

South Esk - Great Lake Aquatic Environment Management Program
August 2003



Hydro Tasmania
the renewable energy business

South Esk - Great Lake Aquatic Environment Management Program

This Document

This document is the outcome of a four-year process in the South Esk – Great Lake catchment undertaken by Hydro Tasmania known as Hydro Tasmania's Water Management Review Program. The aim of this program is sustainable water management, and the South Esk – Great Lake catchment is the first of Tasmania's six major hydro catchments to be reviewed.

This document commences with an overview of Hydro Tasmania and a discussion of Hydro Tasmania's environmental policies and programs. Hydro Tasmania's Water Management Review program is then described, with particular reference to the steps undertaken in the South Esk – Great Lake catchment. Finally, the draft South Esk – Great Lake Aquatic Environment Management Program (AEMP) for Hydro Tasmania's operations is presented.

Hydro Tasmania

The Business

Hydro Tasmania is one of Australia's leading electricity utilities, operating and maintaining Australia's largest and most complex hydro-electric power generating system. Its power system facilities produce in excess of 10,000 GWh annually, and include:

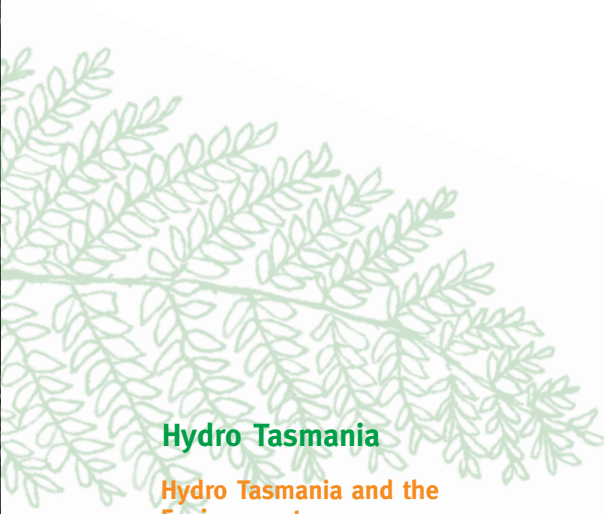
- 27 hydro-electric power stations with outputs of between 1MW and 450MW, and with operating heads of 15 metres up to 835 metres;
- over 50 large dams and numerous other weirs, canals and diversions;
- remote diesel and wind turbine based systems on King Island and a major wind farm at Woolnorth on the north-west coast of Tasmania; and
- a combined oil/gas fired 240MW steam turbine power station at Bell Bay which is used for backup power in times of drought.

Hydro Tasmania is both an electricity generation utility and a significant provider of consulting services. It has gained a wide international reputation for the quality and depth of its engineering, environmental and water management skills and for the systems developed in the investigation, design, construction, operation and management of power facilities.

Hydro Tasmania is a regulated business, with the *Hydro-Electric Corporation Act 1995* and the *Government Business Enterprises Act 1995* providing a statutory framework for its operations. Additionally, Hydro Tasmania is licensed under the *Water Management Act 1999*, and as such must act in a manner consistent with the objectives of this act and associated resource management and environmental protection legislation. Hydro Tasmania as a business strives to go beyond mere compliance in meeting its commitments to sustainability.

Details regarding Hydro Tasmania's generating system and activities, and its capabilities and expertise, can be found on its website at www.hydro.com.au. The policies, programs and reports referred to in this document can also be viewed at this web address.





Hydro Tasmania

Hydro Tasmania and the Environment

In line with changes in community expectations since the 1970s, Hydro Tasmania has endeavoured to minimise the environmental impacts associated with its hydro-electric developments. As well as developing environmental construction guidelines and restoration and revegetation guidelines, Hydro Tasmania has defined pathways to ensure that its activities are environmentally sustainable in the long term.

Hydro Tasmania has developed two interlinked environmental policies that set the direction for its Environmental Management System, described below. These two policies are the Environmental Policy and Aquatic Environmental Policy. The latter was developed in recognition of the fact that water resource management is a core element of this business as a renewable energy generator. Under the Aquatic Environmental Policy, Hydro Tasmania commits amongst other things to responsible environmental management by operating its business in a way that takes into account community views and values, and aims to maintain healthy and functioning aquatic ecosystems. Through this approach, Hydro Tasmania endeavours to effectively comply and cooperate with relevant environmental policies and legislation, and commits to making good water management decisions that are based on open consultation with the community and government organisations as well as on good scientific information.

Each element of these environmental policies leads directly to the setting of annual objectives, targets and performance measures. The policies are supported operationally by standards and procedures in Hydro Tasmania's Environmental Management System (EMS), consistent with the requirements of ISO 14001. The EMS provides a

framework for the systematic evaluation of how Hydro Tasmania's business activities, products and services interact with the environment.

To implement its aquatic environmental policy commitments, Hydro Tasmania has a comprehensive Aquatic Environment Program. Through this program, Hydro Tasmania invests over \$1.5 million annually on activities that move Hydro Tasmania closer towards its goal of managing its water resources in an environmentally sustainable manner. This program incorporates such activities as a Waterway Health Monitoring Program, and the ongoing Water Management Reviews that are described in this document.

Hydro Tasmania's Commitment to Sustainability

Hydro Tasmania's vision is to be 'Tasmania's world-renowned renewable energy business'. Underpinning Hydro Tasmania's activities is a corporate commitment to sustainability and consideration of the triple bottom line.

The World Commission on Environment and Development in 1987 defined sustainable development as that which "meets the needs of the present without compromising the ability of future generations to meet their own needs". Both Hydro Tasmania's Environmental Policy and Aquatic Environmental Policy put sustainable development as the top commitment.

Assessment of the triple bottom line means that profit is not the only bottom line for the business, but equal emphasis is given to business performance in the areas of natural and social environments, i.e. 'People-Planet-Profit'. The Aquatic Environment Program, and most particularly the Water Management Reviews, are major steps in Hydro Tasmania's pathway towards sustainability.

Hydro Tasmania Water Management Reviews

Program Description

The Water Management Review (WMR) program was initiated in 1999 as a mechanism by which Hydro Tasmania would review its environmental performance and identify measures for moving towards more sustainable water management. The program systematically and openly reviews present water management practices in light of their current impacts on the environment, and where warranted identifies and evaluates options that will yield better environmental or social outcomes.

This process is being undertaken on a catchment-by-catchment basis, and was designed at the outset to be consistent with the Department of Primary Industries, Water and Environment (DPIWE) requirements for water management planning, so that outcomes from the WMR could be readily incorporated into broader water management plans developed by DPIWE.

The first catchment to be assessed under Hydro Tasmania's WMR program is the South Esk – Great Lake catchment. The process for this catchment, as with all the WMRs, comprises four stages as follows:

Stage 1 - Information Review

This stage involves documenting Hydro Tasmania infrastructure and operations in the catchment, and identifying known environmental and social issues related to Hydro Tasmania's activities. It culminates in the production of an *Environment Review Report*.

Stage 2 - Community Consultation

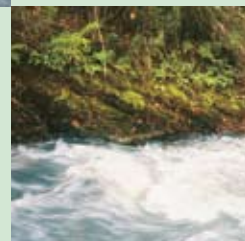
This stage commences with dissemination of and presentations on the Environmental Review document. This is followed by consultation with the community and stakeholder groups to identify concerns and agree on important issues related to Hydro Tasmania water management in the study area. Outcomes from this stage are summarised in a *Community Consultation Report*.

Stage 3 - Technical Studies

This stage involves design and undertaking of comprehensive technical studies, researching the main issues identified and examining the feasibility of different options for their management. The details of these studies and the potential management options identified are presented in a *Scientific Studies Report*. The management options proposed by the studies are then subject to a cost-benefit analysis.

Stage 4 - Program Development

The information from the previous three stages is then used to develop a program that moves Hydro Tasmania forward to its goal of sustainable water management. This program is summarised in an *Aquatic Environment Management Program* document.



Throughout the process, the WMR aims to be open and transparent, allowing for considerable stakeholder review and input. A stakeholder database is maintained, and regular newsletters sent out to keep stakeholders aware of the present status and findings of the program.

The following sections outline the major stages, activities and findings of the first WMR undertaken by Hydro Tasmania; the South Esk – Great Lake WMR.

Map 1



The Poatina Power Scheme utilises water from the Great Lake catchment, Arthurs Lake (originally in the upper Macquarie River sub-catchment), and diversions of the upper Ouse River, the upper Liffey River and Westons Rivulet – upper Brumbys Creek. It consists of three main storages (Great Lake, Arthurs Lake and Lake Augusta), two power stations (Poatina and Tods Corner) and other water diversion and transfer infrastructure. Also associated with the Poatina Power Scheme is Woods Lake, which was enlarged in 1962 to provide irrigation water for landowners on the lower Lake and Macquarie Rivers. The Poatina Power Scheme diverts between 620 and 730 Mm³ per year of Great Lake water from the Derwent catchment, via Poatina Power Station, into the South Esk catchment.

The Trevallyn Power Scheme utilises water from the entire South Esk catchment and re-uses water from the Great Lake catchment that is discharged from Poatina Power Station. The Trevallyn Power Scheme consists of one small storage, Lake Trevallyn, and the Trevallyn Power Station. The majority of water stored in Lake Trevallyn is diverted from Cataract Gorge and discharged into the Tamar Estuary in the vicinity of Home Reach. There is presently a small riparian release from Trevallyn Dam to maintain water flow through Cataract Gorge for aesthetic reasons.

Issues identified in the Environmental Review report fell into the broad categories of water quality, biological condition and threatened species, geomorphological modification and multiple-use. Issues falling into the last category were concerns relating to recreational water use and cultural heritage, and were more fully canvassed during the community consultation phase of the program.

The South Esk - Great Lake Water Management Review

Stage 1 - Information Review

The Environmental Review report described the South Esk – Great Lake catchment, Hydro Tasmania's operations, and known issues. This report served as a starting point for the stakeholder consultation process.

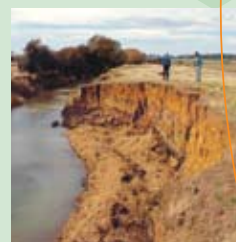
The South Esk Basin is the largest water catchment in Tasmania, covering an area of approximately 8,900 km², which is almost 15% of Tasmania's land area. It is located in the north-east and midlands of Tasmania. Its principal sub-catchments are the South Esk, Macquarie and Meander Rivers. Water from the Great Lake catchment, which lies on Tasmania's Central Plateau, is diverted into the South Esk Basin for the purposes of hydro-electric power generation at the Poatina and Trevallyn Power Schemes. The catchments and hydro-electric infrastructure are shown on Map 1.

Stage 2 – Community Consultation

Targeted consultation and frequent communication with key stakeholders and the wider community has been a cornerstone for the WMR, and has guided the development of options that seek to be both environmentally sound and socially acceptable. While the main avenue for consultation was through stakeholder meetings that were held during the initial stages of the process, several of the technical studies also undertook smaller stakeholder meetings to clarify concerns and make sure research activities were better focused on the issues of concern. A stakeholder database was developed and has 225 listings. An issues survey was sent to those stakeholders who indicated they would participate, and responses summarised in the Community Consultation report. Throughout the process, newsletters have been used to maintain interest in the project and keep stakeholders up to date with program developments.

Concerns raised during stakeholder consultation for the South Esk – Great Lake WMR were wide ranging and covered issues relating to environmental management, threatened species, social and recreational values and water use. The following list illustrates the range of concerns that were identified through both the Environmental Review and Community Consultation stages of the WMR for the catchment:

- Threatened species (Lake Augusta, Great Lake, Arthurs Lake, Woods Lake and Cataract Gorge);
 - Trout fisheries (Lake Augusta, Great Lake, Woods Lake and Arthurs Lake);
 - Recreational use and amenity (Lake Augusta, Great Lake, Arthurs Lake and Cataract Gorge);
 - Stock access and irrigation water use (Lake River, Brumbys Creek and lower Macquarie River);
 - Environmental flows (Lake River and Cataract Gorge);
 - Flooding (Brumbys Creek, Westons Rivulet and lower Macquarie River);
 - Fish migration (Cataract Gorge and Trevallyn Dam); and
 - Estuarine siltation (Tamar River).
- River bank and lake shore erosion (Lake Augusta, Lake River, Brumbys Creek and lower Macquarie River);
 - Water quality (Woods Lake, Lake River, Brumbys Creek and Cataract Gorge);





Stage 3 – Technical Studies

Following examination of the issues identified and stakeholder input for the South Esk – Great Lake catchment, twelve technical studies were developed for this stage of the WMR (see Box). While it was necessary to focus on the key issues for particular waterways in defining the studies, an awareness of additional issues not directly studied was essential so that interlinkages were not neglected.

The approach that was taken for each of the technical studies was uniform to all undertaken under the WMR umbrella. The studies aimed to collect information that would lead to the identification of potential options to manage the issues of concern. Over all studies in the South Esk - Great Lake WMR, a total of 67 options were identified. While the issues, management objectives and options to address the issues of concern varied markedly between technical studies, the basic methodology for investigation involved a standard approach with the following steps:

The 12 Technical Studies for this stage of the WMR:
Lake Augusta
Great Lake
Arthurs Lake
Upper Lake River
Woods Lake
Lower Lake River
Downstream Poatina
Upper Brumbys & Westons Weirs
Trevallyn Spill
Trevallyn Elver Passage
Cataract Gorge
Tamar Siltation

Step 1 – Assessment of issues and current status.

This encompassed general reviews of existing information and liaison with stakeholders, including a detailed look at all stakeholder submissions from the consultation stage that were relevant to the waterway under investigation.

Step 2 – Formulation of study objectives.

This step involved targeted consultation as appropriate to the individual waterway, and included consideration

of the additional information needed to identify potential options for managing the issues of concern.

Step 3 – Data collection and analysis.

This formed the bulk of work in each study, and aimed to obtain sufficient understanding of the issues to be able to develop viable and appropriate management options.

Step 4 – Identification of environmental management options.

This phase of each study aimed to identify and comment on potential options for managing the issues that were investigated. Cost-benefit analyses were undertaken for options identified, to assist in evaluation of options by Hydro Tasmania within its business framework.

Outcomes of the technical studies are provided in full in the Scientific Studies Report, and two-page summaries of each study are also available.

Case Study: Woods Lake

Woods Lake is managed by Hydro Tasmania to provide irrigation water to landowners on the lower Lake River and parts of the Macquarie River. The lake also contains a small but productive recreational trout fishery, and is one of only two water bodies that form the known habitat for the threatened native fish *Galaxias tanycephalus* and *Paragalaxias mesotes*. The main issues for this storage relate to periodic water quality deterioration in the lake and the population status and environmental requirements of the native fish species.

Analysis of water quality and lake level data has shown that high turbidity was related to re-suspension of silt from the lake bed, and that the incidence of these events can be reduced if the level of the

lake is kept above a defined minimum (735.4 mASL). Review of conditions since this minimum level was adopted suggest that it has been effective in improving water quality in the lake, and it was recommended that Hydro Tasmania formally adopt this rule and set in place mechanisms to ensure this minimum level is maintained.

Sampling of native fish in the lake indicated that one species (*Paragalaxias mesotes*) was no longer present in the lake, although healthy populations of *Galaxias tanycephalus* still occur. While habitat surveys suggest that maintaining a minimum lake level of 734.5 mASL will benefit the existing population of *Galaxias tanycephalus*, the principal factors responsible for the decline of *Paragalaxias mesotes* in Woods Lake are still unknown. Significant gaps in knowledge of the ecology and biology of *Paragalaxias mesotes* were identified. Hydro Tasmania recognises the need for additional information and will provide support for further research. Until this knowledge is gained the ability to develop appropriate galaxiid habitat management strategies for Woods Lake is limited.

Case Study: Cataract Gorge

Cataract Gorge is located downstream from Trevallyn Dam on the lower South Esk River, and is one of Launceston's tourist attractions as well as being a popular recreational resource for the city. During environmental review and public consultation, the issues of public use, visual amenity, water quality, environmental flows for the riverine ecosystem and the presence of a threatened freshwater snail (*Beddomeia launcestonensis*) were raised. The technical study focused on collecting

information regarding these issues with the aim of identifying long-term solutions.

The investigations comprised hydrological analysis of flows in the river, detailed surveys of the river to determine riverine habitat under different flows, the collection of data on water quality and the biological health of the river ecosystem, and surveys to determine the distribution and habitat preferences of the threatened freshwater snail. Discussions were also held with local stakeholder representatives, and a trial flow release was made to examine visual amenity issues.

The investigations found that the poor riverine health in this stretch of river could be improved with an increased release of water from Trevallyn Dam. While this would increase the area of habitat that would be available for aquatic biota, it would also provide increased dilution to moderate the impact of pollution entering the river, reduce daytime temperatures in the river that may also be causing stress to aquatic life, and increase the visual amenity of the river for tourists and recreational users. The volume of flow that will be released has also been designed to take into account the use of the Gorge by bathers, who often swim in areas of faster flowing water, and the preference of the threatened freshwater snail for low flows.





Stage 4 – Program Development

The information from the previous three stages was drawn upon to develop the following program to enhance environmentally sustainable water management practices for Hydro Tasmania's operations in the South Esk – Great Lake catchment.

In developing this program, it was necessary for the business to weigh up social and environmental implications of the identified 67 options alongside business economics and power generation requirements. It must be recognised that this process cannot solve all water resource issues, and that Hydro Tasmania in certain cases needed to carefully define the extent of its commitments to ensure ongoing business viability. As a consequence, every study did not lead to a new commitment on the part of the business. However there were many good solutions and improvements that Hydro Tasmania was able to identify through this process, as well as clearer directions for future investigations in its Aquatic Environment Program.

Nine commitments are made by Hydro Tasmania as an outcome of this WMR, and form its Aquatic Environment Management Program for its operations in the South Esk – Great Lake catchment.

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These commitments are in addition to a number of initiatives already taken by Hydro Tasmania, including: maintenance of a minimum flow in the Macquarie River; provision of water in Lake Trevallyn and Cataract Gorge for special events; construction of a redfin perch barrier in Liawenee Canal; weed control, riparian rehabilitation and long-term environmental monitoring in Brumbys Creek; and routine

ecological and water quality monitoring throughout the catchment as part of the Waterway Health Monitoring Program.

The commitments that have been made through the WMR result in an additional cost to the business in the order of two million dollars over the next five years, and are as follows:

- **Lake Augusta** – The key issue focused on in the investigations was dune erosion in relation to lake level fluctuations. The study was unfortunately inconclusive due to an absence of long-term data. In response, *Hydro Tasmania will install instrumentation at Lake Augusta to monitor groundwater movement in relation to lake levels for a three year period, and commits to supporting further investigation of the dune system.*
- **Great Lake** - The investigations focused on the key issue of movement of algal beds in response to water level fluctuations. These beds are habitat for a number of endemic fauna species listed under the Tasmanian *Threatened Species Protection Act 1995*. The concern was that the beds are unable to migrate up and down at a sufficient rate to ensure habitat protection. Investigations showed that not only lake level variations but other factors such as water clarity (affected by turbidity due to long-shore erosion and wind-induced sediment suspension) had an influence on algal bed movement, and these factors are not well enough understood at this stage to define management responses. Faunal relationships also need further understanding. In response, *Hydro Tasmania is committed to support a further five years of research into the Great Lake algal beds and associated faunal relationships.*



- **Arthurs Lake** – The key issues focused on in the investigations were threatened native fish populations and fishing amenity, as this is by far the most popular recreational trout fishery in the State. Native fish studies undertaken during this study found that fish populations in Arthurs Lake are currently healthy and are not threatened by the present lake level management regime. In response to the issues raised, *Hydro Tasmania will endeavour to maintain Arthurs Lake levels above a minimum of 949 metres above sea level particularly during the fishing season.* Hydro Tasmania will be able to maintain

water levels in Arthurs Lake above 949 mASL once Basslink is completed and subject to Great Lake being above 1029.8 mASL. At all other times the system will be operated to avoid where possible allowing the lake to go below this level.



- **Woods Lake** – The key issues are wind-generated sediment re-suspension causing poor water quality, native galaxiid fish species, recreational angling and downstream irrigators. To avoid the lake level being drawn down to depths where turbidity levels have been shown to increase, *Hydro Tasmania commits to maintain the minimum operating level for Woods Lake at 735.4 metres above sea level. Hydro Tasmania will also support further research into native fish species through a University research grant.* Hydro Tasmania as part of this commitment will review its alarm systems for the lake, to ensure that system operators are aware when lake levels are approaching this minimum and adjust system operation accordingly.

- **Brumbys and Westons weirs** – The main issue of concern was flooding in Westons Rivulet when pumps in Westons Weir have insufficient capacity or fail to pump all water diverted from Upper Brumbys Creek into Great Lake. *Hydro Tasmania commits to ensure reliability of the pumps at Westons Weir through a scheduled program of maintenance, and will review its procedures accordingly.*

- **Downstream Poatina Power Station** – Key issues of concern were the impacts of normal power station operations on water levels in Brumbys

Creek and the lower Macquarie River – specifically the impacts on riparian land use and water extraction, erosion of riverbanks, and poor water quality and power station flood rules. The majority of these issues were investigated

in depth as part of studies for the Basslink Integrated Impact Assessment Statement. Basslink was shown in these studies to be likely to exacerbate many of the present concerns downstream of Poatina, and a re-regulation storage was identified as the best option to mitigate these issues. *Hydro Tasmania is committed to construction of a re-regulation storage downstream of Poatina Power Station*, and this storage will address the majority of present concerns raised during the WMR process. The issue of flooding has been reviewed and improvements in communication between local power scheme and operations staff should ensure that local factors are more adequately considered during implementation of the existing flood rules.





- **Spills at Trevallyn Dam** – The main issue of concern was access by irrigators in the South Esk and Macquarie catchments to floodwaters for the purpose of filling on-farm storages, rather than see this water spill over Trevallyn Dam. Hydro Tasmania undertook extensive hydrological analyses and identified the flow conditions that can be used as triggers to allow DPIWE to grant temporary licences to extract water during periods of high flow. *Hydro Tasmania commits to making the timely and appropriate hydrological data available to DPIWE, in order to enable to issue temporary water licences when the Trevallyn Dam is spilling.*

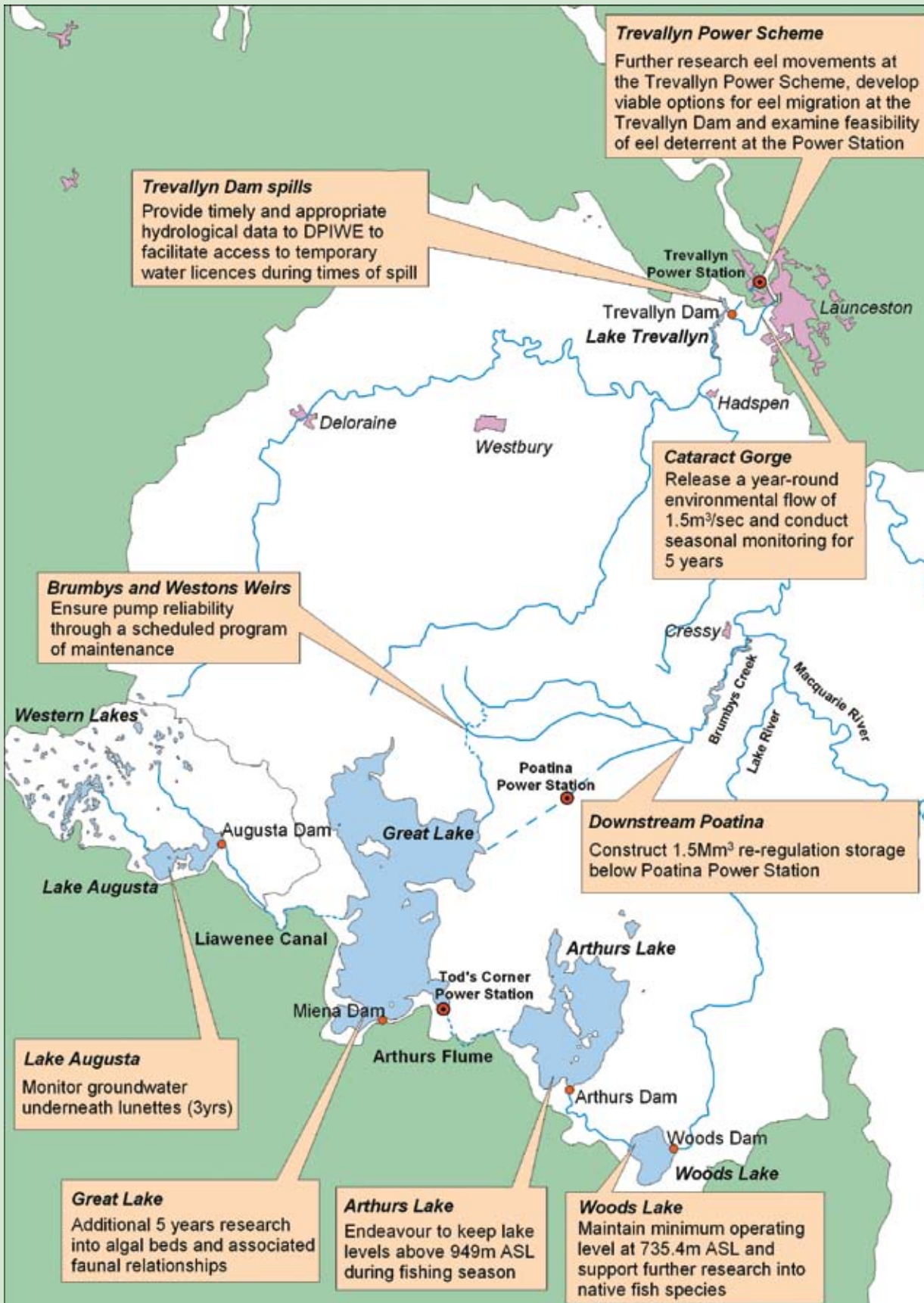
- **Elver Passage at the Trevallyn Power Scheme** – The main issue of concern is that the Trevallyn Dam blocks upstream migration of juvenile eels (elvers) from the sea, and adult eels enter the power station on their downstream migration toward the sea to breed. The investigations looked at a wide range of options, but were unable in the time frame of these investigations to finalise a preferred option to facilitate eel migration. *Hydro Tasmania is committed to further research into eel movements, fate and options at the Trevallyn Power Scheme, to the feasibility of eel deterrent at the Trevallyn Power Station intake, and to continue work towards facilitating eel migration at the Trevallyn Dam.*



- **Environmental Flow at Cataract Gorge** – Key issues at Cataract Gorge were adequacy of the existing environmental flow to meet ecological requirements of aquatic fauna, water quality deterioration during the summer months, and implications of summer minimum flows for public use, amenity and aesthetics. Detailed investigations led to the identification of a range of flows that would meet the needs of the biota, with different species benefiting to a greater or lesser degree depending on the magnitude of the flow. Based on examination of these factors and optimising benefits for community values within the Gorge, *Hydro Tasmania commits to a year-round environmental flow release of 1.5 m³/sec in Cataract Gorge, and seasonal monitoring of the effectiveness of this flow at 3 sites in the river for a five-year period.* This environmental flow commitment is more than three times the present minimum flow in the Gorge. This commitment will improve water quality, reduce human health risks, improve aesthetics and amenity, ensure safe current velocities for swimming, and benefit the aquatic biota including the threatened Cataract Gorge snail (*Beddomeia launcestonensis*).

A summary of the commitments in the South Esk – Great Lake AEMP is provided in Map 2.

Map 2





Conclusion

In conclusion, nine key commitments arise from Hydro Tasmania's Water Management Review in the South Esk – Great Lake catchment. This draft Aquatic Environment Management Plan demonstrates Hydro Tasmania's commitment to sustainability and represents a major step towards this goal. Hydro Tasmania will continue with this process across its other catchments, and in doing so increase its understanding of ecological processes and community values in relation to its water management practices. Commitments to further

research, monitoring and review illustrate Hydro Tasmania's commitment to ongoing assessments of its operations in this catchment. This draft South Esk – Great Lake AEMP demonstrates that the WMR process can result in very positive outcomes for Hydro Tasmania, the environment and the wider community. Whilst 'sustainability' as a final outcome needs to be continually evaluated given changes in ecological understanding and community needs and values, Hydro Tasmania believes that it is the ongoing pathway and commitment to sustainable water management that are the real measures of success.

Following the completion of studies on the other five catchments within the Hydro Tasmania system, the South Esk – Great Lake AEMP will be reviewed, so that the commitment made during this process can be assessed and improved upon in line with Hydro Tasmania's commitment to adaptive environmental management.

Environmental Services Water Management Reviews

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