



Tamar Lake Inc.

Incorporation Number IA 10501

Email: info@tamarlake.com.au

Web: www.tamarlake.com.au

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Reports funded by Tamar Lake Inc. – 2010 – 2024

Since the formation of Tamar Lake Inc (TLI) in 2010, the following studies have been commissioned and carried out by Australian and Globally recognised expert consultancies in each of their fields.

Studies carried out to date:

1. Preliminary Technical Assessment – 35 pages BMT WBM – Dr. Ian Teakle – February 2012

The purpose of this report was to carry out a preliminary assessment of the technical viability of installing a barrage at Point Rapid with a focus on hydrodynamics, sedimentation, water quality and flooding to determine whether TLI should invest in more detailed studies into the feasibility of the Tamar Lake concept.

The results showed that the concept was viable in all aspects studied with the important opinion that the Upper Reaches of the Tamar would become a net exporter of sediment over time.

2. Natural Values Assessment – 160 pages BMT WBM - Dr. Andrew Costen - June 2012

Knowing the concept would involve a substantial change in the ecology of the saltwater section of the estuary, this report compiled a list of all the natural values of the whole estuary, potential effects of the Tamar Lake implementation, and Management, Legislation and the Regulatory Assessment Framework.

3. Rice Grass Infestation

*Rice grass was introduced to the Tamar Estuary in 1947 with the goal of stabilising mudflats, reclaiming intertidal lands and improving navigation. The plant spread rapidly throughout the estuary, and subsequently to other parts of the state. In 1997 **Rice Grass** was estimated to cover 415 hectares within the Estuary, the largest infestation of rice grass in Australia (DPIWE 2002).*

Rice Grass's dense growth and root network act as a trap for sediment, significantly altering the natural rate, magnitude and location of sediment deposition and erosion (Whitehead 2008). These processes eventually elevate shorelines and riverbanks, creating rice grass terraces and marsh islands, which have significant impacts on estuarine hydrodynamics, ecology and amenities. Impacts on biodiversity and integrity of native wetland communities, migratory birds and fisheries are of particular concern.

Furthermore, rice grass adversely affects recreational amenities (Hedge 1997).

Because of its significance, the above quotes are directly from the Natural Values Assessment Report in 2. above.

The Breitfuss Report in 4. below, confirms that *the Rice Grass will die off in the freshwater of the lake but that the mass dieback and decomposition will be unsightly and will smell, and may also cause anoxic conditions in the lower levels of the lake. The extent and duration of this will depend on the rate and volume of water that is able to pass the barrage, and any mixing or layering of anoxic and oxygenated water”.*

This effect and timing will need more study in the required Environmental Assessment Study (EIS).

4. Ecological Assessment of threatened species and potential eco-system impacts – 35 pages CDM Smith - Dr. Mark Breitfuss – June 2012

Dr Mark Breitfuss, then with CDM Smith, was asked to do a peer review of the Natural Values Assessment and specifically to identify the effect on threatened species and potential eco-system impacts.

While the results indicated that there would be impacts on the saltwater ecology above the barrage it indicated that any impacts could be managed over time.

5. Prefeasibility Study for water transfer by a “Submarine River” from Tasmania to Victoria – Via Marina, September 2012

At this time, a French company, Via Marina, that specialises in the long-distance transport of freshwater in pipelines in the ocean environment, heard about the Tamar Lake project and knowing Melbourne was struggling with the future supply of freshwater (the Wonthaggi Desalination Plant was in the final stages of completion) offered to prepare a report on the feasibility of a pipeline from behind the barrage in the Tamar to the Wonthaggi Desalination site and then pumped into the greater Melbourne water supply via the same reticulation as the desalinated water. This was done pro-bono and indicated that the same volume of freshwater as the desalination plant capacity could be sourced from the Tamar catchment at only a fraction of the cost of desalination. and at 200 GL per year would consume less than 10% of the average 3200GL flowing from the catchment into the Tamar.

6. Tamar Lake Economic Study – 39 pages NERA Economic Consultants – Greg Houston – April 2013

NERA is a NY based global economic consultancy with a significant presence in Sydney. They were asked to carry out a study on the economic benefits directly attributed to the formation of the Tamar Lake. Their results looked at: agricultural irrigation in the valley; sale of freshwater to Victoria; use of water for industrial purposes at Bell Bay; positive and negative benefits on the fish industry; the positive effect on residential and commercial property values; and tourism.

The agricultural section was carried out in partnership with Lance Davey of the local firm Macquarie Franklin.

The results showed the potential for a very substantial increase in GRP for Northern Tasmania with the implementation of Tamar Lake.

7. Barrage siting and costing – CDM Smith - Marco van Winden – March 2012

C D M Smith were the designers of the very successful Marina Barrage in Singapore completed in 2008 so were asked to carry out a concept design and costing for a Tamar barrage located at Point Rapid that would have no negative effect on flood levels in Launceston; would allow the level of the lake to be controlled over a very wide range below current and sea level rise high tide levels; provide ship lock facilities for both private and commercial vessels with a maximum beam of 18 metres, the same width as the ship lift facility in Launceston; fail safe capabilities on all the flood gates; and provision for fish ladders that would allow transit both ways for fish species transiting for life cycle purposes.

The conservatively estimated cost of construction in 2012 was \$320m, which may be more like \$500m today.

8. Tamar Lake Economic Impact – 35 pages KPMG – Martin Rees – July 2014

After completion of the NERA economic Study, KPMG Tasmania offered to do a pro-bono peer review of that report and found the following based just on barrage construction, irrigation and tourism.

The study found that the high-level economic impact of the Tamar Lake Project built on the pre-feasibility study by NERA by quantifying the net economic benefits of the project. KPMG’s analysis found that during its first three years, direct expenditure on barrage construction and irrigation scheme construction, the Project would contribute approximately \$313.51m in net additions to Gross State Product (GSP) and support 856 jobs. On an ongoing basis, net additions to GSP and jobs would result from capital works, combined operations of the barrage and irrigation scheme suppliers, and operations of the irrigation scheme users. The favourable impact on tourism would more than offset the adverse impact on existing fisheries, and in net terms, would contribute approximately \$112.48m in net additions to GSP per annum and support 716 jobs.

This study estimated a boost to Gross Regional Product (GRP) of 3% just from agriculture and tourism within 15 years from the implementation of the Tamar Lake.

9. Tamar Lake Flood Modelling – 15 pages BMT WBM – Philip Pedruco – November 2014

An assessment of the flood impact of the proposed Tamar Lake barrage was undertaken using the Tamar River TUFLOW 2D hydraulic model prepared for the Launceston Flood Authority.

This assessment has found that with a normal lake level at 0.8m AHD (approximately 1.0m below normal high tide):

- The approximate drawdown time from 0.8m 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 and below under the current sea level 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 all cases is due to the barrage stopping the influence of the sea level propagate upstream.

Tamar Estuary 3D Hydrodynamic model development

With the technical and economic feasibility of the Tamar Lake concept confirmed, TLI determined the need to carry out detailed studies on sediment deposition and transport and water quality in the two key areas of the estuary, Zone 1 in the Upper Reaches around Launceston and the zones just upstream and downstream the barrage at Point Rapid. To achieve this, a 3D hydrodynamic model of the Tamar was required with an estimated cost of \$150,000 for development by BMT WBM.

An application to the then Infrastructure Minister Hidding secured a grant to TLI of 50% of the cost, and the Launceston Flood Authority contributed the other 50% from their federal fund's allocation. The full amount was then transferred to NRM North to manage the development and ongoing management of this very valuable asset.

3 D Hydrodynamic Studies – BMT WBM – Michael Barry - January 2016 and August 2017

On completion and calibration of the 3D model, TLI then commissioned BMT WBM to model a wide range of Tamar Lake scenarios that looked at the effect of the formation of the Tamar Lake on sediment transport and water quality compared with the current tidal environment with the same input flows.

The specific scenario modelling carried out to date includes:

- 10. The concentration of suspended sediments near the water surface and near the bed for the 17 TEER program water quality sites from Cataract Gorge to Low Head.** This study showed that the turbidity (water clarity) in the whole lake was greatly reduced and would be as clear as the water flowing through the First Basin.

11. Sediment accumulation for the 12 months July 2010 to June 2011 for two locations:

a. The Zone 1 section from the North Esk to Tamar Island

This study confirmed the original opinion of our consultants that fluvial sediment deposition in this area would be greatly reduced, and this zone would become a net exporter of sediment.

b. The estuarine section from the barrage in Long Reach to Low Head

This study showed that provided freshwater from the lake was released through the barrage gates on an ebb tide, sediment deposition in the estuarine section would be greatly reduced with sediment in suspension transported out to Bass Strait.

12. Sediment accumulations for a 3-month dry period from January 2009 to March 2009 for the Zone 1 section from the North Esk to Tamar Island

This study confirmed what most of the community knew that in the **tidal** environment any sediment raked downstream from the Home Reach/Yacht Basin area would return on asymmetric tides, particularly during summer when flows into the estuary are their slowest.

It also confirmed that with the removal of the asymmetric tide and the Tamar Island flocculation zone in a Tamar Lake environment there would be minimal deposition of new sediment in this area.

13. Impact of the barrage on water levels downstream of the barrage

This study confirmed that there would be no significant increase (maximum 10cm) in water levels downstream the barrage under both current and sea level rise tidal conditions

14. A range of water quality scenarios for the 17 TEER water quality sites Cataract Gorge to Low Head comparing the current estuarine case against the proposed barrage case - M.B20921.008.Scenarios_Update.docx

The results from these studies were very complex with the introduction of quantities of the nutrients Nitrogen and Phosphorous into the water column from the sediment bed, in a process called Nutrient Sediment Flux (NSF), on top of the new nutrients flowing into the lake from the farms, logging and sewage treatment plants in the catchment and Upper Reaches. The results for both the Tamar Lake and current tidal scenarios were similar except for that indicated in the deep sections upstream of the barrage where there is the potential for algal blooms to form on the surface in hot summer conditions due to thermal stratification of the water column in this area. The results for Zone 1 which showed a significant improvement in WQ are covered in a separate study in section 16 below.

15. Review of BMT WBM Tamar Lake Scenarios Update – Tony Church and Associates – February 2016

The results presented in 13 above caused some concern for TLI, specifically in that the NSF parameters used to determine the rate of nutrients leaching from the sediment bed were theoretical and based on other similar locations in other parts of the world and seemed excessive. TLI then commissioned this peer review of the report. The peer review reported that based on NSF parameters actually measured at the time of dredging sediment from the mouth of the Yarra on Port Philip Bay, the parameters used by BMT WBM were greatly excessive and recommended actual measurements of NSF be taken at multiple locations in the Tamar under variable seasonal conditions.

The scope of this further study was deemed to be beyond the scope of a feasibility study, so no further work was done on this.

16. Investigation of the water quality in Zone 1 in a Tamar Lake environment versus the current estuarine environment. Reference: R.B22148.002.01.Zone1WQ.docx

This study looked at water quality in 22 locations in Zone 1, from the Norwood STP on the North Esk to Tamar Island under the current tidal environment and a Tamar Lake environment. The input flows to the model looked at the then current water quality from the catchment and existing STPs, the forecast improvement in WQ with the implementation of TasWater's Launceston Sewage Improvement Plan (LSIP), and separately with the implementation of the NRM North Water Quality Improvement Plan (WQIP).

The conclusion reached by this study was that WQ in Zone 1 was greatly improved for all Tamar Lake scenarios because of the removal of the asymmetric tide that locks pollutants in the Upper Reaches of the Tamar. In a Tamar Lake environment, polluted water flows from the catchment and STP discharges flow in one direction downstream.

17. Research on Destratification Systems – BMT WBM - Michael Barry - R. B20921 – February 2016

When the results in 13 above were received, TLI commissioned BMT WBM to research how this potential algal bloom problem was solved in similar barrage installations in Singapore, Cardiff, the 7 barrages on the Seine River in France downstream of Paris and the Charles River in Boston, Massachusetts.

The conclusion was that the technology used in these locations would not be economical for adoption in a Tamar Lake.

18. Tamar Lake Inc. Destratification Scenarios – BMT WBM – R. B22148 - August 2017

As a follow on to global destratification research TLI commissioned an investigation of a range of destratification methods for reducing the risk of late summer algal blooms by controlling the release of reduced dissolved oxygen water through outlets at the base and top of the barrage. This showed some significant reduction in the risk of summer algal blooms at an increase in the risk of passing de-oxygenated water downstream.

19. Estimate of the transfer time from a salt water estuarine system to a freshwater lake system after construction of the barrage

It is estimated in this study, that once the barrage is installed and the gates are closed, the lake will transition from salt to fresh water in 4 to 12 months, depending on rainfall in the catchment.

20. Tamar Lake Funding – AECOM – February 2017

Acknowledging the significant level of funding required to implement the project, Tamar Lake Inc. commissioned AECOM, (a global infrastructure consultancy) in February 2017 to estimate the potential for **value capture funding** methods to contribute to the funding of the Tamar Lake project. The findings from this study indicate that at least 50% of the capital cost of the project could be funded by a private developer in partnership with the State government.

Tamar Lake Feasibility Report - 2017

At this stage, because of the death of my wife in July 2017, no further work was carried out on this series of studies and the Presidency was handed over to Sam Tucker and subsequently Andrew Lovitt, and the Feasibility Report was compiled reporting both benefits and issues that needed further study and submitted to the recently formed Tamar Estuary Management Taskforce (TEMT) under Chairman Allan Garcia with an offer to supply any of the above reports to TEMT members for consideration in their deliberations. This offer has never been accepted.

TEMT Sediment Options Report – June 2021

In June 2021, TEMT under Chairman Gary Swain released a draft report compiled by the members of TEER. The review was claimed to be “*a scientifically robust, evidence-based and peer-reviewed assessment of a wide range of sediment management options for the estuary, including various community proposals that have been put forward in recent years. The review brought together technical experts in flood management, estuarine dynamics, ecology, engineering, and infrastructure management to evaluate the potential management options.*”

The Tamar Lake project was reviewed in this report along with other community proposals but unfortunately, once again, the compilers of this review did not request access to any of the 20 reports listed above.

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. This, and other oversights, raised serious questions about the integrity of the TEMT report.

21. Tamar Lake Longterm Sedimentation Study - A11690– August 2022

Prompted by the very inaccurate sedimentation options review released by TEMT in June 2021, and the limited scope due to budget and hydrodynamic model limitations of the original sediment studies carried out by TLI, TLI solicited from BMT a very comprehensive proposal for a sedimentation study that looks at the whole Tamar Estuary for both fluvial sediment deposits and transport from the catchment and the potential for coarse marine sediment transport upstream from the estuary entrance. These studies covered a forecast over a 50-year period instead of the 12 months currently limited by the then existing 3D model. This extended time frame and the ability to model marine sediments from Bass Strait required a significant upgrade to the current Tamar Estuary modelling system but as it models the Tamar Lake environment as well as the current tidal environment for both current tidal and sea level rise situations, it has now become a major asset for all Tamar Stakeholders.

The cost of this proposal was \$50,000 and initially a request was made to TEMT Chairman Gary Swain for this funding from the State to carry out this proposal and make the results and upgraded model available to all stakeholders. This request was refused by the Chairman.

Based on this refusal, and acknowledging the importance to Northern Tasmania community of developing this understanding, TLI members got together and funded this study.

A summary of the results of this study are as follows:

Sediment Management

In the current **tidal** environment almost 100% of the fluvial silt input load of an average 120,000 m³/year is maintained in the Upper Reaches where it is mobilised and re-distributed upstream by the tidal regime.

In the **Tamar Lake** environment:

- **The lower North Esk** will be a net exporter of bed sediment particularly during flood events.
- **In the Upper Reaches/lake** the Upper Reaches will become a net exporter of sediment due to the erosion of sediment from the Yacht Basin and Home Reach driven by flood events. The on-going fluvial supply from the catchment and any sediment mobilised from Home Reach is predicted to disperse and settle in the relatively deep and wide area of the lake from Stephensen’s Bend to Point Rapid. Sediment settling to the bed from the freshwater of the lake will tend to settle in the deep channels. The predicted sediment load retained in the lake of an average of 86,000 m³/year is likely to result in an annual increase of sediment depth of only 1.8mm per year. At this rate it would take approximately 46 years for sediment to reduce 1% of the lake volume of 400GL
- **Downstream the barrage** – The studies show that in the **lake** case, only an average of 20% or 22,000m³/year of the fluvial sediment flows through the barrage into the

downstream area. This equates to only an average sediment depth of 0.7 mm/year in the area between the barrage and Low head and that it would take the lower estuary 5,000 to 10,000 years to reach regime equilibrium.

- Sand and fluvial sediment - Upstream from the estuary entrance at Low Head**
 In the tidal case there is significant sand transport upstream due to wave and tidal forcing from Bass Strait. With reduced tidal prism under the Lake scenario sand transport at Clarence Point is reduced from 1500 m³/year to just 110 m³/per year, and with the fluvial sediment load into the estuary of only 22,000 m³/year the estimated timescale for infilling of the lower estuary in order to approach regime equilibrium is likely to be of the order of 5,000 to 10,000 years. Over this long timescale the lower estuary would be expected to evolve towards a more fluvial character than the existing tidal case.

IN SIMPLE TERMS, IN THE TIDAL SITUATION THE 120,000 CUBIC METRES OF NEW SEDIMENT ENTERING THE TAMAR EACH YEAR ACCUMULATES IN THE VERY SHALLOW AND NARROW HEAD OF THE ESTUARY BUT IN A TAMAR LAKE SCENARIO MOST OF THIS NEW SEDIMENT ACCUMULATES IN THE VERY MUCH WIDER, DEEPER AND LONGER SECTION FROM FRESHWATER POINT DOWN TO THE BARRAGE.

These conclusions are shown clearly in the following chart of sediment erosion and deposits.

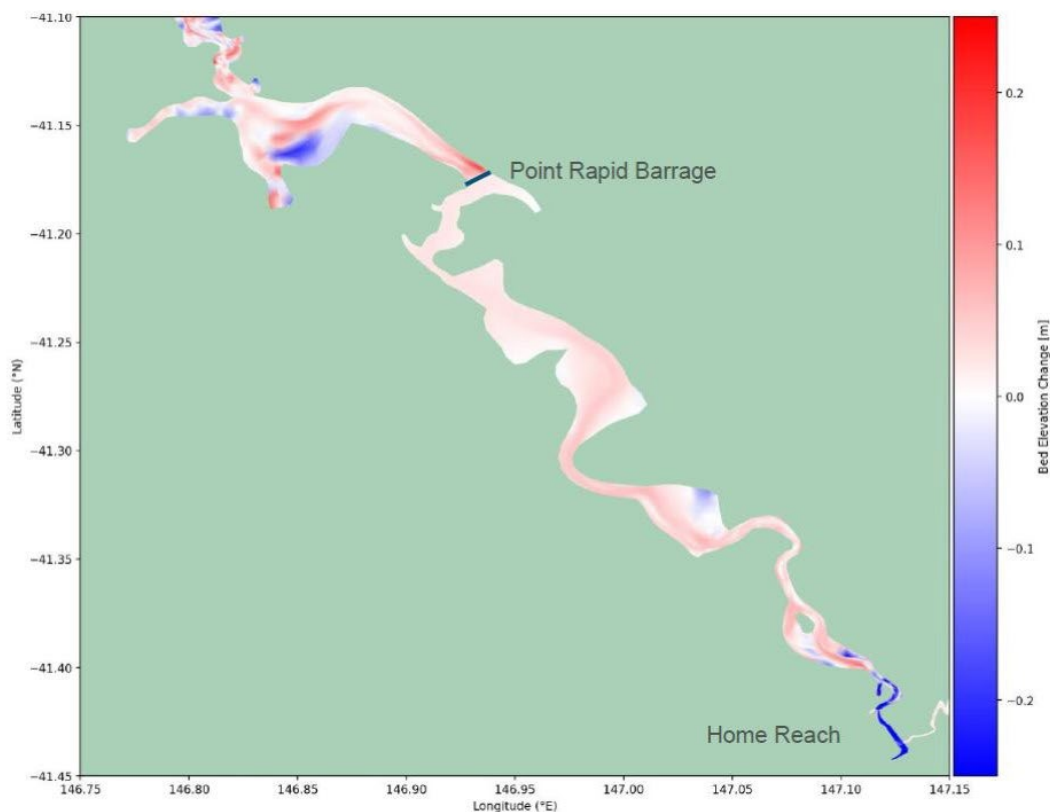


Figure 1 Tamar Sediment erosion and accumulation over a 10-year period.

22. Flood Mitigation Report – Proposal BMT P.2490.001

The original Tamar Lake flood modelling and barrage design carried out in 9. above used the flood flows determined in the 2008 BMT River Tamar & North Esk River Flood Study report and was for the purpose of insuring that the introduction of a barrage at Point Rapid would not have a detrimental effect on flood levels in Launceston.

In early 2024, TLI became aware of an updated 2018 Flood Modelling report (R.M.20921) carried out for the Launceston Council that the climate change driven increase in forecast rainfall, flood levels, and sea level rise collectively mean that Launceston's levee system will no longer provide the desired level of Urban flood protection, not just in the long term but in the short term.

The report showed that if Northern Tasmania had a 1 in 200-year flood event next week, the current levee system at 5.1m AHD would be topped and Invermay and the other low-lying areas of Launceston will be flooded to a depth of at least 2 metres.

With a forecast of rainfall and sea level rise conditions out to 2090, the report showed that if Launceston had a 1 in 50-year flood event it would flood Invermay to a depth of 0.5 to 1.0 metres and a 1 in 200-year event would flood Invermay to a depth of 5m.

Recognising the consequences of this report and based on our previous experience in flood modelling TLI developed a Flood Mitigation proposition that was presented to Council by John Pitt. This gained unanimous support by Council and has eventually led to the approval of the Council's Flood Mitigation Strategy Scoping Study.

Also based on the TLI experience of flood mitigation with the dynamic operation of flood gates in a barrage situated at Point Rapid TLI recognised that a revised design of a barrage and operating parameters should be one of the options considered by Council for their flood mitigation program.

Based on this, TLI approached the BMT Flooding Team Leader located in Sydney for the preparation of a proposal that considers the barrage design and buffer operating options that have the potential to manage flooding in Launceston within the current levee system height and for the projected life of the barrage.

The proposal received by TLI in June 2024 would use a refined TUFLOW model that will be used to simulate:

- Existing design flood conditions for the 1%, 0.5% (1 in 200) and 0.2% (1 in 500) Annual Exceedance Probability (AEP) design events under spring tide boundary conditions.
- Design flood conditions for the 1% AEP and 0.2% AEP design events under 2090 and 2150 Climate Change Scenarios assuming sea level rise.

All simulations will be carried out over 10 tidal cycles.

The Existing Scenario TUFLOW model will be updated to incorporate the proposed development works and used to simulate the "proposed" (or post-development) flood behaviour. We assume the model updates will include:

Representation of the proposed Tamar Lake Concept assuming:

- Scenario 1 – An 800 m wide barrage at Point Rapid, with flood gates crest at –3 mAHD and weir crest at 2.2 mAHD assuming a drawn down of the lake to 0 mAHD prior to flood events.
- Scenario 2 – An 800 m wide barrage at Point Rapid, with flood gates crest at –3 mAHD and weir crest at 2.2 mAHD assuming a drawn down of the lake to -1 mAHD prior to flood events
- Scenario 3 – An 800 m wide barrage at Point Rapid, with flood gates crest at –3 mAHD and weir crest at 2.2 mAHD assuming a drawn down of the lake to -2 mAHD prior to flood events.

Scenario 3 lowers the level of the lake to approximately the current low tide level which of course currently occurs twice per day and would only be required for a projected catastrophic flood event.

In line with the scope provided by Tamar Lake Inc, each Scenario will be designed to cater for the 0.2% AEP flood event under 2090 Climate Change conditions. Up to 3 model iterations will be undertaken for each scenario to determine the required number of gates and the width of weir to comply with this design standard.

The modified model will then be used to simulate flood behaviour for the events listed previously. We have allowed for assessment of the three design scenarios listed above as part of this proposal. Peak flood depths, levels and velocities will be extracted from the results and presented in a report.

The quote for carrying out this proposal and presenting the report to TLI is \$60,000.

It is the opinion of the TLI team that this report should be prepared as soon as possible to determine whether this is a possible solution for the long-term Launceston Flood Mitigation requirements.

Conclusion

A more detailed summary of all the above reports and proposal, and links to all the original Consultant reports is provided on our website at [Tamar Lake Reports – Tamar Lake](#).

Robin Frith

Founder Tamar Lake Inc.

17th November 2024