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Review of the TEER report: Environment, flooding, and aesthetics; sediment in the kanamaluka/Tamar Estuary published in June 2021.

This review looks only at *Section 13, Management option - barrages and weirs* and only as it relates to the Tamar Lake Feasibility Studies published in 2017.

Introduction

The TEER Report does a reasonable job of alerting the community to all the environmental, scientific, and engineering risks that must be considered with any attempt to modify the current Tamar Estuary tidal regime to improve the aesthetic presentation of the Upper Reaches through sediment management or mitigate any residual flood risks to the low-lying areas of Launceston under current or Sea Level Rise (SLR) conditions.

In 2010, Tamar Lake Inc., (TL) a not-for-profit member funded organisation, in response to community concern, proposed the installation of a barrage in the estuary as a solution to the aesthetic presentation of the Upper Reaches, greatly improved amenity and 24/7 navigation for all water sports, and as a barrier to sea level rise that threatens the low-lying areas of Launceston. It then funded 23 studies by world leading experts to demonstrate the feasibility of this proposal. The compiled report was published in 2017 and presented to the Tamar Estuary Management Taskforce (TEMT) with an offer to provide access to any of the studies to assist in their deliberations.

The barrage location and design

The large Tamar Lake, which was the subject of all the studies, is formed with a barrage located at Point Rapid, about 10 kms South of the Bell Bay port and 20 kms upstream of Low Head.

The barrage, designed for TL by CDM Smith, the designers and builders of the Marina Barrage in Singapore in 2008, is equipped with a series of 10 independently operated floodgates, a ship lock for the passage of private and commercial boats, and fish ladders for the passage of marine life needing to transit from salt to freshwater and vice versa for life cycle purposes.

The flood gates are designed to accommodate all flood events up to a 1 in 200-year (0.5 AEP) flood event with Sea Level Rise (SLR) without any negative effects in Launceston.

Review of TEER report

This report was prepared without any consultation with the author of the TL Report, or without requesting access to any of the specialist reports commissioned by the author despite the offer having been made to TEMT. It is clear however, from selective quotes in the report, that the TEER contributors had viewed the brief overview document available on the Tamar Lake website as will be seen below.

The consequence of this neglect is that the authors failed to understand the dynamic operation of the barrage in controlling water levels in the lake, mitigating flood risk, and the release of freshwater downstream and misinterpreted many of the results as shown below. This, and other oversights, raise serious questions about the integrity of the TEMT report.

1. Barrage construction site – p156

The TEER report correctly noted that the SEAMAP of the site at Point Rapid consisted of cobble and silt, then went on to warn in great detail against the potential large scale silt excavation at Freshwater Point, a site never studied or seriously proposed by TL. A visual inspection of the site at Point Rapid and a viewing of a navigation chart of the area will clearly show that any silt accretions are in the tidal area and the remainder of the construction bed is an ideal all rock and cobble with an ideal shallow rock surface for the construction of the flood gates and ship locks.



2. Lake water level – p157

The TEER report correctly identifies that a high-water level could affect drainage outfall and Trevallyn power station output, however as reported by TL, the governing criteria for water level will be determined by the need to maintain water table level in Invermay at around the current tidal level. This is estimated to be about a one metre below current high tide and at that level, would have no effect on drainage and minimum effect on power station production. This would need to be determined at the detailed design stage.

Incidentally, in the current tidal environment, a SLR of 0.8m will cause an increase of 0.8m in the Invermay water table and would seriously affect drainage outfall and power station output if no other mitigating action is taken.

3. Ship lock facilities – p157

Had the TEER report chosen to look at the TL barrage design section they would have seen that the large commercial traffic lock was designed to accommodate all vessels up to an 18m beam, which is the same as the ship lift facility in Launceston.

4. Barrage construction costs – P 158

It is acknowledged that the \$320m cost of construction conservatively estimated by CDM Smith in 2014 could have risen since then. More recently TL have publicly estimated \$500m.

5. Barrage design – fail safe protection – p160

The Tamar Lake report anticipated that with the detailed design of the barrage CDM Smith would incorporate the following fail-safe protection.

Redundancy/backup The system has 10 independently operated gates, with a backup power supply from a diesel-powered generator.

Fail Safe Under normal operation, each of the 10 vertical lift gates will be constrained in the vertical plane by a shear pin or bolt. Should any, or all, of the gates fail to operate with rising flood waters, the water pressure will cause the shear pin/bolt to break and allow the gate to pivot on a horizontal plane about an axis at the top of the gate, allowing unconstrained flow down river to relieve potential flooding.

6. Economic studies – p158

The TL NERA and KPMG economic studies done in 2013 were very conservative in only looking at tourism and irrigation.

If TEER had looked at the NERA economic study, they would have seen that the local respected agricultural economist Lance Franklin of Macquarie Franklin estimated that there is 15,000 hectares of irrigable land in the immediate Tamar Valley and a further 31,000 hectares in the greater Tamar Valley. The economic return shown with water drawn from Tamar Lake was based on irrigation of only 10% of the irrigable land in the immediate Tamar Valley. I believe the Tamar Valley Irrigation scheme is looking at a return on far more than the 1500 hectares of irrigation with water drawn from Lake Trevallyn (power station output?) and the Liffey River.

The potential estimated economic benefits that could accrue to Tasmania with almost unlimited freshwater available near Bell Bay from a Tamar Lake has risen sharply not just from agriculture but also from the huge potential requirements for freshwater for the Hydrogen and Ammonia Production at that site.

Also, to be factored in, is the initial capital cost of a pipeline and reduced power production revenue over many years of piping freshwater from Lake Trevallyn. This would be a major percentage of the capital cost of the barrage construction and operation over the same period. The economics of a Tamar Lake do need a more detailed study in the economic climate of today and a full business plan would be needed before proceeding. This was always envisaged.

7. Property price increase – p159

The methodology used by NERA to estimate residential and commercial property price increases and potential government revenue gains are covered in detail in their report, but it should be noted that the properties looked at in the study were only those fronting the tidal flats in the Upper Estuary from Dilston/Legana to Launceston.

The TEER report talks about the justification of property price increase for properties downstream Legana that they already “front a wide estuary with significant aesthetic and natural values”. They were not included in the NERA report.

It should also be noted that in a study commissioned by TL with the global consulting firm AECOM in 2017 determined that using the modern Value Capture funding methodology, 50% of the capital cost of the barrage construction could be funded by private investors.

8. Water Quality and sedimentation in the Upper Reaches – p160

TEER implies that the TL studies showed water quality and sediment deposition problems in zone 1 that required a flow of 20 cubic metres per second down the Cataract Gorge for flushing. The 20 cubic metres per second for the water quality studies was specified to show worst case for the three very complex scenarios TL carried out for specific water quality studies in Zone 1 of a Tamar Lake (BMT WBM R.B22148.002.01.Zone1WQ.docx). The results confirmed the logical conclusion that with one way flow of the freshwater from the Cataract Gorge, Tailrace and North Esk and no asymmetric tide, (i.e. no locking in of pollutants and sedimentation) the water quality in the Yacht Basin, lower North Esk and Home Reach will be similar to that in Lake Trevallyn, the First Basin and behind the weir at St Leonards on the North Esk, all of which are suitable for swimming at this time.

Separate studies carried out to look at turbidity and sediment deposition in the same area (BMT WBM B20921.008.Scenarios_Update.docx) did not require the 20 cubic metres per second flow down the Cataract Gorge but assumed the basic input flows included in the Tamar Estuary model. These results showed a large reduction in turbidity and sediment deposition in the Yacht Basin and Home Reach under both summer and winter conditions. **The conclusion reached by the BMT WBM report was the “Tamar Lake would be a net exporter of sediment over time.”**

A separate series of studies of the deep section of the lake just behind the barrage showed potential water quality issues in this area that have been acknowledged in the TL reports. Further studies carried out by TL had some success in mitigating the magnitude of this summer only potential for algal blooms, but TL also acknowledged that more work would need to be done on this for community acceptance of the risk.

9. Sediment deposition below the barrage – p 161

The comments made by TEER concerning the potential for significant sediment accumulations below the barrage are incorrect. They were made on the assumption that freshwater was released continuously or at random intervals from the lake. The modelling shown in the BMT WBM report, M.B20921.008.Scenarios_Update.docx, over a 12-month period was carried out assuming that freshwater was released from the lake only on an ebb tide, normally twice per day or, if slow summer flows, when the lake reaches normal operating levels. The gates will be automatically controlled between the high and low limits to ensure a consistent pulse downstream.

The study showed minimal silt deposition in the area below the barrage due to the lighter freshwater with fine particle silt in suspension flowing over the denser salt water out to Bass Strait with minimal mixing and hence flocculation.

It is acknowledged that this is a contentious issue and will need modelling over a much longer period of time to be more certain of the rate of silt deposition. However, it should be noted that because the area of seafloor below the barrage is 20 + times the area of the Upper Reaches and the water depth is also an order of magnitude greater, any potential accumulations below the barrage would have minimal effect on navigation.

10. Cardiff Bay economic success – p161

TEER queries the economic success of the Cardiff Bay barrage completed in 1999. Anyone that has visited this area in the last 5 years will confirm the words of a BBC report in 2017 reporting on the 30 years development of the Cardiff Bay area.

“Once the epicentre of Wales' booming coal and export industries, by the 1980s, Cardiff Bay had become an abandoned wasteland of derelict docks and mudflats.”

"I think it [Cardiff Bay] has been an immense success. There's a whole generation who has no idea what it was like before."

"We cannot contemplate Cardiff without the bay. It's the centre of the city - it's highly successful.

"And all the critics... concerns about ground water and possible flooding and anxieties - all that was quite unjustified.

"The barrage has protected Cardiff from flooding and tidal surges. It's provided protection and not a threat."

11. Loss of navigation depth in the Upper Reaches – p162,3

TEER expressed concern about the potential loss of navigation depth in the upper reaches of the lake due to the potential redistribution of residual sediment from the silt banks into the channels and down the length of the lake. TL acknowledges that this will occur over time, but it would be of little consequence as the new operating lake level of about 1m below current high tide, 24/7, will ensure a huge improvement for navigation in this area for water sports that are now struggling.

12. Sea Level Rise protection – p166

While acknowledging that a barrage has the potential to protect low lying areas of Launceston, TEER claims that the new levee system will protect the areas behind the levee. This is very questionable. As mentioned earlier, a SLR of 0.8m will cause an increase of 0.8m in the Invermay water table and would seriously affect drainage outfall and power station output.

In addition, clearly infrastructure on the wet side of the levee will have no protection from either SLR or floods (2016 floods as an example). With a protected water level about 1m below high tide, a lake provides full protection against SLR.

13. Barrage effects on flooding – p167

With dynamic control of the lake level, with advance notice of potential flooding from the catchment, the level of the lake may be lowered significantly to buffer flood waters when they arrive at the Upper Reaches. As acknowledged by TEER extensive 2D flood modelling carried out for TL by BMT WBM (Tamar Lake Flood Modelling L.M20391.002.BarrageAssessment) for current and forecast SLR conditions showed a reduction in flood levels for all flood events from a 10 year ARI up to a 200 year ARI event. A summary of the conditions and result are as follows:

The existing TUFLOW model was modified to incorporate a barrage near the township of Rowella with the following characteristics:

- *Lake level of 0.9m AHD;*
- *Spillway crest of -3.0m AHD;*
- *Spillway width of 350m; and*
- *Crest level at 2.2m AHD.*

An assessment of the flood impact of the proposed Lake Tamar barrage has been undertaken using the Tamar River TUFLOW hydraulic model. This assessment has found that:

- *The approximate drawdown time from 0.9m AHD to 0m AHD is 4 hours for the current conditions and 14 hours for the climate change conditions.*

- *With 24 hours warning of a flood event on the Tamar River there is sufficient time to create enough storage upstream of the barrage to provide sufficient flood buffering for the 100-year ARI event under the current tidal conditions. In the 200-year ARI event, there is an increase in water levels upstream of the barrage to Swan Bay, but no significant increases in Launceston.*
- *Under the sea level rise conditions there was a reduction in flood levels upstream of the barrage. This reduction in both cases is due to the barrage stopping the influence of the sea level propagate upstream.*
- *The barrage closed scenario shows significant impacts upstream of the barrage, as expected. These increases represent a significant increase in flood risk in and around Launceston. It is recommended that a failsafe is investigated such as a secondary spillway or fuseplug arrangement.*

As shown above, the barrage designers included failsafe provisions in the barrage design.

It should be noted that while there is an urgent need to clean up the foreshore of the Yacht Basin, Home Reach (old Kings Wharf!) and lower North Esk, the proposed infrastructure by TEER to “dress up” this area on the wet side of the levee system will be subject to considerable damage in a tidal environment by even moderate floods (as the floods of 2016 showed). This would be prevented from occurring in a Tamar Lake environment.

14. Environmental Impact – p168,169

While acknowledging that there will be a large change in the ecology of the Tamar with the construction of a barrage, to understand the extent of this potential change TL commissioned an audit of the total natural values of the whole Tamar Estuary in a report by Andrew Costen of BMT WBM titled **Natural Values Desktop Assessment (R.M85555.001.01)** and then a peer review to understand the specific environmental threats and potential mitigation needs from the implementation of the Tamar Lake, Mark Breitfuss of Epic Environmental carried out a further study titled **Further Ecological Assessment of Threatened Species and Potential Ecosystem Impacts** with the conclusion, as quoted in the TEER report *that while there will be some displacement of natural ecological values (which have to be managed), no listed species will be threatened and the freshwater habitats (including the Tamar Island Wetlands) will be greatly expanded.*

Because this is a very complex area of the Tamar Lake proposal it will only be resolved in the planning process with a full Environmental Impact Study (EIS).

15. Rice Grass - p170

The 415 hectares of Rice Grass meadows in the middle reaches of the Tamar Estuary is an introduced pest plant with the largest infestation in Tasmania. While Rice Grass in other areas of Tasmania is the subject of attempts to eradicate it by the government, there is no known attempt to eradicate in the Tamar despite a strong group of residents in the area lobbying for the restoration of the natural shoreline.

All studies agree that the Rice Grass will die of in a freshwater environment and generate a relatively short-term pulse of pollution downstream, but it is very significant that TEER focuses on only the short-term consequences and completely ignores the long-term environmental and bathymetric benefits that will accrue with the restoration of the natural habitats and ecology, and improved amenity and shoreline access for residents and tourists in this area.

Conclusion

This review of the TEER report should never have been needed to be carried out and aired in public if the report accurately reflected and acknowledged the very extensive studies carried out for Tamar Lake Inc. by the most experienced scientific and economic experts the members could afford for their \$500,000 investment in cash and kind.

Having said this, Tamar Lake Inc. acknowledges the attempt by TEER to document for the community all the variables that need to be considered for the whole Tamar Estuary health and amenity improvements.

With the above corrections, this TEER document will provide a good base document as an input for consideration to any plans for improvement in the health, amenity, and economic development of the whole Tamar Estuary to be formulated by the yet to be established Independent Authority (the Tamar Estuary Management Authority), committed for establishment by the Premier before the Tasmanian elections earlier this year.

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2/8/2021