

MDBA ANALYSIS OF THE BELSAR-YUNGERA 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, however there are issues where proposed hydrological targets exceed natural flows and are inconsistent with the Basin Plan. The operating regime set out in the business case must be amended in the detailed design phase of the project to avoid inundation at frequencies above natural levels. This will be required by no later than the end of August 2015 to allow sufficient time for the proposal to be modelled.

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)

The description of the site’s ecological values in the business case is generally consistent with the assessment criteria in the Guidelines.

A detailed description of the ecological values and features of the Belsar-Yungera site was undertaken by Ecological Associates (2104) and is provided (business case Appendix B). The conclusion of Professor Terry Hilman from the Expert Peer Review Panel which Victoria engaged to review the submitted supply measure proposals was that “the proposal and risk assessment provide a sound ecological foundation for the business case for the suite of supply measures at Belsar-Yungera.”

The description indicates that the site has important ecological values. Belsar-Yungera is important for a range of biotic classes including fish (e.g. Murray Cod), vegetation (e.g. 57 rare or threatened species, six ecological vegetation classes of conservation significance), waterbirds (e.g. ibis, freckled duck, blue-billed duck), other birds (regent parrot, sea-eagle, grey-crowned babbler), frogs (e.g. growling grass frog), reptiles (e.g. carpet python), woodland mammals (e.g. sugar gliders) and bats (8 taxa).

A fish passage workshop organised as part of the development of the business case noted that catfish will be a prominent species at this site and that it has particular flow requirements, however there is no mention of this species in the sections in the business case on ecological values, objectives, targets or environmental water requirements. This should be further clarified by the proponent.

The business case does not indicate the current condition of the site (e.g. whether the site is highly modified) with an overview of past management activities and actions to demonstrate the potential for the proposal to achieve its intended environmental outcomes/benefits.

3. Ecological objectives and targets (4.3)

Generally, ecological objectives and targets are specified consistent with business case assessment criteria. The issue of above natural flows needs to be addressed to meet Guideline criteria.

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. As Hattah Lakes was the assessed asset in the ESLT report, it is not unreasonable to expect somewhat different ecological targets at Belsar-Yungera.

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. Two of the targets appear to be set at low levels and it is recommended that consideration is given to enhancing them. These are:

- More than ten adult Murray cod in Narcooyia Creek migrate to and from the River Murray channel at least once per year; and
- More than one ha of dense sedgeland is present in at least two wetland sites by 2030.

Explicit ecological objectives or targets are set only for lignum shrubland - the dominant vegetation class present. Given the importance of the site in supporting a diverse array of vegetation types, it is unclear why objectives and targets have not been specified for other key vegetation classes expected to benefit from the proposed measure, including those with conservation status (e.g. red gum forest and woodland, blackbox woodland).

The specific objective of restoring floodplain productivity to maintain resident populations of vertebrate fauna including carpet python and bats is measured against a target that only represents bat abundance. The rationale for this is not described.

Targets specified are based on commissioning the proposed works in 2020, however the project schedule has commissioning occurring in 2022.

Ecological Associates (2014) refers to an analysis of the frequency and duration of events under natural conditions which appears to have informed the recommended environmental water requirements. However, the more recent hydrological analysis undertaken by Gippel (2014) shows that a number of the hydrological targets are overstated and exceed the flows which have occurred naturally. Based on a comparison of Table 9-1 and the spell analysis of Gippel, four of the hydrological targets in the business case exceed the frequency of flows which would have occurred under natural conditions – these are lignum 50,000 ML/d flow, lignum 70,000 ML/d flow, black box 100,000 ML/d flow, and Lake Carpul 170,000 ML/d flow. More explanation is required regarding how the proposed operating regime relates to the hydrological targets recommended where discrepancies exist.

A comparison of the proposal's hydrological targets with the modelling used to determine environmental water requirements for the Basin Plan further illustrates the issue of providing above-natural flows. At Belsar-Yungera, a 50,000 ML/d equivalent flow for two months for 80 per cent of years is proposed (Table 9-1), whereas Basin Plan analysis indicated that this flow would only have occurred in 47 per cent of years under natural conditions. Similarly, a 70,000 ML/d equivalent flow for (an average of) six weeks for 70 per cent of years is proposed, whereas Basin Plan analysis indicated that this flow would only have occurred in 38 per cent of years under natural conditions.

Further to this, one of the hydrological targets relates to inundation of black box, which Appendix B states requires inundation on average six years in ten (i.e. close to every two years). This differs substantially from the water regime for vigorous growth of black box specified by Roberts and Marston in their publication *Water Regime for Wetland and Floodplain Plants*, which is every three to seven years.

Victoria has provided additional information which indicates that the operating regime in the business case, in which above natural frequencies are proposed, is not how the project will actually be run. The operating regime set out in the business case must be amended as per the additional information when developing the detailed design of the project, to avoid inundation at rates above natural levels. In the interim, the MDBA will pursue discussion with Victoria to resolve the issue, and to ensure that any modelling undertaken is consistent with the intent of the additional information. The amended regime will be need to be settled by the proponent as soon as possible, and certainly no later than the end of August 2015, to allow sufficient time for the proposal to be modelled.

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. Some additional clarification would be helpful to understand the benefits more fully.

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.

A number of measures (construction of fishway, removal of obstructions, increase Narcooyia Creek throughflow) have been put in place to address concerns expressed in the Phase 1 assessment for the management of Murray cod.

The business case identifies seven ecological vegetation classes as being of conservation significance. In addition, a key breeding site for the nationally threatened regent parrot is identified in Appendix B (Gearbox Loop). It should be ascertained what percentage of each of the vegetation classes benefits from the proposed inundation regime and whether the breeding site will also benefit.

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 Belsar-Yungera site. After risk mitigation strategies have been applied, some risks have a residual rating of moderate (low dissolved oxygen, enhanced carp recruitment, increase in pest animal populations, and habitat removal during construction). The business cases states that a risk management strategy is to be developed for these.

Three ecological 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 potential risk of hypoxia with Lakes Powell and Carpul has been identified. 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 highlights the significant risk of works sites providing conditions favourable to carp.
- Permanent removal or disturbance of flora and fauna habitat during construction – identified as a potentially very high risk after mitigation measures. This will require careful consideration during both the design and construction phases.

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 proposal sites (inadequate knowledge of biotic water requirements, presence and distribution of threatened species, effect of watering frequency on accumulation of organic material on the floodplain). 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. The detailed design, construction and operation and a monitoring and evaluation program will be essential to mitigate these risks.

As noted above, there is the potential for adverse impacts on species through the implementation of above natural flows, which needs consideration.

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 LIDAR data where water reflects false geometry in channels. It is assumed that water depth is 3.5m in Murray and 1m in creek systems for the site. Grid cells are lowered manually.
- 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)

While information on environmental water requirements has been provided to the appropriate level of detail to meet the Guidelines criteria, the proposal would benefit from clarification on the issues noted below.

Environmental water requirements are described in the business case, Appendix B. There are inconsistencies between the proposed operating plan (Table 8-1) and the environmental water requirements (Table 9-1). This arises at least in part because there is often more than one flow target for a particular vegetation group (e.g. black box) in environmental water requirements, however the operating plan only recognises a single flow threshold (in some cases, this flow threshold differs from any of the flow targets specified in the environmental water requirements). Another reason for the inconsistency appears to arise from changes over time in the hydrological modelling scenarios used as the basis for analysis, this particularly relates to the use of different 'without development' scenarios.

During the feasibility phase of this project the MDBA requested evidence for the 170,000 ML/d estimate at which Lake Carpul is inundated in the business case. The business case continues to state that significant inundation at Lake Carpul occurs at flows of 170,000 ML/d, however Jacobs (2014) hydrodynamic modelling shows that under existing conditions, the inundation of Lake Carpul commences at flows of approximately 100,000 ML/d. This difference should be explained. In Table 5.2 of the business case the frequency of inundation events for floodplain lakes with the supply measure is incorrectly given as 5 – the correct figure would appear to be 25 (as both Table 8-1 and Table 9-1 of the business case confirm that the intended frequency is 25 per cent of years, five times more frequently than occurred under natural conditions).

There are also inconsistencies concerning the filling of Lake Powell. Appendix B indicates that the lake starts filling at flows of 90,000 ML/d, the business case states that the flow threshold for significant inundation is in the order of 140,000 ML/d, and Figure 8.3 of the business case indicates that the lake is filled by an 80,000 ML/d flow. These differences are significant because the actual flow at which commence-to-fill occurs determines how frequently pumping should be used to support the ecology of the lake and ensures that above natural watering is avoided.

The two lakes have substantially different commence-to-fill flows, and it should be made clear in documentation that there is not a single flow threshold of 170,000 ML/d for the floodplain lakes complex.

Tables 5.2 and 9.1 of the business case indicate that supply measure operation will result in a timing shift for most 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. The shift in timing has 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 in the proposal may occur outside the SFI window for the 40, 50 and 70 GL/d Hattah Lake SFI events (June to December).

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

Monitoring

There is not enough information on 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, though this is expected to moderate, not remove the benefits. For example, even if constraints are relaxed, 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. 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 salt assessment did not trigger the Basin Salinity Management Strategy, however knowledge of this area is poor and SKM's *Preliminary Salinity Impact Assessment for Mallee Environmental Watering Projects* recommended that groundwater bores to gather more information should be installed. This has been included as an action in the business case.

Other risks

The communication plan aims to minimise the risk of landholders/irrigators concerns with the proposed operating regime.

Other operating risks and impacts have been identified and controls put in place. 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 but 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:

- Secondary works would water areas of private land are proposed and agreement with landholders would need to be negotiated, however a management plan has not been provided. It is noted that these works may not proceed.

- 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 states that no new agreements need to be created with water holders in the Basin. This conclusion has been provided without any context on the project’s requirements for environmental water.
- While the business case identifies that no changes to water sharing frameworks and river operations rules and practices are required, how implementation of the project will be reflected in the Victorian Murray Water Resource Plan should be considered in the future.

Easements and rights of access

In order to guarantee the ability to operate 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 the purpose of implementing the operating regime 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 on who is responsible for ensuring that 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 case should include a commitment by the proponent that they will obtain and hold these rights.