



Australian Government



MDBA technical report for Department of Agriculture and Water Resources

Improved flow management works at the
Murrumbidgee River -Yanco Creek Offtake

Engineering Assessment of SDL Adjustment
Business Case submitted by NSW



2015

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Executive Summary

NSW has submitted a Business Case for the SDL adjustment project: *Improved flow management works at the Murrumbidgee River -Yanco Creek Offtake*

The Authority notes that NSW has three projects that will interact in this area. The other two projects are:

- Effluent creeks
- Murrumbidgee CARMS

Having the three projects presented separately means that it is not possible to be sure that the proposed operations of the three are consistent and that the proposed benefits of one project will not be constrained by a requirement of another project.

The project seeks to deliver higher flows to the Mid Murrumbidgee wetlands by reducing the flows to the Yanco creek system.

- The restriction of flows to the Yanco Creek is achieved by constructing a regulator on the Yanco Creek.
- The Yanco Weir on the Murrumbidgee is proposed to be raised through a series of works to allow the weir pool to be raised by up to 2.5m above the current operating range. This will allow for sufficient head to provide regulated environmental flows to the Yanco Creek.
- The upgraded infrastructure at Yanco weir will see the normal weir pool operating level increased by 0.8m

Key issues

Options analysis

The project is presented as a single option, which has only been developed to feasibility stage. The Authority is of the view that a second option the 'No increase in weir pool level', as identified in the Business Case but not investigated, requires serious consideration.

The 'No increase in weir pool level' option represents a significant cost saving (about half the cost). Careful optimisation of the operating regime may result in the 'No increase in weir pool level' delivering almost the same benefit to the mid Murrumbidgee wetlands without the costs and adverse third party and ecological outcomes.

The Authority is of the view that this analysis should be undertaken and subject to independent review before any option is selected to advance to concept design.

Technical Feasibility and Fitness for Purpose

The component works are presented at feasibility design stage. The level of costing and investigation is consistent with this level of project development.

Noting the need to consider the alternative option of the 'No increase in weir pool level' in detail, the following issues have been noted.

Operating regime

The development of concept designs (for either option) will be dependent on a solid understanding and simulation of the proposed operating regime. This will inform the scale of third party impacts, adverse ecological impacts as well as define the key hydraulic aspects of the design (eg differential head for the fishways).

The operating regime needs to be developed and agreed upon by the key stakeholders and include mechanisms to understand how the operating regime may be altered over time so that necessary allowance can be made in the engineering designs.

Fish Passage

The provision of fish passage represents a key cost \$7.7m (about 30% of the construction costs) and challenge for the project. Yanco creek is recognised a key habitat for Nationally and State listed threatened fish species. As such it is anticipated that significant focus will be brought to bear on any fish passage option.

Resolving the head difference and hydraulic conditions that the fishways will need to operate under represents a critical aspect of this project. Once the preferred option for the overall scheme to take to concept design is agreed upon, the resolution of these issues will become a key task.

Risks

The project has four key risks that need to be addressed.

Riverine Flooding / Site inundation

Constructing works in the river channel and on the floodplain results flooding posing a very significant financial risk and one for which there are limited mitigation options.

The cost estimates in the Business Case has not made provision for the flood risk cost to be passed to the contractor and as such it remains with the project proponent. Passing the flood risk cost to the contractor is not a reasonable approach in any case.

Given the Business Case is one of several proposed by NSW and these will be delivered over several years it is unlikely that all would be impacted by floods. However, it is not possible to determine in advance which projects will be affected and to allocate appropriate budget to meet associated costs. A suggested approach is to allow a provision for costs associated with flooding across the whole program of works and to draw on this on an as needs basis during construction.

Cultural Heritage

The proposed construction of major works are immediately adjacent to the river or creek. While most of the major construction will be on disturbed land some of the works will be on undisturbed land and have a high risk of disturbing Cultural Heritage.

Despite all of the best intention and planning the potential for cultural items to be exposed during construction remains. This could result in the need to cease work and potentially demobilise the site while investigations are undertaken and appropriate steps taken to address the issue.

The Business Case has made no allowance for costs incurred due to approval delays. This would appear to be a significant oversight.

Third Party

The proposed raising of the Yanco Weir pool by 2.5 m will have flooding impact on private property and on riparian crown land. This will almost certainly result in adverse impact that will need to be addressed.

The Business Case does not detail how these adverse impacts will be addressed. In the Living Murray Projects there was no appetite for compulsory acquisition of land or easements. If the same approach applies to this project then this represents a critical risk to the project that has not been adequately considered to date.

The Authority is of the view that the quantification of, and process to address, third party impacts represents a critical element of the concept designs.

Failure to address the third party impacts may result in the works being constructed and unable to deliver the proposed benefits.

Environmental

The project acknowledges that by increasing the height of the Yanco Weir, and thus creating a larger weir pool, that;

- weir pool levels will reduce significant habitat for flow-dependant State and Federally listed species (Trout and Murray Cod) by changing a large reach of the Murrumbidgee from a flowing river, with hydraulic diversity required by native fish, into a static body favouring exotic pest species such as carp.
- The desktop flora and fauna survey indicates that the EPBC Act and TSC Act will be triggered through the increased weir pool inundation overwatering the threatened vegetation communities.

The successful resolution of these issues, to the satisfaction of the environmental regulators, will be critical to the ability of the project to progress. The Authority is of the view that as a first step to mitigate this risk, consideration of these issues should form a part of the process to select an option to take to concept design. The risk can be further mitigated by having the environmental regulators engaged in the option selection process.

Introduction

This report has been prepared for the Department of Agriculture and Water Resources by the MDBA as part of the review of the Business Cases for projects submitted under the Sustainable Diversion Limit Adjustment process.

The report provides the Department of Agriculture and Water Resources with an overview of the Business Cases that have been prepared by the NSW Department of Primary Industries. The main body of the report sets out issues that are common across multiple projects. Additional information specific to each of the Business Cases are provided at the end of the report.

Due Diligence Review Approach

In conducting this due diligence assessment the MDBA has drawn on long experience in managing and delivering major engineering works associated with the River Murray System. In the last decade the Authority has been responsible for the delivery of the Living Murray (TLM) Environmental Works and Measures Program (EWMP).

The EWMP is a \$338 million program that delivered major works to facilitate the provision of environmental water to floodplains and wetlands. The scale of the works varies from major works to small scale strategic infrastructure.

The works proposed in this Business Case is of a scale consistent with the works delivered under the EWMP. Assessment of designs, costs and risks have been made by comparing projects and individual project components to similar works constructed under EWMP.

Summary of Key Issues

This Business Case has been assessed against a series of engineering / technical criteria as set out in the *Phase 2 Assessment Guidelines for Supply and Constraint Measure Business Cases*. These are:

Section 4.8 - Technical Feasibility and Fitness for Purpose

- the proposal is able to deliver effectively on its stated outcomes and proposed technology will perform as intended; and
- the project delivery and operation is secure over the long term from a construction and maintenance perspective.

Section 4.10.1 Costs, Benefits and Funding Arrangements

- rationale and justification is provided for the estimate of the total cost of the project design, construction and commissioning;
- the level of contingency appears consistent with the level of risk identified;
- the benefits are appropriately described (quantitatively or qualitatively); and
- Ongoing operation and maintenance costs are realistic.

Section 4.11.4 Risk Assessment of Project Implementation

- all significant project development and delivery risks and impacts have been identified, adequately described and analysed and robust treatments and mitigations proposed;
- the risk management strategy complies with the AS/NZS ISO 31000:2009 Risk management—Principles and Guidelines; and
- all other risks are negligible or adequately mitigated.

Scope of assessment for technical feasibility and cost

The Business Case has been assessed to determine whether or not:

- The proposal is able to deliver effectively on its stated outcomes and proposed technology will perform as intended; and
- The project delivery and operation is secure over the long term from a construction and maintenance perspective.

The approach adopted for the assessment focusses on assessing the adequacy of the engineering design and includes the following elements and concepts:

- Review of engineering processes applied to design (e.g. extent and form of hydraulic/hydrologic functional requirements , application of defensive design principles for water control structures)
- Source and quality of base data and associated assumptions
- Consideration of constructability issues and temporary works requirements
- Peer review processes used to develop designs

This assessment does not extend to an assessment of the security of ongoing operation and maintenance funding or appropriateness of asset ownership arrangements.

Section 4.10.1 Costs, Benefits and Funding Arrangements

Each Business Case is assessed to determine whether or not:

- Rationale and justification is provided for the estimate of the total cost of the project design, construction and commissioning;
- The level of contingency appears consistent with the level of risk identified;
- The benefits are appropriately described (quantitatively or qualitatively); and
- Ongoing operation and maintenance costs are realistic.

The approach adopted for the assessment will focus on assessing the adequacy of the cost estimate and includes the following elements and concepts:

- Development of indicative cost ranges for typical infrastructure by size/capacity (e.g. regulators, bridges, culverts, levees). Data sources to include estimates and actual cost data from recent construction activity within the MDBA and associated agency programs
- Development of generic cost estimate line items for typical projects
- Development of typical project on-cost rates
- Consideration of construction scheduling

This assessment does not extend to a review of project scope to ensure optimisation of cost-effective environmental outcomes.

Section 4.11.4 Risk Assessment of Project Implementation

The Business Case should be assessed to determine whether or not:

- all significant project development and delivery risks and impacts have been identified, adequately described and analysed and robust treatments and mitigations proposed;

- the risk management strategy complies with the AS/NZS ISO 31000:2009 Risk management—Principles and Guidelines; and
- all other risks are negligible or adequately mitigated.

The approach adopted for the assessment is to

- Prepare a generic risk register (Appendix A) for environmental watering projects. This has been used as a basis to assess the comprehensiveness of risks identified in Business Cases and by extension contingency provisions based on past experience.
- Review of the risk costs presented in the Business Cases
- Identify any major risks that are not costed appropriately.

Business Case Review

The NSW Department of Primary Industries Water has prepared the *Improved flow management works at the Murrumbidgee River -Yanco Creek Offtake Business Case* for consideration under the SDL Adjustment process. This Business Case has been developed and prepared with the oversight of Water NSW as the authority responsible for the major existing assets that are proposed to be modified.

The project seeks to deliver higher flows to the Mid Murrumbidgee wetlands by reducing the flows to the Yanco creek system.

- The restriction of flows to the Yanco Creek is achieved by constructing a regulator on the Yanco Creek.
- The Yanco Weir on the Murrumbidgee is proposed to be raised through a series of works to allow the weir pool to be raised by up to 2.5m above the current operating range. This will allow for sufficient head to provide regulated environmental flows to the Yanco Creek.
- The upgraded infrastructure at Yanco weir will see the weir pool operating level increased by 0.8m

The Authority notes that NSW has three projects that will interact in this area. The other two projects are:

- Effluent creeks
- Murrumbidgee CARM

Having the three projects presented separately means that it is not possible to be sure that the proposed operations of the three are consistent and that the proposed benefits of one project will not be constrained by a requirement of another project.

Technical Feasibility and Fitness for Purpose

The Business Case presents works that are logical and realistic but the level of detail is quite limited. The investigations, designs, and costings are consistent with a feasibility level of project development rather than a concept design. As such the assessments that can be made is limited and the project should go through a further two stages of project review:

1. Concept design – including development of an operating regime and preliminary assessment for cultural heritage and vegetation approvals
2. Detailed design – refinement of structure components

The advantage of the two stages is that it manages the risk of funding detailed design for works that are not cost effective or fit for purpose.

The limited level of detail available means that issues such as design considerations (including application of defensive design principles) cannot be realistically assessed at this stage.

Hydrology

The Business Case (more specifically the Yanco Creek environmental flows study (Alluvium 2013)) clearly outlines the changes from the natural hydrology (an ephemeral creek system) to the current hydrological regime (a regulated creek with permanent flow) for each of the reaches in the Yanco Creek system. The Business Case also mentions the importance of overbank flows for the resilience of the health of the wetlands in the Yanco Creek system, but does not mention the hydrological requirements for each wetland. This information would be useful to understand the system and gain a better appreciation of an appropriate operating regime that should be applied.

The hydrology along the Murrumbidgee, for both downstream and upstream of the works, is not explained. The Business Case mentions the hydrology at Narrandera (20kms upstream of the works) and commence to flow for the wetlands in this area. However, does not mention the wetlands downstream of the works, which will be affected by the operations. This information is important to understand the ecological requirements of the downstream area, the risks associated with the addition of the new regulator along the Murrumbidgee, and appropriate operating regimes to achieve the ecological requirements along the Murrumbidgee.

A change of hydrology as a result of the increasing the height of the Murrumbidgee Weir is clearly mentioned in the Business Case to be detrimental to the EPBC and threatened listed flora and fauna – including Grey Box, Trout Cod and Murray Cod. This was questioned and NSW acknowledged that they are not at the stage to quantify these risks because;

- NSW currently doesn't have a spatial overlay of the vegetation communities that will be affected by the works.
- The inundation mapping, extent of the weir pool raising, and the operating rules of the weir have not been defined at this stage of the project, and
- It is currently unknown how raising the weir to 139.7mAHD will affect fast flowing dependant fish, and whether this can be mitigated via operations.

The proposed hydrological regime under the Basin Plan has not been detailed.

The results of the Murrumbidgee IQQM hydrological modelling of the proposed operating regime for the Yanco Creek system indicate the achievement of most types of flow events has negligible change from what is achieved under the current hydrological regime, notably this includes the achievement of overbank flows (2500 ML/Day).

The results of the IQQM modelling in Appendix 2 state the proposal retains the ability to provide freshes, bank full and overbank flows at the duration and frequency found under benchmark conditions. The purpose of raising the weir pool at the Yanco regulator on the Murrumbidgee is to provide the recommended environmental flow target of 2,500ML/Day in the Yanco creek under low flow conditions in the Murrumbidgee. The ecological impact of providing high flows into the Yanco Creek without any of the associated triggers of high flows in the Murrumbidgee (>45,000 ML/day), has not been assessed. This is particularly relevant as the Yanco Creek ecosystem is an artificial system and has developed based on this relationship.

The hydrological modelling presented has not assessed the option of only providing the ecological flows to Yanco Creek when there are high flows in the Murrumbidgee. This would return the ecological connectivity and inter-relationships that the system has evolved from.

The Business Case has detailed how the proposed project and associated proposed operating regime will affect the achievement of environmental objectives in the mid-Murrumbidgee wetlands in terms of reduced Murrumbidgee flows required at Narrandera for a given site specific flow indicator (SFI). Flows in the Murrumbidgee River required to achieve equivalent inundation will be reduced by 8-9% for each SFI with the proposed infrastructure.

Hydraulics

The Business Case makes reference to hydraulic models developed by Water NSW however no details are presented. The MDBA is of the view that the development and application of a hydraulic model is a critical input to the design process, in particular to the fish passage designs and the third party flooding impact due to weir pool raising. Given the critical role of hydraulic models the Authority is of the view that they should be subject to independent expert review.

The MDBA is aware of significant recent improvements in hydraulic modelling software and is of the opinion that hydraulic models to support detailed design should be of the new triangular mesh hydraulic modelling format to allow for greater resolution at key sites. The better representation of the landscape should improve the calibration and provide greater confidence in the application of the models to the detailed design process.

Options assessment

The Business Case provides minimal information regarding other options that were considered. The Authority is of the view that this represents a significant shortcoming as the 'No increase in weir pool level' option would appear to be a highly viable alternative, with a much lower capital cost and removes the significant third party impacts associated with flooding of private landholdings when the weir is raised 2.5 m above current normal operating level.

The Business Case states that the no increase in weir pool level option impacts on the ability to meet environmental flow targets in the Yanco Creek. These impacts have not been quantified. The Business Cases also presents the argument that the No increase in weir pool level option does not demonstrate 'no net impact on affected systems', however these impacts are not detailed or compared to the adverse outcomes from the proposed works. The Authority would expect to see modelling that demonstrates how the achievement of environmental flow targets under the 'no increase in weir pool' option differs from proposed and how the operating regime for the no increase in weir pool has been optimised to mitigate any adverse outcomes.

The Authority is of the view that the No increase in weir pool level option would represent a highly viable alternative. This would require the high flows to the Yanco creek system to be delivered when there are high flows in the Murrumbidgee. This would be consistent with how the two systems have operated historically and the conditions under which the ecosystem in the Yanco Creek has evolved from an ephemeral stream to a regulated waterway with significant ecological values.

It is expected that the no change in weir pool level option will also greatly mitigate the fish passage issue on Yanco Creek, as under normal operation the Yanco Creek offtake can be fully

open and flows will reflect the historic regime (noting that the ecological benefits of the proposed works come from allowing high flows to be passed through to the Mid Murrumbidgee wetlands).

The Authority is of the view that the 'no increase in weir pool level' option needs to be analysed and presented in detail as it represents a significant cost saving, being about half the cost, and would eliminate the detrimental environmental and third party impacts associated with raising the weir pool.

Operating Regime

Overall

The Business Case indicates the operating regime for Yanco Creek will not return to the natural ephemeral system. This is due to:

1. Irrigation demands, and
2. Ecological demands (the regulated flows have created new habitat for large bodied fish in the upper reaches of the Yanco Creek system).

The operating rules do not encompass all structures and also seem to deliberately avoid the coordination of high flows in the Murrumbidgee with flows in Yanco Creek. The lack of clear operating rules represents a key risk for the project as the scale of the negative outcomes of raising the Yanco Weir by 2.5m are defined how this additional weir capacity is used (eg as a reregulating storage for irrigation supply).

Yanco Creek Offtake regulator

The proposed operating rules for the Yanco Creek offtake do not coordinate the higher flows in the Murrumbidgee with the delivery of high flows to the Yanco system as has occurred historically. It is not clear how often the maximum head difference at the Yanco offtake will occur, i.e. when high flows in the Murrumbidgee occur in combination with base flows in Yanco Creek. This will be important for determining the optimum fishway design with the potential for significant savings where this can be optimised.

Given that the maximum environmental flow recommendation of 2,500 ML/day in the upper Yanco is proposed to be reached for 5 days on average every second year, a more coordinated approach to delivery of environmental flows in Yanco Creek with high flows in the Murrumbidgee may enable the achievement of flow targets for the Yanco without the need to raise the level of the weir pool. This option, as well as reducing the scale and cost of fishways will maintain the historical synchronisation between high flows in the Yanco Creek and Murrumbidgee river.

While the operating regime is something that can be developed over time it will be essential to have the overall flow regime very well defined so that the structures and in particular fishways can be optimised through the design process.

It will also be important that the potential for the operating regime to be altered over time is considered as this may alter the environmental benefits / costs that are proposed with the project. While the issue of altered operating regime applies to all of the SDL proposals – it is of particular concern with this proposal due to the very high interdependence of the works and the operation of water supply in the Murrumbidgee. Integration of the proposed works with the delivery of irrigation supplies needs to be addressed and presented as part of the concept designs.

The Authority is of the view that a key aspect of developing concept designs for this project is to have a defined operating regime for the works and how NSW proposes to ensure that the operating regime does not transform into something that has significantly greater adverse ecological outcomes or renders aspects of the new works unnecessary or operating outside the optimal range.

Mid Murrumbidgee Wetlands

An objective of the Business Case is to improve the mid-Murrumbidgee wetlands, however minimal detail is provided. This will have to be assessed in the overall modelling of the system.

Structure type and Functionality

The designs for the structures are all effectively at feasibility level. The designs are sketches and there is no specific geotechnical investigation validation to support the design. As such the assessment does not consider defensive design principles –this would be a key issue to be considered in the development of concept designs and throughout the detailed design process.

Yanco Offtake Regulator

The construction of a temporary diversion channel for the Yanco regulator presents a significant cost and cultural heritage risk. At concept design level we would expect to see justification for the choice of a temporary diversion channel over other options for constructing the regulator or demonstration that the diversion channel has been optimised. Similar structures built as part of the EWMP have been constructed in two parts with bypass flow, eliminating the need for a standalone diversion channel. This reduces the construction footprint, minimising cultural heritage and vegetation impacts, as well as reducing cost.

New Murrumbidgee Regulator at Yanco weir

There is limited detail regarding the proposed increase to the level of the weir pool to justify the choice of 2.5 m for the level of weir pool raising. The Business Case states that it is only feasible to increase the weir by 2.5m. We would expect to see an explanation or analysis that shows how this figure was determined and what factors this feasibility is based on e.g. engineering constraints, cost etc. The analysis should show how a lower weir pool raising would affect the achievement of environmental flow targets in Yanco Creek.

The Business Case states the new weir pool operating level will be 0.8m above the current normal operating height. This represents one third of the total new weir height. It is not clear how this new operating height was determined and whether it has been optimised. It is not clear what environmental benefit or detriment this level of weir pool raising will present. The option of leaving the Yanco Creek regulator fully open and operate the system as it has been historically should be considered the default position, and changes to this should demonstrate the benefits and detriments and how the overall environmental gains have been determined.

The Business Case contains no detail as to when upstream flood runners and tributaries may engage from the increased Yanco weir pool. This represents potential significant unknown third party impacts that represent a significant risk for the project.

Decommissioning costs for the existing fixed crest weir on the meander reach should be included in the cost estimates for this structure.

Natural flood flows

The impact on natural flooding is likely to be a critical consideration for sizing regulators. Detailed designs should specifically review the impact of the works on flood flows and what impact any increase in afflux will have on third parties, including increased flow to the Yanco system via flood runners (ie partially undoing the benefits of the proposed works).

Fish passage

Yanco Creek Offtake Structure- Fishway

A vertical slot fishway is proposed for the new the Yanco offtake regulator. The fishway has been designed for a maximum head difference of 3.5m. This head difference would occur when 44,000 ML/Day is being targeted at Narrandera in conjunction with base flows of 200 ML/day in Yanco Creek. There is no detail or modelling specifying the period of time at which this head difference is likely to occur or if these flows will likely occur within the September to April peak fish passage season. An analysis of how head difference at the fishway may vary over time would provide more robust justification for this choice of design head difference. The proposed 24 cell vertical slot fishway represents a significant cost (\$3.2m, which is 43% of the total construction cost of the regulator/fishway), optimising the design head loss could present a significant saving. Fishways built through the Sea to Hume fishways program were optimised to provide fish passage to target size classes for 95% of possible flow scenarios.

A careful review of the proposed operating strategy, as discussed above, may result in operating high flows to Yanco Creek when there is high flows in the Murrumbidgee. This will reduce the frequency of high head difference at the fishway and result in a fishway optimised around a smaller head difference with significant savings in capital and future operation and maintenance costs.

The basis for the design of the fishway is for native fish >80mm. This appears to be contrary to the note in the Business Case that Yanco creek has a significant population of small bodied native fish. Given the experience from the River Murray fishways where small bodied fish have been identified as migrating in very large numbers (100 000 fish in a week via a fish lock at Lock 15) the lack of provision for fish passage for small bodied native fish appears to be an area that requires further consideration.

The risk assessment identifies the construction of the regulator on the Yanco Creek as having an impact on small bodied fish movement by reducing waterway connectivity between the Yanco Creek and the Murrumbidgee River for these species. The proposed construction of fish passage to service the migratory needs of large bodied fish does not mitigate the potential impact to small bodied fish.

The Authority is of the view that the concept design for the Yanco Creek regulator should specifically investigate and define the fish community that requires passage and how this will be met by the proposed fishway. This should be confirmed with any regulatory body that may need to give approval for the works, noting the potential impact on two threatened species of fish may trigger some regulatory oversight.

Fishway at new Murrumbidgee Regulator

The fishway at the new Yanco weir is proposed to consist of two components. A rock ramp fishway and a vertical slot fishway. The focus of upstream fish migration provision for the proposed fishway is on medium to large fish.

The fishway has been designed for the maximum HW-TW difference at the weir of 5.45 metres. The Authority would expect to see an analysis of the head loss at the weir as a percentage of time as robust justification for this choice of design head loss.

The Business Case identifies adult small bodied fish as migrating in the Murrumbidgee River from spring to summer and to and from Yanco Creek. The fishway is being designed to hydraulically cater for the upstream passage of medium and large bodied fish (60-1000 mm in length). There isn't clear information in the Business Case as to why the upstream passage of small bodied fish has been excluded from the fishway design or justification as to how this decision was made.

The Business Case states that the upstream passage of small bodied fish has not been catered for as they are highly abundant and they do not need to migrate to complete their life cycle. However, the 'Billabong, Yanco and Colombo Creek Fish Base-lining Project report 2012-13' states that small bodied native fish were generally collected at very low abundances and were even absent from some survey sites.

The absence of upstream fish passage will have a negative effect on small bodied native fish due to increased mortality when they are triggered to migrate upstream in summer. Consistent with the approach for the Yanco Creek regulator the Authority would expect the concept design to include an options assessment for the provision of upstream small bodied fish passage to provide robust justification rather than just accepting the proposed provision of upstream fish passage to medium and large bodied native fish only.

Constructability

None of the proposed works appear to be outside the scale or complexity of works that have been constructed under the Living Murray program. As such the works should be able to be constructed.

Third Party Considerations

The proposed project will have many complicated interactions with private landholders, who will have their land flooded due to the raising of the weir pool, and with water supply for irrigation demands. The development of agreements with private landholders will be required. Based on experience with Gunbower and Koondrook EWMP projects, both of which required negotiation with private landholders and interactions with water supply, the MDBA observation is that the work involved in resolving such agreements is often extensive, time consuming and underestimated early in the project.

An example of third party impacts is mentioned in the Business Case where an environmental watering priority by the Commonwealth environmental water holder for the Mid-Murrumbidgee wetlands did not proceed due to third party impact concerns and approvals in relation to the Yanco Creek offtake flow limit which prevented the delivery of the desired flow regime.

The lack of an assessment of; the number of properties affected, areas impacted, costs to mitigate, delays to the project, represents a significant shortfall in the Business Case.

Quality Assurance Method & Review

No external review has been undertaken for the proposed works. This is consistent with a feasibility level of project development. It would be logical for the concept designs to be subject to independent review before proceeding to detailed design.

Given the scale of the proposed works, the detailed designs should be subject to a rigorous review by independent experts. Appropriate allowance should be made in project planning for both the cost and time of this review.

Ownership and O&M Arrangements

The Business Case identifies Water NSW is the owner of the relevant assets. Water NSW will be responsible for ongoing operation and maintenance of the works.

Cost Considerations

The cost estimates have been developed at a high level, consistent with the projects being at a feasibility level of development. The cost estimates provided appear to be in the right order of magnitude for the works proposed although the fish passage costs are lower than the generally accepted initial estimate of \$1m / metre of head difference.

This level of detail is less relevant compared to issues such as considering the option of 'No increase in weir pool level' or refining the head difference over which the fishway will operate.

Detailed design and approvals

The allowance for detailed design and approvals has been estimated based on a percentage of construction cost. The 10% of the total direct cost of the project has been allowed for survey, investigation, design and documentation, and physical modelling. The Business Case has identified the statutory approvals required and made an appropriate allowance for the necessary investigations and reports to support the approvals process.

The Authority would suggest that as part of the development of concept designs a strategy for approvals and cultural heritage management be developed and costed. This should also inform the timeframe for obtaining the relevant approvals.

An allowance of \$600K has been made for cultural heritage and environmental approvals. By comparison Projects of a similar scale proposed as part of the SDL process have allowed up to \$800K for cultural heritage approvals and support alone.

Construction Contingency

A construction contingency of 50% has been allowed in project cost estimates in the business case. At 50% the contingency allowance is considered sensible for this feasibility level of design development.

Risk Assessment of Project Implementation

A risk assessment and proposed mitigation strategies is included in the Business Case. The risk assessment is very high level - consistent with a project in the feasibility stage.

A more robust risk assessment should be undertaken as part of concept design once further information (e.g. Geotechnical investigations, preliminary cultural heritage field surveys) have been undertaken.

As set out in the Risk Report (Appendix A) the majority of the risks that a project will be exposed to can be contained and managed within the project.

The MDBA has identified four key risks that need to be further considered for this project.

Flooding

The experience of the EWMP program is that flood risk is the greatest financial risk to a project and one for which there are limited mitigation options. During the EWMP program the definition of a flood, when a flood delay would occur, and associated costs payable was altered in the construction contracts to reflect the learnings from flooding at early projects which incurred major costs.

The key learnings from EWMP that are relevant to the SDL Business Cases are:

- it is not financially realistic to pass the risk of flooding to the contractor;
- there is a practical limit to the amount of flood mitigation that can be achieved by use of temporary works, beyond this level it is cheaper to accept the cost of demobilising / remobilising site;
- projects need to plan the timing of the works to minimise the flood risk (this is something that should be addressed in the detailed design / approvals phase of the projects);
- sufficient funds need to be allocated to cover the risk that a flood(s) will require a work site to be demobilised and remobilised at a later date. This incurs large costs to both the construction team and for the project management team.

Despite the works occurring in the main channel of the Murrumbidgee no allowance is made in the Business Case for flood risk.

Cultural Heritage

The proposed construction of major works are to largely be undertaken on disturbed land immediately adjacent to the river or creek. Smaller levees and regulators may be required to address adverse third party impact of the weir pool raising. These works, though low in value are likely to be on relatively undisturbed land and have a high risk of disturbing Cultural Heritage.

Despite all of the best intention and planning the potential for cultural items to be exposed during construction remains. This could result in the need to cease work and potentially demobilise the site while investigations are undertaken and appropriate steps taken to address the issue.

The overall magnitude of the proposed allowance is a matter of judgement and risk appetite. If significant cultural heritage is found in places that were not identified in the CHMP process, as

occurred in the EWMP Koondrook project, the costs can be very significant and the allowances will not be adequate.

The Business Case has made no allowance for costs incurred due to approval delays. This would appear to be a significant oversight.

Third Party

The raising of the Yanco Weir pool by 2.5 m will have flooding impact on private property and on riparian crown land. This will almost certainly result in adverse impact that will need to be addressed.

The Business Case does not detail how these adverse impacts will be addressed. In the Living Murray Projects there was no appetite for compulsory acquisition of land or easements. If the same approach applies to this project then this represents a critical risk to the project that has not been adequately considered to date.

The Authority is of the view that the quantification of, and process to address, third party impacts represents a critical element of the concept designs.

Failure to address the third party impacts may result in the works being constructed and unable to deliver the proposed benefits.

Environmental

The Business Case has identified a number of adverse environmental impacts of the project but does not offer solutions other than stating the refinement of the operating plan will mitigate the risks – noting the operations is not yet defined and will also be part of the CARMS project.

The project acknowledges that by increasing the height of the Yanco Weir, and thus creating a larger weir pool, that;

- weir pool levels will reduce significant habitat for flow-dependant State and Federally listed species (Trout and Murray Cod) by changing the weir pool from a flowing river with hydraulic diversity required by native fish into a static body favouring exotic pest species such as carp.
- The desktop flora and fauna survey indicates that the EPBC Act and TSC Act will be triggered through the increased weir pool inundation overwatering the threatened vegetation communities.

The successful resolution of these issues, to the satisfaction of the environmental regulators will be critical to the ability of the project to progress. The Authority is of the view that as a first step to mitigate this risk consideration of these issues should form a part of the selection of an option to take to concept design and that the regulators should be engaged with as part of the option selection process.