Department of Primary Industries
Department of Regional NSW

Our Ref: C22/501 FE22/768
Your Ref: SSI-10050

16 August 2022

Mr Nathan Heath
Infrastructure Assessments
The Department of Planning and Environment

Re: ***Wilcannia Weir Replacement Project (SSI-10050) – EIS Public Exhibition 18/07/2022 to 14/08/2022 - Aquatic Ecology Assessment***

Dear Nathan,

Thank you for the opportunity to review the Wilcannia Weir Replacement Project Environmental Impact Statement (EIS) prepared by Water Infrastructure NSW.

NSW Department of Primary Industries (DPI) Fisheries has reviewed the Wilcannia Weir Replacement (SSI-10050) EIS exhibited to the public between 18/7/2022 to 14/08/2022, and provide the following submission in relation to the aquatic ecological implications of the project (see **Attachment A, B** and **C** for further detail).

DPI Fisheries is responsible for ensuring that fish stocks are conserved and that there is "no net loss" of Key Fish Habitat (KFH) upon which they depend. To achieve this, the Department ensures that developments comply with the *Fisheries Management Act 1994* (FM Act 1994), namely the aquatic habitat protection and threatened species conservation provisions in Parts 7 and 7A of the Act respectively, and the associated *Policy and Guidelines for Fish Habitat Conservation and Management* (Update 2013) and *NSW Biodiversity Offsets Policy for Major Projects - Fact Sheet: Aquatic Biodiversity* (November 2014). In addition, DPI Fisheries is responsible for ensuring the sustainable management of commercial, recreational and Aboriginal cultural fishing within NSW.

The construction of new weirs or the enlargement of existing weirs pose a significant threat to fish and fish habitats. The '*Installation and Operation of In-stream Structures and Other Mechanisms that Alter Natural Flow Regimes of Rivers and Streams*' is listed as a key threatening process to several listed threatened fish species under Schedule 6 of the FM Act due to the impact on natural flow regimes, fish passage, fish breeding and recruitment.

Such works are also contrary to the *NSW Weirs Policy*, which adopts the management principle that "*The construction of new weirs, or enlargement of existing weirs, shall be discouraged".* This principle is reiterated in the Department's *Policy and Guidelines for Fish Habitat Conservation and Management* (Update 2013) due to the significant impact weirs can have on aquatic ecology, the majority of which cannot be mitigated or require considerable design and operational requirements for partial mitigation. As a result, the residual risk of such projects is still likely to be significant and require appropriate actions to offset those impacts (see **Attachment A** for more detail).

Importantly, based on the EIS documents presented for public exhibition, DPI Fisheries cannot undertake a complete assessment nor make full recommendations for the determination and potential conditions of consent. Critically, there are indications that key design elements have not been finalised for the weir/weir gate configuration and the fishway, as well as for the associated operations plan. Without final design parameters, material changes could be required for the assumptions of the operations plan and the current impact assessment.

Much of the proposed mitigation actions for hydrological impacts on aquatic ecology relies heavily on the operating rules for the infrastructure and associated assumptions. However, DPI Fisheries have several concerns and potential gaps with the analysis that will need to be addressed by the proponents. Works to address these concerns could materially alter the analyses and the current conclusions of the aquatic ecology assessment presented in the EIS, including in the:

- Hydrology assessment
- Operations Plan
- Water Quality considerations
- Risk Assessment
- Threatened Species Assessment

DPI Fisheries acknowledges the effort that the proponents have invested in the Wilcannia Weir Replacement Project to date, including actions to avoid and mitigate impacts where possible. DPI Fisheries are happy to continue to work with Water Infrastructure NSW post-public exhibition to address the issues raised in our submission, and further refine the assessment and related finalisation of associated documents including design features and the operations plan.

To coordinate further discussion with DPI Fisheries on the Wilcannia Weir Replacement Project EIS please contact Heleena Bamford, Senior Fisheries Manager (Murray Darling) on 0438 154 830 or heleena.bamford@dpi.nsw.gov.au.

Yours sincerely,

Cameron Lay
Director, Freshwater Environment
DPI Fisheries

ATTACHMENT A

In-stream structures - summary comments

The *Policy and Guidelines for Fish Habitat Conservation and Management* (Updated 2013) states that *"to ensure 'no net loss' of aquatic habitats, NSW DPI requires that proponents should, as a first priority, aim to avoid impacts upon Key Fish Habitat. Where avoidance is impossible or impractical, proponents should then aim to minimise impacts. Any remaining impacts should then be offset with compensatory works".*

Weirs and weir enlargements have significant impacts on native fish and fish habitat. The NSW *Fisheries Management Act 1994* recognises the significant impact of weirs on fish, listing the '**Installation and Operation of Instream Structures and Other Mechanisms That Alter Natural Flow Regimes of Rivers and Streams**' as a Key Threatening Process under Schedule 6. Further, such works are contrary to the *NSW Weirs Policy 1997* which adopts the following management principle "*The construction of new weirs, or enlargement of existing weirs, shall be discouraged".*

The *NSW Weirs Policy 1997* also states that a proposal to build a new weir or enlarge an existing weir:

- '*should not be approved unless it can be demonstrated that the primary component of the proposal is necessary to maintaining the essential social and economic needs of the affected community*', and,
- '*an increase in town water supply for the purposes of meeting projected population demand cannot be used as a justification to approve a proposal to build a new, or expand an existing weir, if environmentally friendlier alternatives to meeting that demand exist, which are also economically feasible.*'

The Wilcannia Weir Replacement Project will have a significant impact on native fish and fish habitats. Weirs can cause changes in physical, chemical and biological conditions, for potentially large distances both upstream and downstream of the weir, which in turn alter the aquatic flora and fauna and ecosystem processes. Given the nature of impacts of weirs on aquatic ecology, these impacts can only be partially mitigated, and a significant residual risk to aquatic ecology is likely to remain.

The Secretary's Environmental Assessment Requirements (SEARs) requires the proponents to address the *NSW Weirs Policy 1997*. This should show that proponents have closely considered other alternatives with potentially lesser ecological impacts to meet town water demands, which is also consistent with the *Policy and Guidelines for Fish Habitat Conservation and Management*, to avoid impacts on aquatic ecology as a first priority.

The current scope of the options considered, as described in the EIS, is narrow and does not appear to have considered some of the less harmful alternatives. For example, offstream storages typically have significantly reduced impacts to aquatic ecology than do instream structures like weirs.

Additionally, it is important to consider that refurbishing or replacing the existing Wilcannia Weir at its current site would likely result in fewer impacts on aquatic ecology, potentially reducing any mitigation and offset requirements. The decision to site a new weir further downstream from the existing appears to be driven by socio-economic benefits and community consultation. This decision has significantly exacerbated the impact on aquatic ecology from the project, contributing to greater consideration of increased mitigation and offset strategies.

The proponents have attempted to mitigate some of the identified impacts of a new weir, particularly through the work to develop a novel design for the weir gate/fishway configuration in lieu of a fixed crest weir. Aquatic ecological impacts from a fixed crest weir design would likely be significantly higher and unable to be mitigated. The inclusion of translucency flows and a stated desire to amend draft operations to avoid false fillings and unnecessary drought operations are also attempting to mitigate some of the most severe hydrological and hydraulic-related impacts.

However, these primary mitigation actions (translucency flows, eliminating false fillings, minimising unnecessary drought operations) are highly contingent upon the final weir/fishway design and a final operations plan. The preliminary assessment undertaken by DPI Fisheries concludes that, given some of the deficiencies of the current assessment, it is plausible that the proponents will not be able to mitigate the impacts of the proposal to the extent suggested in the hydrological and hydraulics analysis. Therefore, the residual risks (i.e. adverse ecological impacts, and the associated offset requirements downstream and upstream of the new weir) for the project may be significantly greater than estimated in the current EIS.

Department of Primary Industries
Department of Regional NSW

ATTACHMENT B

Overarching comments

Issue	Summary Issue	Detail of the Issue	Further Work Required
O1	Final weir and fishway design	DPI Fisheries understands that WINSW is yet to finalise the weir design and the fishway design. The EIS indicates that 2 or 3 gate options are still being considered for the weir and we understand that refinements are still occurring for the fishway design. Alterations to the design may alter the minimum and/or maximum flow thresholds, and this may materially alter the ability to pass translucency flows at the flow rates described in the EIS assessment, as well as how flows are managed during different operating phases/passing flow rates. This in turn may materially alter a range of EIS components including hydrology and hydraulic modelling, the impact assessment conclusions (including risk assessment and threatened species assessment) and the potential need/quantum of aquatic offsets required upstream and downstream of the weir.	1. If designs are altered to the weir/weir gate/fishway configuration, related recalibration of any assessment inputs (e.g. hydrology models, hydraulic modelling, risk assessment and mitigations, threatened species assessment, etc) and reconsideration of conclusions of the aquatic ecology assessment and operations plan will be required.
O2	Impacts need to be assessed across the operating life of the structure	The current EIS assessment does not appear to give full consideration to aquatic ecological impacts across the operating life of the new weir as per related SEARs clause ("include an aquatic ecological assessment from above and below Wilcannia Weir replacement that addresses all direct, indirect, and prescribed impacts of the new weir on Key Fish Habitat and associated flora and fauna including threatened species, populations, and communities **during construction and operation for the life of the storage**"). DPI Fisheries are concerned that neither alterations to future flow conditions in the Barwon-Darling (and subsequent impact on triggers/operations/impacts) nor long-term water demand for Wilcannia have been adequately assessed across the full operating life of the new weir (expected to be 50+ years). These factors need to be incorporated into analyses and the impact assessment. Model outputs over the 119-year historical flow record are important for the assessment; however, these reflect past flow conditions and the interaction with the existing and new structure. There also needs to be consideration of future implications in a changing climate, especially factors that might influence the flow triggers at the Bourke gauge and related operations (e.g. increased drying and warming conditions under climate change). The design life for operation of the new Wilcannia Weir was not clear in the proposal, but in broad terms, we would expect a concrete structure, such as the weir wall, would be in place for somewhere between 50-100 years. Components such as gates may have a shorter life span and may need to be replaced at more regular intervals; however, the physical weir is likely to remain in place for a considerable duration. For comparison, the EIS states that the existing Wilcannia Weir is approximately 80 years old and is only now approaching the end of its effective design life (EIS main report p9 & 17), with additional works possible to further extend its design life by installing a new line of steel sheet piling. Furthermore, future town water demand estimates are forecasted to the year 2050 (at 362ML) and the secure yield is estimated at 371ML. These would appear to fall well short of potential water demand for the lifespan of a 50-100 year structure.	1. Clarification of design life for the infrastructure and ensuring the assessments address impacts across relevant time period. 2. Adjust modelling or undertake new analyses as required to project reasonable upper thresholds of demand estimates for the Wilcannia Weir and potential future changes to the flows (and consequences for triggers) at the Bourke gauge. The assessment should consider potential impacts of climate change, as well as any future management actions that may impact on the flow thresholds at Bourke and have consequences for weir operations and related ecological impacts from a drying and warming climate.
O3	Downstream extent of impact and need to adequately assess habitat features for the full extent downstream	DPI Fisheries suggest that there needs to be greater assessment of the impact of this proposal on the downstream environment and the interaction of altered hydrology (and other impacts such as water quality) with Key Habitat Features to meet the related SEARs Key Issue Water condition ("Include **a thorough description** of the existing environmental conditions and hydrological regime, including: …**Instream assets and functions** associated with all upstream and **downstream river that will see altered flow**"). A detailed habitat assessment for downstream is also required to meet Fisheries' *Policy and Guidelines for Fish Habitat Conservation and Management* (Update 2013) which requires, among other information, "*a clear description of the physical and hydrological features of the development area (which may extend upstream and downstream of the development site in the case of flowing rivers or tidal waterways)*". There is very limited information or assessment of the habitat downstream and the likely interaction/impact of altered flow. Only one (1) location downstream of the new weir has been surveyed during the habitat site assessment. DPI Fisheries suggests that this does not meet the SEARs or Fisheries P&G requirements. Additionally, the aquatic ecology assessment has not adequately designated the extent	1. Undertake additional detailed habitat mapping and surveys downstream and complete a full description of assets, functions and links to flow regimes as per the SEARs and Fisheries P&G. 2. The aquatic ecology assessment will also need to demonstrate links between current hydrology and asset/function relationships (such as commence-to-fill thresholds and duration of flow to fill assets) and be clear how these relate to

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		of downstream habitat that will be subject to altered flows, but it is likely that this impact will extend to the next significant regulating structure downstream (i.e. Menindee Main Weir). DPI Fisheries believe that it is not sufficient to state that other flow inputs will attenuate impacts downstream as there are going to be periods of time where flow past Wilcannia Weir is the only contributing flow downstream. The aquatic ecology technical report (p89) acknowledges that for downstream cease-to-discharge there is some "uncertainty regarding how far downstream effects would occur depending on flow lag and attenuation at the time of the event"; however, DPI Fisheries believe this is not sufficient for the assessment.	changes from the proposal (this should include relating commence to inundate information (ML/d) to AHD at the new weir to better understand implications to downstream flows and key fish habitat). 3. There have already been discussions between WINSW and DPI Fisheries about improving the habitat mapping for more accurate information for the offset strategy and habitat compensation calculations – these negotiations should include a significant downstream component. Failing that, the proponents will need to rectify this omission.
O4	Outputs of the hydrology modelling	As flagged in an email to the WINSW project team by Anthony Townsend on 9 August, DPI Fisheries will be seeking further clarification post public exhibition on some of the graphics, analyses and/or assumptions relating to modelling presented in different parts of the EIS. Some follow-up actions may be simple, but some issues may be more complex. Examples of these issues include: • Better resolution of some graphs to enable easier interrogation of results and comparisons of existing/new weir scenarios. For example, the 119-year spells analyses are very useful, but it is difficult to pick up some of the differences from the way these results are presented (noting previous feedback has been given that, while useful, summarised or averaged data in the tables is not sufficient on its own). • Additional graphics that compare the existing and new weir influence on the flow regime across the 119-year historical record, which we would typically expect to see in the hydrological analysis sections (i.e. Technical Report 1). This information is important to view flow sequences that may need greater scrutiny, identify alterations in flow patterns, and to understand the capacity of the system to recover from low flow periods with flow patterns that break dry periods. This will be important in identifying factors that might need specific attention in the operations plan. Note the flow regime comparison may need to be segmented into shorter time periods to provide enough resolution for the comparison. • In earlier commentary on the aquatic ecology assessment, DPI Fisheries requested more scrutiny of the 70:30 normal vs drought mode in the EIS, noting that an average was of limited value for the aquatic ecology assessment. Some of this has been provided by the spells analysis but additional information will be needed. For example, DPI Fisheries asked to understand how the new drought mode compares under current conditions and future conditions (i.e. across the operating life and considering future demand/inflows under a drying/warming climate). Related to this, there has been limited analysis presented on the occasions when the weir pool will drop below normal FSL and affect passing flows. For both the historical record and future conditions, it would be necessary to understand when this happens (e.g. what type of events and antecedent conditions), the frequency that it occurs, and implications for the efficacy of related operations such as the translucency rule, filling, etc. • Further clarification of the interaction between groundwater and surface water and how that might affect any of the conclusions for surface water flows and hydrology (e.g. will filling drought mode take a greater volume of water than the volume change calculations because it will contribute to groundwater recharge - the EIS main report, table 3.4 p55 shows that the max storage volume of the weir pool will be 4,755ML compared to 4,207ML of the existing weir pool, which is an additional 548ML required to fill to FSL normal mode; and an extra 3077ML to fill to drought mode of 7832ML). The analysis in the reporting (e.g. Technical Report 1) chiefly looks at raises in groundwater levels (AHD changes) and not volumetric changes that result from this groundwater/surface water interaction. If there are interactions that require greater surface water volumes than currently included in the EIS, then the hydrology models may need to be revised, as well as any subsequent conclusions and mitigation actions. It would also be worthwhile confirming whether there are other licenced groundwater users that would extract from highly connected groundwater sources, and if there are discuss any implications this may have on the volume of water that might be recharged from surface water calculations. This type of consideration may also need to be reflected in PEW/HEW considerations as well.	1. Provide additional graphics, analyses and/or assumptions relating to modelling identified in our submission and in response to follow-up conversations post-public exhibition phase.
O5	Thorough assessment of potential impacts to environmental water is still required	Current assessment of environmental water components is insufficient and has material gaps in addressing the SEARs. SEARs Key Issue #2 water states "*Include a thorough assessment of the hydrological impacts of the proposed weir, including: …*"	1. A thorough analysis of environmental water provisions as per the SEARs. This assessment needs to consider the potential impacts of the proposal on all components of environmental water

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		• "An assessment of the impacts of the project to the Environmental Flow Requirements downstream as stated in the relevant Long-Term Watering Plan (LTWP) prepared by DPIE EES as part of basin plan requirements."
		• "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 (PEW) in the catchment downstream of the work.
		  ○ assessment of impact to volume, reliability, effectiveness or deliverability of Held Environmental Water (HEW) 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."
		Many of these aspects of the SEARs do not appear to be adequately assessed in either the hydrology assessment (Consolidated Water Technical Report 1) nor the aquatic ecology assessment (Technical Report 3).
		DPI Fisheries notes that there have been extensive efforts over the past decade to improve protection of environmental water in NSW and to address significant impacts on low flows in the Barwon-Darling and into the lower Darling, and the resulting impacts on aquatic ecology. Further reforms arose as a response to catastrophic fish kills in the lower Darling and impacts on fish communities during the recent severe drought. Recommendations and reforms enacted from a number of reports including:
		• Ken Mathews 2017 '*Independent investigation into NSW water management and compliance — final report*' produced for the NSW Government, particularly recommendations for the protection of environmental water;
		• the Vertessy et al. 2019 report '*Final report of the Independent Assessment of the 2018-19 fish deaths in the lower Darling*' including measures to improve Basin connectivity and to protect low flows in drier conditions, particularly in the Barwon-Darling, and protecting the first flow down the river system after significant rainfall. This report also highlighted the potentially catastrophic risk to fish in western rivers during dry periods from poor water quality and stratification; and
		• the Natural Resources Commission "*Final report: Review of the Water Sharing Plan for the Barwon-Darling Unregulated and Alluvial Water Sources 2012*'.
		It is critical to understand if there are any impacts from the proposed Wilcannia Weir Replacement Project that may adversely affect any of the provisions that have been (or will be enacted) to improve outcomes for low flow ecology in the Barwon-Darling (and into the lower Darling). This includes an assessment of PEW (volume, effectiveness, legal protection) and HEW. This assessment needs to occur across the life of the operating structure, including under a changing climate.
		It is likely that a number of factors from the current structure and proposed operations could impact on the effectiveness of environmental water including:
		• increased volume of TWS take and greater reserve that needs to be filled before passing flows;
		• whether the translucency rule allows for effective passing of all environmental flows or any impediments from drought mode/filling that might interrupt flow events (including timing and duration)
		• Interaction with potentially elevated water quality risks, including the downstream receiving system
		• Reduction in high quality lotic conditions in the existing weir pool may reduce the ecological outcomes that can be achieved from the same flow rates
		<u>HEW assessment</u>
		There is no HEW assessment.
		The consolidated water report (Technical Report 1) states (p74-75) regarding the model scenarios used for the historical record uses:
		'the most recent set of management rules contained in NSW draft water resource plans and the Queensland resource operations plans are included. **Commonwealth water recovery has not occurred in this scenario and these holdings are still used for irrigation with an allocation utilisation similar to other consumptive users.** The exclusion of Commonwealth water recovery from the model is important as it results in a conservative prediction of future flows in the Darling River (Baaka). If Commonwealth water recovery was included in the modelling any water recovered upstream of Wilcannia would be reflected in an increase in the predicted inflows to the weir pool and flows downstream of the new weir.'
			(PEW and HEW). This needs to be considered across the operating life of the infrastructure.
			2. Rectify any gaps in modelling where the models used do not distinguish Commonwealth environmental water allocations/behaviour from irrigation extraction, and undertake an analysis of the impacts of the proposal on HEW, including any impacts on deliverability. The analysis should consider whether there is any impediment on the use/success of Commonwealth or NSW environmental water achieving outcomes with their allocations. The impact of the additional volume of town water reserve that results from even normal operations of the new weir should also be examined.
			3. There needs to be an assessment (preferably quantitative, but at least qualitative) of how the proposal may impact specific environmental water rules and provisions (volume AND effectiveness of those rules across the operating life of the structure), especially with the Barwon-Darling WSP.
			4. The current paragraphs on the resumption of flow rule in the Barwon-Darling WSP are not adequate for our assessment. Further consideration is required, such as how the equivalency of the triggers is maintained and ensuring that the desired social and ecological outcomes/mitigation of risks are still being achieved, noting the potential implications from reduced hydraulics at different flows and potential exacerbation of adverse water quality outcomes from the increased weir pool and downstream interactions. This consideration should also note the change in gauge resulting from the Wilcannia Weir Replacement Project (and any implications), and whether the 30GL flow passing Bourke needs revision given approximately 500ML of new town weir pool below FSL may require filling before flows pass.

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<tr><th>Issue</th><th>Summary Issue</th><th>Detail of the Issue</th><th>Further Work Required</th></tr>
<tr><td></td><td></td><td>Although this approach may be conservative in estimating inflows to the weir pool, it doesn't allow for the project team to analyse impacts on HEW as per the SEARs condition. The behaviour of allocations that are extracted (i.e. irrigators and consumptive users) will be materially different to HEW that is usually kept in-stream.

<u>PEW Assessment</u>

The assessment of PEW is very cursory and has missed key considerations about the potential impacts from the Wilcannia Weir Replacement Project on the effectiveness of PEW. There are numerous measures within the Barwon-Darling Water Sharing Plan for PEW that need to be considered. These aspects include (but not limited to) active management provisions, class restrictions through commence to pump thresholds to ensure minimum passing flows; Individual Daily Extraction Components (IDECs), and the resumption of flow rule.

There is also a volumetric or effectiveness loss with the extra potential town water consumption that should be considered (even though this may be a small volume), as well as the additional volumes required to fill the new town weir pool before reaching the new normal FSL level, which will impact the volumes or effectiveness of PEW (i.e. EIS main report, table 3.4 p55; the max storage volume of the weir pool will be 4,755ML compared to 4,207ML existing weir pool which is an additional 548ML required to fill to FSL normal mode; also, only after this volume is reached will translucency rule apply).

Resumption of flow rule

In early feedback on the aquatic ecology assessment, DPI Fisheries requested specific consideration of the resumption of flow rule in the aquatic ecology assessment. The current EIS content on this rule is only cursory and has not examined this issue in sufficient detail. It also hasn't considered the impact on this rule over the operating life of the infrastructure, which may be triggered more frequently in a drying and warming climate.

This rule is particularly relevant, as it was put in place to protect the critical first flows after an extended low flow or dry period. This is likely to be impacted by the Wilcannia Weir Replacement Project. DPI Fisheries note that the consolidated water report (Technical Report 1, p106) stated that 'the conclusion presented on p106 of the Water Report (Tech Report 1) stated that 'the settings of the flow resumption rule triggers means that there would be times when the new weir would be in the reset phase and filling while irrigation use is restricted. Analysis of the outputs of the storage behaviour water balance model for instances over the 119-year simulation period where the new weir would be in the reset phase and filling when irrigation is in use is restricted identified 9 occasions where this occurred".

Since no other analysis was provided, we conclude that this means <u>approximately half</u> of the occasions that the resumption of flow rule would apply will be impacted by the new weir arrangements, potentially significantly diminishing the social and environmental benefits this rule was targeting. This is based on the initial analysis undertaken for the resumption of flow rule as outlined in the September 2019 Factsheet that indicated that the rule would only be activated at Wilcannia 18 times in the 119-year historical flow record (see excerpt below). Given this significant impact, there may need to be some revision of the resumption of flow rule or other mitigation mechanisms put in place (for example, the 30GL flow past Bourke threshold may need to be revised upwards as the extra volume in new Wilcannia Weir pool may need to be filled before the flow starts passing downstream).

Excerpt from the Sept 2019 factsheet on the resumption of flow rule:

Table 1 shows results of modelling the package of proposed plan rule amendments, had the resumption of flow rule been in place over the historical 119 year flow record. It shows the number of times that the rule would have been activated and the number of these events that would have been protected by temporary water restriction orders, based on current and historical practice by the NSW Government. The resumption of flow rule will replace a large portion of the temporary water restrictions expected in the future.

Table 1: Activation of resumption of flow rule compared to temporary water restrictions
<table>
<tr><th>Location</th><th>Number of times resumption of flow rule activated</th><th>Number of times a temporary water restriction would have applied</th><th>Number of additional water restrictions due to resumption of flow rule</th></tr>
<tr><td>Walgett</td><td>26</td><td>20</td><td>6</td></tr>
<tr><td>Brewarrina</td><td>26</td><td>19</td><td>7</td></tr>
<tr><td>Bourke</td><td>22</td><td>16</td><td>6</td></tr>
<tr><td>Wilcannia</td><td>18</td><td>14</td><td>4</td></tr>
</table></td><td></td></tr>
<tr><td>06</td><td>Finalising Operations Plan and ensuring it is achieving optimal</td><td>A major component of the mitigations proposed for the Wilcannia Weir Replacement Project will be derived from actions proposed in the operations plan. As such, the EIS assessment of ecological impacts is highly contingent upon the ability of identified measures to</td><td>1. The proponent to work closely with agencies, including DPI Fisheries, to finalise the operations plan. Part of the</td></tr>
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Issue	Summary Issue	Detail of the Issue	Further Work Required
	mitigation of impacts on aquatic ecology	mitigate impacts on hydrology, hydraulics and aquatic ecology as identified. The project team have also suggested that further mitigation will be possible by further modifying operating rules to reduce false fillings and triggering drought operation unnecessarily. A draft operations plan was provided with the EIS, and DPI Fisheries agrees that further refinement of the operations plan is required. A key element of this work is to refine triggers for different operating phases. The current rules based on flow rate (ML/day) triggers at Bourke alone are too simplistic and, as noted in the EIS, would result in significant impacts from the project on the upstream and downstream environments. The project team has already suggested that refinement of the triggers to eliminate false fillings and avoid unnecessary drought operation modes will be important to mitigate major impacts of the project. These triggers should better reflect actual and antecedent Wilcannia water demand, climate and catchment conditions (including forecast flows from upstream or tributary connections). Upon review of the EIS, DPI Fisheries will work with the project team on refinement of the operations plan post-public exhibition. As part of this refinement and finalisation the operations plan will need additional considerations including those related to water quality interactions with flow rules and the inherent risk posed through thermal stratification in weir pools, as well as the risk downstream from re-starting rivers. Additional analyses raised in other sections of this attachment would be needed to help this process. Given the importance of the operations plan, should the Wilcannia Weir Replacement Project be approved, DPI Fisheries would expect to see adequate post-implementation (monitoring, evaluation, reporting (MER) of the operations and the efficacy of these measures in eliminating impacts, including false fillings and unnecessary drought modes. The MER plan should be sufficient (both in terms of the timeframe and types of conditions that are examined) to give an acceptable degree of certainty for the project mitigations. There should also be remedial actions identified if the ability to mitigate impacts of the project are less than projected in the final assessment, noting that additional offsets may be required if mitigation is not possible.	finalisation should involve adoption of flow triggers that are more responsive to demand, antecedent conditions and broader catchment considerations at a minimum to mitigate false-fillings or unnecessary drought operations. 2. Include specific water quality considerations in the operations plan, including aspects such as a modified decision support tree, to minimise adverse water quality impacts within the weir pool and from any releases downstream (see Water Quality section in Attachment B). 3. Adequate MER of the structure and operations, as well as the identification of remedial actions that need to be taken if the operations plan is less effective than projected. 4. Conditioning any approval of the project to ensure that the final operations plan objectives are clearly oriented to preventing impacts on hydrology, hydraulics and aquatic ecology. This may include specifying avoidance of false fillings, unnecessary drought mode, and more refined consideration of triggers for different phases. Work to finalise the operations plan, and any subsequent revisions, must be done in conjunction with DPI Fisheries (via the governance structure proposed below). 5. Conditioning any approval of the project to ensure that the implementation of the final operations plan is overseen by appropriate governance that must be engaged throughout decision making and implementation (not on an as need basis or discretionary view as currently proposed in the operations plan). This governance structure should include DPI Fisheries. 6. Depending on the outcome of the final assessment, approval and conditions, DPI Fisheries may seek that an environmental bond be held until it can be shown that the operations plan successfully mitigates the impacts of the project as predicted in the aquatic ecology assessment.
07	Cumulative Impact Assessment	The information presented in the EIS Main Report does not specify the time period selected for the cumulative impact assessment per the *Impact Assessment Guidelines for State Significant Projects.* The time period will vary depending on the characteristics of the matter and the scale and nature of the potential impacts on the matter, but will, in most cases, match the life of the project.	1. Greater consideration of cumulative impacts from developments that may alter Bourke flow conditions or to protect low flows in the Barwon-Darling (i.e. Western Weirs, Better Baaka). At a

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		Given the nature of the Wilcannia Weir Raising Project, upstream and downstream impacts may need to influence the scale of the assessment of issues considered for cumulative impacts, including the extent of altered flow downstream. Rationale for the chosen scale the proponents used in the cumulative impacts may need further explanation (and consider comments above about downstream impacts). Most of the issues considered in the cumulative impact assessment will have limited interaction with the Wilcannia Weir Replacement Project from an aquatic ecology perspective. However, there are likely to be significant cumulative interactions with projects that change infrastructure and flows passing Bourke weir (for example Western Weirs/Better Baaka), as well as work that is underway in the water management space to improve flow connectivity into and through the Barwon-Darling (for example critical needs and connectivity considerations in the Western Regional Water Strategy program). DPI Fisheries acknowledges that a key objective of the Western Weirs project is to improve system flows, but the EIS statement on p384 that "any future improvements to the volume or quality of inflows to Wilcannia that are identified would be beneficial" is not supported by any evidence. There could be improvements to flows to Wilcannia, but the Wilcannia Weir operation could interfere or modify some of the ecological benefits that are being targeted by the proposed Western Weirs project. This is not examined in the document. Also, modifications to upstream structures (i.e. weirs) may also interfere with flow patterns that reach Wilcannia and may alter the relationship between triggers at Bourke and Wilcannia weir operation, and consequently could exacerbate impacts from Wilcannia Weir or reduce the ability to mitigate projected impacts on hydrology, hydraulics and aquatic ecology. Again, this is not raised in the cumulative impact assessment. Similarly, the cumulative impact assessment has not identified or discussed potential impacts that might arise from the 'Better Baaka' program, which includes scoping changes to Bourke Weir (reconfiguring the weir, construction of a new fishway and installing a low-level outlet for more flexible operation) among other initiatives. This could have considerable interactions with the Wilcannia Weir Replacement Project, which may be potentially positive and/or negative, with changes to the passing flows at Bourke linked strongly to operations and impacts from Wilcannia Weir. As the Wilcannia Weir Replacement Project is so intricately linked to flows and water management, it is also important to consider the interaction with upcoming water management measures. Many of these actions are trying to implement reforms that protect low flows in the Barwon-Darling and increase connectivity to and within the Barwon-Darling. Again, there could be negative or positive impacts arising from these interactions, plus a likely influence on the triggers/operation of Wilcannia Weir that the current measures are proposing to mitigate impacts from the project. The water management measures include: • Critical dry condition triggers in the Barwon-Darling and at the Menindee Lakes • Improving connectivity between rivers and catchments in the northern Murray–Darling Basin – noting the Natural Resources Commission made key recommendations to improve connectivity in the Barwon-Darling. This work is being coordinated and investigated under the Western Regional Water Strategy program (https://www.dpie.nsw.gov.au/water/plans-and-programs/water-management-in-far-west-nsw)	minimum this should include consideration of any potential future alterations to existing triggers and the implications of this with the operations plan and subsequent hydrological impacts. 2. Commentary about how Wilcannia Weir may interact with water management actions (particularly critical dry triggers and investigations to improve connectivity into and through the Barwon-Darling). 3. Conditioning any approvals of the project so that future developments (infrastructure or water allocations/management) that impact on upstream flow triggers (e.g. Bourke) or low flows will consider 'flow-on' impacts to Wilcannia Weir and provide additional mitigations or habitat compensation if required. 4. Ensure that the operations plan has enough flexibility to adapt to possible implications from future projects or water management initiatives.
08	Alternative Options	The current EIS has only listed a few alternative options considered in the analysis and only has a cursory amount of information about these deliberations and rationale/rankings of final options. There seem to be few environmentally friendlier options that have been considered to meet town water demand, such as improvements water management options and off-stream storage. The EIS should detail all alternative options explored (both infrastructure and non-infrastructure options) and outline why the preferred option presented in this would meet the *NSW Weirs Policy 1997:* "In determining the need for a new or expanded weir, the following general principles apply: • Provision for fish passage cannot be used as a sole justification to approve a proposal to enlarge an existing weir. • An increase in town water supply for the purposes of meeting projected population demand cannot be used as a justification to approve a proposal to build a new, or expand an existing weir, if environmentally friendlier alternatives to meeting that demand exist, which are also economically feasible. • Provision for future industrial expansion (such as, but not limited to, tourism) cannot be used as a justification to build a new, or expand an existing weir. • Subject to the usual EIA process, a proposal for the construction of new, or expansion of an existing weir, that will result in a net environmental benefit may be approved."	1. The EIS should detail alternative options explored (both infrastructure and non-infrastructure options) and outline why the preferred option presented in the proposal would meet the guidelines of the *NSW Weirs Policy 1997*. This will require additional evidence than the relatively cursory examination of alternative options presented in the EIS.
09	**Water Quality** Greater consideration of water quality in the aquatic	Water quality decline is a major cause of the reduction in fish diversity and numbers in NSW. Pollutants can directly lead to a decline in fish numbers by increasing fish and egg mortality rates, or by reducing the quality of fish habitat. Nutrients, dissolved oxygen content, pH, turbidity, altered temperature, salinity and chemical contaminants are all important aspects of water quality from a fisheries	1. The EIS needs to have better consideration of potential water quality issues/risks that may arise from weir

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	ecology assessment including considering its relationship with hydrology mitigation actions	perspective. The EIS needs to have better consideration of potential water quality issues and risks that may arise from weir pool operation and flows management. This consideration should include greater recognition of these potential interactions with the hydrology analysis and the impact assessment. It is likely that water quality risks will be a key limiting factor on the ability of the operations plan to mitigate impacts to the extent projected. Heightened risks of thermal stratification (and associated dissolved oxygen levels) in the weir pool and potential adverse outcomes downstream from flow releases either of poor-quality weir pool water or "small flows over hot, dry river bed could increase temperatures that threaten biota in refuge pools, or water low in dissolved oxygen could mix with refuge pools and create hypoxic conditions" are key factors (the latter already noted in Technical Report 3, p98). Whilst these issues have been broadly raised in the aquatic ecology assessment, there has been no attempt to correlate those potential adverse events with the hydrological outputs. DPI Fisheries believes that potentially positive events indicated in the hydrology analysis (e.g. translucency flows that break CTF events) could result in adverse outcomes and significantly affect the ability to reduce the impacts projected for the new weir. There are also significant risks to 're-starting' the river after long periods of drought, particularly if the relieving flows are small and the system is experiencing heightened risk factors (such as high temperatures, stratified weir or refuge pools, algal blooms, high nutrient concentrations in refuge pools, etc). As a result, DPI Fisheries suggests that there needs to be further analysis looking at the predicted hydrology mitigations considering potential water quality risks. At this stage, DPI Fisheries' would conclude that there is a higher risk to aquatic ecology from adverse water quality than has been indicated by the analysis and commentary in the aquatic ecology assessment. Thermal and dissolved oxygen stratification risk is likely to be exacerbated by the project and will be a particularly heightened risk during drought operations mode due to the low/no flows to the weir pool, increased pool depth, concentration of nutrients/potential algal blooms, and salinisation, as well as the cumulative interaction between such risk factors. These risks will be highest in hotter periods and longer CTF periods, which will often be associated with drought operation mode. Weir pool turnover and dissolved oxygen depletion can cause major fish kills, even if these events are rare, the result can be catastrophic for the fish community, including threatened species. Weir pool turnover in hot periods could arise from local rainfall events, sudden temperature/pressure changes (e.g. from weather fronts), small inflows to the weir pool, or potentially from releases over weir gates that can create eddies in the weir pool and cause mixing with low dissolved oxygen layers. Risks to the downstream habitat from poor water quality or inappropriately timed small releases could also have significant adverse impacts. Although many of the issues discussed in this section are touched upon in the EIS analyses (main report and technical reports), the statements within or between reports are on occasion seemingly contradictory or underplay the potential impact (or ability to mitigate those impacts) on aquatic ecology. And although the water quality risk to aquatic ecology may be recognised in the text, there isn't always a clear mitigation action proposed or full consideration of the risk in mitigation actions that are proposed. Further, DPI Fisheries would question some of the assumptions in the analyses, particularly regarding thermal stratification (see specific notes in Attachment C from our submission). For example, • In several places, the assessment considers that the new weir increases thermal stratification risk (e.g. p394 of the EIS main report that rates the residual likelihood as high, residual consequence as major and residual risk of thermal stratification as high even after mitigation actions). On the other hand, the documents also make statements such as "Given the new weir would have a higher storage level compared to the existing weir (one metre higher), the onset of thermal stratification would occur between six and eight months after it enters drought security operation mode." This claim was not supported with evidence about how the time estimate has been derived and it is difficult to determine what this calculation is based on from the other content in the document. Broadly speaking, increased depth of a weir pool typically increases stratification risk rather than decreases it, although several factors other factors also influence the risk of stratification. • Similarly, the PWA report p30 Appendix B uses a weir pool destratification flow rating of 0.035m/s. A range of work from Mitrovic and Baldwin clearly shows that the risk to thermal stratification and mixing is exacerbated by increased depths and reductions in velocity, both of which will occur in the new weir when compared to the current weir. Water quality risks from initial filling The EIS documents do recognise that there are possible water quality impacts from initial filling events. These could have adverse impacts on aquatic ecology, but current mitigation actions do not adequately address these risks as they are seemingly focused on impacts on drinking water quality. The EIS main report states (p143) "it is expected that some reduction in water quality would occur during the first filling periods, particularly with respect to nutrients (total nitrogen and total phosphorous) and subsequently turbidity and dissolved oxygen. This could present an issue at the water treatment plant when drawing water for drinking water purposes, however it is likely that this would be no different to a significant rainfall event in the catchment." Other potential WQ clarifications The groundwater assessment suggested that there may be some salinisation of low-lying habitats when the water table is elevated; however, this does not appear to have been discussed in the aquatic ecology assessment. It would be beneficial if the proponents can	pool operation and flows management, including the recognition of these potential interactions with the hydrology analysis and the impact assessment. Hydrological mitigation analyses should consider how potential adverse water quality outcomes will affect predicted outcomes/mitigation. 2. Decision support tool for water quality management (with potential modifications specific to the Wilcannia Weir infrastructure and catchment context) should be appended to the operations plan using Baldwin (2021) decision support tool as a guide. 3. Maintaining adequate water quality monitoring during operation of the new weir (beyond commissioning). Intensive water quality monitoring within the weir pool is recommended, particularly during drought operations and during hot periods, where 'real time' water quality data on weir pool stratification status and dissolved oxygen levels will be required as a minimum to guide translucency releases, transition phase operations, and river re-start, etc. Further indicators such as nutrient load, presence of algal blooms, etc may also be needed to guide decisions. Condition monitoring of downstream receiving systems may be needed, particularly in critical drought/dry periods and high-risk summer periods. 4. Determine monitoring and potential remedial actions that might be required to manage water quality risks to aquatic ecology from the initial filling of the new town weir pool and the initial filling of the 18.81km of upstream weir pool. Note, this may need to extend to the existing weir pool, but it was unable to be determined if this has a similar risk from the initial drought mode filling from information in the EIS.

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		please clarify if this is because the issue has been considered and there are no anticipated aquatic ecology impacts on those habitats, and if this also applies to any salinisation of low-lying areas with drought mode water table levels. Additionally, it would be good to confirm whether there would/wouldn't be any salinity/groundwater implications on aquatic ecology from the intrusion of the weir pool into tributaries or drainage courses (noting the report is predicting the greatest intrusion in Kallyanka Creek and the Paroo River - backing up by about 100m - and other tribs/watercourses between 10-30m – p 146 Technical Report 1).	
O10	Risks and Offsets Assessment	The EIS risk analysis for operations (Table 6.8 in Tech Report 3) has not listed the existing weir pool. DPI Fisheries suggest that this may need to be included (there is a risk category for this included in the EIS main report Table 23.1). Residual risks remain in relation to a significant drop of high-quality hydraulic conditions (e.g. from the backwatering effect) and the loss of high-quality lotic conditions across the rock bars. Predicted loss of high-quality lotic flows (>0.05m/s) will reduce the ecological outcomes that can be achieved with the equivalent flows into the future (the assessment of PEW and HEW needs to be considered here) and is also likely to contribute to increased risk of thermal stratification in the existing weir pool and risks to water quality. Additionally, there is a limited consideration of impacts on vegetation from the drought operations mode, particularly smothering effect on emergent or riparian vegetation from inundation (particularly events where inundation lasts longer than 2 weeks). This may in turn have impacts on fish species that have a close association with these types of vegetation (such as Olive Perchlet) and water quality. As per the EIS Main Report and the consolidated water report (Technical Report 1), the Wilcannia Weir pool site already records some of the poorest water quality of sites in the Barwon-Darling, and that the weir development proposal is likely to exacerbate the risks to key water quality parameters. The offsets strategy discussions do not mention downstream implications from the proposed project as potentially requiring offsets; however, based on the documentation provided, DPI Fisheries suggest that it is yet to be concluded that no offset is required for downstream areas, given some of the issues raised in our response, including potential resolution required for the area downstream impacted by altered flows.	1. The Risk Assessment and Offsets may need to be re-evaluated in light of feedback and the subsequent Response to Submissions process. Additionally, re-evaluation may be expected if changes occur to the weir/fishway design and consequently the operations plan.