Our ref: DOC22/612801
Your ref: SSI-10050

Nathan Heath
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Water Assessments
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Dear Nathan

Wilcannia Weir Replacement Environmental Impact Statement exhibition

Thank you for your email dated 14 July 2022 to the Biodiversity, Conservation and Science Directorate (BCS) seeking advice on the Environmental Impact Statement (EIS) for the proposed new Wilcannia Weir.

Broadly, identification of the impact footprint from the project is poorly defined and justified. As a result, it is difficult for BCS to determine whether the mitigation measures, residual impacts, and subsequent biodiversity credit obligation are correct. In addition, all potential operational impacts described in the EIS and Biodiversity Development Assessment Report (BDAR) are based on a draft operations plan. BCS cannot comment on the appropriateness of the impact assessment and offset obligation until the operations plan has been finalised. BCS welcomes the opportunity to support Water Infrastructure NSW by providing ongoing input into the operations plan, to ensure that ecological impacts are minimised wherever possible.

BCS has identified a number of inadequacies in the application of the Biodiversity Assessment Method (BAM), the majority of which relate to the assessment of the likely terrestrial biodiversity impacts associated with changes to the water management regime during the operational stage of the project. These matters will require review to ensure adequate application of the BAM to the project and correct calculation of the final biodiversity credit obligation.

Broadly these deficiencies include:

- Assessment of operational impacts on biodiversity are based on preliminary operating rules only. Some avoidance, minimisation and mitigation measures depend on the outcomes of the final operations plan.
- The approach to identifying operational impacts requiring biodiversity credits has not been adequately justified, meaning the final credit obligation may be incorrect.
- There is a lack of evidence provided to support a number of conclusions regarding the extent and nature of biodiversity impacts, which may impact the final credit obligation.
- Inadequate justification for undertaking out-of-season surveys for three species credit species.
- Some apparent errors and inconsistencies in plot data and vegetation zone entries in the BAM calculator (BAM-C).

Appropriate assessment of these matters may require additional survey work, the assumption of species presence or the preparation of expert reports; updates to the BAM-C and spatial data; and additional assessment and justification in the BDAR.

The most effective way to minimise inundation, water quality, and downstream impact issues due to the operation of the replacement weir will be ensuring downstream flows are maintained for as long as possible. This can be achieved by avoiding and mitigating the implementation of the drought security operation mode. Review of the *Hydrology, Geomorphology, Groundwater, Surface Water and Flooding Impact Assessment* Report and the Main Report of the EIS indicates that opportunities to reduce the drought security operation mode have not been fully explored.

The assessment of the project on the environmental water requirements (EWRs) described in the Barwon-Darling Long-Term Water Plan is inadequate. The impact on hydrology, described in reference to the EWRs, should be used to inform impacts to biodiversity as assessed in the BDAR, including whether residual impacts require a biodiversity offset obligation.

The approach to modelling changes to the hydrological regime over the life of the infrastructure is inconsistent or lacking in detail, and the current approach may under-estimate impacts to hydrology and biodiversity.

Finally, there are numerous components of the water and flooding SEARs which have not been adequately assessed. A summary of BCS's comments and recommendations against the specific SEARs is included in this response.

BCS's recommendations are provided in **Attachment A,** detailed comments on biodiversity are provided in **Attachment B**, and detailed comments on water and flooding are provided in **Attachment C**.

If you require any further information regarding this matter, please contact Tim O'Kelly, Principal Project Manager via tim.okelly@environment.nsw.gov.au or 0400 258 232.

Yours sincerely

Sarah Carr
Director North West
Biodiversity, Conservation and Science Directorate

19 August 2022

Attachment A – BCS's Recommendations

Attachment B – BCS's Detailed Comments – Biodiversity

Attachment C – BCS's Detailed Comments – Water and Flooding

BCS's recommendations

Environmental Impact Statement – Wilcannia Weir

BAM	Biodiversity Assessment Method
BAM-C	Biodiversity Assessment Method Calculator
BDAR	Biodiversity Development Assessment Report
BC Reg	*Biodiversity Conservation Regulation 2017*
EWR	Environmental Water Requirement
FSL	Full Supply Level
HEW	Held Environmental Water
PCT	Plant Community Type
PEW	Planned Environmental Water
SAII	Serious and Irreversible Impact
SEARs	Secretary's Environmental Assessment Requirements
TBDC	Threatened Biodiversity Data Collection
WMA	*Water Management Act 2000* (NSW)

Recommendations - Biodiversity

Assessment of all potential operational impacts cannot be completed ahead of a finalised operations plan.

1.1 The impact assessment should be updated as necessary after finalisation of the operations plan and prior to any project approval.

Aspects of the biodiversity assessment approach and conclusions made are not adequately justified with supporting evidence. Revision is necessary to meet the requirements of the BAM.

2.1 Fully justify the conclusion that inundation of the expanded weir pool extent above the location of the existing weir will not result in total or partial loss of integrity for any PCT. This should include:

a) a spatial representation of the modelled extent of inundation upstream of the existing weir under the existing arrangements (no new weir) and the proposed 'normal' operation and 'drought' operation FSLs of the new weir

b) mapping of native vegetation extent within the expanded weir pool area supported by adequate plot data

c) support conclusions regarding the need or otherwise for biodiversity credit calculations on the basis of full or partial loss with:

i. details of the expected changes to inundation frequency, extent and duration and

ii. evidence-based assessment of the likely impact of those changes to inundation patterns on the PCTs and biodiversity values present

2.2 Justify the spatial extent of the downstream impact assessment.

2.3 Adequately describe the downstream biodiversity values and likely ecological responses to the changed flow regimes.

2.4 Supply all data and references to peer-reviewed literature on which the downstream impact assessment was based.

2.5 Consider describing changes to the flow regime with reference to the Barwon-Darling Long Term Water Plan environmental water requirements for the Wilcannia to Lake Wetherell planning unit.

2.6 Following adequate definition of the nature and extent of impacts to biodiversity resulting from changed upstream and downstream water management, update the prescribed impact assessment as necessary to address all requirements of BAM:

a) ensuring that impacts to water quality, water bodies and hydrological processes that sustain threatened entities are clearly described and evaluated.

b) referencing adequate supporting information.

3.1 Demonstrate that the area of direct impact entered into the BAM-C to account for the impact of inundation of native vegetation between the proposed and existing weirs corresponds with the expected maximum extent of inundation in the new town pool at the proposed drought security mode FSL. This should include mapping of the expected extent of inundation overlaid on the vegetation mapping.

3.2 Where the 'river channel' has been excluded from vegetation zones – reference the supporting information that demonstrates either:

a) the lack of native vegetation within that area

b) the lack of impact in that area from the proposed changes to inundation.

4.1 Fulfil all requirements of the BAM for assessment of groundwater impacts as a prescribed impact.

4.2 Ensure the proposed adaptive management strategy outline adequately addresses s.8.4 (2.d.) of the BAM.

4.3 Utilise quantitative information from the low-lying sites noted to have already been affected by groundwater salinisation resulting from the existing weir pool to:

a) predict the likely impacts to biodiversity values from the expected groundwater changes associated with the new town pool.

b) predict the likely impacts to biodiversity values from the expected groundwater changes associated with the weir pool in drought mode.

c) identify the likely indicators of adverse vegetation integrity impacts attributable to salinity.

4.4 Clarify what, if any, mitigation measures would be implemented to address adverse biodiversity impacts resulting from the predicted groundwater changes.

4.5 Predict the residual biodiversity impact associated with the expected groundwater changes following implementation of any mitigation measures.

Some plot data entered into the BAM-C may not reflect field data sheets

5.1 Undertake an audit of stem size class scores and tree regeneration data entries in the BAM-C for plots where trees have been recorded to ensure all data entries reflect field data sheets.

Some vegetation integrity plots may not be representative of site context

5.2 Review vegetation zone stratification for each PCT within the subject site.

5.3 Detail the basis on which each PCT was delineated into condition states (vegetation zones), including plot/spot sample data analysis, site photos, and any other relevant data collected from the site and field assessment methods to justify zone allocations.

5.4 Justify the condition class assigned to Plot 12 which is located across two vegetation zones as per Figure 5-1 of the BDAR.

Candidate species assessed will require review – inappropriate exclusion of species based on out-of season surveys will impact on the credit obligation

6.1 For *Convolvulus tedmoorei*, *Swainsona murrayana* and the Masked Owl:

a) undertake surveys in accordance with TBDC and the relevant departmental guidelines, or

b) assume presence, or

c) obtain an expert report for those species

to comply with the requirements of s.5.2.4 of the BAM.

6.2 Meet all information requirements for the assessment of potential SAII for *C. tedmoorei* in accordance with s.9.1 of the BAM.

6.3 Within the area of impact associated with the project, identify the areas considered to provide suitable habitat for *Solanum karsense* and discuss the suitability of seasonal conditions for this species at the time of survey, with reference to peer-reviewed literature.

Mitigation measures require review to meet the requirements of the BAM and facilitate identification and understanding of residual impacts.

7.1 Ensure the BDAR addresses all components of s. 8.4 of the BAM, including but not limited to:

a) Consideration of the potential biodiversity impacts arising from both the construction and operational stages.

b) identification of any measures where there is a risk of failure.

c) evaluating the risk and consequence of any residual impacts likely to remain after mitigation measures are applied.

7.2 Ensure mitigation measures adequately address both hollow and non-hollow dependent fauna with consideration of critical life cycle events such as breeding or nursing. The area within which mitigation measures will be implemented (i.e. the extent of the buffer zone to be applied for indirect impacts) should be indicated.

Recommendations – Water and Flooding

Opportunities to avoid and mitigate the impacts of the replacement weir are not fully articulated or exploited

8.1 Demonstrate the avoid, mitigate and offset hierarchy has been implemented to minimise impacts to hydrology and therefore biodiversity, relating to both inundation upstream and downstream hydrological regimes.

The approach to modelling changes to the hydrological regime over the life of the infrastructure is inconsistent or lacking in detail

9.1 Discuss the most appropriate climate data for use in a hydrological model intended to assess impacts over the life of the proposed infrastructure.

9.2 Discuss the assumptions and consequences of modelling demand over a different timeframe to the life of the infrastructure.

9.3 Assess the downstream impact of the replacement weir in terms of the spatial and temporal extent, and relate these impacts to biodiversity, identifying residual impacts after mitigation measures have been implemented.

The environmental water requirements are one method to describe hydrological change that may be used in the prescribed impact assessment

10.1 The EWRs presented in the Barwon-Darling Long Term Water Plan should be used as a guide for achieving NSW environmental objectives and targets in water management.

10.2 Changes in hydrology due to the proposal can be compared with the EWRs to determine impacts to biodiversity.

10.3 Residual impacts arising due the replacement weir should be incorporated into the prescribed impact assessment in the BDAR.

10.4 The prescribed impacts assessment may require additional information or multiple lines of evidence to determine the effect on terrestrial biodiversity.

The cumulative impacts of programs in the Barwon-Darling water resource plan area need to be considered

11.1 Address cumulative impacts for concurrent work to improve connectivity in the Barwon-Darling or describe where this will be addressed.

11.2 Address cumulative impacts for other projects such as Western Weirs or describe where these will be addressed.

The EIS has not adequately addressed the Secretary's Environmental Assessment Requirements (SEARs) related to water and flooding

12.1 SEAR's related to water and flooding are adequately addressed according to the recommendations in Table 2 of BCS's response.

Attachment B

BCS's detailed comments

Environmental Impact Statement (EIS) – Wilcannia Weir

Biodiversity

1. Submission of the EIS ahead of Operations Plan finalisation has compromised the adequacy of the impact assessment

The environmental impact assessment has been undertaken on the basis of preliminary operating rules for the proposed weir.

BCS understands that the new weir would be operated in accordance with an operations plan which will outline governance arrangements, define the operating rules for the normal and drought security operation modes and filling and reset phases, and document the approvals process for any future plan updates and amendments.

It appears that many aspects of the impact assessment are predicated on the final operations plan, including identification of upstream and downstream impacts and the assumption that the plan will consider rules to avoid, minimise and mitigate biodiversity impacts arising from changes in water management. This approach has created a high degree of uncertainty around definition of impacts, the degree to which adverse outcomes can be mitigated and prediction of the residual impacts.

The Biodiversity Development Assessment Report (BDAR) states that the intention is to finalise the operations plan prior to the approval of the proposal. BCS considers the operations plan central to ensuring the assessment of likely biodiversity impacts is undertaken to the fullest degree possible prior to approval.

Recommendation

1.1 The impact assessment should be updated as necessary after finalisation of the operations plan and prior to any project approval.

2. The nature and extent of biodiversity impacts associated with the expanded (longer and deeper) weir pool and predicted changes to downstream flows is inadequately described and assessed

The Biodiversity Assessment Method (BAM) requires the calculation of biodiversity credits for direct impacts to biodiversity values and threatened species habitat that relate to loss of native vegetation. Impacts to native vegetation may be permanent or temporary and may result in partial or complete loss of structure, composition or function as represented by vegetation integrity scores.

A consent authority may also require calculation of biodiversity credits for other impacts on biodiversity values 'prescribed' by cl. 6 of the *Biodiversity Conservation Regulation 2017* (BC Reg) These can be direct or indirect impacts and are additional to the impact of native vegetation removal. Impacts to water bodies, water quality and hydrological processes that sustain any threatened entities is one such prescribed impact of relevance to this project.

Adequate assessment of likely native vegetation loss and additional prescribed impacts related to changed water management regimes cannot be completed until the extent and nature of all impacts associated with the proposal have been appropriately defined. Deficiencies in the description and justification of the extent of impacts arising from changed hydrological regimes are highlighted below for surface water, with comments on the groundwater assessment included under Issue 4 in our response below.

Changed upstream inundation patterns

Conclusions regarding the biodiversity impacts likely to occur due to changed inundation patterns upstream of the proposed new weir have not been adequately justified.

The BDAR (page 1) defines the impact area for which a biodiversity credit obligation has been calculated as:

- The portions of the development site where native vegetation exists and will need to be cleared to allow construction of the weir.
- Native vegetation currently located within the river channel and banks (within the future weir pool) which will be subject to inundation at full supply level (FSL) and considered permanently removed.

Section 9.1 of the BDAR narrows the area of direct impact associated with weir pool inundation from the above definition to native vegetation within the river channel in the 'new town pool area' only (the 4.92-kilometre section of river between the site of the proposed weir and the existing weir). Further discussion regarding the method used to calculate the extent of this affected area is under Issue 3 below.

For the expanded weir pool upstream of the existing weir, the BDAR states that:

- Biodiversity credit requirements have not been calculated in relation to future inundation areas because:
    - impacts in that zone are considered temporary and variable compared with the more permanent inundation in the new town pool (page 118-119) and would not result in permanent adverse biodiversity impacts.
    - there are no areas of shallow wetland or instream vegetation communities that would be inundated.
- There will be no prescribed impacts to threatened entities above the existing weir due to upstream environments being highly disturbed with a lack of 'important habitat' and variation in weir pool levels is expected to restore some natural seasonal variability with benefits to biodiversity values and fauna habitat.

Insufficient evidence has been referenced to support these conclusions.

The BDAR (s.9.3.4.3) indicates that at the time of surveys some native vegetation was present within the channel above the existing weir, and some areas were bare. Six photos and partial data from only two BAM plots/transects is provided along the 80.60-kilometre extent of the predicted maximum weir pool above the existing weir. Approximately 18 'rapid assessment plots' are mapped in the BDAR along this stretch of the river, however no data from those is provided.

The BDAR does not specifically discuss the likely changes in extent, duration and frequency of inundation above the existing weir in the context of potential vegetation response.

Downstream flow impacts

The BDAR indicates that riparian vegetation condition and aquatic habitat downstream of the weir was assessed with the intent of identifying the presence of pools and in-stream wetland vegetation that may provide 'important habitat' for threatened fauna.

Minimal description of biodiversity values within the downstream zone of impact is provided. No information on downstream BioNet records or PCTs is included. The BDAR indicates that six downstream 'rapid assessment plots' were established (Figure 9-1) however no data is provided. Four photos within the 28-kilometre extent considered are included (s.9.3.4.3).

The BDAR does not explain the reasons for downstream impacts being considered to have a maximum extent of 28 kilometres from the proposed weir. In addition, the BDAR does not

demonstrate consideration of changes to the flow regime with reference to the Barwon-Darling Long Term Water Plan environmental water requirements for the Wilcannia to Lake Wetherell planning unit (further comments under Issues 9 and 10 in our response below).

The impacts on the flow regime indicated in Technical Report 1[1] are noted, but the likely associated ecological responses are not stated. Based on the absence of 'important aquatic habitat features' for wading and waterbird species, no further consideration of likely biodiversity outcomes associated with the modelled impact of the weir on downstream flows has been considered.

Recommendations

2.1 Fully justify the conclusion that inundation of the expanded weir pool extent above the location of the existing weir will not result in total or partial loss of integrity for any PCT. This should include:

a) a spatial representation of the modelled extent of inundation upstream of the existing weir under the existing arrangements (no new weir) and the proposed 'normal' operation and 'drought' operation FSLs of the new weir.

b) mapping of native vegetation extent within the expanded weir pool area supported by adequate plot data.

c) support conclusions regarding the need or otherwise for biodiversity credit calculations on the basis of full or partial loss with:

i. details of the expected changes to inundation frequency, extent and duration.

ii. evidence-based assessment of the likely impact of those changes to inundation patterns on the PCTs and biodiversity values present.

2.2 Justify the spatial extent of the downstream impact assessment.

2.3 Adequately describe the downstream biodiversity values and likely ecological responses to the changed flow regimes.

2.4 Supply all data and references to peer-reviewed literature on which the downstream impact assessment was based.

2.5 Consider describing changes to the flow regime with reference to the Barwon-Darling Long Term Water Plan environmental water requirements for the Wilcannia to Lake Wetherell planning unit.

2.6 Following adequate definition of the nature and extent of impacts to biodiversity resulting from changed upstream and downstream water management, update the prescribed impact assessment as necessary to address all requirements of BAM:

a) ensuring that impacts to water quality, water bodies and hydrological processes that sustain threatened entities are clearly described and evaluated.

b) referencing adequate supporting information.

[1]'Technical Report 1 – Consolidated Water Report'. Jacobs (2022) *Wilcannia Weir Replacement – Hydrology, Geomorphology, Groundwater, Surface Water and Flooding Impact Assessment*. Report to Water Infrastructure NSW dated dated 5 July 2022

3. The extent of native vegetation to be inundated within the 'new town pool' appears underestimated.

The BDAR states that the area of impact to native vegetation from inundation within the new town pool was calculated by assuming complete loss for the area of mapped vegetation intersecting with the FSL during drought security operation mode, equating to 1.49 hectares (although only the 'normal' operation mode FSL of 65.71 metres AHD (Australian Height Datum) is quoted in this section) (page 103). Conversely, the EIS and page 118 of the BDAR state that the direct impacts resulting from the new town pool equates to two hectares.

The BDAR states that a distance of 1.5 metres either side of the 'river channel' was used to determine the area of native vegetation within the FSL for the new town pool (page xv). BCS understands that no GIS shapefile of the predicted weir pool extent was available to the assessor and the 1.5 metre distance either side of the 'river channel' was considered sufficient to represent the proposed FSL during drought operation mode (Chris Tompson, Principal Ecologist, Jacobs *pers. comm*, phone conservation with Erica Baigent of BCS on 9 August 2022).

The BDAR has not demonstrated that a 1.5 metre distance either side of the mapped channel equates to or exceeds the height of inundation at the FSL of the new town pool during either normal or drought security operation modes. BCS has been unable to reconcile this uniformity of impact zone with statements in Technical Report 1 (s.9.4) regarding the lateral weir pool extent varying with the channel profile, features and tributaries.

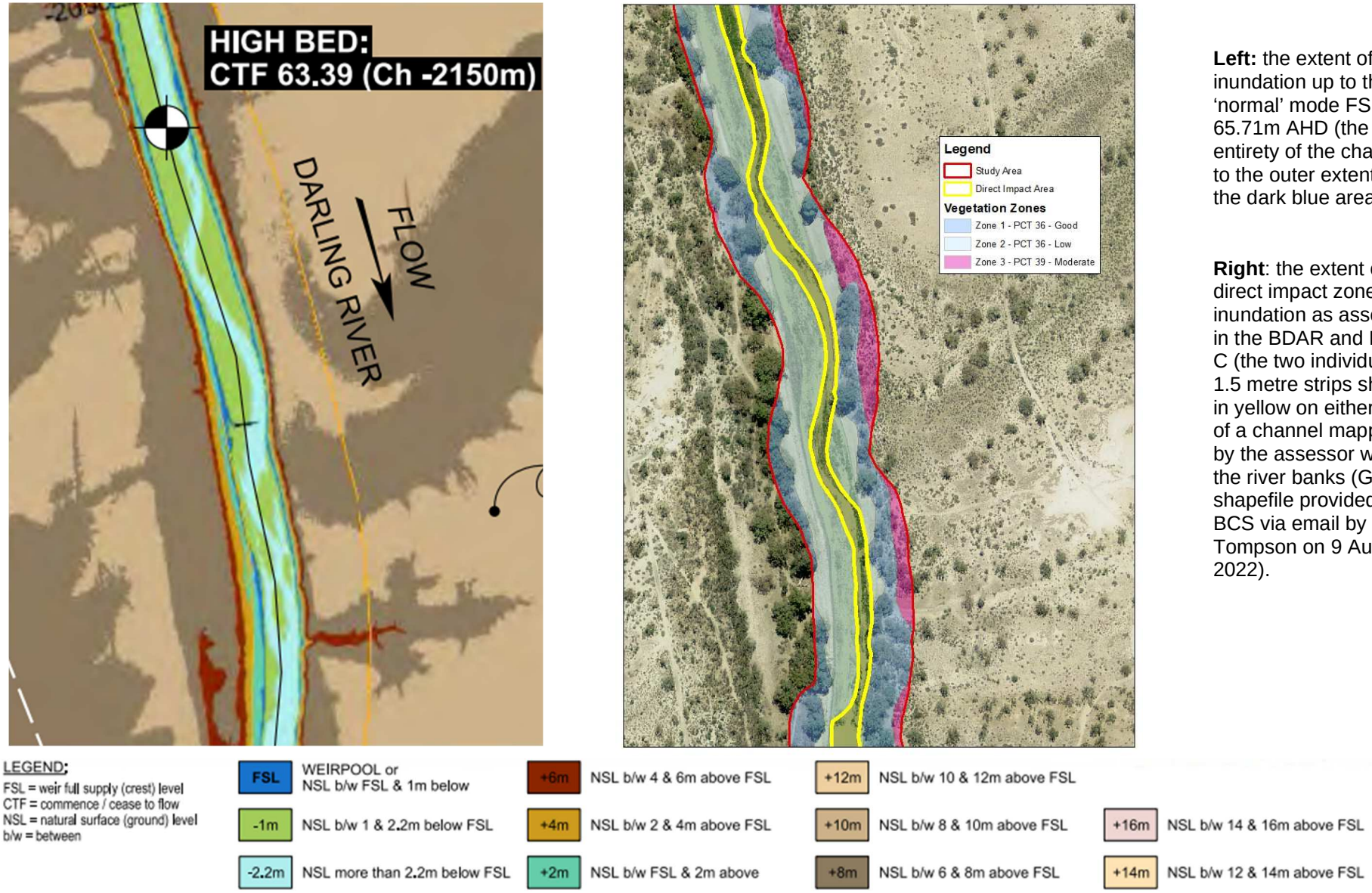
Furthermore, the BDAR has not justified the definition of 'river channel' adopted for this purpose, and which was excluded from the vegetation zones entered into the Biodiversity Assessment Method calculator (BAM-C), with no linkage to any hydrological or geomorphological assessment made. The assessor has indicated that for this purpose the 'channel' was defined as the extent of water in the river during the field surveys in November 2020 (Chris Tompson *pers. comm.*, phone conservation with Erica Baigent of BCS on 9 August 2022).

Technical Report 1 refers to weir pool extent mapping undertaken by Public Works Advisory (PWA)[2]. Comparison of the GIS shapefile utilised to calculate the area of native vegetation impacted by inundation within the 'new town pool' against the Public Works Advisory mapping of weir pool extent[2] suggests that the area of native vegetation to be subject to increased inundation within the 'new town pool' has been substantially underestimated.

Figure 1 below shows an example section of the Darling River within the new town pool and allows:

- an understanding of the predicted weir pool lateral extent at the 'normal' mode FSL, although is less clear for the extent associated with the 'drought' operation mode, as the legend depicts a range from the normal FSL to two metres above, rather than one metre above.
- comparison of the weir pool extent with the area of direct impact to native vegetation associated with inundation the new town pool assessed in the BDAR and BAM-C.

[2] Public Works Advisory (2019) *Wilcannia Weir Upgrade – Addendum to Business Case – Technical Investigations*. Report No ISR19093, July 2019. https://www.industry.nsw.gov.au/__data/assets/pdf_file/0019/235045/Wilcannia-Weir-Business-Case-Addendum.pdf



Left: the extent of inundation up to the 'normal' mode FSL of 65.71m AHD (the entirety of the channel to the outer extent of the dark blue areas).

Right: the extent of the direct impact zone for inundation as assessed in the BDAR and BAM-C (the two individual 1.5 metre strips shown in yellow on either side of a channel mapped by the assessor within the river banks (GIS shapefile provided to BCS via email by Chris Tompson on 9 August 2022).

Figure 1: Excerpt from Figure 4-4 of Public Works Advisory (2019)[2] showing weir pool extent for an example section of the Darling River within the 'new town pool' compared with impact zone shapefile provided by Jacobs. FSL in this figure refers to the 'normal' operating mode of 65.71 AHD.

Recommendations

3.1 Demonstrate that the area of direct impact entered into the BAM-C to account for the impact of inundation of native vegetation between the proposed and existing weirs corresponds with the expected maximum extent of inundation in the new town pool at the proposed drought security mode FSL. This should include mapping of the expected extent of inundation overlaid on the vegetation mapping.

3.2 Where the 'river channel' has been excluded from vegetation zones – reference the supporting information that demonstrates either:

a) the lack of native vegetation within that area

b) the lack of impact in that area from the proposed changes to inundation.

4. The BDAR must address all requirements of the BAM for predicted groundwater changes as a prescribed impact.

The BDAR lists four PCTs in the surrounding landscape with high likelihood of ground-water dependence (page 124). A further two PCTs mapped in the surrounding area are identified as having medium likelihood of groundwater dependence.

The BDAR reports likely groundwater mounding associated with the 'new town pool' up to 100 metres out from either side of the river channel, with equilibrium groundwater levels near to the pool being expected to rise to within five metres of the ground surface. Shallow groundwater in this area (less than three metres below ground level) has potential to become saline over time. Whilst not clear, it appears the predicted groundwater impacts are based on the 'normal' mode FSL for the new town pool only.

The BDAR concludes that the impact of this increased salinity on PCT condition is uncertain and difficult to predict, however also notes that long-term groundwater salinisation in low-lying areas surrounding the new town pool and downstream low-lying areas would be similar to that which has already occurred upstream of the existing weir in low-lying areas. The actual observed impacts of the existing groundwater salinisation upstream of the existing weir on the PCTs at those locations are not stated. The BDAR does not identify the extent of low-lying areas adjacent to the weir pool that would fall within the predicted zone of impact for salinisation.

Page 123 of the BDAR also concludes that the proposal is not expected to result in groundwater changes that will adversely impact groundwater dependent ecosystems downstream of the proposed weir. However, within the *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act) assessment (page 197), the BDAR notes that the groundwater assessment report did not assess the potential for changes in downstream groundwater levels associated with increased cease-to flow events and concludes that the impact of the changed flow regimes on the condition of the surrounding GDEs downstream of the weir is also difficult to predict and uncertain.

The BDAR proposes to address uncertainties regarding groundwater related impacts to biodiversity via a monitoring program and adaptive management strategy (s. 8.5 of the BAM) to inform the need for mitigation and further biodiversity offsets in instances where negative changes to vegetation integrity can be attributed to increased salinity. The monitoring sites would include PCTs within 100 metres of the weir pool and additional floodplain sites 'immediately downstream' of the new weir.

Whilst the BDAR alludes to mitigation measures being implemented to address adverse salinity related impacts, no examples of potential measures are included within the BDAR. Regarding the likely effectiveness of mitigation, Table 10-1 simply states that proposed adaptive management is a *'known and proven effective measure'.*

However, Technical Report 1 (s.7.5) indicates that further investigations and potential mitigation measures will only be implemented where monitoring finds that groundwater levels are higher than predicted. This implies that no mitigation of groundwater levels that fall within the predicted range of impact will be implemented.

Technical Report 1 also (s.7.5) indicates that groundwater level data will be analysed 12 months and five years following the start of operation. This is inadequate and designed for assessing weir pool impact on emergency water supply bores in the deeper aquifer. Additional monitoring should be proposed to investigate the potential impacts of salinisation on terrestrial biodiversity.

The predicted groundwater impacts resulting from the proposal are a prescribed impact (i.e. potentially affecting water quality and hydrological processes sustaining threatened entities). The BDAR must address all requirements under the BAM for assessing prescribed impacts on threatened entities and their habitat including predictions for impacts that are uncertain, acknowledging data limitations and assumptions (s.8.3 (2) and s. 8.3.4 of the BAM).

Section 8.4 (2.d.) and s. 8.5 (7) require the BDAR to provide an outline of any proposed adaptive management strategy. Additional detail is required within the BDAR to provide an adequate outline of the proposed strategy, including the specific management actions proposed. Recommended considerations to be addressed as an outline of an adaptive management strategy are included within the Department's recently released BDAR template[3].

Recommendations

4.1 Fulfil all requirements of the BAM for assessment of groundwater impacts as a prescribed impact.

4.2 Ensure the proposed adaptive management strategy outline adequately addresses s.8.4 (2.d.) of the BAM.

4.3 Utilise quantitative information from the low-lying sites noted to have already been affected by groundwater salinisation resulting from the existing weir pool to:

a) predict the likely impacts to biodiversity values from the expected groundwater changes associated with the new town pool.

b) predict the likely impacts to biodiversity values from the expected groundwater changes associated with the weir pool in drought mode.

c) identify the likely indicators of adverse vegetation integrity impacts attributable to salinity.

4.4 Clarify what, if any, mitigation measures would be implemented to address adverse biodiversity impacts resulting from the predicted groundwater changes.

4.5 Predict the residual biodiversity impact associated with the expected groundwater changes following implementation of any mitigation measures.

5. There appear to be errors in BAM-C entries and plot locations which require review by the assessor.

The assessor is required to stratify areas of each PCT that are in different broad condition states into separate vegetation zones. The assessor must describe each vegetation zone in the BDAR to

[3] https://www.environment.nsw.gov.au/-/media/OEH/Corporate-Site/Documents/Animals-and-plants/Biodiversity/biodiversity-development-assessment-report-template-guide-220209.pdf

accurately reflect significant and distinct differences in condition (BAM s.5.3.1 and page 16 BAM Operational Manual Stage 1).

In reviewing the BOAMs case, BCS notes that some function condition scores do not reflect the plot data. For example, Plot 3 has recorded presence of river red gum (*Eucalyptus camaldulensis*) however, there is no indication of presence of trees in the Plot 3 function condition score data. Review of stem size class scores and tree regeneration presence is recommended for all plots where trees have been recorded to ensure the correct condition state is applied.

Minimal description of each zone is provided in the BDAR and few example photos are provided to justify why each plot meets a certain condition state. For example, Plot 22 is located along the edge of a road and is allocated a 'poor' condition state. However, Plot 22 has a comparable, or at times higher, species diversity and cover in comparison to Plot 5 and Plot 6 data, which is assigned a 'low' and 'moderate' condition state respectively, for the same PCT. Additional explanation of the key decision points, such a presence/absence of any canopy species, species diversity per stratum as compared to benchmark condition states and additional plot photos is requested to justify why the allocated condition states are appropriate. If adjustment of allocated condition state for certain plots is required, please ensure this information is appropriately updated in the BAM-C and maps.

As part of any associated vegetation condition state mapping review, particular attention is requested for Plot 12. As per Figure 5-1 (1 of 8) of the BDAR, Plot 12 begins in a 'moderate' condition state for PCT 158, however, the transect bisects the 'moderate' and 'low' condition state zones. This can impact the BAM-C vegetation integrity score calculations, by reducing the 'moderate' condition or increasing the 'low' condition inappropriately. Review and further justification of the use of Plot 12 for PCT 158 'moderate' condition state is requested.

Recommendations

5.1 Undertake an audit of stem size class scores and tree regeneration data entries in the BAM- C for plots where trees have been recorded to ensure all data entries reflect field data sheets.

5.2 Review vegetation zone stratification for each PCT within the subject site.

5.3 Detail the basis on which each PCT was delineated into condition states (vegetation zones), including plot/spot sample data analysis, site photos, and any other relevant data collected from the site and field assessment methods to justify zone allocations.

5.4 Justify the condition class assigned to Plot 12 which is located across two vegetation zones as per Figure 5-1 of the BDAR.

6. The BDAR presents insufficient information to demonstrate that the BAM requirements for candidate species credit species surveys have been met.

The BAM (s.5.3) requires assessors to perform targeted species surveys for all candidate species credit species carried forward for further assessment. The BAM specifies that the assessor must:

- only survey during the time specified for that species in the Threatened Biodiversity Data Collection (TBDC), unless there is clear justification to vary the timing and the reasoning is documented in the BDAR
- comply with the Department's published threatened species survey guides
- use best-practice methods that can be replicated for repeat surveys, if the Department has not published any relevant guides (the TBDC may also provide information on appropriate survey methods and effort).

Where surveys are undertaken outside the survey months in the TBDC or the Department's taxa-specific survey guides, assessors must provide adequate justification for the timing of the surveys using appropriate published or peer-reviewed references and/or suitable data from reference sites for those species. Otherwise, the assessor must either assume presence or obtain an expert report for those species to comply with s.5.2.4 of the BAM.

Threatened flora

The *BAM 2020 Operational Manual – Stage 1* and the Department's guide for surveying threatened plants permit the assessor to adjust survey months from those listed in the TBDC and BAM-C to accommodate a species' response to local environmental conditions, where this can be adequately justified. Examples as to when this might be appropriate are provided on page 5 of the Department's guide for surveying threatened plants.

Justification for survey times outside those identified in the TBDC is expected to include appropriate published or peer-reviewed references and/or plot data (including reference sites if applicable).

Two candidate species credit flora species (bind weed *Convolvulus tedmoorei* and Slender Darling pea *Swainsona murrayana*) were surveyed for later than the survey window specified in the TBDC and BAM-C. BCS has sought advice from the Department's accountable officers for these species.

The assessor has not provided adequate justification that the surveys were undertaken at the optimum time for detection of these species (see Table 1 below). *C. tedmoorei* is identified as a potential entity for 'serious and irreversible impacts' (SAII).

Considering optimal rainfall conditions were experienced for four months prior to the November surveys, it would be likely that both these flora species put on growth, flowered and set seed within their regular cycle, rather than a delayed response.

Using the presence of other species, but not the target species, is not a valid reason to justify surveys outside of the designated period.

Table 1 Out of season survey – *Convolvulus tedmoorei* and *Swainsona murrayana.*

BDAR – Justification of out of season survey	**BCS comments**
***Convolvulus tedmoorei* (Bind Weed)** The TBDC specifies June-September survey period, however the survey for this project was undertaken in November 2020 The BDAR contends that the survey timing was suitable for detection of *C. tedmoorei* due to: • optimal conditions following rainfall, • the assessor's view that *C. tedmoorei* would have been likely to have been in seed in November and likely to be detected even when not flowering • Only one *Convolvulus* species being detected (*C. remotus* not in flower) during the survey with different seed characteristics to *C. tedmoorei*	This species has been identified as a data deficient species. The limited information available regarding this species lifecycle and herbarium specimens collected to date have been used to develop guidance regarding the likely optimal survey period for detection and identification. *C. tedmoorei* is an autumn growing species, flowering in late winter to early spring. Mature seeds are needed to positively identify *C. tedmoorei* due to the vegetative similarity to other *Convolvulus*. If this species were present: • Good winter-spring rainfall is unlikely to have induced a delayed or extended flowering/fruiting period. • It is likely that any seeds would have been dropped by the November surveys • Detectability may have decreased by the November surveys due to the species dying back to its taproot. In comparison *C. remotus*, which was recorded, may flower throughout the year, but mainly in spring and summer and is therefore likely to be noticeable during November-timed surveys and have seed present.

BDAR – Justification of out of season survey	BCS comments
***Swainsona murrayana* (Slender Darling Pea)** The TBDC specifies a September survey period, however the survey for this project was undertaken in November. The BDAR considers the survey period adequate for detecting this species because: • another *Swainsona* species in the survey area (*S. greyana*) was flowering and could be distinguished from *S. murrayana.* • whilst *S. murrayana* dies back after flowering in spring, the assessor considers it possible that plant remains would have still been identifiable during the November survey considering the high rainfall in the preceding months.	Good seasonal conditions may see *S. murrayana* flower earlier, making it even more likely that the plants will have died back by the November survey period. *S. greyana* in comparison has a longer flowering period (through until March).

The proposal has also been deemed a controlled action under the Commonwealth *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act), with the Menindee Nightshade (*Solanum karsense*) specifically identified as a species for assessment.

The TBDC recommends survey for this species after flood recession if possible. The BDAR has not discussed whether survey conditions were optimum for the detection of *Solanum karsense*, if it were present.

Threatened fauna

The survey for the little eagle (*Hieraaetus morphnoides*) and masked owl (*Tyto novaehollandiae*) were undertaken later than the TBDC survey window.

For the little eagle, TBDC specifies an August – October survey window. However, BCS has determined that in this case the risk is low given no evidence of active use of stick nests. Fledglings will remain near a nest site six to eight weeks after leaving the nest, which would still make them visible in the area during the survey. Pre-construction clearing surveys will provide another layer of protection provided that mitigation measures are strengthened.

For the masked owl, the TBDC specification is for May-August surveys. The BDAR acknowledges that on-site surveys were undertaken outside of this period and notes that surveys focused on determining if a resident pair and recent fledgling were present, to assess if the study area was part of a core breeding territory. Evidence of previous occupancy was searched for beneath large hollow bearing trees, when encountered.

The assessor has not sufficiently justified the adequacy of surveying the for the masked owl almost three months outside of the specified survey window. There are known records of this species from the locality on BioNet. The BDAR notes the presence of suitable breeding habitat and indicates impacts to at least 20 hollow-bearing trees (the number of hollows identified as suitable for the masked owl is not specified, but 11 hollows were stag-watched). Masked owls have extremely large home ranges reducing the likelihood of the surveys being able to detect a resident pair, particularly almost three months outside of the breeding period. Similarly, any juveniles are likely to have dispersed by November.

Recommendations

6.1 For *Convolvulus tedmoorei*, *Swainsona murrayana* and the masked owl:

a) Undertake surveys in accordance with TBDC and the relevant departmental guidelines, or

b) assume presence, or

c) obtain an expert report for those species

to comply with the requirements of s.5.2.4 of the BAM.

6.2 Meet all information requirements for the assessment of potential SAII for *C. tedmoorei* in accordance with s.9.1 of the BAM.

6.3 Within the area of impact associated with the project, identify the areas considered to provide suitable habitat for *Solanum karsense* and discuss the suitability of seasonal conditions for this species at the time of survey, with reference to peer-reviewed literature.

7. Revision of mitigation measures is required to improve effectiveness, certainty and facilitate identification of any residual impacts.

A BDAR is required to identify measures to mitigate or manage impacts in accordance with s. 8.4 and 8.5 of the BAM. Mitigation measures are required for displacement of resident fauna, any indirect impacts on native vegetation and habitat, and any prescribed impacts. BDARs are expected to reference the techniques, timing, frequency and responsibility for each measure, identify any measures for which there is a risk of failure and evaluate the risk and consequence of any residual impacts.

Proposed mitigation measures are set out in Table 10-1 of the BDAR. BCS has only completed a cursory review of this table in the time available to review the BDAR. Some specific comments related to terrestrial flora and fauna mitigation measures are provided below.

Minimal reference is made within Table 10-1 to hydrology-related mitigation measures. Comments related to potential mitigation of predicted groundwater salinisation are included under Issue 4 above. Other comments related to mitigation of inundation, water quality and downstream impacts are included under Issue 8 below.

Overall, the BDAR does not appear to identify and evaluate any measures for which there might be a risk of failure and the consequences of any residual impacts likely to remain after mitigation measures are applied. In most cases Table 10-1 simply describes the outcome as ‘avoid, minimise and mitigate impacts to biodiversity’ with the actions described as ‘known and proven effective’.

Action BIO5 of Table 10-1 proposes supplementary surveys to validate presence/absence within the appropriate survey seasons required under the BAM for *C. tedmoorei*, *S. murrayana* and *little eagle* breeding habitat. The stated outcome is avoidance and minimisation of clearing of vegetation and habitat during proposal planning. To what extent the clearing of habitat could be avoided or minimised within the disturbance footprint is not discussed.

Action BIO6 includes pre-clearing inspection by an ecologist in the weeks prior to clearing commencing to identify fauna with the potential to be disturbed, injured or killed as a result of clearing activities (specifically noting nesting birds and large stick nests occupied by threatened diurnal raptors). Hollow-bearing trees will be marked, and stag watched for an unspecified period of time will be undertaken to determine if these are being used by fauna. features to be protected will be marked.

Whilst not specifically mentioned in Table 10-1, s.9.2.1 of the BDAR also proposed pre-clearing surveys a mitigation measure for edge effects, presumably within a buffer area surrounding the construction footprint.

Action BIO7 proposes staged removal of habitat, with a focus on hollow-bearing trees. This action also includes *'if possible, avoid clearing during breeding seasons for hollow-dependent fauna'*, with no indication that avoidance of breeding seasons for non-hollow dependent fauna would be considered.

Recommendations

7.1 Ensure the BDAR addresses all components of s. 8.4 of the BAM, including but not limited to:

a) consideration of the potential biodiversity impacts arising from both the construction and operational stages.

b) identification of any measures where there is a risk of failure.

c) evaluating the risk and consequence of any residual impacts likely to remain after mitigation measures are applied.

7.3 Ensure mitigation measures adequately address both hollow and non-hollow dependent fauna with consideration of critical life cycle events such as breeding or nursing. The area within which mitigation measures will be implemented (ie. the extent of the buffer zone to be applied for indirect impacts) should be indicated.

Water and Flooding

8. Opportunities to avoid and mitigate the impacts of the replacement weir are not fully articulated or exploited.

The most effective mitigation method to the inundation, water quality, and downstream impact issues of the replacement weir will be ensuring downstream flows are maintained for as long as possible. This can be done by optimising the timing of drought mode, maintaining flow during the filling phase (filling gradually with less abrupt gate operation), increasing opportunities for discharge (which may include translucency), or resuming normal mode as a matter of priority. In several places, the EIS refers to an objective of minimising downstream hydrological impacts while providing water security, although this is not listed in the EIS's proposal objectives (1.1.2).

Opportunities to avoid and mitigate drought mode do not appear to have been fully explored. The storage modelling report (Technical Report 1, Appendix B) identifies town water restrictions as an opportunity to improve downstream flows, as well as other demand management opportunities such as reducing leaks.

The storage modelling report identified that evaporation loss from the weir pool is significantly greater than the water supply extraction (s.4.2). It follows that options to reduce evaporation would be able to reduce time in drought mode. Reducing evaporation by including off-stream storage could be explored as a method to avoid or mitigate the impacts of the weir but is not mentioned. This is an alternative or complementary option as required by the Secretary's Environmental Assessment Requirements (SEARs) in an analysis of feasible alternatives (Appendix A.2 and A.3). This analysis should address off-stream storage and other non-weir solutions. Given the significant rates of evaporation from this weir pool, alternative options may address water security and planned environmental water (PEW) concerns. This weir was not assessed as part of the Western Weirs project, where these analyses have been included in the project scope.

The operations plan should have an opportunity for revision when demand management measures are implemented.

Table 7-8 of the Main Report of the EIS describes the 'HY2' mitigation measure impacts as 'triggers for the filling phase'. The impact should instead describe the numerous impacts arising from the weir pool in drought mode. Reviewing the trigger for the filling phase to reduce the frequency of filling is a significant mitigation measure which will impact on the hydrology results and subsequently the effect on terrestrial and aquatic biodiversity. However, as this trigger is subject to change, BCS is concerned that the trigger could be altered to increase the frequency of filling, having the opposite effect. It would be preferable for this mitigation measure to be further developed and include safeguards to ensure biodiversity impacts are not underestimated within the EIS.

In addition to considering inflows when determining the triggers for the filling phase, other options that should be considered include:

- the actual town water supply demand (noting that the drought mode was adequate for a future population in a future climate)
- antecedent conditions and the impact on demand
- the presence or forecast of imminent drought
- reference to DPE drought stage and extreme events policy
- assurance that the *Water Management Act (2000)* principles for water sharing are observed
- maintaining flow downstream during filling

- the readiness of groundwater supplies (capacity in addition to the secure yield provided by the weir pool)
- ensuring appropriate town water restrictions are in place.

Table 7-8 also includes mitigation measure 'HY3' to describe optimisation of the translucency rule. As above, the impact should describe the impact of the weir pool in drought mode. The mitigation measure seeks to reduce this impact. The translucency rule is used to demonstrate the improvement to the cease-to-flow conditions between the old and new weirs and so represents the best way to mitigate cease-to-flows once they are occurring. Optimising the translucency rule, or creating releases when there is no inflow, has the potential to significantly impact hydrology, and biodiversity impact as measured by environmental watering requirements (EWRs). As above, there is no safeguard here for adjustments to the rule that would have a detrimental effect. It is not clear if this mitigation measure seeks to adjust the rule within a narrow scope (such as changing flow rates) or change the rule itself (such as new triggers).

In addition to monitoring, this mitigation measure should consider:

- risk of de-stratifying hypoxic pools downstream with no overall oxygen improvement
- rates of release and cessation to manage geomorphic risks
- achieving flow rates that achieve EWRs.

Recommendation

8.1 Demonstrate the avoid, mitigate and offset hierarchy has been implemented to minimise impacts to hydrology and therefore biodiversity, relating to both inundation upstream and downstream hydrological regimes.

9. The approach to modelling changes to the hydrological regime over the life of the infrastructure is inconsistent or lacking in detail.

The assessment methodology for hydrology, which includes modelling, has been described in section 7.2 of the EIS. 119 years of historical flow data has been used to simulate the impacts of the base case and proposed replacement weir. Discussion on whether this approach is appropriate in a changing climate is required to determine whether modelled impacts are likely or underestimated for the life of the infrastructure.

The town water supply demand has been projected for a period of time shorter than the likely life of the infrastructure. A description of options is required to address the risk of underestimating impact based on this assumption.

The downstream impacts of a replacement weir in a river of the size and significance of the Darling River at Wilcannia requires appropriate effort. The single node at the output of the weir pool behaviour model is unlikely to satisfy requirements for information downstream for the length of impact. The approach does not return a satisfactory level of information about the distance of impact downstream, the likely contribution of antecedent river condition to the flow, interaction with groundwater or interaction with river users. While EWRs have been published for a single gauge at Wilcannia, this does not constrain scope of the investigation to this point. BCS encourages discussion on how biodiversity values can be identified, and impacts assessed, in the absence of EWRs below the Wilcannia gauge. The outcomes of this assessment have direct relevance to the prescribed impact assessment within the BDAR.

Recommendations

9.1 Discuss the most appropriate climate data for use in a hydrological model intended to assess impacts over the life of the proposed infrastructure.

9.2 Discuss the assumptions and consequences of modelling demand over a different timeframe to the life of the infrastructure.

9.3 Assess the downstream impact of the replacement weir in terms of the spatial and temporal extent, and relate these impacts to biodiversity, identifying residual impacts after mitigation measures have been implemented.

10. The environmental water requirements are one method to describe hydrological change that may be used in the prescribed impact assessment.

The Long-Term Water Plans (LTWPs) describe the water requirements of a range of key water dependent plant, waterbird and fish species, as well as ecosystem function (driven by the *Commonwealth Basin Plan 2012* and *Basin Watering Strategy*). These water requirements contribute to targets and objectives over 5-, 10- and 20-year timeframes. The EWRs consolidate best available science to guide the management of water for environmental outcomes.

When using EWRs to describe the impacts of proposed hydrological change, there may be aspects that require further enquiry. BCS encourages multiple lines of evidence to be used where and when appropriate. Further information is available in DPE's draft *Guidance for the use of Environmental Water Requirements*.

When using EWRs to analyse flows, it is preferable for results to be presented in parallel to the EWR in the LTWP. Even if the EWR fails before and after the proposed intervention, it is still useful to know the magnitude and direction of change arising from the proposal. Some results may fall within the range of acceptable EWRs, and these should also be acknowledged. An adequate level of understanding will need to be described for incorporation into the method for determining prescribed impacts in the BDAR.

The downstream impacts are highly sensitive to the operations plan of the weir. Since this plan is in draft, it is inappropriate to finalise an assessment of impacts. The following comments are therefore made with a view to finalising when the weir operations and extent of hydrological change are known.

The EIS states that one objective is to minimise downstream impacts while ensuring town water security. The EIS should demonstrate that timing and rate of weir filling has been optimised to ensure cease-to-flow events or very low flows have not worsened, or have been improved, in comparison to the base case. The EIS should also address what proportion of cease-to-flow events occur within the preferred limits described by the EWR; of those that occur outside the preferred limits, whether the operations plan can mitigate their occurrence; whether the proposed weir contributes residual cease-to-flow events that do not meet EWRs; and how these residual impacts can be incorporated into the BDAR's prescribed impact assessment (it may be that the prescribed impact assessment requires more information for specific species).

As a mitigation measure, evidence should be provided of how often the translucency event has an impact on cease-to-flow. Specifically, clarification as to whether the translucency rule provides a very low flow of adequate duration such that the duration of the cease to flow is within EWR limits should be provided.

Results presented in Tables 7-3 and 7-4 of the Main Report of the EIS suggests the translucency rule has no effect on the worst cease-to-flow events. It is not apparent whether the operation of the gates can be used to break up long cease-to-flow events, or maintain an adequate regime of very low flow or baseflow. This would equate to storing water for use in a drought for the purposes of meeting EWRs (akin to environmental water).

To determine the impact of the replacement weir, the change in the number of cease-to-flow events outside the EWR limits (eg. 20 days) needs to be presented.

It is not clear whether the rates of release from the weir pool will be capped to maintain bank stability and prevent slumping. This needs to be clarified if there is a corresponding upper limit to EWRs that can be achieved through weir releases.

Table 7-4 of the Main Report of the EIS presents a reduction of 447 days in total days of very low flow over the model period. It is not clear whether the difference in the total number of very low flow days is due to the filling phase only, or whether are there other reasons. It is also not clear whether all the cease-to-flow events are caused by weir filling less than 20 days in duration.

The analysis should present the number of years that very low flow duration is met i.e. 340 non-consecutive days (or 165 for dry years). Similar to the cease-to-flow issue above, the analysis should clarify whether any years that do not meet this EWR can be mitigated through gate operations. For residual impacts arising due to the replacement weir, the analysis should indicate how these will be incorporated into the prescribed impacts assessment in the BDAR. A similar process should be followed for the remaining EWRs chosen for the analyses.

Finally, it is unclear how the total duration of baseflows could improve by 22% in comparison with a weir that is not in drought mode. Further explanation is required on this matter

Recommendations

10.1 The EWRs presented in the Barwon-Darling Long Term Water Plan should be used as a guide for achieving NSW environmental objectives and targets in water management.

10.2 Changes in hydrology due to the proposal can be compared with the EWRs to determine impacts to biodiversity.

10.3 Residual impacts arising due the replacement weir should be incorporated into the prescribed impact assessment in the BDAR.

10.4 The prescribed impacts assessment may require additional information or multiple lines of evidence to determine the effect on terrestrial biodiversity.

11. The cumulative impacts of programs in the Barwon-Darling water resource plan area need to be considered.

The general requirements of the SEARs include an assessment of cumulative impacts. This should include an assessment of the replacement weir in consideration of the body of work being undertaken in NSW to improve low flows and connectivity in the Barwon-Darling River and with the Menindee Lakes System. The interactions with this work should be described, including whether each project is presenting information that accounts for the other. If not, it should be clear how the cumulative impacts of these projects will be addressed. The considerable costs in improving connectivity and low flows, and how this project impacts on those achievements, should be described.

There is a risk of cumulative impacts should additional weir upgrades go ahead as proposed under the Western Weirs project. BCS recommends outlining whether cumulative impacts will be considered in this EIS or elsewhere.

Recommendations

11.1 Address cumulative impacts for concurrent work to improve connectivity in the Barwon-Darling or describe where this will be addressed.

11.2 Address cumulative impacts for other projects such as Western Weirs or describe where these will be addressed.

12. The EIS has not adequately addressed the Secretary's Environmental Assessment Requirements (SEARs) related to water and flooding

Table 2 below provides a comparison of the content provided in the EIS against the SEARs issued by BCS relating to water and flooding. The detailed comments and recommendations should be considered and addressed.

Recommendation

12.1 Ensure all SEAR's related to water and flooding are adequately addressed according to the recommendations in Table 2 of BCS's response.

Table 2 Comparison of the EIS content against BCS's SEARs for water and flooding.

Water & Flooding SEARs	Comments and recommendations
Geomorphic criteria to inform measures to arrest and prevent deterioration of channel condition, address sediment starvation downstream of the weir, and promote geomorphic recovery in regulated rivers impacted by changed flow regime.	Cannot be assessed as no geomorphic criteria is identified. Section 6 of Technical Report 1 has mitigation measures for riverbank stability but not for channel condition, sediment starvation, or any plans for geomorphic recovery if required. Monitoring should be undertaken when the weir gates are operated for the first time to determine mitigation strategy for undercutting/ notching risk.
Catchment scale water balance and projected alterations in water supply and demand management.	A figure is not given for annual or average increase in Wilcannia's water supply. Demand management is not addressed other than demand restrictions (town water restrictions). The current approach to restrictions allows for opportunity to improve downstream flows. Are adjusting restrictions proposed as a mitigating measure? Proposed restrictions allow cease-to-flows to occur before demand restrictions are in place. Has this been considered in relation to WMA priorities?
Means to provide adequate volumetric limits, timing, inundation, flow velocities and associated stream power or shear stress in channel and on adjacent floodplains.	This cannot be assessed while the operation plan is in draft.

Design criteria relating to flow hydrographs, release rules, any proposed translucency measures and other alteration of riverine hydrology, flow energy and sediment transport in the process of regulating a currently unregulated river.	This cannot be assessed while the operation plan is in draft.
Predicted impacts on licensed water users, including any impact to water quality and availability, and the potential for land salinisation adjacent to the extended weir pool.	Quantification of impacts on licensed users, including both improved or worsened access should be provided. Description of potential impacts in Technical Report 1 (s5.4.4) is inadequate. Need to describe reasons for low risk to non-town water supply groundwater bores, which are shallower than the town water supply bores. No quantification of change in water quality on users, including town water supply, has been predicted. Applies to downstream licenses also. The potential for *land salinisation* adjacent to the extended weir pool has been described but not addressed, mapped or quantified.
An assessment of the potential impact on groundwater and surface water users and details of how existing water rights will be protected.	Requires assessment of non-licensed water use such as Basic Land Rights. What interaction do users have with the weir pool?
Changes to environmental water availability, both regulated/licensed and unregulated/rules-based sources of such water, specifically • assessment of the impacts on environmental water availability and flows to downstream receiving waters. • assessment of impacts to the volume, reliability and effectiveness of Planned Environmental Water in the catchment downstream of the work. • assessment of impact to volume, reliability, effectiveness or deliverability of Held Environmental Water assets in the catchment downstream of the works. • any water substitution effects of the removal of surplus or tributary flows from the catchment that may then require held or discretionary planned environmental water to make up the shortfall.	This cannot be assessed while the operation plan is in draft. The treatment of Held Environmental Water has not been presented. It is unclear what specific planned environmental water will be released downstream, and whether the volume, reliability and effectiveness will be preserved. Will flow rates of PEW be capped so as not to risk slope stability/slumping? Does translucency apply to resumption of flow rule? Does translucency apply to flow rates less than 350ML/day? How will the operator be held accountable for releasing planned environmental water? How is increased evaporation accounted? Is this a volumetric reduction in planned environmental water?
The ambient NSW Water Quality Objectives (NSW WQO) and environmental values for the river, including the indicators and associated trigger values or criteria for the identified environmental values.	Section 2.3.3 of Technical Report 1 does not address this item. The objectives are mentioned but not presented in a clear way. Eg. results for 9 indicators are shown but there are 10 objectives.

The significance of any identified impacts including consideration of the relevant ambient water quality outcomes.	This summary did not include salinisation in normal weir pool operations. Potential impacts were identified but not qualified, quantified or listed for mitigation. Risks of releasing poor quality water into downstream receiving environments was not addressed. Risk of de-stratifying downstream pools with flow rates that are insufficient to maintain adequate oxygen levels was not addressed.
How construction and operation of the project will, to the extent that the project can influence, ensure that: • where the NSW WQOs for receiving waters are currently being met they will continue to be protected; and • where the NSW WQOs are not currently being met, activities will work toward their achievement over time.	Sections 8.4.1 and 8.4.2 of Technical Report 1 do not address the item. The assessments are descriptive and do not refer to protecting NSW water quality objectives, where they are met, or achieving them if they are not met.
Assess changes to thermal stratification in the weir pool.	Estimates for timing of stratification (6-8 months following drought mode) are not supported with evidence. The monitoring mentioned has not been included in mitigation measure SW11.
Identify flood risk on-site (detailing the most recent flood studies for the project area) and consideration of any relevant provisions of the NSW Floodplain Development Manual (DIPNR, 2005), including the potential effects of climate change, sea level rise and an increase in rainfall intensity. If there is a material flood risk, include design solutions for mitigation.	Any future plans by Central Darling Shire Council (CDSC) for flood studies should be referenced. CDSC's current approach to flood management should be described.
Map features relevant to flooding as described in the Floodplain Development Manual 2005 (NSW Government 2005), including: • Flood prone land. • Flood planning area, the area below the flood planning level. • Hydraulic categorisation (floodways and flood storage areas). • Flood hazard.	No information has been given for significant infrastructure, property access or environmentally sensitive areas that may occur before riverbank overtopping and breakout occur.