice to NVIRP and relevant agencies. Final advice to Secretary, DSE to be made publicly available.	Secretary, DSE following advice from the Expert Review Panel.	Before operations of relevant works commences.
5	Environmental Watering Plans	Review of draft NVIRP documentation and written advice to NVIRP and relevant agencies. Final advice to Minister for Water to be made publicly available.	Minister for Water following advice from the Expert Review Panel.	Before operations of relevant works commences.

1.4 Purpose of the Waterways Short-listing Report

The purpose of the Waterways Short-listing Report is to identify valued waterway ecosystems that are potentially placed at risk by hydrological changes *resulting from the operation of NVIRP*. The Short-listing Report also identifies which waterways require an Environmental Watering Plan (EWP) to be prepared. It includes a schedule for the development of the EWPs, based on NVIRP’s program of works.

The starting point is the list of sixteen waterways given in Table 8 of the Water Change Management Framework (WCMF). This preliminary list comprises waterways nominated in Attachment 1 (of the Minister’s Conditions) and those identified by a desk-top analysis, plus an additional one, identified as a candidate waterway by North Central Catchment Management Authority (NCCMA). As two on the preliminary list are the same, the number of waterways to be considered remains sixteen. All waterways on this list are expected to have a significant hydrological change as a result of irrigation modernisation. However, their environmental values are not certain. Some are believed to have high environmental values but for others no environmental values were identified in the preliminary analysis.

The purpose of this short-listing report is therefore to establish the environmental values of each waterway on the preliminary list, to confirm the hydrological findings, and to evaluate the likelihood of the environmental values being adversely affected by the NVIRP modernisation. It is intended that this be done by following the procedures and methods outlined in the WCMF.

Expert Review Panel Advice on Waterway Short-listing Report

This Waterways Short-listing Report and the analysis that supports it were completed prior to the WCMF establishing clear guidelines for the process. As such, there are some inconsistencies between this report and the Framework. These are noted below and their materiality considered.

1.5 Process used by the Expert Review Panel

The ERP has commented on two draft versions of the Waterways Short-listing Report (Draft F and Draft I) and this Advice is based on Draft I. This advice is submitted to the Secretary of the Department of Sustainability and Environment on the understanding that editorials from the ERP regarding report structure, formatting and editorials will be thoroughly addressed in the Waterways Short-listing Report (Final) which is to be submitted on the 11th August 2009, together with this advice.

Feehan Consulting was engaged by NVIRP to undertake the above mentioned process and determine waterways for which EWPs are recommended along with the associated timing of these EWPs. Feehan Consulting then employed Hydro Environmental as sub-consultants to undertake the hydrological assessment. The report was reviewed (in draft form) by the Technical Advisory Committee (TAC) prior to the ERP's review.

A presentation of the Waterways Short-listing Report was made to the ERP in July 2009.

1.6 Criteria Used by the Expert Review Panel

The ERP has structured its advice around three criteria:

- (i) completeness and adherence to the process given in the Water Change Management Framework
- (ii) adequacy of the technical assessment in determining:
 - a. the environmental values of the waterways
 - b. incidental water and outfalls to the waterways
 - c. likely environmental effects of NVIRP on the waterways
- (iii) soundness and reliability of the conclusions and recommendations.

2. ADVICE ON THE ADEQUACY OF REPORT

2.1 Adherence to the WCMF process

The process for short-listing waterways is outlined in the WCMF in Section 14; it is alluded to in Section 15, and is set out in more detail in Attachment D. As given in Attachment D, the short-listing process for waterways comprises the following four steps:

- (i) a review of the assessment and recommendations made in the Desktop Assessment Report;
- (ii) documentation of the environmental values of each waterway, through reports, literature, consultation and field inspection
- (iii) documentation of incidental irrigation water, outfalls and water regime of receiving waterway, where feasible

Expert Review Panel Advice on Waterway Short-listing Report

- (iv) an assessment for each waterway of whether reduced outfalls are likely to have a significant negative impact; and whether or not further work, or the development of an EWP, is warranted.

The manner in which each of these four steps has been addressed is as follows.

For the comparative review, the report provides a table for each waterway that summarises the environmental values and hydrological assessment from both the Desktop Assessment Report and as established through this Waterways Short-listing Report; it also provides a reconciliation table comparing the findings from both studies, and giving an explanation for points of divergence. These tabulations are considered adequate as a review.

For the documentation of environmental values, the report draws on a range of reports and hence accesses types of information beyond those that were used in the earlier Desktop Assessment Review. It also consulted with agency staff and landholders which, together with a field inspection, in autumn, effectively grounded the information. In addition, each waterway was photographed. A compilation of these photographs is available separately. The outcome of this is documentation for each waterway containing a description of environmental values, with sources and summary. This is a readily available description of each waterway that acts both as a point of reference into the future, and can be expanded and updated, as needed.

For incidental water, and the hydrological regime of each waterway, the report documented these, as far as possible, by accessing data on outfall volumes for the baseline year from relevant authorities. Outfall data are a reliable measure of volumes being discharged into the receiving waterway only when the outfall is a direct connection to the waterway. Outfall data are an over-estimate for waterways with indirect outfall connections where outfalls are discharged into a drain or other carrier that then discharges into the waterway. In these instances, allowance must be made for seepage and evaporation along the drain, and sometimes for licensed drainage diversion. The documentation gives the information relevant to estimating this reduction, such as the length of drain between the metered outfall and the waterway (ranging from 0.5 km to 40 km), and the locations and volumes licensed for diversion either along the drain or in the waterway itself. Maps or images are included, giving general information on waterways rather than specific locations of service points for drainage diversions and outfall locations are explained adequately in the text.

The fourth step is in two parts. For the assessment of whether a reduction in channel outfalls will have a significant effect on environmental values, the report draws on what it has already established in earlier steps, and exercises logic and professional judgement to project the consequences, given as the waterway being either *at risk* or *not at risk*.

For the very final scheduling assessment, the report uses the NVIRP works program for the next 2-3 years to develop a schedule. The final draft received by the ERP identifies which waterways require further investigation but does not specifically identify which require an interim EWP, nor which waterways are expected to be subject to a neutral or positive effect on environmental values.

The findings were reviewed by the Technical Advisory Committee (TAC). The ERP commends this as an invaluable part of the process for extending the knowledge base.

In summary, the execution of the Waterways Short-listing Report is in accordance with the procedures set down in the WCMF. Gaps and omissions, as noted above, are to do with

presentation and interpretation rather than content. They are not substantial and will not affect the overall completeness, or recommendations.

2.2 Adequacy of the Technical Assessments

2.2.1 Environmental values

Fifteen of the sixteen waterways being considered were identified in the Desktop Assessment Report as likely to experience significant hydrological change should outfalls be reduced. Their environmental values were also determined, using reports, databases and a workshop, however the determinations were considered preliminary, being a summary of where environmental values were 'thought to exist' or for which there was no knowledge. The additional waterway was included because it was believed to have significant environmental values likely to be at risk from irrigation infrastructure modernisation. Therefore, establishing the environmental values of all sixteen waterways and their dependence, if any, on outfalls, is a critical part of the short-listing process.

As a group, the waterways are diverse. They include distributary channels, ephemeral streams, anabranches, flood-runners and main river channels; they therefore vary in size, flow characteristics, water quality and geomorphic attributes, and hence also in their environmental values. Ideally, environmental values should embrace more than species, such as habitat values, ecosystem services and functional significance, and these should be considered at both local and regional scales. Determining environmental values can be challenging for dynamic systems, especially when restricted to a short time-frame and reliant on existing documentation and knowledge.

The process used in the Waterways Short-listing Report for identifying environmental values was to access and consult relevant literature, mainly reports of regional agencies, supported by consultation with agency staff, landholders and the TAC. The process did not focus exclusively on positive attributes but considered also factors contributing negatively to waterway condition such as dredging, de-snagging, straightening and occurrence of nuisance growths such as cumbungi. Site inspections were done, and all waterways were visited, which provided valuable interpretation of the written material.

The benefits of this rounded approach are evident in the summaries for each waterway. These refer to habitat, connectedness, and regional importance, and make it clear that much more was considered and included as environmental values than species records, and that the dynamic nature of some of these waterways was considered. For some waterways, environmental values are described only as being linked to flood flows. Concerns within the ERP that this meant that the role of outfalls and their attendant values, if any, had been overlooked were dispelled by the author who advised (Pat Feehan, pers. comm., 4th August 2009) that in fact this was not the case.

The ERP is of the opinion that, in the absence of a standardised and robust protocol for determining the environmental values of a waterway, the descriptions given in the short-listing report are reasonable, rounded and reliable; and that these descriptions can be used as a future reference for NVIRP and other interested stakeholders and agencies.

2.2.2 Incidental irrigation water and outfalls

Incidental irrigation water, as defined in Table 2 of the WCMF, is distribution system operating water ie evaporation, seepage, leakage, meter error and outfalls, as well as on-farm losses. The

Waterways Short-listing Report considers only one of these, outfalls losses. Determining how much of an outfall enters a waterway is a necessary precursor to establishing the impact of modernisation on the waterway hydrology.

Estimating this is quite straightforward when the outfall is directly connected to the waterway. In this case, the volume received can be considered the same as the volume discharged. However this does not apply when the outfall is indirect when the outfall discharges into a drain and travels along the drain to be eventually discharged into a waterway. In this case, there are two types of losses reducing the outfall volume before it enters the waterway which are transmission losses (principally seepage and evaporation) and opportunistic diversions.

Transmission losses can be modelled or estimated informally; opportunistic diversions, which are rarely metered, may be approximated by the license volume. The Waterways Short-listing Report does not attempt to estimate transmission losses but instead relies on qualitative judgements that take into account outfall volume, drain length and characteristics. It determines the likelihood of the outfall volume reaching the waterway by comparing the total licensed diversion with the outfall volume: if the licensed diversion was similar to or exceeded the outfall volume for the baseline year then it was considered unlikely to make much or any contribution to the waterway. The volume reaching the waterway is estimated as a percentage of the outfall and these estimates for all waterways are tabulated clearly.

Given the tight time-frame for the Waterways Short-listing Report, the ERP considers that the approach to assess the incidental water, focussing on outfalls, is appropriate. The ERP notes that the author and sub-contractor were diligent about visiting all sites and that both are familiar with the region and have relevant experience in irrigation systems. Their assumptions, in the form of estimated percentages of outfall contribution, are systematically noted and tabulated. Interpretation is backed by analysis.

A possible limitation is that the comparison between outfall volume and licensed diversion are based on just one year of outfall data (the baseline year) whereas licensed diversions are time-integrated. The ERP is of the view that this limitation is unlikely to have affected the short-listing findings and also understands that appropriate treatment of the baseline year is to be covered in the methods relating to mitigation water which are to be developed and incorporated in the Water Savings Protocol.

2.2.3 Likely environmental effects of NVIRP

The third and most critical technical assessment is determining whether reducing outfalls will have a significant effect on environmental values of a waterway.

In the Desktop Assessment Report, this question was constrained to determining significant hydrologic impact, and was addressed using flow duration curves and comparing historic (20 years) recent and recent with reduced outfalls. This time-integrated approach was only partly effective. It could not be applied to all waterways under consideration, as only some have a gauging record. Moreover, flow duration curves although powerful are usually only one tool in an investigation package as they cannot address timing and water quality factors that are important for waterway ecology.

In this short-listing report, the question of whether reducing outfalls is likely to have a significant environmental effect is addressed by considering:

- outfall volume likely to reach the waterway;

- this volume in relation to flow regime of the waterway;
- flow-dependent environmental values of the waterway which are dependent on outfalls; and
- site characteristics specifically depth and cross-sectional area.

These are considered together but no formal integration is followed. The process is thus synthetic and subjective, akin to conceptualisation, but is also time-constrained (baseline year) and volumetric. Timing and water quality are not specifically considered other than in the analysis for Calivil Creek which explores timing of peak outfalls relative to broilga breeding.

The Waterways Short-listing Report does not contradict the findings of the Desktop Assessment Report as to which were high value waterways but addresses a more specific question. It finds that six of the sixteen waterways have environmental values expected to be affected by reduced outfalls.

The findings of the short-listing study were reviewed by the TAC which gives confidence in the conclusions, notwithstanding that the ERP has some reservations about the overall process. The first relates to the practice, based on the WCMF, of referring only to the baseline year when establishing hydrological dependence. The inherent assumption is that outfalls in that year are representative of outfalls in the preceding years, and therefore are a reliable indicator of what the environment has been receiving. This assumption may not be generally true. In the Campaspe region, for example, outfalls do not 'behave' uniformly and consistently in the 5-10 years preceding the baseline year, with the consequence that the outfall volumes in the baseline year are not indicative of recent outfall trends. The ERP understands that appropriate treatment of the baseline year is to be covered in the methods relating to mitigation water which are to be developed and incorporated in the Water Savings Protocol.

The second relates to not integrating or building on the hydrological analyses (flow duration curves) from the Desktop Assessment Report. Further consideration may be warranted which would strengthen the overall findings.

The third reservation relates to the fact that to date the flow characteristics at risk from NVIRP modernisation have been limited to channel outfalls (overflow and leakage). At the current stage of NVIRP implementation this is a reasonable approach, but future NVIRP-related development may influence other aspects of inflow to waterways. The proposed Groundwater Assessment Report and the adaptation of the short-list after this process will support the continual improvement process and reduce this risk.

2.3 Soundness and Reliability of Conclusions and Recommendations

The Waterways Short-listing Report concludes that five of the original 16 waterways, as well as the additional one (ie total of six) need to be considered for further investigation and, by inference, for an Environmental Watering Plan. All six have, or are believed to have, high environmental values partly dependent or affected by outfalls and receive discharge in volumes that indicate outfall reduction would affect the flow regime of the receiving waterway. The NVIRP works schedule shows that for two of these, a section of the Campaspe River and a part of the Loddon River affected by Torrumbarry IA, outfalls will be affected in the coming irrigation season; by implication, these will require an Interim Environmental Watering Plan. Most of these waterways were reaches in large lowland systems or their anabranches, ie the Loddon and

Campaspe Rivers, and the Broken Creek, all with multiple and complex connections to the irrigation system.

The ERP considers that these conclusions are sound and provide a reliable basis for the development of EWPs. Inconsistencies between the short-listing study and expectations as detailed in the WCMF are not substantial and the ERP is of the opinion that the short-listing process was thorough and appropriate. In this regard, it acknowledges the important guiding role of the TAC.

However, the ERP point out that it does not consider this list as being definitive. More waterways may need to be added as knowledge of regional hydrology improves understanding of how modernisation will affect surface, soil-water and groundwater (specifically the Groundwater Assessment Report), and as a regional perspective of environmental values is brought into consideration. It notes also that the starting point was not definitive. The additional waterway that was added on the advice of North Central Catchment Management Authority is one originally excluded from consideration but has been found to warrant further investigation. Finally, it notes that the Waterways Short-listing Report and the Desktop Assessment Report were broadly in agreement and that the principal points of difference, two waterways (Calivil Creek and Nine Mile Creek) where flow duration curves indicated a large increase in the time dry, were resolved.

3. CONCLUDING ADVICE

This short-listing report has considered the environmental values and potential for significant impact on these for sixteen waterways. It refers five of these as warranting the development of EWPs and one for further consideration and investigation. A proportion of the Campaspe and of the Loddon Rivers is likely to be affected by the modernisation process currently, therefore require an Interim EWP for the 2009-2010 irrigation season.

The report provides a firm basis for determining which waterways will require an Interim EWP or an EWP or no EWP.

The short-list is based on available current knowledge. It is expected to be reviewed and if necessary adjusted in future as understanding of regional hydrological processes is improved and findings of specific reports, notably the Groundwater Assessment report, are taken into consideration.

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