The Tamar Valley

A Vision and Strategic Plan for its Development

Part 1. Vision, Concept and Benefits of the Tamar Lake Strategy

Robin Frith
March 2016
Introduction

Over the last five years, Tamar Lake Inc (a not-for-profit incorporated association), through the generosity of its members and consultants, has examined the technical, environmental and economic feasibility of installing a barrage in the Tamar River as a permanent solution to the silt accumulation in the upper reaches of the Tamar.

This natural silt accumulation has been a major restriction in the growth of the Launceston area through a continued decline in the aesthetic, commercial and recreational amenity of one of its major natural assets – the Tamar River.

This document, which presents the results of the work carried out by Tamar Lake Inc, is presented in two sections:

Part 1. – Vision, concept and benefits of the Tamar Lake Strategy

Part 2. – A summary of the results from the reports into the technical, environmental and economic studies carried out by our consultants.

Vision

The Tamar Lake Inc. vision for the development of the Tamar Valley incorporates measures to not only enhance the natural beauty of the valley and its waterways, but to greatly increase its economic production in the agriculture, aquaculture, industrial and tourism sectors.

Our 10 year vision will see:

- A “clean, green” silt free Tamar that enhances the clean, green image of the State

- All of the valley south of the barrage, and especially Launceston, “global warming proofed” against sea level rise.

- A large freshwater lake extending from the Cataract Gorge and the St Leonards weir in the south, to the barrage located at the Rowella/Long Reach area in the north, with a permanent water level near current high tide, and water clarity with a visual depth of up to 2 metres.

- A very wide range of white water, swimming, and aquatic sports 365 days per year at multiple locations on the lake, including the Yacht Basin, Home Reach and the Launceston surrounds. Water quality in zone 1 improved from current D to B+ quality.
• Large private yachts and power boats visiting the Tamar from interstate and overseas during the tourist season.

• The Tamar Valley becoming a major wine and fruit growing area with 99% irrigation certainty.

• The Tamar Lake becoming a major centre for freshwater aquaculture and recreational fishing.

• A cycling and walking track near the water’s edge around the periphery of the whole lake.

• Large 100 to 200 passenger tourist boats on day excursions from Launceston to Low Head with stops at waterfront access vineyards, and resorts, with no navigational time restrictions.

• The Tamar Estuary and George Town becoming a must do stop for cruise liners visiting Tasmania, with the larger vessels (2000 to 3000 passengers) moored in the sheltered waters off Lagoon Bay, Low Head, and the smaller (300 to 500 passengers) luxury liners (Silversea etc.) berthing at Inspection Head wharf.

Figure 1- Pacific Dawn- 2000 passengers - (250m long, draft 8.2m) – shown to scale - moored at Low Head – depth of mooring 27 metres.
Shore excursions could include:

- A history and sightseeing tour to Launceston and surrounding areas by bus or tour boat
- A round of golf at Barnbougle and/or Lost Farm golf courses
- Full day Tamar Valley wine tour
- ½ day history tour of George Town, and Low Head including Maritime Museum and Penguin Rookery
- ½ day tour of Beaconsfield Mine Museum, and Platypus and Sea Horse exhibits.

Bell Bay once more a thriving industrial zone and port with a wide range of additional manufacturing and freshwater dependent industries.

Bell Bay with a large ship lift and ship repair and maintenance facility

George Town with full employment and a rapidly expanding population stimulated by new industry and tourism businesses
- The TasWater Launceston Sewage Improvement Plan (LSIP) fully implemented with EPA standard tertiary treated discharges into a freshwater lake environment.

- A continual Water Quality Improvement Plan (WQIP) program run by the NRM North TEER group to improve the water quality flowing into the Tamar from its catchments.

- In the longer term, the sale of up to 10% of the wasted freshwater flowing from the Tamar catchments out to Bass Strait. Tamar Lake studies have shown that a water volume equivalent to the production capacity of the Wonthaggi desalination plant could be delivered by new technology undersea pipeline to Wonthaggi at a delivery cost of $100 per ML.
Strategy Statement

Tamar Lake Inc believes that the only long term strategy for the Tamar River Recovery Plan is to conduct the upper reaches raking program as planned in the short term, and implement the Tamar Lake Strategy in parallel with the Launceston Sewage Improvement Plan (LSIP) in the 5 to 10 year time frame.

Overarching Strategy

With the above Tamar Lake strategy, the suggested overarching strategy including all stakeholders should be:

- Support TasWater in obtaining the funding for their Launceston Sewerage Improvement Plan (LSIP) in this election cycle.
- Support the Launceston Flood Authority silt raking program as only a short term Band-Aid solution, and that the only long term solution is a barrage as above.
- In this election cycle, gain a commitment to provide $5 million to the State specifically for reviewing the Tamar Lake feasibility studies and carrying out the detailed planning and approvals necessary to justify implementation funding in 3 years’ time.
- I believe that if this longer term strategy is adopted the huge economic benefits, will greatly enhance the prospects for a Federal Government grant for obtaining the LSIP funding.

The transformational Tamar Lake Strategy involves the separation of the Tamar River, (one of the longest tidal estuaries in the world) with a barrage into a 60km long freshwater lake section and a shortened 20km long tidal estuary off Bass Strait. The economic justification for doing this comes not only from the boost to direct revenues and the employment generated for the whole Northern Tasmania, but from the indirect benefits to the Launceston area from the ability to manage the effects of sea level rise, flooding and water quality in the upper reaches of the Valley.

The Tamar Lake Concept

Previous studies, carried out for the local authorities over the last 50 years, had identified that the accumulation of silt flowing into the Tamar from the catchments, is deposited in the flocculation zone between Tamar Island and Freshwater Point, then is “pumped” upstream to the Home Reach/Yacht Basin area by the asymmetrical tidal action.
Installing a barrage at Rowella/Long Reach, just south of the Bell Bay Port, the Tamar Lake concept moves the flocculation zone beyond the barrage and removes any asymmetrical tidal action in the Upper Reaches.

Studies carried out for Tamar Lake Inc, has confirmed that this change will eliminate the deposition of new silt in the Upper Reaches, and with the long term erosion of residual silt there will be a net export of silt into Bass Strait with each major flood event. The tidal area downstream of the barrage will accumulate very little silt because of the reduced tidal action and the absence of any asymmetrical tidal flows.

Not only does this solve the silt accumulation problem, but with resultant 60km long freshwater lake a major new asset for the State is formed with a storage volume of 405 GL, or 80% the size of Sydney Harbour. Tamar Lake provides many quantifiable and unquantifiable economic benefits to the Valley.

The 3D studies carried out estimate that the transition time from salt water to freshwater in the lake on completion of the barrage is from 4 months to 12 months depending on rainfall in the catchment.

With a permanent mid to high tide water level, tourism and aquatic sports are obvious beneficiaries with 24 hour navigation for pleasure and tourist vessels from their berths in Launceston downstream to Low Head, with passage through a lock in the barrage.

*Figure 3 – Preferred barrage site at Long Reach*
The technical studies also showed that the barrage would protect the whole of the Tamar Valley, upstream of the barrage, from sea level rise due to Global Warming. This is particularly important in the low lying areas of Invermay.

Waterfront residential and commercial developments will also receive a major boost.

With freshwater supply currently limited to one small pipe down each side of the Valley, the Tamar Lake will future-proof the supply of freshwater for residential, industrial and agricultural developments throughout the Valley, and in doing so, it will provide a major economic boost to the whole valley, but in particular, the struggling Bell Bay and George Town regions.

The studies have shown that the barrage will not negatively affect flood levels in Launceston, but with the ability to control water levels in the lake, the effect of flood events up to a 200 year flood may be mitigated.

In addition, the ability for low to moderate flood events to top the banks on the low lying wet side of the new levee system (North Bank, Seaport, Royal Park) may be prevented.

The environmental impact assessments show that while there will be some displacement of natural ecological values, no listed species will be threatened and the freshwater habitats (including Tamar Island Wetlands) will be greatly expanded.

This expansion may also benefit the introduced pest fish, Gambusia. It is Tamar Lake’s position that all attempts should be made to eradicate the Gambusia prior to the implementation of the barrage.

The only species to die will be the imported rice grass.

The formation of the freshwater Tamar Lake does increase the risk of anoxic conditions in the area just upstream of the barrage that may either create extensive algal bloom problems or acidification, because of the high nutrient loads currently entering the river from the Launceston sewage treatment plants and the extensive Tamar catchment area.

However, two programs that are currently in the early planning/implementation stages; the TasWater Launceston Sewage Improvement Project (LSIP), and the NRM North TEER Water Quality Improvement Plan (WQIP) are both expected to have made major reductions in both diffuse and point sources of sediment, nutrients and bacteria entering the lake by the expected completion of the barrage in 2022, thus greatly reducing the risk of algal blooms.

Despite the above plans to reduce pollutant flows into the Lake, Tamar Lake Inc are looking at ways to mitigate the risk of toxic algal blooms using destratification techniques in the vulnerable areas.
Tamar Lake Benefits

For an infrastructure investment of around $320m, Tamar Lake has demonstrated the following benefits, over and above the raking benefits, to the State, Launceston and the whole of the Tamar Valley:

- **Economic**
  Economic studies carried out for Tamar Lake assumed a start date for construction of the barrage in 2019, a construction period of 3 years, and then modelled the economic impact over the subsequent 15 years of operations.

  The KPMG analysis found that over the 18 year period of the modelling:

  - Over the 3 years of construction, the combined capital works from barrage construction and construction of the irrigation scheme, would contribute approximately $313.5 Million in net additions to Gross State Product (value added) and support the employment of 856 jobs.

  - Over the subsequent 15 years, the capital works relating to irrigation scheme connections by the users, combined with the expenditure from operations of the barrage, suppliers and users of the irrigation schemes would initially contribute approximately $10.33 Million per annum, rising to $19.64 Million per annum in net additions to Gross State Product (value added) and support the initial employment of 67 jobs rising to 128 jobs per annum, as the irrigation scheme becomes fully subscribed and operational, and

  - The favourable impact on tourism, will contribute $112.5 Million per annum in net additions to Gross State Product (value added) and support the employment of an additional 716 jobs.

In summary, over the 3 years of construction of the barrage and the following 15 years of operations in agriculture and tourism, the State will benefit from the support of 856 jobs in the construction phase and a further 844 jobs per annum in direct and dependent industries at the end of the 15 year modelling period.

**It should be noted that these economic benefits result only from the construction of the barrage, and subsequent operations in the agriculture and tourism sectors over the 15 years.**

The NERA economic study carried out for Tamar Lake Inc forecast a net increase in residential and commercial property values in Launceston and the upper Tamar Valley at $333 Million over the same period due to the formation of the Tamar Lake. The forecast one time increase in GSP over the 15 years is 2.3%.
The substantial boost to construction and the service industries resulting from this perceived increase in household net asset values, has not been included in the KPMG results.

- **Siltation**
  Sedimentation transport studies carried out for Tamar Lake Inc by consultants BMT WBM using the recently completed 3D hydrodynamic model of the Tamar have shown that the construction of a barrage at Long Reach will almost completely eliminate new silt accumulation in the Tamar and deliver a net export of residual silt over time with each significant flood event.

  Specifically, the study focussed on the critical areas of Home Reach/Yacht Basin and between the barrage and the estuary entrance at Low Head.
Home Reach/Yacht Basin

The studies showed that with the removal of the current flocculation zone from Tamar Island/Freshwater Point to downstream the barrage, and the complete removal of the asymmetrical tidal action, the incoming new silt from the catchment travels in suspension one way through the lake and beyond the barrage gates.

The net result in this area is an almost clear freshwater lake with a constant level of 0.3m below the current high tide.

The studies also show that over time with each flood event that tops the Trevallyn Dam, residual silt on the bed of Home Reach/Yacht Basin will be eroded downstream, never to return.

Mechanical agitation in the form of raking could be used to increase the rate of erosion of this residual silt if required.

The following charts show the sediment build up in the Upper Reaches in the 12 months following a period of maximum inflows from the catchment.

12 months Sedimentation – Maximum inflows

Barrage Downstream

As new silt from the catchment enters the Tamar principally in times of heavy rainfall, this silt suspended freshwater travels through the barrage gates as they are opened on an ebb tide, and are carried out to Bass Strait with limited mixing (and hence flocculation) due to the greatly reduced tidal prism in this area.

The net result is no reduction in water clarity of this pristine marine environment, and even less silt deposition than in the current tidal environment.

The following charts show the sediment build up downstream of the barrage in the 12 months following a period of maximum inflows from the catchment.
12 months Sedimentation – Maximum inflows

**Figure 6 - Tidal Estuary – Tidal Estuary case**  
**Figure 7 - Tidal Estuary – Tamar Lake case**

**Home Reach – Summer inflows**

The following charts show the sedimentation build up in Home Reach with summer inflows due to asymmetrical tidal action pumping the silt back upstream in the tidal estuary case, but the absence of silt build up in the Tamar Lake case.

3 Months Sedimentation – Summer Inflows

**Figure 8 - Home Reach – Tidal Estuary case**  
**Figure 9 - Home Reach – Tamar Lake case**

**Lake transition from salt to freshwater**

It is estimated in the 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.
- **Water Turbidity**
  Provided the sewage strategy is implemented, and point source and non-point sources of nutrient flows into the lake are managed, the turbidity of all the water in the lake, after a suitable period of flushing, will be the same as the current North and South Esk inflows. This is illustrated in the sample photos below with the red lid being the current turbidity in the Yacht Basin at Royal Park, and the green lid being the turbidity of the North and South Esk rivers upstream of the weir and dam, and hence the expected water clarity of the whole of Tamar Lake.

This turbidity level was confirmed using the 3D model of the Tamar with the results shown in the following chart.

*Water Turbidity – Cataract Gorge to Low Head*

*Base Case is current tidal estuary, developed case is the formation of Tamar Lake.*

*T1 is at Kings Bridge and T17 is at Low Head.*
• **Flood Mitigation**

Tamar Lake flood modelling, which compares the effect on flood levels with and without the barrage installed, has been carried out by BMT WBM.

The study shows that with normal operation of the flood gates in the barrage, there is no detrimental effect on flood levels in Launceston for either the current sea level conditions, or assuming a future rise in sea level of 0.8m.

With the ability to lower the level of the lake to mid tide level to create a buffer of more than 45,000 ML of flood waters, coupled with the removal of any tidal effects upstream of the barrage, there is up to a 1.0m reduction in flood levels along the length of the lake.

The following table summarises the forecast flood levels with the barrage in place for all flood events from a 10 year ARI event to a 200 year ARI event, compared to levels without the barrage.

The report shows that ability to buffer floodwaters for the more frequent low to moderate flood events (5 to 20 years) will enable the prevention of floods topping the banks of the low lying areas of Launceston on the wet side of the new levee system – Glebe flats, North Bank, Seaport Boardwalk, Royal Park etc.


• **Sea Level Rise**

The barrage provides a protection against a sea level rise of up to 0.8m for the whole of the Valley upstream of the barrage.

This is particularly important for the low lying areas of Invermay.
- **Water Table Management**
  The level of the lake may be adjusted to maintain a constant water table in the Invermay/North Esk area.
  With all the new commercial construction taking place in Invermay, this is even more important than the protection against sea level rise.

- **Fresh Water Supply**
  An almost unlimited supply of that very valuable commodity, freshwater, at any point on the lake for agricultural, industrial, commercial and residential applications.
  The storage volume behind the barrage is approximately 405 GL, with inflows of 1500 to 4000 GL per annum depending on catchment rainfall.

- **Marine Navigation**
  With a lock in the barrage able to accommodate vessels as large as the Wyuna or the Queenscliff ferry, and water level in the lake at 0.3m below current high tide, 24 hour a day navigation along the whole of the current watercourse with a minimum depth of 5 metres will be achievable with a higher margin of safety than at present.

  With a reduction in the very large tidal flows at the Bell Bay port, the ease of berthing is facilitated and the risk of grounding of vessels berthing at the wharves is greatly reduced.

  Also, with the reduced tidal flows, the passage and mooring of larger cruise liners in the Port Dalrymple area is enabled.

- **Water Quality**
  The results of the 3 D water quality modelling has not been completed as of this date, but the inconclusive results show that:

  1. It seems likely that the viability of the Tamar Lake project is not dependent on the implementation of either or both the LSIP and WQIP programs as the reduction of the TN and TP concentrations in the lake will not be sufficient to mitigate the possibility of the growth of blue/green algal blooms in the area just upstream of the barrage.
     It seems likely that a destratification system will need to be employed during the late summer months in the area just upstream of the barrage to mitigate any possibility of algal blooms forming. Further studies are being done to ascertain the most cost effective mechanism for destratification.

  2. From an environmental approvals viewpoint, it seems likely that the Tamar Lake project will not be approved unless the discharges from the STPs under the LSIP plan are determined to meet EPA standards for discharge into a freshwater lake environment.
Barrage Location

The general location of the barrage in the Rowella/Long Reach area has been determined by the strategic requirements of flood mitigation, silt transport and economic costs/benefits.

As shown earlier in this document, the Long Reach site is now the preferred option, but alternative sites, and community acceptance must be explored before a final site is chosen.

![Figure 10 - Preferred barrage site](image.png)

Barrage Design

*Construction Materials and cost*

The barrage, located in the Long Reach section of the river (see figure 4,) will be constructed with a concrete faced rock wall for the deep and non-operational section of the total 800 metre long barrage, with the 350 metre wide gate section and the two locks constructed of pre-formed concrete on the much shallower rock ledge section off the West shore.

The barrage design consultants, CDM Smith, have provided a preliminary cost estimate of $320m, with 75% of the labour and materials locally sourced, 20% from interstate, and 5% internationally. This figure includes a 50% contingency cost factor.
Barrage Functions

The functions that the barrage must perform are:

- To provide a clear separation between the freshwater lake environment and the saltwater estuary environment for all tidal events up to a sea level rise of 0.8m.

- The ability to pass all normal and up to 200 year ARI flood flows without negatively affecting flood levels upstream in Launceston.

- The ability to maintain a constant water level in the lake, but to operationally vary that water level from current mid to high tide level.

- The ability for small leisure craft and larger commercial vessels to transit the barrage via two locks.

- The ability for migrating fish and eels to transit the barrage for life cycle purposes.

Barrage Components

To achieve the above functions, the following components will be incorporated in the barrage design.

- **Crest Level**
  Crest level of at least 2.2 metres AHD to block current tidal levels plus provision for a sea level rise of 0.8 metres.

- **Spillway Gates**
  Size - 10 vertical lift gates each 35 metres wide by 5.2 metres high

**Flood Safety Control** – The flood analysis carried out by our consultants, BMT WBM, has shown that with normal operation of the gates, there will be no detrimental effect on flood levels in the valley south of the barrage or in Launceston, when compared with flood levels in the current tidal regime. However, if for some reason the gates are unable to operate, the barrage presents as a weir with a crest at 2.2m AHD, in which case the flood levels in Launceston and the Valley could be increased by as much as 1.0m for a 200 year ARI flood event.

To prevent this from ever occurring, the barrage will be designed to be completely fail safe.

This will occur at two levels:
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.

The design of this mechanism will be included in the detailed design of the barrage.

- **Locks**
  Barrage will be fitted with two locks for the passage of boats and small ships up and down the river. To reduce cycle time, the small lock will accommodate pleasure powerboats and yachts, with a larger, less frequently used lock for the commercial tugs, ferries, tourist boats etc. The small lock will be user operated with suitable security.
  A preliminary estimate of the lock sizes are:
  - Small lock – 40m long by 8m wide
  - Large lock – 70m long by 18m wide

- **Footbridge/bike path**
  An elevated footbridge/bike path will be constructed on top of the wall; integrated into the vertical lift gate assembly; and mounted on top of the lock gates.
  This will provide passage for pedestrians and cyclists except when a lock is in operation.

- **Fish Ladders**
  Fish ladders, principally for the passage of eels and Australian Grayling will be incorporated in the wall.
Project Status

The Tamar Lake project is still in the early stages of planning with $500,000 of private funding in the form of cash, kind, and pro bono consulting services invested to date in examining the technical, environmental and economic viability of the project.

Since the formation of Tamar Lake Inc in 2010, the following studies have been commissioned and carried out, with the results available from our web site [www.tamarlake.com.au/Project/project-status](http://www.tamarlake.com.au/Project/project-status) in printed format by clicking on Part 2 – Summary of Technical, Environmental, and Economic Reports.

Studies carried out to date:

- **Preliminary Technical Assessment** – 35 pages
  - BMT WBM – Dr. Ian Teakle

- **Natural Values Assessment** – 160 pages
  - BMT WBM – Dr. Andrew Costen

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

- **Tamar Lake Economic Study** – 39 pages
  - NERA Economic Consultants – Greg Houston

- **Tamar Lake Agricultural Benefits** – 14 pages
  - Macquarie Franklin – Lance Davey

- **Barrage siting and costing** – CDM Smith - Marco van Winden

- **Tamar Lake Economic Impact** – 35 pages
  - KPMG – Martin Rees

- **Tamar Lake Flood Modelling** – 15 pages
  - BMT WBM – Philip Pedruco

**Environmental Impact – Peer review by NRM North**

The Tamar Estuary and Esk Rivers (TEER) program of NRM North has conducted a peer review of the Tamar Lake Inc of the environmental studies carried out by BMT WBM and CDM Smith.

The Executive Summary of this report is available from the Tamar Lake web site, and the full report is available from the NRM North web site.
3 D Hydrodynamic Studies – BMT WBM – Michael Barry

With the agreement of the manager of the stakeholder owned 3D Hydrodynamic model of the Tamar, NRM North, BMT WBM has modelled a range of Tamar Lake scenarios that looks at the effect of the formation of the Tamar Lake on sediment transport and water quality.

Sediment transport studies have been completed, but water quality studies are on-going and dependent on forecasts for reductions in pollutant loads from diffuse and point sources in the catchment.
Tamar Lake Inc.

Established 5 years ago as a not-for-profit Incorporated Association, Tamar Lake Inc has privately funded the investigation of the technical, environmental and economic feasibility of the Tamar Lake Concept.

The Association currently has 36 Members, all Launceston businessmen and retirees.

The President, Robin Frith, is a Tasmanian graduate in Electrical Engineering, with an extensive 50 year career in national and international corporate management, and strategic planning, before returning to Tasmania in retirement in 2005.

The Secretary, Michael Steele has a professional background in engineering and business, commercial property and business interests in Launceston and chaired numerous local boards including Esk Water (forerunner of Taswater) and Northern Tasmania Development.

The Treasurer, Tony Gray, is the Principal of financial advice business TG Financial and has worked in the financial services sector for 20 years. He is a graduate of the University of Tasmania (Commerce and Laws), a Fellow of Finsia and a Certified Financial Planner.

Current Members

<table>
<thead>
<tr>
<th>Ross Ambrose</th>
<th>Scott Anthony</th>
<th>Charles Booth</th>
<th>Errol Stewart</th>
<th>Kevin French</th>
</tr>
</thead>
<tbody>
<tr>
<td>Peter Thyne</td>
<td>Ralph Norton</td>
<td>Ted Pedley</td>
<td>Mike Steele</td>
<td>David Vautin</td>
</tr>
<tr>
<td>David Youngman</td>
<td>Jack Bain</td>
<td>Tim Dowling</td>
<td>Tony Gray</td>
<td>Andrew Lovitt</td>
</tr>
<tr>
<td>Bob Ruddick</td>
<td>Alec Purves</td>
<td>Stu Cottrell</td>
<td>Denis Tucker</td>
<td>Bill Woolcock</td>
</tr>
<tr>
<td>Phil Frith</td>
<td>Robin Yates</td>
<td>Richard Matson</td>
<td>Marcos Ambrose</td>
<td>Ross Peck</td>
</tr>
<tr>
<td>Robin Frith</td>
<td>Barry Larter</td>
<td>Martin Rees</td>
<td>Tim Lack</td>
<td>Peter Keam</td>
</tr>
<tr>
<td>Scott Bell</td>
<td>Robert Dutton</td>
<td>John Scott</td>
<td>Ian Goninin</td>
<td>John Ferrall</td>
</tr>
</tbody>
</table>