NERA
ECONOMIC CONSULTING

Tamar Lake Economic Pre-feasibility Study

Tamar Lake Inc

10 April 2013

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Contents

1. Introduction

This report has been prepared by NERA Economic Consulting (NERA) at the request of Tamar Lake Inc. Its subject is the potential economic benefits of the 'Tamar Lake Strategy', which calls for the conversion of the 70km long tidal estuary that is the Tamar River, extending from the entrance into Bass Strait at Low Head, to the confluence with the North and South Esk Rivers at Launceston, into a 50km long freshwater lake. The proposed transformation of the Tamar River would be achieved by the installation of a barrage located at Point Rapid, 20km upstream from the entrance.

The purpose of this economic pre-feasibility or scoping study is to identify and, where possible, quantify the potential economic benefits that could accrue to the northern Tasmanian community from the implementation of this strategy.

Our report is structured as follows:

- section 2 provides a brief description of the Tamar Lake Strategy, the preliminary estimate of its capital costs, the nature of the economic benefits that it is likely to generate and the methodology we have applied for evaluating those benefits;
- sections 3-9 each discuss a particular type of benefit, commencing with a description of the nature of the benefit and the role of the proposed Tamar Lake in creating that benefit, the method for measuring those benefits, and our best estimates of the extent of the benefit, quantified where it is practicable to do so within the limits of a pre-feasibility study; and
- section 10 presents our conclusions.

2. Background and Methodology

This section summarises the main elements of the Tamar Lake Strategy, and describes the methodology we have adopted for evaluating the potential benefits arising from it.

2.1. Tamar Lake Strategy

Under the Tamar Lake Strategy, a barrage will be installed at Point Rapid, between Long Reach and Moriartys Reach.[1] The installation of the barrage will result in the conversion of 50km of the Tamar River – from Point Rapid to the confluence with the North and South Esk Rivers at Launceston – into a freshwater lake. Figure 2.1 displays the location of the barrage and resulting lake.

The total length of the barrage will be approximately 650m and construction has been estimated to cost around $200 million.[2] This includes the creation of a footbridge and bike path, gated spillways, locks for the passage of boats, fish ladders and turbine generators. The completed barrage would have an estimated useful life of 100 years.[3]

Converting the majority of the Tamar River into a lake will result in a net export of silt from the lake, enhanced flood mitigation and the creation of a major new fresh water supply. Each of these outcomes has the potential for economic benefits to be achieved across a number of industries, including agriculture, industrial processes, and tourism. Additional gains are likely to be available from the increased value of residential and commercial property, and the avoided costs of flood and sediment management.

We describe and quantify these potential benefits in the remainder of this report.

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1 Two alternative locations for the barrage have been proposed by Tamar Lake Inc; however, for the purpose of this report, we focus on the Point Rapid location.

2 A more accurate costing is to be the subject of a separate study by the Marina Barrage designers, CDM Smith.

3 Tamar Lake Inc, *The Tamar Valley: A Strategic Plan and Vision for its Development,* July 2012, page 41.

Figure 2.1
Proposed Location of the Barrage

Source: Tamar Lake Inc, The Tamar Valley: A Strategic Plan and Vision for its Development, July 2012, page 10.

2.2. Economic value added

We have assessed the potential economic benefits arising from the Tamar Lake Strategy using a standard, welfare-based framework for the application of cost benefit analysis. This framework applies the concept of economic 'value added'. Economic value added can be estimated as:

- the value of new output/services produced under the Tamar Lake Strategy; less
- the costs incurred in producing the new output/services (including capital costs); less
- the value of any existing (forgone) production.

Where appropriate, the value added of the economic benefit has been calculated into perpetuity, ie, the relevant cash flows are assumed to be achieved in all future periods.

2.3. Discount rate

The derivation of a net present value (NPV) of the cash flows we identify above requires the adoption of a discount rate. In our opinion, a real discount rate of 7.5 per cent is a reasonable estimate of the cost of capital for unregulated infrastructure developments. Adopting the framework of the capital asset pricing model (CAPM), such a rate is consistent with *long term* values for the various components of the weighted average cost of capital, as follows:

- a real risk free rate 3.5 per cent, which approximates the long term growth rate of the Australian economy;
- a market risk premium 6 per cent, which reflects widely accepted estimates of the long term returns (over and above the risk free rate) available in the Australian equity market;
- a debt premium of 2 per cent, giving rise to a real cost of debt of 5.5 per cent, and which in our opinion reflects a reasonable estimate of the long term cost of debt, given our assumed level of gearing (as below);
- an equity beta of 1, reflecting economy-average levels of systematic risk; and
- a gearing level of 50 per cent.

On the assumption that expected inflation remains at the mid-point of the 2-3 per cent target range adopted by the Reserve Bank of Australia, this would give rise to a nominal discount rate of around 10 per cent. However, since the discount rate we have applied is specified in real terms, the effect of consumer price inflation is excluded from our benefit assessment analysis, ie, all estimates are made by reference to current prevailing prices.

We note that our preferred real discount rate of 7.5 per cent is not too different from the rates that appear to be adopted by the Tasmanian Department of Infrastructure, Energy and Resources. For example, in a 2012 submission to Infrastructure Australia, the Tasmanian Department of Infrastructure, Energy and Resources stated that it applied *a standard government discount rate for project evaluation…typically six per cent.*[4] Notwithstanding, in its 2011 submission a discount rate of 7 per cent was applied.[5]

Finally, consistent with the public nature of the benefits we describe below and the societal perspective adopted by our benefits assessment, our analysis takes no account of corporations or other taxes in either the discount rate or our assessment of economic value added.

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[4] Tasmanian Department of Infrastructure, Energy and Resources, Tasmanian government's 2012 submission to Infrastructure Australia, 3 August 2012, page 20.

[5] Tasmanian Department of Infrastructure, Energy and Resources, Tasmanian government's 2011 submission to Infrastructure Australia, 10 November 2011.

3. Agricultural Irrigation

This section describes the nature and extent of the benefits that can be expected to be derived from increased agricultural production as a result of irrigation schemes that would be able to be developed in the Tamar Valley following implementation of the Tamar Lake Strategy. It draws substantially on a companion report prepared for Tamar Lake Inc by agriculture consulting firm, Macquarie Franklin, entitled 'Tamar Lake Proposal, Pre-feasibility estimate of Agricultural Benefits' dated March 2013 (the Macquarie Franklin report).

The Macquarie Franklin report is attached as Annexure A.

3.1. Context

The majority of the agricultural activity in the Tamar Valley comprises dryland grazing, with irrigation-dependent enterprises – namely dairy, wine grapes, apples, pears and cherries – accounting for a relatively small portion of agricultural production.[6] Currently, a number of the agricultural properties are irrigated by on-site storage dams, which are fed by creeks, springs and rain water.

Elsewhere in Tasmania, a number of irrigation schemes have been developed in order to boost agricultural production by diverting or otherwise capturing and storing sources of freshwater, for distribution to farms. The Tamar Lake Strategy will establish a substantial, new freshwater resource in the Tamar Valley, thereby enabling the creation of one or more irrigation schemes to serve the surrounding agricultural land.

The majority of irrigation schemes in Tasmania have been developed by the state-owned company, Tasmanian Irrigation (TI), although there are also four private schemes in the state.[7] TI is responsible for the development and operation of new irrigation schemes in Tasmania.[8] TI currently has funding to produce 14 schemes, of which nine are already operational, and a further five schemes are under proposal and/or development.[9]

Farmers purchase water entitlements from TI, and then pay yearly charges to use the water – consisting of an annual and variable component.[10] The current offer of water entitlements for the Upper Ringarooma Irrigation Scheme and South East Irrigation Scheme (Stage 3 Expansion) provide an example of the size of these costs, with water entitlements being offered at $1,200 per ML and $2,700 per ML respectively.[11] Annual costs for both these

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6 Macquarie Franklin, *Tamar Lake Proposal: Pre-Feasibility Estimate of Agricultural Benefit*, March 2013, page 5.

7 National Water Commission, *Australian Water Markets Report 2010-11*, December 2011, page 232.

8 TI website, http://www.tasmanianirrigation.com.au/index.php/about/.

9 See TI, *Tranche Two Irrigation Scheme Funding Submission to Infrastructure Australia*, August 2012, pages 6 and 10; and TI website, www.tasmanianirrigation.com.au.

10 TI website, http://www.tasmanianirrigation.com.au/index.php/about/about-buying-water/.

11 TI, *Upper Ringarooma Irrigation Scheme: Landholder Water Sale Offer Document*, September 2012, page 1; and TI, *South East Irrigation Scheme Stage 3 Expansion: Landholder Water Sale Offer Document*, October 2012, page 1.

schemes are reflected in a fixed charge[12] and a transfer charge[13] paid by users, with these having been estimated by TI as follows:[14]

- Fixed charge:
  - Upper Ringarooma Irrigation Scheme: $59.42 per ML; and
  - South East Irrigation Scheme (Stage 3 Expansion): $92.72 per ML
- Transfer charge:
  - Upper Ringarooma Irrigation Scheme: $7.57 per ML; and
  - South East Irrigation Scheme (Stage 3 Expansion): $159.35 per ML.

Variable costs for the two schemes depend on the location of the irrigated land in relation to the pump stations. These have been estimated by TI to lie within the following ranges:

- Upper Ringarooma Irrigation Scheme: $3.50 - $53.85 per ML;[15] and
- South East Irrigation Scheme (Stage 3 Expansion): $13.94 - $43.82 per ML.[16]

3.2. Potential benefits

We understand that TI is interested in operating an irrigation scheme that would be established under the Tamar Valley Strategy. This would allow for land proximate to the lake to be irrigated, whereas it currently is not.

The availability of reliable irrigation water enhances the productive capability of the land, so that it would be able to be used to produce crops or support livestock that was previously not possible. For example, although grapes do not require a relatively large amount of water (compared to other crops), the availability of a reliable water source is necessary for the plants' growth. This requirement has translated into many existing vineyards having onsite dams and, under irrigation, it would be possible for land without onsite water sources to produce grapes as well as providing a more reliable water source to those vineyards with onsite dams.

The existence of an irrigation scheme would not only expand the range of production options that are able to be produced from land in the Tamar Valley, but also would allow for an increase in the productive potential value of land that is already under production; agricultural enterprises that require low levels of water may be able to be converted to higher

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[12] Payable regardless of whether water is consumed or not.

[13] Payable whether water is consumed or not, however, this cost may be avoided if the water user nominates that water is not required prior to an irrigation season.

[14] TI, *Upper Ringarooma Irrigation Scheme: Landholder Water Sale Offer Document*, September 2012, page 11; and TI, *South East Irrigation Scheme Stage 3 Expansion: Landholder Water Sale Offer Document*, October 2012, page 10.

[15] TI, *Upper Ringarooma Irrigation Scheme: Landholder Water Sale Offer Document*, September 2012, page 11.

[16] TI, *South East Irrigation Scheme Stage 3 Expansion: Landholder Water Sale Offer Document*, October 2012, page 10.

value enterprises. TI notes that such high value industries include wine, speciality cheeses, salad vegetables, stone fruit and berry-fruit.[17]

3.3. Benefit assessment

The potential value added from the increased agricultural production arising as a consequence of the irrigation of currently dry land has been estimated with the assistance of Macquarie Franklin.[18]

Macquarie Franklin undertook a pre-feasibility study to estimate the agricultural benefits that could arise under the Tamar Lake Strategy.[19] This involved the estimation of:

- the likely irrigated land;
- the nature of the irrigation enterprises; and
- the likely time for each to reach its full production.

Macquarie Franklin then combined these estimates with net margin figures developed from its previous work with TI to estimate the economic benefit from agriculture of $37.9 million – assuming a real discount rate of 6 per cent and cash flows over a 20 year period. [20]

In the remainder of this section, we provide a summary of these elements of the analysis set out in the Macquarie Franklin report, as well as amending the Macquarie Franklin analysis to estimate the economic benefit of agriculture assuming cash flows into perpetuity, and to bring the discount rate into line with that we describe in section 2.2.

We note that, under the measurement approach adopted in the Macquarie Franklin report, the potential for an increase in the value of agricultural land does not form part of the benefit estimation. The land value effects of irrigation development will ultimately be determined by the extent to which any charges for irrigated water capture a proportion of the total value added.

3.3.1. Potential irrigated land

Macquarie Franklin estimates that approximately15,170 hectares of land surrounding the Tamar Lake could potentially be irrigated.[21] This estimate includes land in the immediate Tamar Valley area and excludes forestry, plantations, water bodies, residential areas and reserves (see Figure 3.1 below).

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17 TI, *Tranche Two Irrigation Scheme Funding Submission to Infrastructure Australia*, August 2012, page 20.

18 Macquarie Franklin is a business, agriculture and environment consultancy firm and has recently undertaken work for TI. This work involved the estimation of the potential agricultural benefits that could be derived under proposed irrigation schemes.

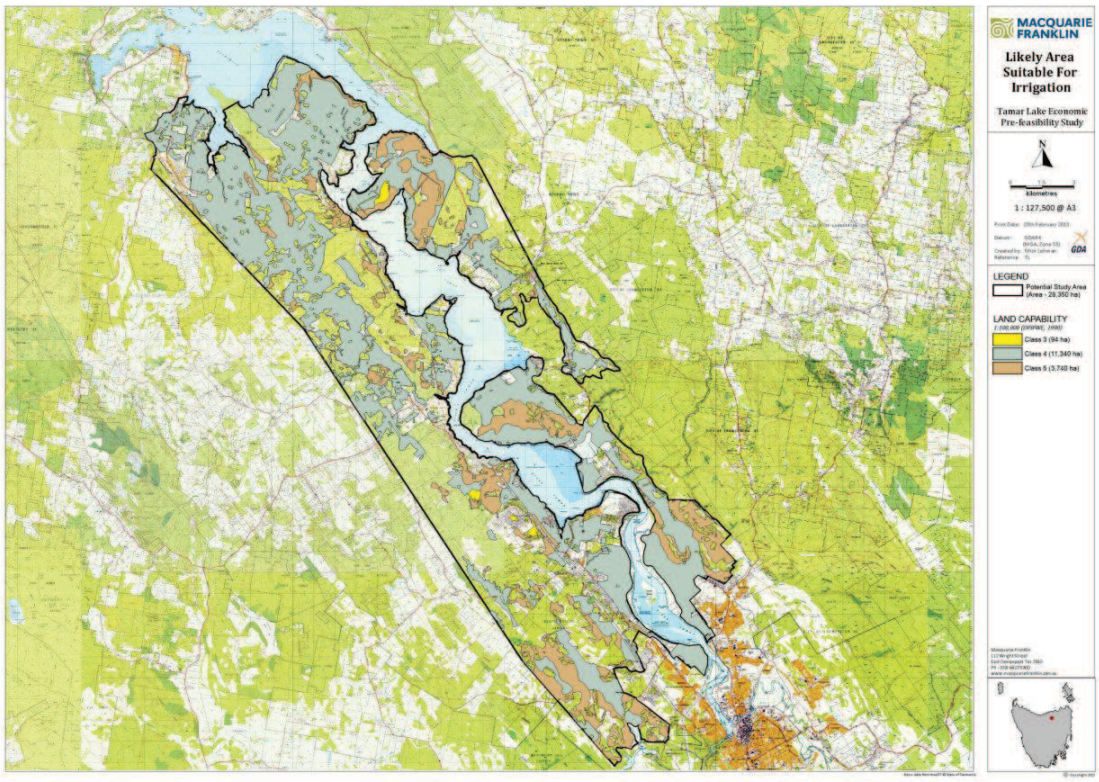
19 Macquarie Franklin, *Tamar Lake Proposal: Pre-Feasibility Estimate of Agricultural Benefit*, March 2013.

20 Macquarie Franklin, *Tamar Lake Proposal: Pre-Feasibility Estimate of Agricultural Benefit*, March 2013, pages 12-14.

21 Macquarie Franklin, *Tamar Lake Proposal: Pre-Feasibility Estimate of Agricultural Benefit*, March 2013, page 7.

We note that Macquarie Franklin considered an expanded agricultural zone. However, it concluded that the outer sections of the larger area would not be likely to have a high demand for water from the Tamar Lake.

Figure 3.1
Total Area Available for Irrigation



Source: Macquarie Franklin, Tamar Lake Proposal: Pre-Feasibility Estimate of Agricultural Benefit, March 2013, Figure 2, page 9. Key: Area enclosed in black is the total area available for irrigation; yellow, class 3; grey, class 4; and brown, class 5.

The total area available for irrigation consists of three different land classes, with each giving an indication of the limitations of the land for agricultural use. The 15,170 hectares of available land primarily consists of class 4, with the remaining land classified as either class 3 or 5 (see Table 3.1 below).

Table 3.1
Total Area Available for Irrigation by Land Class

Land Class	Land (hectares)
3	90
4	11,340
5	3,740
Total	15,170

Source: Macquarie Franklin, Tamar Lake Proposal: Pre-Feasibility Estimate of Agricultural Benefit, March 2013, Table 2, page 7.

The suitability of each of these land classes – as defined by the Department of Primary Industries, Water and Environment – is as follows:[22]

- Class 3: "Land suitable for cropping and intensive grazing. Cultivation for cropping should be limited to two to five successive crops in a rotation with pasture or equivalent. Soil conservation practices and sound management are needed to overcome the moderate limitations to cropping use. The range of crops able to be grown is generally more restricted than on Class 1 or 2 land."
- Class 4: "Land marginally suitable for cropping because of limitations which restrict the range of crops that can be grown, and/or make major conservation treatment and careful management necessary. Cropping rotations should be restricted to one to two years out of ten in a rotation with pasture or equivalent. This land is well suited to intensive grazing."[23]
- Class 5:"Land with slight to moderate limitations to pastoral use. This land is unsuitable for cropping, although some areas on easier slopes may be cultivated for pasture establishment or renewal. The effects of limitations on the grazing potential may be reduced by applying appropriate soil conservation measures and land management practices."

In the Tamar Lake region, all three classes are capable of supporting irrigated pasture, perennial horticulture (including grapes, cherries and apples), while annual cropping is only possible on class 3 land.[24]

Although the total area potentially available for irrigation is 15,170 hectares, in Macquarie Franklin's opinion a number of limiting factors mean that only 1,500 hectares of this is likely to be irrigated.[25] These factors:

> "….include the following:
>
> 1) The large number of small-scale or life-style farmers who are unlikely to be involved in intensive irrigated agriculture;
>
> 2) The limited number of larger properties that are currently lacking irrigation water and would be potentially suited to large-scale intensive horticulture – wine grapes, apples, pears, cherries, etc;

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22 K E Noble, Department of Primary Industries, *Water and Environment, Tamar Report: Land Capability Survey of Tasmania*, 1992, page 20.

23 Although class 4 land is generally suitable for poppies, the class 4 soils in the Tamar Valley area are not capable of supporting these crops.

24 The suitability of class 4 and 5 land for perennial horticulture depends on the slope, aspect and drainage of the land. See: Macquarie Franklin, *Tamar Lake Proposal: Pre-Feasibility Estimate of Agricultural Benefit*, March 2013, pages 7-8.

25 Macquarie Franklin, *Tamar Lake Proposal: Pre-Feasibility Estimate of Agricultural Benefit*, March 2013, page 9.

3) The limited number of dairy farms within a reasonable distance of the river which may require additional water. New conversions from current dry land beef or sheep enterprises are more likely to occur in areas of the state other than the Tamar Valley.

4) For crops such as poppies and vegetables, the relatively poor soil types of the region from an annual cropping point of view are likely to limit and large scale expansion, particularly when combined with the likely high cost of distribution to a widely space group of potential users.

In our view the additional area irrigated is likely to be limited to the "Immediate Tamar Valley" and may only occupy around 10% of the potential irrigable area – say, 1,500 hectares."[26]

The following section describes the agricultural enterprises that could be established on the 1,500 hectares of likely irrigable land.

3.3.2. Potential agricultural enterprises

Macquarie Franklin estimates that, of the total 1,500 hectares of land likely to be irrigable, 50 per cent would be utilised for perennial horticulture.[27] This would mostly consist of wine grapes, although some of this area could be used for apples or cherries. The time for these enterprises to develop the land fully is estimated to be 15 years, at a rate of 50 hectares per annum.[28]

Poppies and dairy are each estimated to account for 20 per cent of the 1,500 hectares, with the uptake of these enterprises assumed to take a total of five years at a rate of 60 hectares per annum.[29] Macquarie Franklin allocates the remaining 10 per cent of likely irrigable land to other horticultural enterprises and assumes that it would take 15 years to reach full utilisation, at a rate of 10 hectares per annum.[30]

For each of the agricultural enterprises, Macquarie Franklin has estimated the water requirement per hectare. These estimates, as well as the total area and uptake times, are set out in Table 3.2 below.

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[26] Macquarie Franklin, *Tamar Lake Proposal: Pre-Feasibility Estimate of Agricultural Benefit*, March 2013, page 9.

[27] Macquarie Franklin, *Tamar Lake Proposal: Pre-Feasibility Estimate of Agricultural Benefit*, March 2013, page 10.

[28] Calculated as (0.5*1,500)/15.

[29] Calculated as (0.2*1,500)/5.

[30] Calculated as (0.1*1,500)/15.

Table 3.2
Estimated Area, Uptake Time and Water Requirements of Agricultural Enterprises

	Area		Uptake Time		Water Requirement	
Enterprise	**Percentage**	**Hectares**	**Time to Reach Full Expansion**	**Rate Per Year**	**ML per Hectare**	**ML**
Perennial Horticulture	50%	750	15	50	3.0	2,300
Poppies	20%	300	5	60	2.5	800
Dairy	20%	300	5	60	5.5	1,700
Other	10%	150	15	10	3.0	500
Total	100%	1,500			3.5	5,300

Source: Macquarie Franklin, Tamar Lake Proposal: Pre-Feasibility Estimate of Agricultural Benefit, March 2013, page 10.

3.3.3. Valued added

To calculate the valued added for each agricultural enterprise, Macquarie Franklin draws on the enterprise margins developed in its previous work for TI. These enterprise margins include:[31]

- the enterprise's gross margin (income less variable costs);
- dryland gross margin foregone;
- additional farm overheads;
- irrigation infrastructure costs; and
- capital expenditure

Table 3.3 below sets out the net margin per megalitre for each enterprise.

Table 3.3
Net Margins of Agricultural Enterprises

Enterprise	**Net Margin ($/ML)**
Perennial Horticulture	1,700
Poppies	600
Dairy	350
Other	1,000

Source: Macquarie Franklin, Tamar Lake Proposal: Pre-Feasibility Estimate of Agricultural Benefit, March 2013, page 12.

We noted above that Macquarie Franklin estimates the value added by adopting a discount rate of 6 per cent in real[32] terms, and an estimation period of twenty years.

[31] Macquarie Franklin, *Tamar Lake Proposal: Pre-Feasibility Estimate of Agricultural Benefit*, March 2013, page 11.

[32] A 'real' discount rate excludes any allowance for inflation.

Since the potential agricultural benefits under the Tamar Lake Strategy arise in the context of a significant investment in infrastructure that will elicit a wide range of economic benefits, we have modified the value added estimates derived in the Macquarie Franklin report so as:

- to extend these into perpetuity, rather than constraining them to a twenty year period; and
- to adopt our preferred real discount rate of 7.5 per cent, which reflects that the costs and benefits of the Tamar Lake Strategy extend well beyond the agriculture sector.

Combining the water requirements, uptake times and net margins of the potential agricultural enterprises, we derive the value added by agricultural irrigation as $48 million. This represents the net present value of the expected agricultural benefits for all future periods, discounted at 7.5 per cent.

4. Sale of Freshwater to Victoria

The Tamar Lake Strategy would establish a substantial, new fresh water resource in northern Tasmania. One potential source of value added for this resource would be its transfer across Bass Strait for use in southern Victoria – a region in which substantial investment has recently been made in order to augment supplies of fresh water.

This section describes the potential means for giving effect to such transfer of fresh water and evaluates its potential economic benefits.

4.1. Submarine pipeline transfer option

Tamar Lake Inc has held preliminary discussions with the French infrastructure development company Via Marina[33] on the possibility of developing a flexible, submarine pipeline that would enable the transfer of fresh water from Tamar Lake to Wonthaggi in southern Victoria. Wonthaggi is the site of a recently commissioned desalination plant, and so has the benefit of infrastructure providing for the supply of large volumes of water into the Melbourne supply system.

Via Marina has designed a low-cost water transportation system that transports water using flexible pipes up to 4 metres in diameter resting on the seabed. The system uses less energy than conventional methods, such as desalination, and Via Marina states that water can be transported over hundreds of kilometres. Via Marina's submariver® system has received a positive evaluation from numerous environmental specialists, and Via Marina has been the subject of a number of preliminary studies on the potential use of such pipelines for the large scale transfer of fresh water.

A pre-feasibility study prepared by Via Marina for Tamar Lake Inc has estimated that a submarine pipeline from Tamar Lake to Wonthaggi could deliver 400 ML per day (146 GL per year), and would involve a capital cost of $1 billion and annual operating costs of $110 per ML.

However, the undersea pipeline that would be required to transport water from Tasmania to southern Victoria involves the use of unproven technology – although Via Marina has undertaken various preliminary studies for a number of countries, it has yet to construct a submarine pipeline. For this reason, in combination with the analysis we set out section 4.2 below, we have adopted a cautious approach in our assessment of the potential benefits from the sale of freshwater to Victoria.

The remainder of this section sets out our assessment of the nature and extent of the economic benefits of such a development.

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[33] See: http://www.vinci-construction-projects.com/via-marina.

4.1.1. Victorian desalination costs

The recently commissioned Victorian water desalination plant has been developed under a private public partnership agreement between its owner and operator, AquaSure, and the Victorian government. Under this agreement the Victorian government has the right to order up to 150GL of water per year, for delivery to the Melbourne supply system.

The Wonthaggi desalination plant was commissioned in December 2012[34] and so is now available as a potential source to augment supplies from the system of dam storages, which the Melbourne water supply system has hitherto relied. However, given the relatively high level of stored water presently available, the Victorian government did not place an order for water in either 2012-13 or 2013-14 and so the plant has been placed in standby.[35]

AquaSure is under contract by the Victorian government to build, finance, operate and maintain the desalination plant for 30 years, at which time the plant is to be handed over to the government in full working condition.[36] The total cost of building, financing and operating the desalination plant over the life of the 30 year contract has been estimated at $5.7 billion (in net present value terms).[37] This figure includes a capital cost of $3.5 billion and assumes that the plant will produce 150 billion litres (GL) of water per year for the full contract period.[38]

The plant is capable of supplying up to 150 GL per year – approximately one third of Melbourne's annual water requirements – with an option to expand the plant to supply 200 GL per year.[39] The Victorian government's Our Water Our Future water plan stated that the 150 GL of water produced by the desalination plant – in conjunction with two other supply projects – would allow Melbourne to rebuild its water storages due to an excess of water supplied by these projects.[40]

The Victorian government has the option of ordering water up to the full 150 GL each year, with annual orders typically expected to be a multiple of 25 GL, ie, 0, 25, 50, 75, 100, 125 or 150.[41] The annual order is to be placed on 1 April for water to be supplied for the following

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34 Victorian Department of Sustainability and Environment website, http://www.water.vic.gov.au/initiatives/desalination/construction-update.

35 Victorian Department of Sustainability and Environment website, http://www.water.vic.gov.au/initiatives/desalination/construction-update.

36 AquaSure website, http://www.aquasure.com.au/public_private_partnership.php.

37 AquaSure website, http://www.aquasure.com.au/public_private_partnership.php.

38 AquaSure, *Victorian Desalination Project: Project Overview*, June 2010, http://www.aquasure.com.au/cms_files/ProjectOverview.pdf.

39 AquaSure website, http://www.aquasure.com.au/project_description.php.

40 Victorian Government, *Our Water Our Future: The Next Stage of the Government's Water Plan*, June 2007, page 17.

41 Department of Sustainability and Environment and the Department of Treasury and Finance, *Partnerships Victoria Project Summary: Victorian Desalination Project*, November 2009, page 4.

financial year (commencing 1 July of that year), although there is scope for the government to increase or restrict supply during the year.[42]

The payments to be made to AquaSure comprise two elements, ie: [43]

1. A water security payment – to account for the security provided by the plant through its ability to produce water. A water security payment will only be made if AquaSure is capable of delivering the ordered water, both in terms of quantity and quality. This payment will still be made if no water is ordered, provided that AquaSure is able to demonstrate that it could have supplied an order of 150 GL of water.
2. A water usage payment – to account for the variable costs of producing water. This payment is only made for ordered water that is delivered.

The water security payment to be made to AquaSure in 2012/13 is estimated to be $654 million, while this would have been increased to $763 million in the event that 150 GL had been ordered.[44] In other words, the Victorian government is required to pay AquaSure $654 million regardless of the volume of water purchased, and an additional $109 million for 150 GL of water.

4.2. Comparison of desalination and transfer costs

Pre-feasibility estimates prepared by Via Marina of the cost of an undersea pipeline from Tamar Lake to Wonthaggi, Victoria have been based on transporting 400 ML of water per day, which is equivalent to 146 GL per annum, ie, around the same delivery capacity as the existing Wonthaggi desalination plant. Via Marina has estimated that the transfer of this water to Wonthaggi would involve a capital cost of $1 billion and operating costs of $110 per ML.[45]

The potential value added by such a submarine pipeline can be derived from:

- the per ML value of water once transferred to Wonthaggi, less:
  - the resource cost per ML of transporting the water; and
- multiplied by the estimated annual quantity of that would be taken by Victoria at a price no higher than its maximum value (capped at 400 ML per day).

A preliminary estimate prepared by Via Marina suggested that the delivered cost of such water would be $450 per ML. However, this estimate did not include any allowance for the

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[42] Department of Sustainability and Environment and the Department of Treasury and Finance, *Partnerships Victoria Project Summary: Victorian Desalination Project*, November 2009, page 4.

[43] Department of Sustainability and Environment and the Department of Treasury and Finance, *Partnerships Victoria Project Summary: Victorian Desalination Project*, November 2009, pages 4 and 17.

[44] PricewaterhouseCoopers, Letter to the Department of Sustainability& Environment entitled Victorian Desalination Project Service Payments – Full Project Term, 28 February 2011, see http://www.premier.vic.gov.au/media-centre/media-releases/319-revealed-the-true-cost-of-john-brumbye28099s-desalination-plant.html.

[45] Tamar Lake Inc, *Discussion Paper: Water – Make, Buy or Recycle – a Tough Decision for the Victorian Government*, 22 October 2012.

cost of (rate of return on) the necessary capital. To incorporate the cost of capital, we estimate the delivered cost of water under the following assumptions:

- 400 ML per day of water to be sold to Victoria;
- operating costs of $110 per ML;
- capital costs of $1 billion occurring now (at year zero);
- construction taking two years with water sales commencing at year two;
- a real cost of capital of 7.5 per cent; and
- an operational pipeline life of 50 years.

Under the above assumptions, the resource cost of transferring water to Victoria would be approximately $678 per ML.

The potential economic benefits of the proposal are represented by the difference between the total cost of building and operating the necessary infrastructure to transfer water by submarine pipe, and the incremental cost of manufacturing it by means of desalination (given that the capital costs of the desalination plant have already been incurred).

Put another way, assuming that the Victorian government would be willing to commit to purchasing 400 ML per day of water from Tasmania, water security payments must continue be made to AquaSure.[46] These payments reflect the 'already incurred' capital costs associated with the building of the Wonthaggi desalination plant. It follows that the security payment cannot be avoided under any arrangement involving the procurement of water from Tamar Lake, and so the relevant comparison for the purpose of our analysis of economic value added is:

- the cost of purchasing 150 GL of water from AquaSure, which in the current year amounts to $109 million; and
- the cost of purchasing 146 GL of water sourced from the Tamar Lake, which we estimate to be $99m (or, $102m for 150GL equivalent).[47]

It should be noted that if the Victorian government had not already arranged for the development of the desalination facility and so committed to making an annual water security payment to AquaSure, then approximately the same volume of water could have been supplied by Tasmania at a substantially lower cost, ie, $99 million per year, as compared with a $763 million fixed annual payment in 2013 – albeit, declining slowly thereafter.

Table 4.1 sets out the total cost to the Victorian government for purchasing the maximum volume of water from AquaSure and Tasmania.

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[46] See section 4.1.1.

[47] Calculated as $678 multiplied by 146 GL.

Table 4.1
Cost to the Victorian Government of Purchasing Approximately 150 GL of Water

	Security Payment to AquaSure	Payment for Water	Total
Purchase 150 GL from AquaSure	$654 million	$109 million	$763 million
Purchase 146 GL from Tasmania	$654 million	$99 million[1]	$753 million

Sources: PricewaterhouseCoopers, Letter to the Department of Sustainability& Environment entitled Victorian Desalination Project Service Payments – Full Project Term, 28 February 2011.
Notes: (1) Calculated as $870 multiplied by 146 GL.

Alternatively, for AquaSure to be willing to purchase 400 ML per day of water from Tasmania, its operating costs would need to be less than $678 per ML. The operating costs of the desalination plant are not publically available. However, if the cost of supplying no water is assumed to approximate the fixed cost of providing water, then the implied variable cost of supply is $727 per ML.[48] This is consistent with the figures given in Melbourne Water's Draft 2013 Water Plan, which states that the total variable cost of 150 GL of water is $110 million, or $733 per ML.[49]

Since our estimated cost to AquaSure of $733 per ML for producing water from its own plant is only slightly more than the estimated total cost of $678 per ML for supplying water by means of submarine pipe from Tamar Lake, it seems unlikely that AquaSure would be willing to enter into a long term commitment of the form that would be necessary to justify the development of the Via Marina water transfer proposal.

This conclusion is reinforced by the fact that our estimated cost of supplying water from Tamar Lake is contingent upon the full 146 GL being taken each year, thereby allowing the amortisation of capital costs over that entire quantity. By contrast, under its current agreement, AquaSure has effectively granted a 'call option' to the Victorian government on the quantity of water to be supplied by it, and so cannot be expected to commit to purchasing water it may not be able to on-sell.

On the information available to us, the still unproven nature of the technology in combination with the fine balance between the future costs of operating the Wonthaggi desalination plant as compared with the total cost of submarine transfer from Tasmania means that neither the Victorian government nor AquaSure appears likely to be willing to purchase water from Tasmania.

For these reasons, we have not included any benefit from the potential for future transfers of water to Victoria. Nevertheless, we recognise that, in the event the practicability of submarine transfer was to be proven, implementation of such an arrangement does represent a possible future source of benefit, particularly if there was to be a significant increase in demand for water in southern Victoria. However, the ability to realise such benefits would depend upon the willingness of either:

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48 Calculated as ($763 million-$654 million)/150,000.

49 Melbourne Water, Draft 2013 Water Plan, pages 59 and 63.

- the Victorian government to procure water outside or beyond its arrangements with AquaSure; and/or
- AquaSure, to source water from Tasmania in preference to operating its own desalination plant.

5. Use of Water for Industrial Processes

This section describes the potential benefits that could be derived from the increased availability of water for industrial processes, as well as the method used to estimate these benefits.

5.1. Avoided costs of potential industrial development

The Tamar Lake Strategy would allow for the potential sale of water to industrial businesses for commercial purposes. This could enable commercial development around the periphery of the proposed lake that would otherwise not be possible, as well as potentially allowing industries already established to increase output or to reduce costs. Similar to the agricultural benefits, this would lead to enhanced productive capacity of the land surrounding the lake.

We understand that the possibility of new industrial development or expansion directly relating to the use of water in the Tamar Lake region may be limited. However, some benefits may be able to be realised – in the form of cost savings, if the Tamar Lake were to supply water to the Bell Bay Pulp Mill – should that potential development proceed.

Prior to Gunns' being put into administration and then liquidation, it had planned to build a pulp mill in the Bell Bay area of Tasmania. In order to process pulp, the Bell Bay Pulp Mill requires an average water flow of approximately 74 ML per day, based on an annual supply of 26,000 ML.[50] Gunns had intended to source this water from the Trevallyn Dam by pumping it 40 km to the Pulp Mill.[51] This would have required Gunns to construct the 40km pipeline at a cost of approximately $100 million,[52] with the pipeline constructed to follow the Hydro Tasmania pipeline to its power station, then crossing the Tamar River to follow the route of the East Tamar Highway to the pulp mill.[53]

In terms of operating costs, Gunns would have been required to pay Hydro Tasmania a market based fee for the water (including a component to compensate Hydro Tasmania for any lost generating capacity).[54]

If the Tamar Lake Strategy and the Bell Bay Pulp Mill proposal were both to proceed, Tamar Lake would be able to supply the mill with water at a lower total cost (including capital and operating costs) than would otherwise be the case. These cost savings, which would accrue for the life of the mill, would represent a benefit of the Tamar Lake Strategy.

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50 Gunns Limited, *Bell Bay Pulp Mill Draft: Integrated Impact Statement, Volume 1*, page 10-500

51 Gunns Limited, *Bell Bay Pulp Mill Draft: Integrated Impact Statement, Volume 1*, page 10-500; and Gunns Limited website, http://www.gunnspulpmill.com.au/water.php.

52 Estimate provided by Les Baker, former Gunns pulp mill project general manager. This cost includes the pipeline and the purchase of easements from farmers.

53 Gunns Limited, *Bell Bay Pulp Mill Draft: Integrated Impact Statement, Volume 1*, page 10-507.

54 Gunns Limited, *Water Usage and the Bell Bay Pulp Mill Project*, April 2012, page 2.

5.2. Benefit assessment

Ideally, the potential economic value added in relation to the water use for any industrial processes would be calculated as:

- the value of the additional output produced, less:
  - costs incurred in producing that additional output (eg, labour, capital, etc); and
  - the current value of any forgone production (ie, the current revenue less current costs), if relevant (say, if a new industrial process was to displace an existing enterprise);
- less any resource costs associated with transporting water from the lake to the relevant enterprise (note, these may be shared since such infrastructure may be common to many users).

Any benefits assessment developed by reference to this framework would result in an estimate of value added per industrial entity. The number of firms that could be established around the lake would need to be estimated in order to calculate the total valued added from industrial processes. However, such an analysis is not possible because the necessary data is not publically available.

By way of alternative, we have provided an estimate of the potential value of increased availability of water for industrial processes, by reference to the pulp mill proposal. We noted above that, if developed, the Bell Bay Pulp Mill would require an annual supply of 26,000 ML of water, with this to be supplied from the Trevallyn Dam in combination with the development of a 40km pipeline at a cost of approximately $100 million. Under the Tamar Lake Strategy, water could be pumped from just behind the barrage at Rowella to the proposed pulp mill site using a submarine pipeline across the river. This would be a distance of less than 4km (see Figure 5.1).

Figure 5.1
Location of Proposed Pulp Mill and Barrage

Sources: Bell Bay Pulp Mill website, http://www.gunnspulpmill.com.au/; and Tamar Lake Inc, The Tamar Valley: A Strategic Plan and Vision for its Development, July 2012, page 10.

Under the Tamar Lake Strategy, the length of the pipeline will be reduced by at least 90 per cent, ie, from 40km to less than 4km. Further, if a submarine pipeline was used, then easement costs would be unlikely to be incurred – the $100 million cost of the 40km pipeline included easement payments to farmers (see footnote 52). Given the reduced distance of the pipeline and removal of easement costs, it is likely that capital costs would reduce substantially under the Tamar Lake Strategy.

To obtain a best estimate of these avoided costs, it is necessary to know the cost of constructing a pipeline from the proposed barrage to the pulp mill site, a figure that is not available. However, on the assumption that the reduced distance and easement costs would allow for a 90 per cent decline in capital costs (in line with the reduced pipe distance), then the cost savings would amount to $90 million.

If the user of such a water supply were to source water from the Trevallyn Dam, then the annual costs of obtaining this water would include a market based fee for the water. However, under the Tamar Lake Strategy, the cost for obtaining water would also be expected to consist of a market based fee (reflecting the economic scarcity of the source water). Although it may be that the more plentiful fresh water supply available from Tamar Lake may imply a lower market based fee, there is no practicable way to quantify any such differential. For this reason, we have not included any potential reduction in the market fee for obtaining the necessary water supply, but rather have assumed that the annual cost of obtaining water is likely to be consistent regardless of the source from which the water is obtained.

We conclude that, providing the proposed Bell Bay Pulp Mill development does proceed in accordance with its original intent, the Tamar Lake Strategy would result in a decline in the capital costs (and similar operating cost) applicable to the mill development, and thereby give rise to a one-off economic benefit of the proposed barrage of approximately $90 million.

6. Fisheries

This section describes the potential benefits that could be derived from the development of fisheries as a result of the Tamar Lake Strategy, as well as the method used to estimate those benefits.

6.1. Development of eel fishery

The substantial supply of freshwater that will become available under the Tamar Lake Strategy, in combination with the connection of this body of water to the Tamar Estuary by fish ladders, will allow for the expansion of fresh water fish in the lake.[55] For example, the lake may allow for growth in the annual catch of eels.

Tasmania exports eels to Europe, Asia and produces eel products for the Australian market.[56] The Local eel fishery industry is supported by the Inland Fisheries Service, who restocks rivers and lakes in Tasmania for the purpose of maintaining the commercial viability of the industry.[57] The Inland Fisheries Service has stated that there is an increasing demand for eels,[58] and if the Tamar Lake Strategy were to allow for an increase in the production of eels, then this would represent a benefit of the barrage.

Tasmania currently catches approximately 45 tonnes of short-finned and long-finned eels annually,[59] with short-finned eels accounting for approximately 98 per cent of the annual catch.[60] It has been estimated that under the Tamar Lake Strategy, the annual catch of eels may increase by as much as 100 or 200 per cent.[61]

However, the gender of the eels that would reside in the lake affects the income that could be generated by the eel industry. Female eels are larger in size than males and attract increased value in Asia. Professor Nigel Forteath has suggested that the location of the Tamar Lake may result in a large proportion of the eels being female, although the reverse is likely to eventuate at the barrage end of the lake because male eels prefer to remain in freshwater close to the sea.[62]

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55 Tamar Lake Inc, *The Tamar Valley: A Strategic Plan and Vision for its Development*, July 2012, page 32.

56 Inland Fisheries Service website. http://www.ifs.tas.gov.au/fishery-management/commercial-fisheries/eel-fisheries.

57 Inland Fisheries Service website. http://www.ifs.tas.gov.au/fishery-management/commercial-fisheries/eel-fisheries.

58 Inland Fisheries Service website. http://www.ifs.tas.gov.au/fishery-management/commercial-fisheries/eel-fisheries.

59 Inland Fisheries Service website. http://www.ifs.tas.gov.au/fishery-management/commercial-fisheries/eel-fisheries.

60 Australian Government, Department of the Environment and Heritage, *Assessment of the Tasmanian Freshwater Eel Fishery*, November 2004, page 6; and Queensland Government, Department of Primary Industries, *Ecological Assessment: Queensland Eel Fishery*, November 2002, page 3.

61 Estimate provided by Piers Ranicar, the marketing director of Eels Australis Pty Ltd – a Tasmanian based eel business. See http://www.australianexporters.net/companyID2336.htm. Further, Nigel Forteath (see footnote 62) stated that the size of Tamar Lake could allow it to become a significant eel fishery.

62 Professor Nigel Forteath is an expert on aquaculture and established the University of Tasmania's Australian School of Aquaculture. See http://www.australianoftheyear.org.au/honour-roll/#browse:view=fullView&recipientID=741.

Although the price of eels is not published, Highland Pacific Exports – a Tasmanian freshwater eel fishing and export business – has advised that short-finned and long-finned eels sell for approximately $15 per kilo and $25-$30 per kilo respectively.[63]

6.2. Effect on salmon fishery

By contrast, the proposed barrage may have a negative effect on the fish farms that are currently in operation in the lower Tamar. In particular, a salmon farm, Van Diemen Aquaculture,[64] that is located at Rowella may be affected by reduced tidal flows that presently cause substantial movement of water through its salmon farm. The water flows at Rowella are higher than at other farmed areas in Tasmania, and this is of benefit to the process of rearing salmon.[65] If the water flows were to reduce under the Tamar Lake Strategy, then the output and price of Van Diemen Aquaculture's salmon may reduce.

On the other hand, a potential benefit of the Tamar lake Strategy to Van Diemen Aquaculture is that pen damage due to moderate flood events may be reduced. This benefit is most likely to arise in the circumstance of a flood coinciding with an outgoing tide.

6.3. Benefit assessment

We have derived an assessment of the value added from fisheries by means of:

- the value of the fish produced both in the lake and the river; less
  - the resource costs (capital and operating) incurred in raising the fish;
  - the current value of fish (ie, the current revenue less current costs) produced on the Tamar River that would be displaced by the lake.

We indicated above that the Tamar Lake Strategy would result in a large body of fresh water, providing for a possible expansion in the number of wild eels present in the Tamar.

On the assumption that the tonnage of freshwater eels were to increase from 45 tonnes to 95 tonnes (ie, an increase of 100 per cent), and 98 per cent of the catch are short-finned eels while the remainder are long-finned eels, then this would give rise to an increase of 44.1 tonnes (44,100 kg) and 0.9 tonnes (900 kg) of short-finned and long-finned eels, respectively. Adopting an average price of $15 per kg for short-finned eels and $27.50 per kg for long-finned eels would give rise to an increase in revenue of $686,250 per annum. Similarly, if the volume of eels were to increase by 200 per cent, then revenue would rise by $1,372,500 (see Table 6.1 below).

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[63] See http://www.agriculturesource.com/c-highland-pacific-exports-pty-ltd-362746.html; and http://www.highlandpacific.com.au/.

[64] Petuna, a trout and salmon farming company, recently acquired a major shareholding in Van Diemen Aquaculture. See, http://www.petuna.com.au/about/sites/.

[65] ABC Rural, *Tamar Salmon Swimming Against the Tide*, 1 February 2010, http://www.abc.net.au/rural/content/2009/s2768562.htm

Table 6.1
Change in Eel Fisheries Revenue

	Current Scenario	Increase by 100%	Increase by 200%
Total volume (tonnes)	45	90	135
Total volume (kg)	45,000	90,000	135,000
Volume short-finned eels (%)	98%	98%	98%
Volume long-finned eels (%)	2%	2%	2%
Volume short-finned eels (kg)	44,100	88,200	132,300
Volume long-finned eels (kg)	900	1,800	2,700
Price short-finned eels ($)	15	15	15
Price long-finned eels ($)[1]	27.5	27.5	27.5
Revenue short-finned eels ($)	661,500	1,323,000	1,984,500
Revenue long-finned eels ($)	24,750	49,500	74,250
Total ($)	686,250	1,372,500	2,058,750
Change ($)		686,250	1,372,500

Notes: (1) Calculated as the average of $25 and $30.

The eels in the Tamar Lake would be wild and so the costs associated with raising them would be relatively low when compared with a fish farm. Details of the relevant costs are not available, but can be assumed to be less than revenue. It follows that, taking the upper bound estimate of a 200 per cent increase in eel production, the benefit to the eel fishing industry would be a value not exceeding $1.4 million.

Under the Tamar Lake Strategy, the flows that pass through Van Diemen Aquaculture would be reduced. The salmon farm relies on strong tidal movements and fresh water inputs from upstream to culture the salmon. Since the barrage will reduce the water flows, it has the potential negatively to affect the existing operation and, in the extreme case, may result in the closure of the salmon farm. Van Diemen Aquaculture produces approximately 2,500 tonne (2,500,000 kg) of salmon annually, equating to an annual revenue figure of $17 million.[66]

Adopting a worst case scenario, ie, the closure of the salmon farm, then the annual loss in revenue to Van Diemen Aquaculture is $17 million, which significantly exceeds that of the potential increase in revenue to the eel industry (of $1.4 million). Although a proper comparison would require annual profit of the two operations to be compared, these are not available. However, if the cost of growing and processing salmon are assumed to be in line

[66] Estimates provided by Dianne Maynard, General Manager of Van Diemen Aquaculture.

with global benchmarks of $3.50/kg and $1.30/kg respectively, then the current annual profit of salmon farming can be estimated to be $5 million.[67]

The costs of eel farming are also not publically available. However, the profit margin associated with the Agriculture, Forestry & Fishing industry is 13.3 per cent.[68] If this profit margin were applied to the increase in eel revenue of $1.4 million (assuming an increase in output of 200 per cent), the estimated annual profit (or value added) would be approximately $200,000.

Taking the balance of these estimates of profit forgone ($5 million for salmon farming) and additional profit realised ($200,000 for the eel fishery), under the conservative assumption that the salmon farming operation would cease, the Tamar Lake Strategy would result in annual lost economic value to the fishing industry of approximately $4.8 million. Adopting this net loss in perpetuity, at a real discount rate of 7.5 per cent, results in a (negative) value added of -$64 million.

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[67] Venture Positioning Services prepared for Aquaculture Development Council, *Aquaculture Growth: Key Success Factors*, October 2008, page 13.

[68] Australian Bureau of Statistics, Australian Industry, 2010-11 (8155.0), released July 2012. We calculated the profit margin by dividing operating profit before tax by total income.

7. Residential and Commercial Property

This section describes the potential benefits that could be derived from the value appreciation of residential and commercial property located in the vicinity of the proposed Tamar Lake, as well as the method used to estimate those benefits.

7.1. Increase in amenity value

The proposed lake is likely to give rise to a significant increase in the amenity value of the Tamar Valley and its surrounding properties. The increased desirability of the location can be expected to raise land values.

In addition, water will become available to supply residential and commercial areas that are currently not serviced by existing pipelines, and the desirability of lakeside properties will be enhanced by the protection against a rise in sea levels provided by the barrage.

7.2. Benefit assessment

The economic value added from the increased amenity of residential and commercial properties can be expressed as:

- the expected land value appreciation of both existing properties and currently undeveloped land.

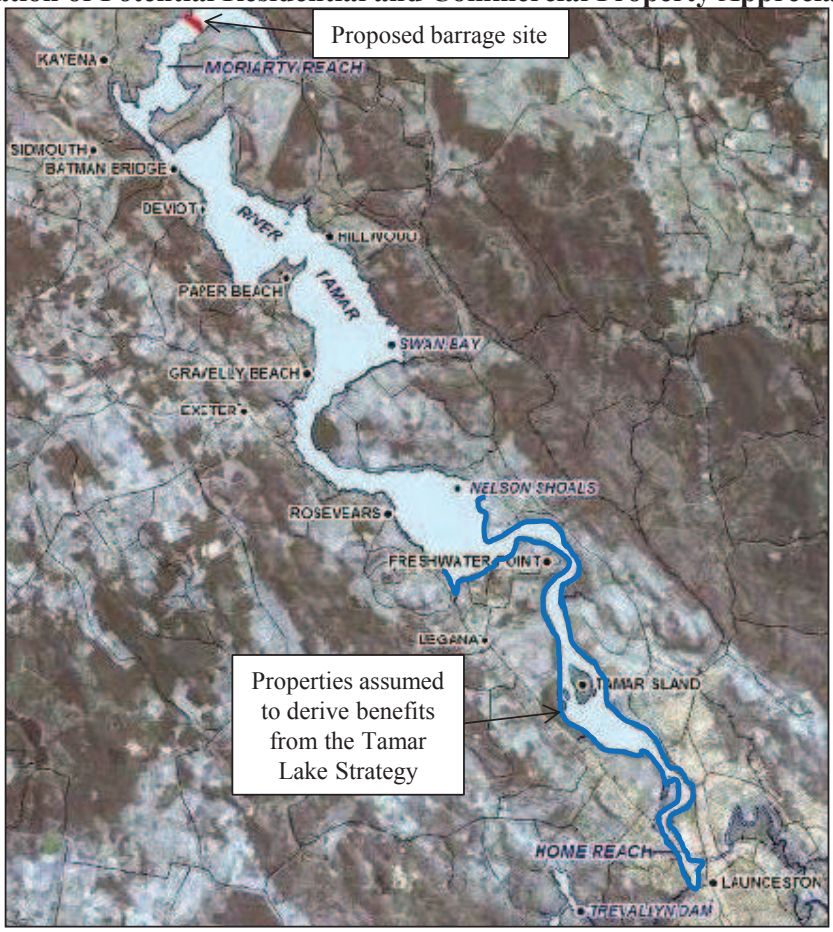
The extent of the value appreciation can in turn be estimated by obtaining:

- an estimate of the area of positively affected residential and commercial land; and
- an estimated value accretion, on a per hectare basis.

Since a portion of this value enhancement may involve converting some land from its existing use (eg, agriculture to residential), care is required not to double-count the appreciation of land that is assumed to be used for another purpose. For example, if an area of land has been expected to be used for agricultural purposes, then this land should not be incorporated by way of any contribution to the value added through enhanced residential and commercial amenity.

Although the majority of the land surrounding the proposed lake was included in the calculation of potentially irrigable land for agricultural purposes (see Figure 3.1), only 10 per cent of the land deemed to be available for irrigation was used to derive an agricultural benefit (see section 3.3.1). To avoid estimating residential and commercial benefits for land that was assumed to derive an agricultural benefit (ie, double counting), we have restricted the area of potential residential and commercial benefits to lakeside land located between Rosevears and Launceston (see Figure 7.1 below). Further, the stretch of river located between the suburb of Rosevears and the barrage is not greatly affected by silt flats, which is consistent with its exclusion from the residential value added analysis.

Figure 7.1
Location of Potential Residential and Commercial Property Appreciation



Source: Tamar Lake Inc, The Tamar Valley: A Strategic Plan and Vision for its Development, July 2012, page10.

The distance surrounding the proposed lake (ie, from below Rosevears and Windermere to Launceston) is approximately 42km.[69] Converting this number into square hectare sections results in 420 hectares, ie, this assumes that all sections are 100 metres by 100 metres. If the average number of houses per hectare is assumed to be 6,[70] then the number of properties beside the lake is 2,520.

The potential increase in the amenity value of each of these properties under the Tamar Lake Strategy can be estimated using the increase in property prices that resulted from a similar development. For example, the Trevallyn Dam was commissioned in 1955, which converted

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69 NERA measurement derived using the mapping program Maptitude.

70 The approximate number of dwellings per urban hectare in Launceston is 12, however, a number of the suburbs bordering the Tamar Lake are rural areas, and so we have reduced the assumed housing density. See, Launceston City Council, *Launceston Residential Strategy 2009-2029*, February 2010, page 26, see http://www.launceston.tas.gov.au/lcc/?c=279.

a section of the South Esk River into a lake (Lake Trevallyn).[71] The suburb that borders onto Lake Trevallyn is Blackstone Heights and the change in house prices following the establishment of this lake could be used to approximate the changes to properties surrounding Tamar Lake. However, median house prices are not available prior to and immediately following the establishment of Lake Trevallyn.

An alternative means for estimating the increase in property prices consequent upon the establishment of Lake Trevallyn is by reference to the difference in the median house price in Blackstone Heights, and those prevailing for suburbs bordering the proposed Tamar Lake. The median house price for Blackstone Heights in 2011 was $412,500,[72] and the average of the median house prices for the suburbs bordering the proposed Tamar Lake, from Rosevears to Launceston was $280,275 – a difference of $132,225 (see Table 7.1).

Table 7.1
Median Sales Price 2011

Suburb	Median Sale Price
Launceston	348,700
Trevallyn	320,000
Riverside	290,000
Invermay	220,000
Mowbray	202,500
Newnham	255,000
Legana	325,000
Dilston	281,000
Average	280,275
Blackstone Heights	412,500
Difference	132,225

Source: Median prices from REIT Statistics published by Real Estate Institute of Tasmania (REIT), available on http://reit.com.au/market-facts/suburb-reports/.

On the assumption that all properties bordering the proposed Tamar Lake would experience an increase in value to the level of Blackstone Heights, then the average increase in economic value per property would be $132,225, resulting in a net increase of approximately $333 million.[73]

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[71] Hydro Tasmania, *South Esk – Great Lake Water Management Review: Scientific Report on Tamar Siltation*, August 2003, page 1.

[72] Real Estate Institute of Tasmania (REIT), *REIT Statistics: Blackstone Heights*, 2012, http://reit.com.au/wp-content/uploads/web-blackstone-heights.pdf.

[73] Calculated as 132,225 multiplied by 2,520.

We note that this estimate substantially exceeds the anticipated cost of the barrage, and all others forms of economic benefit. Even if a significant discount were applied to this estimate through a desire to be highly conservative, the above estimate underlines the very significant potential for property value appreciation in light of the amenity value created by the Tamar Lake Strategy.

8. Tourism

This section describes the potential benefits that could be derived from increases in tourism to the Tamar Valley region, as well as the method used to measure these benefits.

8.1. Tourism enhancement

Tourism it the region is overseen by Tourism Tasmania – a Tasmanian government organisation – with the state divided into five 'zone market groups'.[74] The zone marketing groups are responsible for managing the marketing of their geographic region and the Tamar Valley falls into the 'Launceston, Tamar and the North' group. However, a new regional tourism initiative is currently being implemented in Tasmania. This initiative will result in the creation of four regional tourism organisations established to develop the strategic direction for tourism in their region.[75] Each organisation will be independently able to plan and deliver tourism programs and will be accountable to the industry.[76]

The Tamar Lake Strategy would result in a permanently full lake, allowing for increased tourism developments around the edge of the lake. This increased amenity is likely to give rise to an increased number of tourist visitors and average stay length in the Tamar Valley region.

Such tourism enhancements are likely to include:

- kayaking – the Tamar Lake Strategy would allow for constant access to the water;
- yachting – similar to kayaking, the Tamar Lake Strategy would allow for constant access to the water;
- rowing – participation in rowing is at present restricted to times of higher tides – the Tamar Lake Strategy would allow for rowing to occur at all times of the day;
- house boating – we understand that a house boat tourism venture was once attempted on the Tamar River, but was unsuccessful due to difficulties in navigating the river;
- fishing – the presence of brown trout are likely to increase in the lake[77] and would provide for recreational fishing; and
- river trips – river cruises that are currently restricted to operating at times of relatively high tides would be able to expand their times of operation – the depth of water in the navigation channel from Launceston to Rosevears at low tide is approximately 2 metres,

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74 Tourism Tasmania website, http://www.tourism.tas.gov.au/about; and Launceston City Council website, http://www.launceston.tas.gov.au/lcc/index.php?c=355.

75 Tourism Tasmania, Annual Report 2011-12, page 11.

76 Tourism Tasmania, Annual Report 2011-12, page 11.

77 Tamar Lake Inc, *The Tamar Valley: A Strategic Plan and Vision for its Development*, July 2012, page 20. This is an extract from the following document: Tamar Lake, Natural Values Assessment Report prepared for Tamar Lake Inc by Dr. Andrew Costen, Principal Environmental Scientist, BMT WBM, June 2012. Professor Nigel Forteath has also stated that he would expect the number of brown trout to increase under the Tamar Lake Strategy. See footnote 62.

with visible mud banks either side of the channel.[78] This passage of the river is therefore restricted to smaller boats with drafts of less than 2 metres.[79] The Tamar Lake Strategy would enable larger vessels to operate at all times of day and enhance the appearance of the river. Further, we understand that wineries have attempted to establish river access, but have been unsuccessful due to the presence of mud flats limiting access to times of high (or near high) tides.

We also note that the proposed Craggy Ridge Estate – an eco-tourism attraction with accommodation – may benefit from the Tamar Lake Strategy.[80] These benefits would be provided from water based activities, which may enhance the number of visitors to Craggy Ridge Estate and their length of stay at the property.

Further, the barrage will provide an additional bridge for pedestrians and cyclists to cross the Tamar River, and will include locks to allow for the passage of tourist boats.

8.2. Benefit assessment

Ideally, the transaction-based value added from tourism would be calculated as:

- revenue from the forecast enhancement to total tourism in the Tamar Lake area, less
  - resource costs of providing the tourism services;
- less the value of any existing tourism activities lost (if any) as a result of the proposed Tamar Lake.

However, the resource costs of providing tourism services are not publically available, and so it is necessary to estimate the value added from tourism by means of an alternative approach. In particular, we have developed an estimate based on an expected increase in time spent by tourists in Launceston following the establishment of the Tamar Lake.

The total visitors to Launceston (including the Tamar Valley) in fiscal year 2011 on scheduled air and sea services was 558,400.[81] Of this total, 470,300 were interstate visitors, while the remaining 88,100 are assumed to be international visitors.[82] In addition, Launceston received a number of visitors from intrastate. Table 8.1 below sets out an estimate prepared for Launceston Council of the average spend per visitor type.

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78 See tide charts on such websites as http://tides.willyweather.com.au/tas/northern/rosevears.html and http://www.tides4fishing.com/au/tasmania/launceston.

79 'Draft' refers to the minimum depth of water that a vessel is able to pass through.

80 Craggy Ridge Estate website, http://www.ourcraggyridge.org/.

81 The Stafford Group, *Launceston Strategic Tourism Plan: Prepared for Launceston City Council*, February 2012, page 26. This figure was taken from Tourism Tasmania, *Tasmanian Tourism Snapshot*, Year ending June 2012.

82 Tourism Tasmania, *Tasmanian Tourism Snapshot*, Year ending June 2012, Table 3.

Table 8.1
Tourist Length of Stay and Spend in Launceston

	Intrastate Day	Intrastate Night	Interstate Day	Interstate Overnight	International
Average stay (nights)	0	2.6[1]	0	2.8	8.9
Average spend per night/day ($)	$99[1]	$128[1]	$136	$133	$71
Number of visitors	331,232[2]	118,768[2]	13,114[3]	457,186[3]	88,100
Total Spend	$32,791,968	$39,525,990	$1,783,570	$170,255,886	$55,670,390

Source: Stafford Group, Launceston Strategic Tourism Plan: Prepared for Launceston City Council, February 2012, page 29 and 84; and Tourism Tasmania, Tasmanian Tourism Snapshot, Year ending June 2012.
(1) Figures are for Tasmania, and as such represent an approximation of the length of stay and spend in the Launceston area. (2) Launceston only. (3) Calculated by proportioning the total interstate visitors to the Launceston region (470,300) based on the percentage of interstate visitors to Tasmania that were day (21,600/774,600=3%) and overnight visitors (753,000/774,600=97%).

Implementation of the Tamar Lake Strategy is likely to give rise to an increase in both the length of stay per visitor and the number of visitors, on account of the additional tourism activities available and the enhanced appearance of the region. However, it is intrinsically difficult to estimate the extent to which these variables may increase, since it is difficult to identify any objective basis from which to draw comparisons.

We have therefore adopted a clear, relatively simple basis on which to derive such an estimate, so that these can be varied by interested parties that may prefer to adopt a more or less optimistic view on the likely tourism effect of the Tamar Lake Strategy. In particular, we have assumed that, following the implementation of the Tamar Lake Strategy, all overnight visitors would stay an additional night and total visitors to the region would increase by 10 per cent (and remain at that increased level for all future periods). The effect of these assumptions is an increase in annual gross income from tourism of approximately $120 million per year.

The economic value added can be derived from an estimate of the increase in tourism net profit under the Tamar Lake Strategy. However, the costs that underlie the above income from tourism are not available, and so we have had to use an alternative approach to convert tourism income to profit.

The Launceston Tourism Plan includes a breakdown of the tourism dollar as spent across various industry sectors.[83] This breakdown, in conjunction with the profit margin of the respective industries, allows the profit from tourism by to be estimated by determining a profit margin to apply to the increase in annual tourism income of $120 million. Table 8.2 below sets out the percentage of the tourism dollar spent across various industries and the profit margin of each industry.

[83] Stafford Group, *Launceston Strategic Tourism Plan: Prepared for Launceston City Council*, February 2012, page 84.

Table 8.2
Industry Specific Tourism Spend and Profit Margins

	Percentage of Tourism Dollar	Profit Margin[1]	Weight[2]
Accommodation & Food Services	39%	7.4%	41%
Retail Trade	13%	5.7%	14%
Transport, Postal & Warehousing	12%	9.4%	13%
Manufacturing	8%	7.2%	9%
Education & Training	7%	13.8%	7%
Ownership of Dwellings	6%	n/a	n/a
Arts & Recreation Services	3%	13.0%	3%
Wholesale Trade	3%	4.2%	3%
Administrative & Support Services	3%	12.5%	3%
Rental, Hiring & Real Estate Services	2%	27.2%	2%
Information Media & Telecommunications	2%	13.9%	2%
Health Care & Social Assistance	1%	15.2%	1%
Other Services	1%	14.3%	1%
Financial & Insurance Services	0%	n/a	n/a
Agriculture, Forestry & Fishing	0%	13.3%	0%
Professional, Scientific & Technical Services	0%	20.2%	0%
Public Administration & Safety	0%	10.9%	0%
Mining	0%	38.6%	0%
Electricity, Gas, Water & Waste Services	0%	12.1%	0%
Construction	0%	8.4%	0%
Total	100%	-	100%

Notes and sources: Stafford Group, Launceston Strategic Tourism Plan: Prepared for Launceston City Council, February 2012, page 84; Australian Bureau of Statistics, Australian Industry, 2010-11 (8155.0), released July 2012.
(1) Profit margin calculated by dividing operating profit before tax by total income; (2) Weight derived to calculate the weighted average of the profit margins. Calculated by dividing the Percentage of Tourism Dollar for each industry (with an available profit margin) by the total of the Percentage of Tourism Dollar excluding 'Ownership of Dwellings' and 'Financial & Insurance Services'.

We have calculated the weighted average of the profit margins for the industries that are the recipients of tourism spending by taking an average of the profit margins for all the industries that receive income from tourism (and for which a profit margin estimate is available), and weighting these by the percentage contribution that each receives of estimated tourism spend (see column four of Table 8.2). The resulting profit margin is 8.8 per cent.

Profit margin is defined as 'profit' divided by 'net sales'. To derive an estimate of the increase in tourism profit, we multiply the tourism income of $120 million by the estimated profit margin of 8.8 per cent, which results in an annual increase in operating profit of approximately $10.7 million.

On the assumption that this increase in tourism activity and so increase in profit will be sustained indefinitely, the economic value added from tourism as a result of the Tamar Lake Strategy can be expressed in net present value terms by discounting this benefit into perpetuity at 7.5 per cent. This gives rise to an estimated net benefit of $142 million.

9. Flood and Sediment Management

This section describes the potential benefits that could be derived from the avoided costs of flood and sediment management, as well as the method used to estimate these benefits.

9.1. Avoided costs of flood and sediment management

Implementation of the Tamar Lake Strategy would have significant positive benefits for the current flood and sediment management situation in the Tamar Valley.

9.1.1. Context

The Tasmanian government currently faces costs from flood mitigation and sediment management. The Launceston Flood Authority (LFA) – established by the Launceston City Council in 2008 – is responsible for managing these activities.[84] Specifically, the LFA is required:[85]

- to design, construct and maintain the Invermay Flood Levees to provide protection against a 1 in 200 year average recurrence interval (ARI) flood;
- to maintain all publicly owned flood levees in the Launceston Flood Protection Scheme (LFPS);
- to provide flood risk preparation, response and evacuation education; and
- to manage the sediments in the upper reaches of the Tamar River Estuary.

Flood protection is particularly necessary in the suburb of Invermay, which lies below the high tide level – flood levees protect the area from being inundated with water on a twice daily basis.[86] These levees were constructed to protect low lying areas and are up to four metres high. However, the levees are difficult to maintain since they are mostly built on silt, resulting in the levees sinking over time.[87]

In addition to the Invermay levees, the LFA maintains earth and concrete levees in the LFPS (the location of these levees is depicted in Figure 9.1 below). The levee maintenance costs for the year ended 30 June 2012 of $132,658 provide an estimate of the annual maintenance costs faced by LFA.

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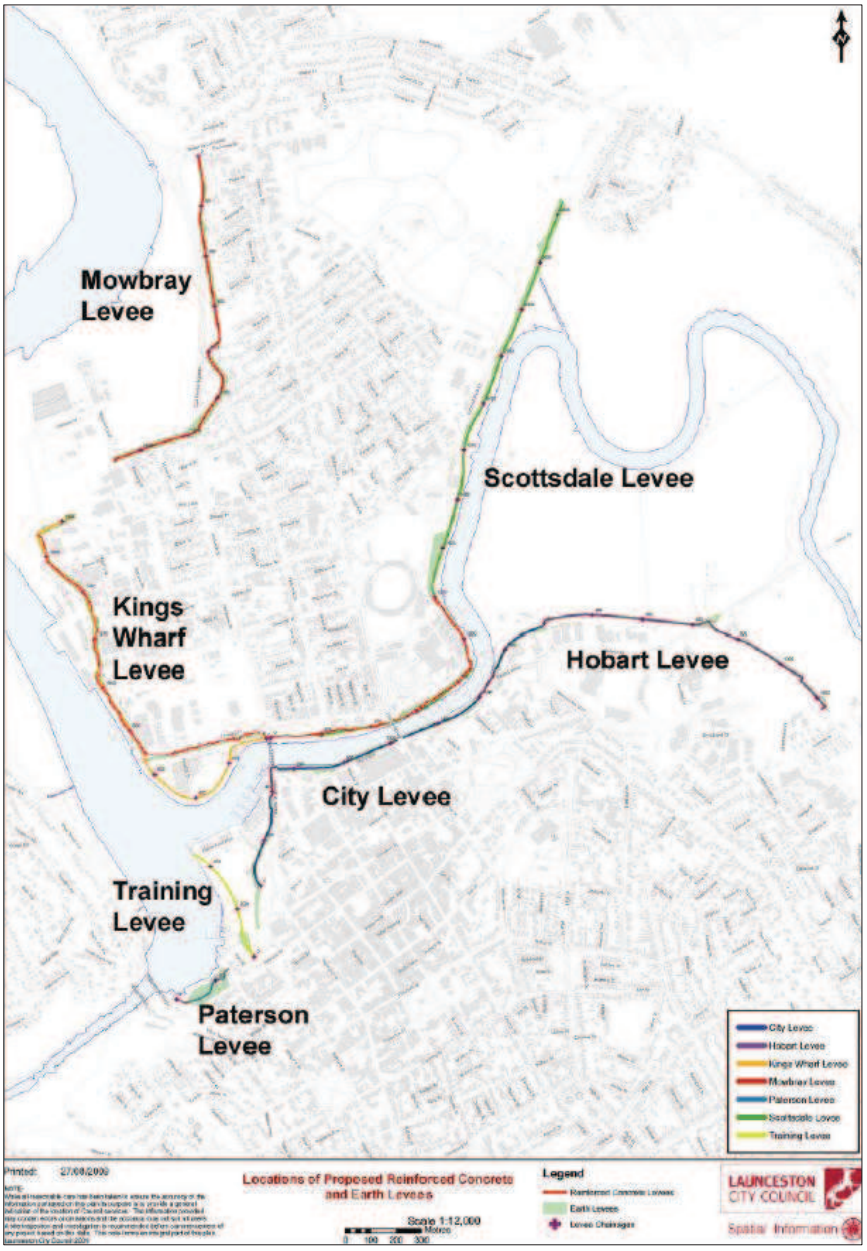
[84] Launceston Flood Authority, Annual Report 2012, page 1; and Launceston City Council website, http://www.launceston.tas.gov.au/lcc/index.php?c=163.

[85] Launceston Flood Authority, Annual Report 2012, page 1.

[86] Launceston City Council website, http://www.launceston.tas.gov.au/lcc/?c=174.

[87] Launceston City Council website, http://www.launceston.tas.gov.au/lcc/?c=174.

Figure 9.1
Location of Levees in Launceston



Source: Launceston Flood Authority, Progress Report, Quarterly Report to the Crown for the period ending 30 June 2012, page 2.

As at 30 June 2012, the LFA had spent a total of $15.2 million on levee construction and design, with an additional $19.7 million spent on land acquisition and compensation – a total

of $34.9 million in capital costs incurred since 2008.[88] Funding of $57 million has been provided for these projects by the Commonwealth, State and Local governments.[89]

In addition to providing flood protection, the LFA is responsible for managing the sediments in the Tamar River Estuary. The LFA undertook a raking trial in 2012 to assess the method for removing the sediment.[90] Following this study, the LFA have estimated that it will remove up to 100,000m^3 of sediment per year at an approximate cost of $300,000.[91]

9.1.2. Nature of benefits

The establishment of the Tamar Lake would eliminate the effects from tides and would also increase the capacity to dispose of excess water via gated spillways on the barrage. This would reduce the level and duration of flooding in Launceston from low to moderate flood events, eg, five year flood events. However, the Tamar Lake Strategy would only have a minor effect on flooding levels from extreme flood events (including a 100 and 200 year flood).

By eliminating the tidal effects, the expenditure on flood levees is likely to reduce. This reduction in expenditure would result from the reduced exposure of the levees to water from daily tidal movements. Further, the ability of the barrage to lower the level of the lake in anticipation of flooding will also reduce the risk of damage from moderate floods.

Additionally, under the Tamar Lake Strategy, the predicted sea level rise of 0.8 metres over the next 50 years will be accommodated by the barrage. We understand that LFA is required to protect Launceston against a 1-in-200 year flood for 80 years and the sea level rise over this time is therefore included in its protection measures. Further, the existing concrete levees and earth levees are said to be sufficient to protect Launceston against a 0.8 meter rise in sea levels.[92] However, the barrage will provide protection against predicted sea level rises to all areas in the Tamar Valley between the barrage and Launceston. In other words, the protection will be extended from Launceston to encompass all areas up to Point Rapid.

In the case of sediment management, the Tamar Lake Strategy would eliminate the present need to relocate silt from the upper reaches of the Tamar downstream and, as such, any future costs of sediment relocation will be reduced to zero.

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88 Launceston Flood Authority, Annual Report 2012, page 23.

89 Launceston Flood Authority, Annual Report 2012, page 25.

90 Launceston Flood Authority, Annual Report 2012, page III.

91 Launceston Flood Authority, Annual Report 2012, page V.

92 BMT WBM published a report in 2008 that considered the effect of a 0.8 meter rise in sea levels. BMT WBM found that a 0.8 meter rise in sea levels would result in a 130mm rise in a 95 per cent 200 year flood – the level that the levees are currently able to withstand. The Launceston Flood Authority state that the concrete and earth levees have 500mm and 300mm freeboard respectively (freeboard refers to the additional height of a levee above the height for which it was designed to provide protection). See, BMT WBM, *River Tamar and North Esk River Flood Study Final Report*, 2008, section 4.3.

9.2. Benefit assessment

The economic value added from the avoided costs of flood and sediment management can be estimated as the sum of:

- the reduction in the proposed spend on flood and sediment management over the life of the barrage; and
- the reduction in potential damage (lost production, property damage, etc) arising from flood events.

The reduction in expenditure on flood mitigation measures can be derived from the four areas identified in section 9.1.2, namely:

- increased protection against low to moderate flood events – the ability to mitigate flood levels for these flood events may allow for a reduction in costs relating to flood damage, although it is not possible to quantify these avoided costs at this time;
- avoided costs of levee maintenance – as stated above, the LFA spent $132,658 on levee maintenance for the year ended 30 June 2012. Assuming that this figure is representative of the annual expenditure on levee maintenance, by removing the daily tidal erosion effects on the levees, the Tamar Lake Strategy may allow for a reduction in maintenance costs of less than $132,658. However, it is not possible to determine the extent of avoided costs at this stage. We note that levee capital costs will not be able to be avoided under the Tamar Lake Strategy;[93]
- avoided costs due to predicted sea level rise – the levees in Launceston already allow for a 0.8 metre rise in sea levels. However, under the Tamar Lake Strategy, protection against predicted sea level rises will be extended to the whole lakeside section of the Tamar Valley, resulting in a reduction in potential flood damage costs. Again, however, it is beyond the scope of this study to quantify the avoided costs from flood damage due to sea level rise; and
- avoided costs of sediment management – the LFA is forecasting $300,000 per annum for sediment management. Under the Tamar Lake Strategy, sediment deposition will be reduced to a negligible level and so sediment management costs of $300,000 will be avoided.

Although the Tamar Lake Strategy is likely to result in avoided costs across all of the cost categories identified above, only the avoided costs of sediment management are readily quantifiable for the purposes of this pre-feasibility study. We estimate the value added by flood and sediment management by assuming that $300,000 of costs will be avoided for all future years – at a discount rate of 7.5 per cent, this gives rise to an estimate of economic value added of $4 million.

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[93] The LFA is responsible for providing a 1-in-200 year level of flood protection. Given that the barrage would not provide protection against a 1-in-200 year flood, the LFA would still need to maintain the levees under the Tamar Lake Strategy.

10. Conclusion

Our estimate of the potential economic benefits of the Tamar Lake Strategy, separated into each of the sources of benefit identified in section 3 to 9, is presented in Table 10.1 below.

Table 10.1
Benefits of Tamar Lake Strategy

Type of Benefit[1]	Value Added
Agricultural irrigation	$48 million
Use of water for industrial processes	$90 million
Fisheries	-$64 million
Residential and commercial	$333 million
Tourism	$142 million
Avoided costs of flood and sediment management	$4 million
Total	$553 million

Notes: (1) As noted in section 4.2, the potential sale of freshwater to Victoria is not included in the total benefits associated with the Tamar Lake Strategy.

Our analysis indicates that the total economic value added of the Tamar Lake Strategy (before taking account of its anticipated cost of implementation) is approximately $553 million. Since the total benefits of the Tamar Lake Strategy greatly exceed the expected capital cost of the barrage of around $200 million, we conclude that the strategy has substantial economic net benefits.

To put these benefits into context, the gross state product (GSP) of Tasmania for 2011-12 was $24,175 million.[94] The total anticipated benefits of the Tamar Lake Strategy (before taking into account the capital cost of the barrage itself) therefore amount to a one-off economic effect of around 2.3 per cent of the most recent measure of Tasmania's GSP.

Notwithstanding this very favourable assessment, the benefit estimates presented in this report are derived from a preliminary study. These values represent our best estimate of the benefits that would be derived under the Tamar Lake Strategy, based on a limited pre-feasibility study.

To derive estimates of economic benefit that reflect a higher level of robustness, it would be necessary to undertake a full feasibility study. Such a study would involve a detailed verification of the benefits and costs identified in this report. Potentially, this would include engaging relevant industry representatives to assist in the calculation of the underlying cost and revenue components of each of the benefit categories. NERA would be willing to assist in preparing such a study following a suitable request from either the Tasmanian or Commonwealth government.

[94] Australian Bureau of Statistics, Catalogue number 5220.0.

Report qualifications/assumptions and limiting conditions

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Tamar Lake Economic Pre-feasibility Study

Annexure A

Macquarie Franklin Report

Tamar Lake Proposal

Pre-feasibility estimate of Agricultural Benefits

Report prepared for Tamar Lake Inc. as part of an overall Pre-feasibility study of the Tamar Lake Proposal.

March 2013

MACQUARIE FRANKLIN

Macquarie Franklin was formed in April 2011 by the merger of two Tasmanian based consulting firms - Agricultural Resource Management (ARM) and Davey & Maynard.

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TABLE OF CONTENTS

Page

LIST OF TABLES

1. Overview

The key questions to be answered in relation to the economic benefits of additional irrigation water for agriculture in the Tamar valley region are:

1) What is the amount of potentially irrigable land in the area?
2) Is the expansion of irrigated agriculture currently being limited by the water availability?
3) Will water be able to be delivered at a cost that makes expansion economically viable for farmers?

The pre-feasibility study outlined in this report is based on Macquarie Franklin experience in assessing irrigation schemes throughout the state in recent years and our knowledge of agriculture in the Tamar Valley in particular. No detailed farm survey work or costing has been undertaken, and no analysis of current water rights in the area or the potential for additional winter-take from streams. We also do not have indicative pumping costs to deliver water from the storage - given the lift involved this is likely to be a key factor in irrigation economics for lower value enterprises at further from the lake. The results are therefore a preliminary estimate only.

While on the surface there is a large area of land that could be potentially irrigated from the proposed lake, uptake is likely to be limited by a number of factors including the following:

1) The large number of small-scale or life-style farmers who are unlikely to be involved in intensive irrigated agriculture.
2) The limited number of larger properties that are currently lacking irrigation water and would be potentially suited to large-scale intensive horticulture – wine grapes, apples, pears, cherries etc.
3) The limited number of dairy farms within a reasonable distance of the river which may require additional water. New dairy conversions from current dryland beef or sheep properties are more likely to occur in areas of the state other than the Tamar Valley.
4) For crops such as poppies and vegetables, the generally poor soil types of the region from an annual cropping point of view are likely to limit any large scale expansion, particularly when combined with the likely high cost of distribution to a widely spaced group of potential users.

Our conclusion is that, over time, an additional 1,500 hectares of land might be irrigated in areas reasonably adjacent to the storage, with total annual uptake of around 5,000 ML

The present value of additional farm net margin has been estimated at $37.9 million before annual overhead and delivery costs.

The main enterprises likely to benefit are intensive perennial horticulture crops such as wine grapes, apples and cherries, plus dairying and poppies.

2. Current Agriculture in the Tamar Valley

Agriculture in the Tamar Valley region largely comprises dryland grazing enterprises plus a limited area of higher value irrigated enterprises.

The irrigation enterprises include a significant area (in Tasmanian terms) of perennial horticultural enterprises such as wine grapes, apples, pears and cherries plus a small number of dairy farms two of which are close to the Tamar River.

According to the Australian Bureau of Statistics there was a total of 62,135 hectares of agricultural land in the extended "Tamar Valley" in 2010-11 with a gross value of $50 million (Table 1).

Livestock production occurred on around 34,000 hectares of improved pasture with a total gross value ex-farm of $21.2 million in 2010-11 (excluding eggs) – equivalent to $625 gross value per hectare.

Cropping (excluding hay & silage) occurred on around 2,500 hectares but had a total value of around $27.3 million – equivalent to $10,900 gross value per hectare average.

There were around 771 hectares wine grapes and 330 hectares of orchard crops (mainly apples) in the 2010-11 census. The latest Tasmanian wine report[1] lists 503 hectares of currently bearing wine grapes in the Tamar Valley which is around 33% of the state total of almost 1,500 hectares.

[1] 2012 Tasmanian Vintage Report, Wine Tasmanis.

Table 1: Current agricultural enterprises in the Tamar Valley region

Enterprise	Area (ha)	Value ($m)
Crops		
Hay & silage	2,969	0.7
Pasture seed		0.5
Cereals	326	0.2
Vegetables for seed	4	0.1
Nurseries & cut flowers & turf		3.4
Potatoes	5	0.2
Peas	87	0.1
Fruit	330	
Apples		7.7
Pears		0.5
Cherries		0.5
Other orchard fruit		0.1
Blueberries	30	1.4
Wine grapes	771	11.2
Other (incl.poppies)	963	0.3
Total crops	**5,485**	**28.0**
(Excluding hay & silage)	*(2,516)*	*(27.3)*
Grazing		
Grazing improved	33,872	
Other grazing land	22,778	
Total grazing	**56,650**	
Livestock slaughtered		
Sheep & lambs		4.4
Cattle & calves		7.6
Total livestock slaughtered		**12.0**
Livestock products		
Eggs		1.1
Wool		2.2
Milk		7.0
Total livestock products		**10.3**
Total	**62,135**	**50.3**

Source: ABS Agricultural Commodities and Value of Agricultural Production, 2010-11 (George Town Pt A & Pt B, Launceston Pt B & Pt C, West Tamar Pt A & Pt B)

3. Potential Irrigation Area and Enterprises

3.1. Potentially irrigable land

Depending on the area which might be serviced by additional irrigation water the potentially irrigable area might be somewhere between 15,170 and 31,810 hectares (Table 2).

The larger estimate relates to a broad agricultural zone around the proposed lake – some of which is up to 10 km from the lake (see Figure **1**). In our view the outer parts of this zone are unlikely to have a high demand for water from the proposed lake due to:

1) The likely cost of getting water there.
2) The reduced suitability of the land for high value perennial horticulture and also limited potential for annual cash crops such as poppies.
3) In many cases the potential to access water from local streams as winter-take into storage (eg Pipers River area).

The smaller estimate relates to land in the immediate Tamar Valley area (see Figure 2). In our view this is the area most likely to benefit from additional water because of its proximity to the water source, its general suitability for wine grapes and other intensive perennial horticulture, and the more limited alternative supply options.

Table 2: Potentially irrigable land

Land Class	Immediate Tamar Valley	Greater Tamar Valley
	(ha)	(ha)
3	90	90
4	11,340	21,620
4+5		2,880
5	3,740	7,220
Total	**15,170**	**31,810**

Source: Macquarie Franklin – from DPIPWE 1:100,000 1990

The calculated areas exclude forestry, plantations, water bodies, residential areas and reserves. While, on the surface the potential irrigable area is quite large and might indicate a potential water requirement of say 45,000 to 95,000 ML (at an average of 3 ML/ha), in practice the actual land that will require additional water will be substantially less. This is because of factors such as the presence of large numbers of "lifestyle blocks" in the area and, for many farmers, the opportunity to access water from other sources.

The land class system referred to in **Table 2** is largely defined around the suitability of the land for annual cropping. Classes 1 to 3 constitute prime cropping land. There is only a small amount of this in the study area – on the eastern side of the river near Batman Bridge and on the western side above the highway and south of Riverside.

Class 4 land is less suitable for annual cropping but is widely used throughout the state for crops such as cereals and poppies and sometimes for more intensive vegetable and potato crops. In the

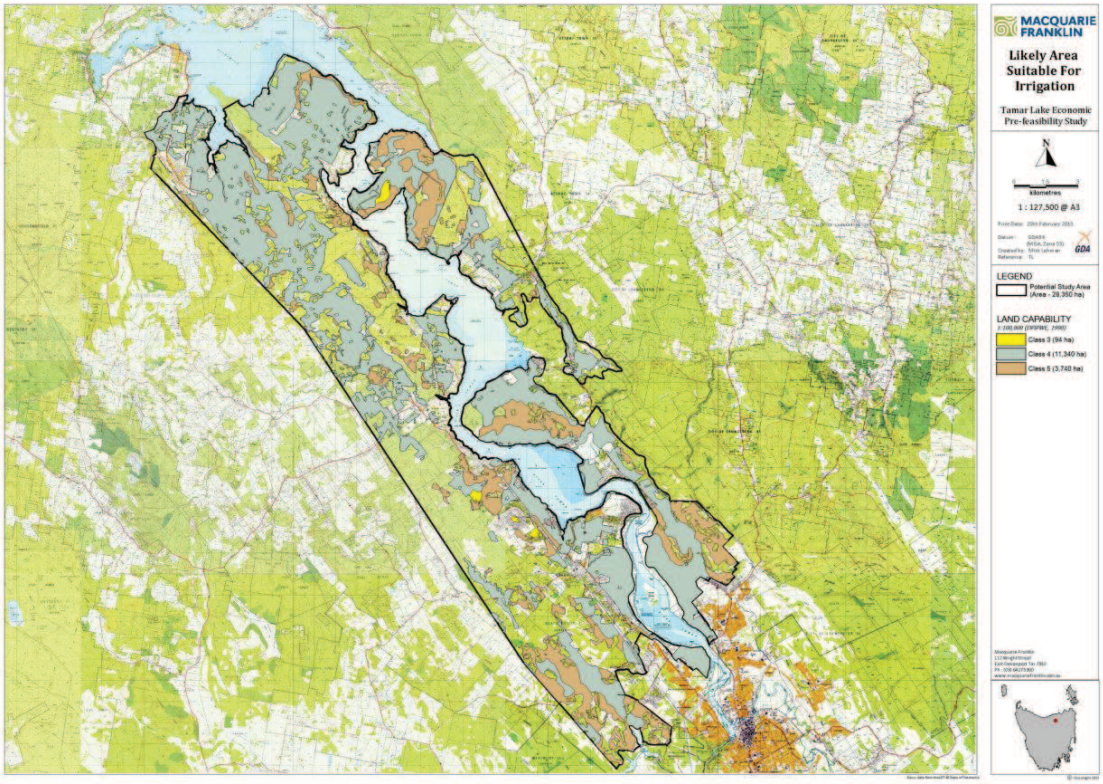
Tamar Valley these soils are often not suitable for cropping because of their shallow clayey nature. In the case of poppies the major companies (Glaxo Smith Kline and Tasmanian Alkaloids) do not view the area favourably because many of the soils do not dry out sufficiently to allow cultivation and planting prior to the end of September.

Class 5 is generally not suitable for annual crops.

Generally Class 3, 4 and 5 land is suitable for irrigated pasture. And, depending on slope, aspect and drainage, it is also possible to undertake perennial horticulture (grapes, cherries, apples) on all three land classes. In the Coal River, for example, grapes tend to be grown on the slopes on relatively poorer soil types because of better drainage and being less prone to frost. In the Tamar Valley also, slope and aspect are likely to be more important in determining the suitable vineyard sites than soils (within reason).

Figure 1 Land Capability – Greater Tamar Valley

Figure 2 Land Capability – Immediate Tamar Valley



3.2. Likely irrigated land

While on the surface there is a large area of land that could potentially be irrigated from the proposed lake uptake is likely to be limited by a number of factors including the following:

1) The large number of small-scale or life-style farmers who are unlikely to be involved in intensive irrigated agriculture.

2) The limited number of larger properties that are currently lacking irrigation water and would be potentially suited to large-scale intensive horticulture – wine grapes, apples, pears, cherries etc.

3) The limited number of dairy farms within a reasonable distance of the river which may require additional water. New conversions from current dryland beef or sheep enterprises to large-scale dairy farms are more likely to occur in areas of the state other than the Tamar Valley.

4) For crops such as poppies and vegetables, the relatively poor soil types of the region from an annual cropping point of view are likely to limit any large scale expansion, particularly when combined with the likely high cost of distribution to a widely spaced group of potential users.

In our view the additional area irrigated is likely to be limited to the "Immediate Tamar Valley" and may only occupy around 10% of the potential irrigable area – say 1,500 hectares. In a more detailed feasibility study this might be confirmed (or otherwise) by:

1) Undertaking a detailed survey of potential users both close to the storage and further away.

2) Assessing current water rights in the area and the potential for additional winter-take into storage.

3) Undertaking irrigation investment studies for various enterprises when the cost of delivery is known with some certainty.

3.3. Irrigation enterprises and water requirements

Table 3 below outlines our assumptions in relation to the enterprises expected to utilise additional water from the proposed storage.

In our opinion perennial horticulture is likely to make up around 50% of the additional 1,500 hectares of irrigated land. This would be largely for additional wine grapes and could mean a doubling of the current area of vineyards in the Tamar Valley. Expansion could potentially occur at around 50 hectares per year over 15 years. At this rate it would constitute a major expansion given that the total Tasmanian area of bearing vines has increased at an average of 67 hectares per annum over the past 18 years – from 283 hectares in 1994 to 1,498 hectares in 2012[1]. Some of the assumed 2,300 ML for perennial horticulture might also be used on current or new apple orchards or additional cherries.

While there is limited poppy growing land within the area it is possible that another 300 hectares of poppies could be grown in the immediate Tamar Valley area. Similarly another 300 hectares of dairy land could be irrigated - including on a current dairy farm at Rowella. Uptake for these enterprises would probably occur at a faster rate than for perennial horticulture, possibly over 5 years.

In Table 3 a further 10% of additional irrigated area has been assumed for "other" possibly higher-value horticultural enterprises. As for perennial horticulture it has been assumed that this would occur gradually over a 15 year period (10 hectares per annum).

Table 3: Irrigation enterprises and water requirements

Enterprise	Area		Water requirement	
	(%)	(ha)	(ML/ha)	(ML)
Perennial horticulture	50%	750	3.0	2,300
Poppies	20%	300	2.5	800
Dairy	20%	300	5.5	1,700
Other	10%	150	3.0	500
Total	**100%**	**1,500**	**3.5**	**5,300**

Source: Macquarie Franklin estimates

4. Enterprise Net Margins

4.1. Introduction

The longer-term demand for water will largely depend on the net margins per ML that can be earned from irrigation farming versus the cost of the water. Estimates of enterprise margins are presented in this Section.

Enterprise net margins are a function of:

1) Enterprise gross margins (income less variable costs)
2) Dryland gross margin foregone
3) Extra farm overheads associated with the increased intensity of the farming operation.
4) Extra irrigation infrastructure required (irrigators, underground mains, power supply, pump stations etc).
5) Extra on-farm capital expenditure for items such as orchard establishment, cool stores, plant and machinery etc, and in the case of perennial horticulture, the time required to reach full production

While net margins are readily determined for annual crops or dairying, perennial horticulture requires a long lead time in terms of capital outlay versus water use and eventual income. For the South East Irrigation Scheme Macquarie Franklin developed 20 year investment models for grapes, apricots and cherries. The investment models took into account:

1) Gross returns – net of packing, commission and freight and taking account the time to develop the land and reach full yields.
2) The timing and value of all capital investment required, assuming a green-field site. This included the cost of sheds, plant and machinery, site preparation, irrigation infrastructure (including on-farm storages), planting material and labour, trellising, picking crates, netting and so on.
3) Enterprise operating costs including fertilisers, tractor and plant operating, irrigation costs (excluding water), packing materials, wages, management allowances, insurances and administration and general overheads.
4) The opportunity cost of existing non-irrigated enterprises.

For the purpose of the economic assessment, these investment models were transferred into enterprise net margins by:

1) First, discounting all revenue capital and annual operating cost streams.
2) Second, transforming the net present values into annuities.
3) Third, expressing the annual revenues and costs as levelised values per ML of actual water use by dividing the annualised revenues and cost by the annualised water use.

4.2. Enterprise net margins

The enterprise net margins used in this pre-feasibility study (Table 4) have been taken from work undertaken by Macquarie Franklin for Tasmanian Irrigation over the past few years - for the proposed South East, Upper Ringarooma and Kindred North Motton Irrigation Schemes. A more accurate determination would require a detailed survey of potential irrigators and their current and proposed irrigation enterprises and capital costs.

Table 4: Irrigated net margins

Enterprise	Weighting	Net Margin
	% water	$/ML
Perennial horticulture	44%	1,700
Poppies	15%	600
Dairy	32%	350
Other	9%	1,000
Weighted Average	**100%**	**1,040**

Source: (1) Dairy & Poppies - Macquarie Franklin Upper Ringarooma and Kindred North Motton Irrigation Scheme Enterprise Mix and Margin Reports for Tasmanian Irrigation (2011)
(2) Perennial horticulture – Macquarie Franklin South East Irrigation Scheme Enterprise Mix and Margin Reports for Tasmanian Irrigation (2011)

5. Agricultural Benefits

5.1. Background

The potential agricultural benefits are based on:

1) Enterprise net margins from Section 4.
2) Assumed water uptake over time.
3) Discounting of water usage times net margins over time to give a present value of future net margins – using a 6% real discount rate.

In determining the total net value no account has been taken of the annual overhead and delivery cost of taking water from the lake to individual farm properties.

5.2. Water uptake

As discussed previously it has been assumed that the perennial horticulture irrigated land and total water requirement is taken up progressively over 15 years. On the other hand it has been assumed that poppy and dairy additional uptake occurs over five years. This is shown in Figure 3 and Figure 4 below

Figure 3 Increase in irrigation area over time

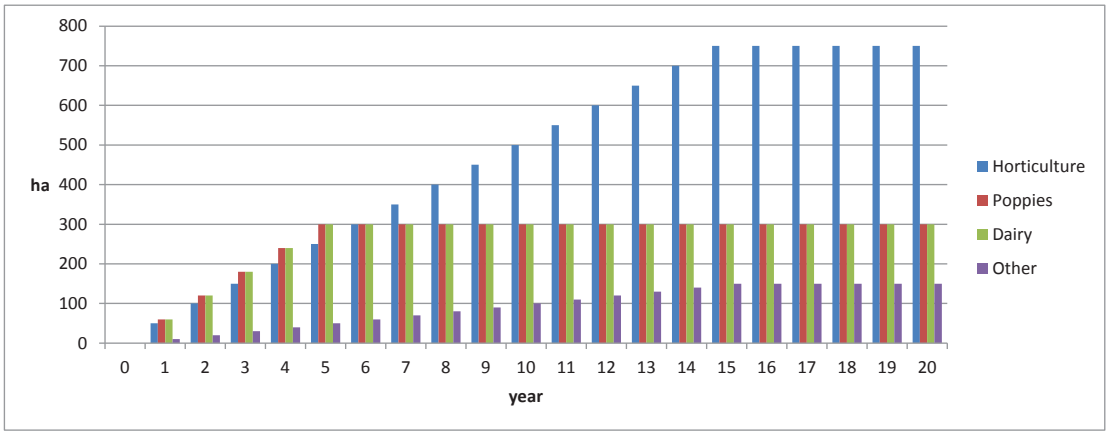
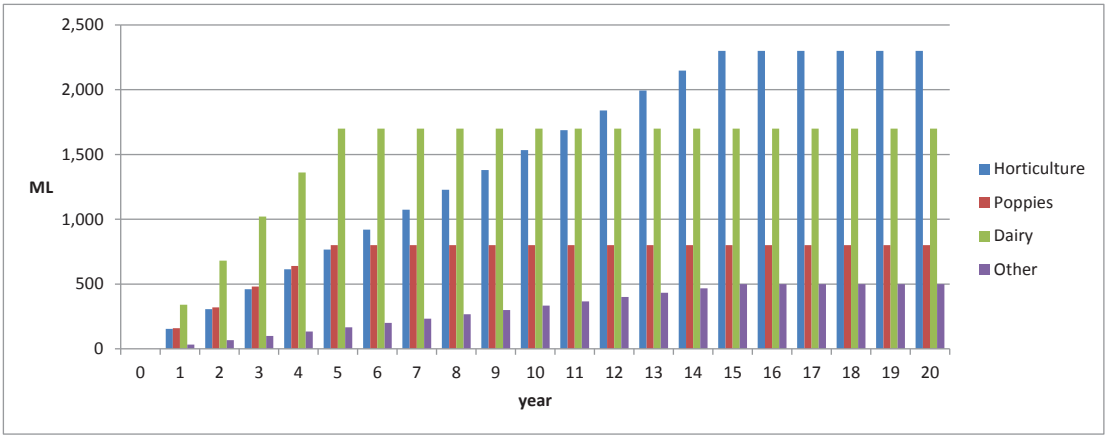


Figure 4 Increase in water usage over time



5.3. Agricultural benefits

The economic benefit of additional farm net margins has been assessed at $37.9 million in present value dollars (**Table 5**). This is before annual overhead and delivery costs associated with the scheme.

Table 5: Economic benefit – present value of additional farm net margins

Enterprise	Economic benefit
	PV$m
Perennial horticulture	24.4
Poppies	4.6
Dairy	5.3
Other	3.1
Total	**37.9**

Macquarie Franklin estimate, 20 years, 6% real discount rate.