This is an OBJECTION to the proposal by StateWater to raise Warragamba Dam (SSI-8441)

I objected to several aspects of the EIS as exhibited. I now object that neither:

- the Response to Submissions, nor
- the Preferred Infrastructure Report,

submitted by StateWater provide a sound basis for approving the proposed project.

In objecting to the EIS as a basis for approving the proposal, I joined many LGAs, community groups and citizens in pointing to inadequacies in the EIS. The Response to Submissions (hereafter, 'RtS') and the PIR might have repaired those deficiencies had they been adequate to the task. My submission is that neither achieves their aims.

The Response to Submissions

Navigating the DPE Major Projects portal to find the RtS is difficult. 'WDR RTS_final_031122 221118' is hardly an obvious choice of name for this document.

The RtS notes that the overwhelming majority of submissions regarding the EIS opposed the proposal. A reading of the small number submissions which supported the proposal show that those submitters were either lukewarm or did not understand the proposal.

Objections submitted by LGAs and by Aboriginal custodians and groups were summarized in separate 'concerns' sections of the RtS, with detailed responses. But objections by others seem to have overwhelmed StateWater: they were just been allocated a code, counted, and dismissed.

The law requires those making delegated decisions to actively engage with submissions. I call on whoever determines this proposal to engage with the intellectual basis of the many objections which have been dismissed by StateWater in its RtS.

StateWater, in the RtS, has summarized the basis of each objection as a count for each of nineteen categories (page ii). That so many categories were required is itself illuminating. Some of the titles used for those categories are inadequate. For example, several objections queried the economic rationale claimed in the EIS and argued that the State Treasury Guidelines had not been correctly applied in the economic evaluation. Those objections seem to be subsumed under '*Economic – cost of proposal*', or that suchlike will be addressed in the Business Case" (which might never be published). Those categories are different from those which DPE directed the proponent to use in the RtS.

A project with highly uncertain benefits and costs and a *claimed* benefit-cost ratio of only 1.05, estimated using a flawed methodology, is hardly a candidate for environmental approval when so many impacts of the proposal, were it to be implemented, weren't capable of monetary evaluation because they aren't market-traded goods.

I have reviewed, to the extent that time allows in the limited time between publication of the RtS and the closing date for further submissions, the response to several of my earlier objections. This was not made as easy as it should have been because the table of contents for the RtS is found not at the start of the document but from page vi (the seventh page of the pdf). The page numbers shown in the Table of Contents do not match the page of the pdf, so navigation is difficult unless one were to print the document.

It is implicit that no one will read the whole document of 869 pages,. As with the EIS, this seems to be the justification for another 'Executive Summary', and waste of bytes by reproducing (as in table 2-2 and figure 2-1) the same information in different formats. And yet the RtS does not respond at all to the substance of many objections.

The document is lengthy because the 'heritage' sections of the EIS needed to be done *de novo* and the diversity offset material substantially modified.

With difficulty, I found that my objections to the EIS were given the sequence number 1777 and DPE code SE-32804776. The RtS (page A57) states that my objections can be classified as falling within the code numbers assigned by DPE of B2, B5, E1, E2, E3, E4, E5, E6, E7, F1, F2, F4, G1, G2, G3, G5, H1, J1, K1, N2 and N4. That characterization does not capture the range of matters raised in my two objections.

Firstly, the codes assigned by DPE can't be stretched to assign either code N2 or N4 to my statement that the EIS was deficient in grammar, logic, labelling of figures, absence of material information nor several other criticisms I levelled at the document.

Second, I queried the methodology for assessing the required area of biodiversity offsets, and this somehow led to assignment of seven of the ten 'E' codes to my objection, when my comments were not species-specific.

Third, I argued that Appendix M (dealing with socio-economic issues, particularly flood insurance) was deficient, but this objection seems to have been subsumed under N2 or N4, rather than "K, not further refined".

Fourth, I argued that the benefit-cost analysis reported in the EIS was deficient, because it failed to acknowledge the huge uncertainty arising from hydrological risk and the timing of future benefits. These carefully-reasoned objections seem to have been coded as "N4". Section 6.14.4 of the RtS does not acknowledge this concern, nor respond to it. Instead, the RtS suggests elsewhere that the appropriate place for presentation of the economic analysis is in the Business Case. But the SEARS required justification of the proposal, and StateWater chose to include considerable (misleading) detail on a BCA in the EIS. Either it was included in error, or its adequacy can be called into question by an objector, *and that objection responded to*.

I've examined the sections of the RtS which allegedly deal with my objections, as categorized into one or more of the 58 sub-issues (see Table A1 for the cross-tabulation of codes and sub-issues to the place in the RtS where each was addressed).

The identified sections of the RtS show that *none* of the issues I raised were addressed in the 'concerns' nor in the 'responses'.

Preferred Infrastructure Report

StateWater, in the currently-exhibited PIR, claims to have considered all of the submissions raised in response to the EIS. If they did consider mine, and others I have read on the Department's website, they have either not taken them seriously (other than those relating to the woefully-inadequate treatment of heritage issues in the EIS), failed to understand them, or are just willful.

The overwhelming proportion of the submissions to the EIS were thoughtful objections. The small number of submissions in support of the project were typically brief and many did not address the issues meaningfully. There seem to be few who will publicly support this project.

Why do I assert that the PIR is deficient?

There are many reasons for objecting to the PIR. Like the EIS, it is overly long: it attempts to drown those who care to read it in detail through quantity, it uses specious reasoning, and it adopts a "how dare you" tone whenever it deigns to acknowledge that other points of view or analytical frameworks are and can be held by thoughtful citizens and are widely regarded as relevant to the environmental assessment of large projects.

It's a sad thing to have to read it in its entirety, as it wasn't properly proof-read

One example will suffice. On page v of the PIR, the first paragraph, under the heading *Post-EIS exhibition* states:

> "*Responses to the submissions received have not required a need to change the dam raising configuration to achieve a 14 metre flood mitigation zone being the basis of the Project objective to lower the flood risk downstream. A number of submissions proposed alternative solutions for flood mitigation. The responses to these have outlined their consideration as flood mitigation solutions has already been considered through the extensive options assessment work undertaken by the Taskforce since 2013 and reassessed for the EIS*."

After the oddness of the heading, I was (almost) ready for this non-sequitur. The grammar of the third sentence obscures whatever meaning the writer had in mind.

A re-write of the first sentence is: *After considering the submissions, StateWater is not persuaded to modify the Project, nor is it willing to engage in this document with most of the objections.*

I turn now to a few of the other deficiencies. Doubtless there will be several thoughtful objections to the heavily-revised material on heritage (both Aboriginal and the remaining elements of later occupation), on the method for assessing the potential area affected by inundation were the Project built and a major flood to occur, and on the proposed method for offsetting that damage.

Impact of the proposed Project on flood insurance premiums

See page vii of the PIR. The last dot point suggests, without evidence, that flood insurance premiums might be lower for *some commercial and residential property* if the project proceeds. I note that insurers active in Australia can no longer provide affordable natural disaster coverage for many households or businesses in many parts of Australia.

Suppose the unregulated premiums were lower *for some properties*. Would they be *affordable*? Would the cover be purchased? As I pointed out in a previous objection, the EIS was deficient in not investigating what proportion of those at risk were insured, either for traditional hazards or for flood (including business interruption caused by flood).

No reference to Treasury requirements for economic evaluation

Several objectors to the EIS noted that that document did not correctly apply the guidelines issued by NSW Treasury for the economic evaluation of State infrastructure. I cannot find any reference in the PIR to subsequent clarification with Treasury of the anomalies. If there is such a reference in the PIR, it defied my search of the document.

Flooding and hydrology

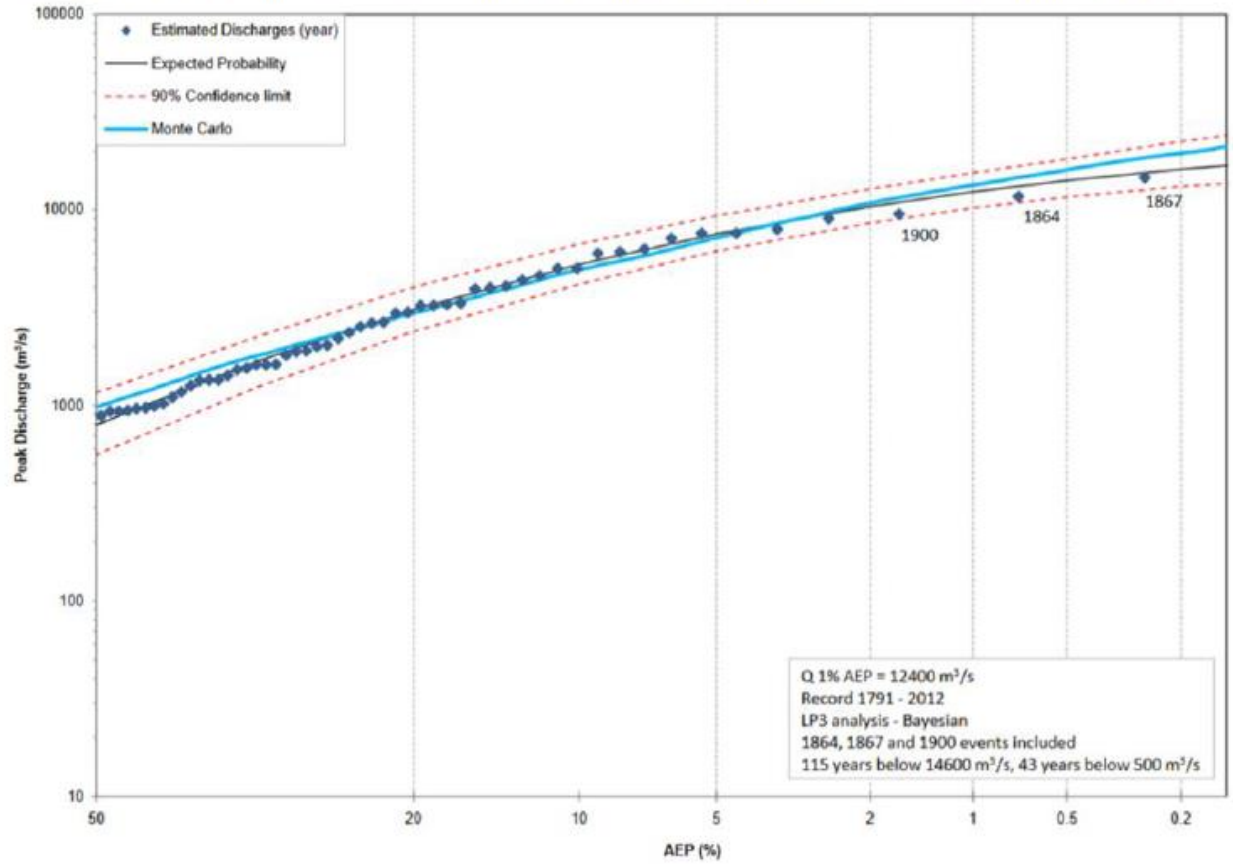
The cosmetic changes described in Appendix D do not address the issues I raised in relation to the EIS. There is

- an over-reliance on *Australian Rainfall and Runoff* for a design flood estimation task; and
- an over-confidence in the ability to merge *estimates* of the runoff from design storms over a large and poorly-gauged area with the limited amount of flood discharge data for the estimation of flood frequencies, during a period marked by changing hydrologic conditions.

While there is acknowledgement that the climate is changing, there doesn't seem to be an awareness that the sequence of prolonged numbers of wet years followed by extended drought does not allow the application of the usual statistical methods for the construction of confidence intervals.

In at least one respect, the PIR is misleading and/or deceptive. Figures 6-3, 6-4 and 6-5 are on pages 31-33 of the PIR. For ease of understanding my claim that these are misleading or deceptive, Figure 6-3 is reproduced here:

Figure 6-3 Pre-dam flood frequency analysis compared to Monte Carlo results – Warragamba



Source: *Hawkesbury-Nepean Valley Regional Flood Study*, Volume 1 (Infrastructure NSW 2019)

This figure employs *four decades* (orders of magnitude, for base 10) for the *Y* axis, of which only slightly more than one presents useful information. Horizontal division of the ordinate scale is only provided at multiples of ten, and the thinly tick marks for intermediate values are only provided on the left hand side. A consequence of using four decades instead of (say) 1.5 or even two decades is that it *appears* that the confidence interval is relatively narrow over the full range of AEPs. Replotting the graph (or rescaling it) would show that the confidence interval is wide, and increasingly so for rare floods.

Truth be told, the AEP of a flood with a peak discharge of 10,000 m^3/s cannot be estimated for this site with any precision with the techniques and data available.

Furthermore, the expression *Expected probability* is not appropriate in the context of this figure. It has a very specific meaning in statistics. The so-called Bayesian analysis begins with an overly-confident prior, and would be rejected by any statistician trained in Bayesian methods. And the Monte Carlo methodology does nothing to inspire the confidence apparently intended. ***The proposal to raise Warragamba Dam has, inherently, hugely uncertain benefits,*** which the EIS and PIR have downplayed or ignored throughout.

A truthful statement would be:

There are methods for estimating the frequency of rare floods which are useful in places with lots of relevant data and low variability of peak discharges. That is not the case for the Hawkesbury-Nepean catchment, and this was recognized by hydrologists in the first edition of AR&R. Changes in design flood estimation since 1956 do not overcome the inadequate data nor the extreme variability, and are not suitable when, as for this catchment, peak annual floods are not an independent realization of a random process. Nor are current methods suitable in the face of climate change. A decision to raise Warragamba Dam might be informed by the results using the available methods and data, as long as it is recognized that huge uncertainties exist. Any such decision would be a political one rather than one capable of a meaningful economic evaluation.

Absence of detail on how development controls will be maintained

StateWater is the proponent, but has no direct involvement in the imposition and maintenance of adequate controls on further development of flood-liable land downstream of the Dam. History shows that the weak and ineffective controls currently in place are liable to watering down when several decades of no major floods have been experienced. The development lobby is amoral at best, and LGAs strive to increase rate revenue through additional development, relaxation of planning controls, and an unwillingness to require flood-tolerant design.

It therefore falls to DEP to provide the assurance, through conditions or rejection of the proposal, that implementation of the project, if it were approved and built, will be accompanied by much more rigorous controls than heretofore. Owners of flood-liable land ought to be refused compensation for cancellation of their expected development expectations, by legislation if necessary. The argument that this is a 'taking' is wrong; the flood risk has been there since time immemorial, and the land continues to be burdened by it.

If implemented, the project would deliver a windfall benefit to occupants of the floodplain, with no proposal evident in the EIS, RtS or PIR that they would contribute to the cost, or even that they strongly support the proposal.

The failure of the PIR to address these issues is hard to comprehend.

Buy-backs

The PIR adds a little more detail than in the EIS on buybacks, but remains simplistic in its dismissal of this as the most desirable option. The analysis in the RtS was prepared by Infrastructure NSW and not by the proponent, and is simplistic.

Experience relevant to my objections

I am a retired engineer, formerly employed by a predecessor of StateWater, and alive to the political, environmental and planning issues in the management of the nation's water resources. I have supervised the construction of several large dams, been involved in dam safety in three states, and remain an expert in flood frequency analysis and the economic evaluation of public-sector projects. I have taught water and environmental engineering at graduate level in NSW and Queensland, as well as the principles of general insurance at graduate level. I was awarded the degrees of Bachelor of Science, Bachelor of Engineering in civil engineering, and Master of Engineering by research, and a graduate certificate in environmental policy by UNSW, and attained the Fellowship qualification of the Insurance and Finance Institute of Australia and New Zealand. I remain passionate about wise choices for floodplain management throughout Australia.

11 December 2022

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