

MDBA ANALYSIS OF THE BURRA CREEK FLOODPLAIN MANAGEMENT

PROJECT BUSINESS CASE

PROPONENT: VICTORIA

The MDBA's advice covers the following criteria in the Basin Officials Committee agreed *Phase 2 Assessment Guidelines for Supply and Constraint Measure Business Cases* (the Guidelines):

- Eligibility (3.1)
- Ecological values of the site (4.2)
- Ecological objectives and targets (4.3)
- Anticipated ecological outcomes (4.4)
- Hydrology of the area and environmental water requirements (4.5)
- Operating regime (4.6)
- Assessment of risks and impacts of the operation of the measure (4.7)
- Complementary actions and interdependencies (4.9)
- Project governance and project management arrangements - legal and regulatory requirements (4.11.2)

Business case assessments by the Department of the Environment will include advice from the MDBA on the technical feasibility and fitness for purpose of proposals as per section 4.8 of the Guidelines.

Key points/summary

- The proposal meets the definition of a 'supply measure' under the Basin Plan and has adjustment potential.
- Information provided for ongoing operations and maintenance resourcing does not currently meet the phase 2 business case criteria and until this issue is resolved, there will be a significant risk for this project. Decommissioning works is not a suitable risk management action as this would negate the SDL adjustment benefits. A clear statement of ownership, funding and responsibility for ongoing operations and maintenance is required to meet phase 2 business case requirements.
- There is evidence that the project will provide ecological benefits, with some further clarification required in the detailed design.

1. Eligibility (3.1)

The proposal meets the eligibility requirements under the Guidelines for further assessment and consideration in the SDL adjustment mechanism.

1.1 Supply measure requirements (3.1.1)

The proposal would meet the definition of 'supply measure' under the Basin Plan (cl.7.03 and (cl.7.15) to:

- operate to increase the quantity of water available to be taken in a set of surface water SDL resource units compared with the quantity available under the benchmark conditions of development;
- achieve equivalent environmental outcomes with a lower volume of held environmental water than would otherwise be required; and
- have no detrimental impacts on reliability of supply of water to holders of water access rights that are not offset or negated.

noting that a final determination will require MDBA modelling.

1.2 Measures not included in the benchmark conditions of development (3.1.2)

The MDBA confirms that the measure was not in the benchmark conditions of development (cl.7.02 of the Basin Plan).

2. Ecological values of the site (4.2)

A detailed description of the ecological values and features of the site is provided (section 4 and Appendix B of the business case). The project area is focused entirely on the Burra Creek North area which is largely unmodified and retains natural values (wetland, forest and woodlands).

The growling grass frog is identified as a value of the site within the business case (Section 4.1), however is not mentioned elsewhere in the document or in Appendix B.

3. Ecological objectives and targets (4.3)

Generally, ecological objectives and targets are specified consistent with business case assessment criteria. Some additional clarification would be helpful to understand the targets more fully.

Ecological objectives and targets are described in section 5 of the business case and Appendix B. Site specific targets for the site have been cross-referenced against the broad Basin Plan objectives, however their relationship with site specific objectives and targets in Appendix D of the proposed '*Environmentally sustainable level of take for surface water of the Murray–Darling Basin: Method and outcomes*' (November 2011) (ESLT report) is not directly addressed. The MDBA's assessment is that the site specific targets are not inconsistent with those objectives. Ecological targets have been quantified however further evidence/analysis is required to enable a determination as to whether the selected targets are adequate or meaningful.

The specific objectives of restoring floodplain productivity to maintain resident populations of vertebrate fauna including bats, sugar glider and lace monitor is measured against a target that only

represents bat abundance and red gum health. The rationale is not clearly described although it is assumed that these measures are being used as proxies for other vertebrate fauna.

The condition of red gum and black box stands is targeted (Table 5-1 of the business case). It is assumed that this refers to stands inundated at flows less than 35,000 ML/d, given that Table 4-2 states that flows above 35,000 ML/d have not been significantly impacted by river regulation (although this statement itself seems erroneous as Gippel (2014) shows that the number of years with events greater than 35,000 ML/d has reduced from three per cent of years under natural to one per cent of years under baseline conditions and the interval between events has quadrupled). It may be that the more pertinent point is that whilst impacted, these flows occur very infrequently naturally).

Targets specified are based on commissioning proposed works in 2020 however the project schedule has commissioning occurring in early 2021.

4. Anticipated ecological outcomes (4.4)

4.1 Anticipated ecological benefits (4.4.1)

Anticipated ecological benefits described in the business case generally meet business case assessment criteria. Inconsistencies and further justification where required should be clarified in the development of the detailed design.

Anticipated ecological benefits are described in the business case and Appendix B. A monitoring program is proposed to test outcomes against assumptions and adaptively manage works operations.

During the feasibility phase of this project the MDBA requested more information on how outcomes for Murray cod and other native fish will be maintained or improved. For example, one of the stated benefits within the feasibility study was 'enhanced flowing habitat within floodplain channels, particularly suited to species such as the EPBC-listed Murray cod'.

The business case states that Burra Creek when flowing would have supported large channel-specialist fish such as the EPBC listed Murray cod. The proposal seeks to restore flowing habitat through the removal of barriers constructed within the waterway (24 blockages in total) which increased the flow threshold of Burra Creek and resulted in a loss of flowing habitat. It is, however, noted that the operation of structures being constructed at the upstream and downstream ends of Burra Creek to allow through-flow will influence the ability to re-instate flowing habitat. Unlike other works proposals within Victoria the risk assessment did not consider the potential for episodic reductions in hydrodynamic diversity due to the construction of regulators. As such it remains unclear if the net effect of the proposed measure is expected to maintain or enhance habitat for these species.

The business case (Section 3.2) also states that the status of pump diversion infrastructure would need to be established before removal. It is unclear how the anticipated outcomes for seasonal anabranches and billabongs would be impacted if removal of this infrastructure is not possible/supported.

There is some inconsistency which should be clarified within the business case regarding flows to be re-instated and the required volumes. The Executive Summary and Section 3.1 state that the proposal will replicate flows of 30,000 ML/d and require 2750 ML of water. Section 3.2 quotes figures of 35,000 ML/d and 1474 ML respectively. Similarly, Section 1.4 of the business case states that 'almost all of the flood dependent communities found within the forest are inundated by the proposal' yet Table 4-

1 shows that the area to be watered represents approximately one third of flood dependent water regime classes.

As shown in Table 8-1 of the business case, the Burra maximum strategy which aims to water Black Box and Red Gum Woodland is proposed to operate two years in 100. Under natural conditions, the targeted inundation extent occurs three per cent of years (reduced to one per cent of years under baseline and Basin Plan scenarios). This brings into question the flood dependency of these vegetation communities as it appears likely they are accessing other sources of water such as local runoff, rainfall and groundwater rather than being dependent on river flows. Further justification of the ecological benefits provided through construction of works that will be operated roughly once every 50 years are sought, particularly in the context of ongoing costs to maintain these works

The business case identifies ten inundation dependent ecological vegetation classes of which five have some level of conservation significance. It should be ascertained what percentage of each of these classes benefits from the proposed inundation regime.

4.2 Potential adverse ecological impacts (4.4.2)

Potential adverse ecological impacts are covered to an acceptable level for the business case, noting that responsibility for actioning these strategies (including funding to adequately resource) must be incorporated into the detailed design and implementation of the proposal.

The risk assessment has identified a number of high priority ecological risks for the Burra site. After risk mitigation strategies have been applied, some risks have a residual rating of moderate (low dissolved oxygen levels from watering events, increased carp and pest animal populations, habitat disturbance and fire). The business cases states that a risk management strategy is to be developed for these.

Three risks of particular concern where mitigation measures and monitoring will be essential are:

- Low dissolved oxygen levels – Ning et al 2014 assessed potential blackwater risks (unclear if assessment was undertaken using the two blackwater models developed by MDFRC as this is not presented). The report provided general recommendations for minimising risks while also acknowledging that the works can offer benefits in mitigating the impacts of hypoxic blackwater. Specifically, the operation of the Burra Creek works will result in pooling of water which is identified as a potential risk in the accumulation of high loads of bioavailable carbon. In addition the aggregated risk posed by multi-site watering is also raised although robust data does not exist. Managing the timing of flows/inundation and minimisation of pooling of water are two key mitigation strategies recommended along with a monitoring and evaluation program. It should be noted that the risks of negative watering impacts are not assessed in the SDL adjustment method.
- Increased carp populations – Recent carp population modelling undertaken by the Arthur Rylah Institute highlight the significant risk of works sites providing conditions favourable to carp.
- Permanent or temporary removal or disturbance of flora and fauna habitat during construction – identified as a moderate risk after mitigation measures. This will require careful consideration during both the design and construction phases.

Although not specifically considered in the risk assessment, the potential for alterations to flowing habitat is especially important for Murray cod. The proposal seeks to restore flowing habitat through

removal of blockages, however, the operation of regulators could counteract these benefits and the detailed design phase should consider how outcomes for native fish can be maximised.

When considered in total, implementation of the mitigation measures for all the risks represents a large commitment of resources. As the supply measure is assessed on the basis that the risk mitigation strategies are put in place, it is important to ensure that responsibility for implementation of these strategies (including funding to adequately resource) is clearly defined in the detailed design in the event that the risk materialises. These include for example:

- additional monitoring (e.g. organic matter loads, dissolved oxygen levels, temperature and salinity levels);
- additional on-ground actions (e.g. eradicate new infestations of pest plants, control pest animal populations, revegetate construction sites);
- additional planning and management functions (e.g. integrate water management with other sites in seasonal water planning processes, develop a 'fish exit strategy' to inform regulator operation during the drawdown phase to maintain fish passage); and
- additional operational requirements (e.g. tailor watering regimes to provide a competitive advantage for native fish over carp, agitate water using infrastructure to increase aeration, time water manipulations to drown invasive seedlings).

Lloyd Environmental (2014) identify a number of ecological risk knowledge gaps across all current proposal sites (presence and distribution of threatened species, threats from episodic reduction in hydrodynamic diversity, stranding/isolation of native fish). There is therefore the potential that ecological risks have been underestimated due to a lack of available information. Given this uncertainty, these risks require further consideration throughout the life of the project i.e. detailed design, construction and operation and a monitoring and evaluation program will be essential to mitigate these risks.

5. Hydrology of the area and environmental water requirements (4.5)

5.1 Current hydrology and proposed changes to the hydrology (4.5.1)

The business case and supplementary information provide sufficient information to explain the project's current hydrology, and changes associated with the supply measure proposal. This meets the requirements of the Guidelines. To assist the proposal's integration into the MDBA's model-based assessment framework further clarification and refinements are likely to be required.

A hydraulic model was developed for the project using the MIKE-FLOOD modelling suite and was assessed by the Expert Peer Review Panel. As stated in the Panel's report and the business case, the hydraulic modelling outputs were derived from steady state conditions which may result in an overstatement of the inundation (and environmental benefits) of the supply measure.

While best current information has been used there are still some limitations which increase the uncertainty in SDL offset volume estimation, including:

- Representation of channel elevation is driven from a LIDAR data where water reflects false geometry in channels. It is assumed that water depth is 2m in Murray and grid cells for channel sections are lowered manually with some minor modifications which are made for creek system within the site.

- The rating curve at the downstream boundary is driven by a combination of trial model runs and other information available. Inaccurate representation of the boundary condition may lead to different water surface profiles.
- Different loss and seepage assumptions may lead to a different inundation extent.
- Modelling should be improved using hydrographs in the River Murray. This would also quantify the effect of return flows in the River Murray downstream.

Notwithstanding these issues, the assumptions used to represent the measure have been documented and the models and information provided appear sufficient for the proposal to be integrated in the assessment framework at this stage.

An estimate of the volume of environmental water used at the site is given for one of the operating strategies, noting losses and return flows were not taken into account. This volume appears reasonable.

5.2 Environmental water requirements (4.5.2)

Environmental water requirements are described in Appendix B, and are consistent with Guideline criteria. More explanation is required regarding how the proposed operating regime relates to the hydrological targets recommended where discrepancies exist. In some instances these do not appear to align directly e.g. different frequencies and/or duration. This appears to have arisen at least in part because the recommended environmental water requirements have been informed by Ecological Associates (2014), which refers to an analysis of the frequency and duration of events under natural conditions. For example, Ecological Associates (2014) state that the frequency and duration of 30,000 to 35,000 ML/d flow events have not been significantly affected by river regulation. As pointed out in the objectives and targets section above this is inconsistent with more recent natural hydrological analysis undertaken by Gippel (2014).

In relation to the above, the prevalence of 30,000ML/d flows in the business case is equal to the modelled natural prevalence at two in ten years (Table 5-2 of the business case). This is inconsistent with the hydrological targets set in the business case of one out of ten years (p139 of Appendix B). The rationale for deviating from the two in ten years regime recommended should be explained, preferably supported by scientific literature, or the operating regime amended. It is also unclear why the Ecological Associates (2014) hydrological target of one out of ten years differs substantially from the water regime for vigorous growth of lignum specified by Roberts and Marston in their publication *Water Regime for Wetland and Floodplain Plants*, which is every one to three years. In addition, lignum shrubland and woodland have a denser and more diverse groundlayer with less frequent inundation or form dense, continuous thickets when flooded. It is unclear how this relates to an inundation frequency of one or two years in ten.

There is an inconsistency in recommended water requirements for the same vegetation community between business cases submitted by Victoria, and they vary quite widely e.g. hydrological targets specified for lignum vary from three in ten years at Wallpolla, seven - eight in ten at Belsar-Yungera and one in ten at Burra Creek. Similar inconsistencies occur for red gum and black box watering requirements. Whilst some variation between sites would be expected due to differences in hydrology, access to other sources of water etc., further explanation of these discrepancies and better

linkages to literature describing water requirements of flood dependent vegetation would considerably strengthen the business cases.

Tables 5.2 and 9.1 of the business case indicate that supply measure operation will result in a shift in timing of most of the inundation events to late autumn - early winter. This is considerably earlier than would have occurred naturally however a rationale is not provided in the business case. There are also some implications from an environmental outcome scoring point of view. Specific flow indicator (SFI) equivalence mapping is timing dependent and it is possible that inundation events generated through works for seasonal anabranches may occur outside the SFI window for the 16, and 20 GL/d Gunbower-Koondrook-Perricoota Forest SFI events (June to December). However parts of this proposal for lignum, red gum and black box will most likely align with the 30 and 40GL/d SFIs which are not timing dependent.

6. Operating regime (4.6)

The business case does not provide a detailed operating regime, however the initial proposal of potential operating regimes is at a level of detail appropriate for concept design stage and is sufficient for initial modelling purposes. It is anticipated that further modelling to support a more detailed operating plan will be undertaken as this project is progressed. Noted below are areas in which further work should be carried out in the development of detailed designs.

The business case sets out the role of each key asset for the range of operating scenarios. The preferred timing, frequency and duration have been detailed for each operating scenario in the proposed operating plan for the works.

The risks associated with operation of the works are addressed to an appropriate level for a concept design.

The design of the various assets is robust and allows for adaptive management of the scheme over time.

Monitoring

There is not enough information about the monitoring activities to determine if there is sufficient monitoring planned to support operations and water accounting. Information about water entering, flowing within and exiting the site is necessary for the effective management of environmental watering events and their co-ordination with other river operations activities.

Accounting for the delivery and use of environmental water

All watering sites will need fully-developed water accounting arrangements supported by well-resourced monitoring in order to determine environmental water use. There are a number of methods that could be used and it is expected that accounting arrangements will be similar to equivalent sites under The Living Murray. Information about water entering, flowing within and exiting the site is necessary for the effective management of environmental watering events and their co-ordination with other river operations activities.

Water returning to the River Murray from the assets should be measured to allow re-crediting where possible. The MDBA is working with Victoria on this through the PPM Implementation Plan for the River Murray System. The business case does not discuss linkages between this work and the proposal, for example how water use will be measured or estimated.

Where irrigation infrastructure is used to deliver water to environmental sites, it is expected that arrangements will be put in place to secure delivery and set out how competing demands will be managed.

Use of environmental water

There is the potential for interaction between the proposed project and constraints, which may reduce, although not remove the benefits. The project allows for a directed, efficient delivery of environmental water and targeted inundation under dry conditions.

Achieving proposed flows will require close collaboration with river operators and other environmental water holders, such as the CEWH and VEWH. There is insufficient information to assess whether arrangements are in place to ensure that environmental water can be delivered to the asset. Delivering proposed flows to watering sites will involve the use of held environmental water and it may not be possible in practice to deliver flows according to the preferred timing, frequency and duration detailed in proposed operating scenarios. There may be issues with an environmental water holder's watering priorities and whole-of-system operational considerations and allowing for this is not apparent in the business case.

In particular, whether approvals/licences etc. are required to ensure the regulators can extract water from the river, and whether arrangements are in place to manage flows between MDBA and other river operators is not clear. The Reference Group to assist and advise on commissioning and operation for each project will include the CEWH and VEWH, providing opportunities for input at this stage. The business case does not describe any consultation with water holders during the development of the proposal, and does not identify environmental entitlements required.

7. Assessment of risks and impacts of the operation of the measure (4.7)

The risk management approach adopted is consistent with the AS/NZS ISO 31000:2009 standard and the level of detail is appropriate for application at the concept design stage. It describes mitigation measures and additional considerations for the six risks that remain moderate after mitigation. However, a number of risks have not been mitigated in the current business case to a level which meets Guideline criteria, as noted below.

Operation and maintenance

Information provided for ongoing operations and maintenance resourcing does not meet the phase 2 business case criteria and until this issue is resolved, there will be a significant risk for this project.

The risk assessment of potential operation impacts lists lack of funding for ongoing operation, maintenance and management as a high risk to project success. The proposed mitigation actions aim to reduce the residual risk to low and include maintaining strong relationships with funding bodies and suspending operations if there are insufficient resources. Decommissioning works and/or suspending operations are not suitable risk management actions as they would negate the SDL adjustment benefits. In addition, a lack of resources for maintenance would result in asset impairment quite quickly. Should resourcing be reinstated at some later point, operation of those assets may not be possible. A clear statement of ownership, funding and responsibility for ongoing operations and maintenance is required to meet phase 2 business case requirements.

This assessment does not consider the risk of insufficient resourcing for operations and maintenance from the perspective of being able to operate works into the future to achieve the benefits upon which the SDL adjustment is based. A failure to operate due to lack of funding would result in the intended ecological equivalent outcomes not being achieved, in effect a project in which the adjustment is not delivered on an ongoing basis. As such, this risk is not adequately mitigated without a clear funding source.

The MDBA considers that funding of operations and maintenance of these assets must be assured by the relevant state.

Ownership and governance

While the business case outlines the issues to be taken into consideration for determining governance arrangements, it does not provide information on important issues such as the ownership of the assets created as part of this project and responsibility for on-ground operation of the works.

There is a risk that the works could become impaired if the organisation responsible for operating the works does not have an experienced engineering crew to promptly undertake repairs, especially following high flows.

Water quality

Risks associated with water quality parameters outlined in chapter 9, part 2 of the Basin Plan have been addressed for the most part and have followed the AS/NZS ISO 31000:2009 Risk management—Principles and Guidelines.

The business proposal will alter the frequency, duration and extent of floodplain inundation. There is the potential for salt to be mobilised through changes in groundwater level and surface run-off with a subsequent impact on the River Murray. Significant resources for monitoring and modelling are required to assess these adverse impacts. SKM's Preliminary Salinity Impact Assessment for Mallee Environmental Watering Projects reported a lack of monitoring bores in the floodplain and recommended that groundwater bores to gather more information should be installed, included as an action in the business case.

In section 7 the business case notes that the nature of any downstream salinity and/or water quality impacts, and any potential cumulative impacts with other measures, cannot be formally ascertained at this time because of other upstream impacts. However, the specific water quality impacts on the river associated with this measure should be assessed individually using modelling.

Other risks

All other significant operating risks and impacts have been identified and controls put in place to reduce these risks. Those that retain a moderate risk rating once mitigation controls are implemented have additional considerations listed in the business case. Concerns with some of these are noted in section 4.2.

8. Complementary actions and interdependencies (4.9)

The business case partly meets the Guidelines criteria for complementary actions and interdependencies.

The business case identifies the surface water SDL resource unit affected by the measure and states that any potential inter-dependencies for this supply measure and its associated SDL resource unit, in terms of other measures, cannot be formally ascertained at this time.

The MDBA expects that the proposed works will be operated as part of a reach-based approach potentially including Nyah, Vinifera, Belsar-Yungera and Burra Creek. Careful consideration will need to be given as to how these works are best co-ordinated in order to achieve whole-of-system outcomes, and further details should be provided as to how best to manage co-ordinated watering to achieve outcomes as part of the next phase.

Linkages between constraints and the supply measure have not been addressed in the business case and should be considered where relevant in the assessment of the project.

9. Project governance and project management arrangements (4.11)

9.1 Legal and regulatory requirements (4.11.2)

The business case has provided most of the required legal and regulatory requirements and an appropriate management strategy for each. This criteria will be further reviewed in the Department of the Environment's assessment.

Some limitations to the information provided are:

- A possible need for legislative change for securing native vegetation offsets has been identified, but a management strategy for this change is not provided – however non-legislative options are also being explored.
- The business case flags that no new agreements need to be created with water holders in the Basin. This conclusion has been provided without any context around the consideration of the project's requirements for environmental water. The Reference Group to assist and advise on the commissioning and operation for each project will include the CEWH and VEWH, providing opportunities for input at this stage. However consideration of how the timings and volumes of environmental water required might be accessed is not readily apparent.
- While the business case identifies that no changes to water sharing frameworks and river operations rules and practices are required, consideration of how the implementation of the project will be reflected in the Victorian Murray Water Resource Plan should be considered in the future.

In order to guarantee the ability to operate the project works into the future, the owner of the asset or its agent will need to obtain and hold:

- the right to construct, operate and maintain the assets and the specific land required for these assets including land needed to gain access to the assets; and
- rights of access to all land impacted by a project for purpose of implementing the operating regime in order to achieve the intended ecologically equivalent outcomes upon which the SDL adjustment is based.

Although the business case includes some information about the need for easements and access rights, there is insufficient information about who is responsible for ensuring they are obtained, or who the beneficiary of the rights will be.

The MDBA's experience with similar infrastructure suggests that not addressing these issues early can impact the effective operation of the assets. The business cases should include a commitment by the proponent that they will obtain and hold these rights.