SUBMISSION NO. 82

SUBMISSION

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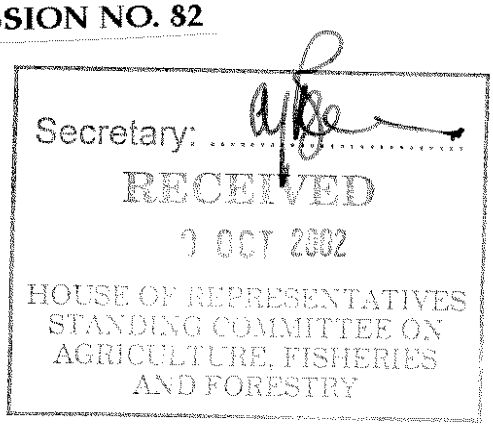

HOUSE OF REPRESENTATIVES

STANDING COMMITTEE ON AGRICULTURE, FISHERIES AND FORESTRY

INQUIRY INTO FUTURE WATER SUPPLIES FOR AUSTRALIA'S RURAL INDUSTRIES AND COMMUNITIES

FROM

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Introduction

Our perspective comes from being:

- Land farmers and residents in the Little Swanport Catchment, which is situated within the two driest regions of Tasmania;
- Marine farmers (aquaculturalists) in the Little Swanport River Estuary;
- Developers of a land-based marine farming enterprise which will draw water from the near coastal environment; and
- Concerned community members.

TERMS OF REFERENCE

Inquiry into the provision of future water supplies for Australia's rural industries and communities.

The role of the Commonwealth in ensuring adequate and sustainable supply of water in rural and regional Australia.

Since the adoption of the concept of 'ecologically sustainable development' (ESD) in the early 1990's the nation's awareness of water being a finite resource has heightened, along with the recognition that all living things and the broader environment are dependent upon it for its life supporting capacity.

What we as a nation have not come to grips with is the pressing need to develop and implement a management framework for natural systems (catchments and their effects as far as they extend into the oceans), and a decision making process taking into account information, hazard analysis, risk assessment and an interacting performance assessment feedback loop.

Recommendation

The Commonwealth government should explore the development of a basic decision making framework.

- Define the over arching decision-maker.
- Build in the capacity to delegate decision-making.
- Set objectives (natural system, regional, state and national).
- Identify the hazards to sustainability.
- Analyse the risks.
- Set priorities.
- Develop and implement solutions (which may include management controls and licence conditions).

It is a fundamental requirement to develop an information base (which within itself should identify the limitations of the knowledge) and a performance assessment system that both feed into each dot point stage above.
Much of this information already exists in various data bases such as the Geographical Information System (GIS), CSIRO, National Land and Water Resources Audit etc. etc.

Such a system will identify gaps in knowledge, risks and priorities towards which limited resources can be directed for the most beneficial uses and results in our collective endeavours to achieve ecologically sustainable development.

Recommendations

- That the Commonwealth government use the Australia State of the Environment (SoE) report (which draws together and summarizes much data from many and varied sources) as the springboard for action to address the problems which affect, inter alia, adequate and sustainable supply of water to Australians.

- That the Federal government legislate to make it mandatory that the SoE Report be acted upon, and legislate to provide the mechanism/s by which such action can be taken, rather than just having the report 'laid on the table' and remaining stagnant.

- That the House of Representatives devise an action plan based on the decision-making framework recommended above.

The subsequent SoE Reports then analyse the performance assessment of the action program, thereby achieving continual improvement toward ESD.

We in the Little Swanport Catchment are attempting to set up such a system through strategic plan development and partnership agreements between the community, local and state governments, with potential linkages to federal government participation.

With such a system in place, the limitations of a particular natural system's water resources would be defined, capped, allocated and managed sustainably in accordance with the climatic variation and different objectives across the regions of the nation.

The effect of Commonwealth policies and programs on current and future water use in rural Australia.

The
- Council of Australian Governments Strategic Framework for Water Reform, linked with the
- National Competition Policy Assessment Framework for Water Reform (the basis for the National Competition Council's assessment of state's compliance against water reform commitments) and
- National Competition Policy payments for progress,

were meant to be the important first steps in changing from the unsustainable practices of the past in regard to water and its use, to instituting water management planning that takes into account the effect of all water use (by agriculture, industry, households and the environment) in a way and at a rate that is sustainable.

Recommendation for Action

That the National Competition Policy National Competition Council's
- assessment processes/scrutiny of actual performance/compliance be tightened considerably and made more stringent, and
- tranche payments be with-held until that actual (rather than theoretical) performance and compliance can be positively demonstrated as meeting progress criteria.

Reasons for the Recommended Action:

- Despite the creation of a *Water Management Act 1999*, Tasmania continues to encourage, facilitate and approve the ad hoc development and use of this state's fresh water resources.
- As yet, no Water Management Plans have been completed in Tasmania, yet approvals for in-stream (for the most part) dams (with the capacity of over 1 megalitre) and their corresponding water allocations have proceeded at a rate of approximately three (3) per week since the commencement of the Act in January 2000.
- Those approvals have been made without the necessary consideration (meeting the requirements of or provision) of water for water dependent ecosystems, particularly estuaries and near coastal environments, and without the necessary consideration of the downstream users/uses dependent on those ecosystems – fisheries - both commercial and recreational, and marine farming/aquaculture.
- Our prolonged struggle to:
  - be recognised as existing and legitimate users of fresh water and the fresh water dependent aquatic (estuarine) ecosystem;
  - be recognised as having embraced 'sustainable development', as opposed to agriculture, and
  - maintain ecological processes, biodiversity and ecosystem function (see our Case Study attached).
- The importance of the natural delivery of water quantity and quality to estuarine and near coastal habitats for fisheries is increasingly being recognised nationally, three examples being for spawning triggers, Ian Halliday's work in Queensland on barramundi recruitment (an FRDC project), and the National Oceans Office recognising (as part of the South East Regional Marine Plan planning process) the significance of catchment impacts on fisheries and ecosystem health.
- We believe that First Ministerial Council (chaired by the Commonwealth) will soon be considering a paper seeking to elevate the importance of estuaries as water dependent ecosystems, and the water requirements to maintain estuarine processes, given that their significance has not been appropriately or sufficiently recognised through the CoAg Water Reforms.
- Despite Tasmania having created a Water for Ecosystems Policy 2001 (on paper), it has not been implemented (as stated by the Minister for Primary Industries, Water and Environment in a letter of 13th June 2002).
- In the same letter the Minister says, in regard to that Policy, that he does not know how many:
  - stressed aquatic ecosystems; and
  - unstressed aquatic ecosystems there are; nor how many
  - dam works applications and/or water allocations have been made, approved or refused on those stressed and unstressed aquatic ecosystems.
- And yet, in the 2002 NCP Assessment Framework for Water Reform at page 23 it says, "Tasmania had 16 stressed surface water systems that required action by June 2001. For all stressed systems, environmental water requirements had been determined and water management plans were well under way."
  This is clearly not the case, as demonstrated by the Minister's own admission in his above-mentioned letter, and to date, there exists only one Draft Water Management Plan.
- Further, under the Water for Ecosystems Policy, only one out of the six cited (National Principles For The Provision of Water For Ecosystems, being part of the CoAG Water Reforms) water dependent aquatic ecosystems has been identified (in-stream area of rivers) and environmental water requirements been determined for them.

- Riparian Vegetation
  Springs
  Wetlands
  Floodplains and
  Estuaries, along with near-coastal ecosystems, in Tasmania have not even been identified as water dependent ecosystems, and consequently their requirements are neither being appropriately considered nor met
- Water Management Branch informs us that:
  -the relevant methodology for identifying *Environmental Water Requirements* is not attached to the Policy, even though the Policy requires it to be;
  -there is no preset level of allocation for our catchment despite the Policy requiring it; and
  -the triggers (that under the Policy must be included) to initiate more detailed investigation once water allocations reach a preset level, are non existent.

Commonwealth policies and programs in rural and regional Australia that could underpin stability of storage and supply of water for domestic consumption and other purposes.

Living in an area of low rainfall that is subject to regular droughts, it is frustrating watching the water level fall in dams through seepage and evaporation, and equally frustrating to discover in a newspaper article (Weekend Australian July 6-7 2002) that since 1970 CSIRO and others have been researching and proving an alternative water storage and recycling method - Aquifer Storage and Recovery (ASR). The article lists the wide variety of services and benefits that ASR (underground dams) can provide:

- harvest city stormwater run-off and save it to irrigate parks, sports ovals, golf courses and gardens during the dry season;
- supplement household water supplies for communities whose natural supply becomes salty or dries out in summer;
- harvest treated urban sewage effluent and improve it to a level safe for watering crops or the urban landscape;
- provide water security to fast-growing suburbs and industry on the outer metropolitan fringe without building new dams or destroying local rivers;
- make saline groundwater irrigable and even drinkable by blending it with fresh water harvested on the surface;
- provide farmers, silviculturists and horticulturalists with a new way to store water without having to construct costly surface dams;
- use surplus water from rare floods in arid regions to recharge natural artesian and fossil aquifers;
- save precious water in hot, arid areas (like the West Australian Goldfields) for re-use by the mineral processing industry or for greening townships;
- save money and infrastructure in water storage;
- reduce water losses from evaporation;
- save environments and productive land that might otherwise be flooded by building a dam.

The article identifies other advantages of subterranean storage, such as its ability to disinfect water, purging it of disease-causing organisms, thereby making it clean enough to recycle for irrigation, stock water, and if properly operated, for drinking supplies.

The CSIRO team leader Dr. Peter Dillon is quoted as saying that aquifers are far more common than good dam sites. The question is, how do we locate these aquifers in a cost-effective manner, and what are the injection and recovery techniques? Can we also marry other energy saving technology such as wind mills and solar/wind power to this robust alternative?

It is apparent that, through CSIRO, Commonwealth monies have been invested in this research.

Recommendation

We recommend that, given the significance of the benefits and services the research promises, a Commonwealth policy and program be developed to deliver the opportunity for implementation of ASR throughout rural and regional Australia.

Commonwealth policies and programs that could address and balance the competing demands on water resources.

Socially, government has facilitated the distribution of wealth to the disadvantaged through allowing 100% taxation deduction of donations to approved charities, a process which means that the whole community shares the burden through foregoing the collection of taxation on what would otherwise be taxable income.

Recommendation

We need a similar, equitable enabling system to facilitate giving back over-allocated resources to the environment that distributes the burden across the community as a whole.

For example, in a catchment that has had its water resources over allocated, and needs the return of water for the environment for ecosystem function, a person should be able to return to the environment an amount of water and be compensated for that at market valuation by an equivalent dollar value taxation deduction, if necessary, spread over a number of years.

This is equally applicable to other natural resource based industries such as fishing, with the need for reduced fishing effort as a result of the creation of Marine Protected Areas. Of course this would require the development of appropriate qualifying criteria such as caps on water take, or in the case of fishing, total allowable catch. Any further adjustments by way of re-allocation through gaining greater knowledge of sustainability of the resource must equally then return a monetary benefit to society.

Recommendation

Another issue that needs to be addressed is that, if primary producers are to be economically, and simultaneously environmentally sustainable, a minimum return to the producer which takes into account the cost of environmental stewardship and duty of care, must be phased in as part of trade practices and as part of the continuing journey of ESD implementation.

CASE STUDY

This case study is presented in light of the:

- The COAG Water Resource Policy, at:

  "4. In relation to water allocations or entitlements:

  (b) where they have not already done so, States, would give priority to formally determining allocations or entitlements to water, including allocations for the environment as a legitimate user of water;

- National Principles For The Provision Of Water For Ecosystems, and,
- the release of the National Competition Council's *2002 National Competition Policy Assessment Framework for Water Reform* (26th February 2002), which notified Tasmania that it will come under scrutiny for compliance with water reforms in regard to (inter alia):
- "*Principle 6 (further allocation of water for any use should only be on the basis that natural ecological processes and biodiversity are sustained).* The Council will examine this principle again when water management plans are in place.
- *Principle 9 (all water users [sic uses] should be managed in a manner that recognises ecological values).* The Council will monitor this issue in future assessments."

Introduction

The world's supply of fresh water is limited. It has been estimated that of all the world's water, 97% is contained in oceans and brackish water, 2% is locked up in ice caps and glaciers, with the remaining 1% being fresh water. That meagre percentage of fresh water (and its life supporting capacities) are currently, world wide, under focus of the highest priority, as to their 'sustainable use and development'.

Australia State of the Environment Report 2001: Inland Waters at page 2 says, "Only 32% of total run-off can feasibly be diverted for human use and typically consists of baseflows and low to moderate flows that are also important for the health of inland (and for that matter, estuarine and near coastal) aquatic ecosystems. Based on the sustainable yields determined for 15 river systems in Australia, on average 20% of Australia's total run-off can be sustainably diverted for human uses." [Our comment in parenthesis.]

Our business and some coastal fisheries rely totally on the health of the water environment in which they are conducted. Our activities, as part of the local marine farming industry have embraced the concept of 'sustainable use and development'. The need for, and availability of sufficient quantities of quality fresh water for the estuarine environment in which we exist are undeniable.
This case study records some of our experience of the past; present and future issues, observations, challenges, effects, benefits and struggles pertaining to fresh water and integrated catchment management in the Little Swanport Catchment.

LITTLE SWANPORT ESTUARY AND THE ANTHROPOGENIC CONNECTION WITH OYSTERS

Oyster Harvesting

As long as 4,500 years ago, humans were harvesting oysters from the Little Swanport Estuary. The Register of the National Estate Database Place Report (registration 25th March 1986) contains the Australian Heritage Commission's "Official Statement of Significance" for Little Swanport, which says:

"This area contains an excavated Aboriginal midden site known as Little Swanport, which is of great scientific and historic importance. It is regarded as a landmark piece of research in Australian prehistoric studies and remains the single most important archaeological site yet excavated in eastern Tasmania. The site dates back to 2500 BC and provides important data about economic organisation and human responses to a changing environment during the Holocene period.

Description
The Little Swanport estuary is one of the largest in eastern Tasmania, and is acknowledged as having perhaps the greatest known concentrations of shell middens in this region. The excavated site has a basal r-c date of 4490 +- 120BP, and its occupation continued until recent times. Analysis of material suggests use as a temporary, primarily estuarine shell fishing camp, to which flaked stone tools were brought already fashioned.

Condition
Some middens have been mined extensively for lime."

(It is interesting to note here that the vast majority of shells still evident in the remaining middens are those of large, mature oysters – a clear indication that the Aboriginals consciously practiced sustainable harvest methods, leaving the immature stock in the water to grow to maturity and breed – natural increase of natural capital – before becoming the target of harvest.)

Lime Works

The lime works were established on a commercial level in 1896/1897, sourcing the shells from middens covering some 80 acres up to 8 feet deep, on the property "Seaford". The lime works operated (with some interruptions) for many years until 1942 when the kilns were used for charcoal production during the Second World War.

Further Oyster Harvesting

During the 1800's wild oysters were harvested in large numbers from the Little Swanport Estuary (then known as Swanport). Parliamentary Report – Fisheries of Tasmania: Report of Royal Commission; 1882, No. 92 Legislative Council (132 House of Assembly) records that 5,235,000 (436,250 dozen) oysters were harvested and brought to market from Little Swanport in one of the best harvest years.

Unfortunately, by the early 1880's, the fishery (Tasmania wide) had become unsustainable and met its demise. The Report of the Royal Commission, 1882 suggested that this decline was due to overfishing, mussel encroachment, disease and inclement weather. Parliamentary Report – Fisheries Inspectors: Reports for 1884; 1885, No. 90 muted that the colonisation and clearing of the land for settlement and agriculture also led to increased silt loads in the rivers and bays which is said to have killed many beds.

Oyster Farming

Lands Department records show that leases (totalling approximately 180 hectares) for oyster farming in the Little Swanport Estuary were applied for (and subsequently granted by that Department) in 1969. The records go on to say that early attempts (during the early 1970's) at spawning mature oysters dumped along the foreshore in the hope of catching spat fall on sticks proved unsuccessful, and those leases were later cancelled. Others were granted in 1978, 1983 and 1986, along with various expansions. During 1985/86, a land-based oyster nursery was also established on the northern bank of the estuary.

Through the Marine Farming Development Planning process begun in 1996 under the umbrella of sustainable development objectives, the oyster farmers in Little Swanport initiated a reduction (by relinquishment and re-location) of 27 hectares (from a total of 86.837 hectares) of lease area allocated in the estuary, (down to 59.837 hectares), to achieve sustainability. This effectively reduced the area of the previously ad hoc allocated natural resource (water) by 31%, instead of an increase as the government proposed, as there was insufficient information or evidence to support an increase in resource allocation, without effecting other users and ecosystem productivity (function). The reduction has established a limit/line beyond which, for further allocation of resource, the proponent would need to prove that any further allocation of resource was, in fact, sustainable. This result has delivered certainty and comfort to government, the community, industry and the environment, and clearly indicates to any proponent, the work necessary to be done before the possibility of a development proposal succeeding.

Management

Through the Great Oyster Bay and Mercury Passage Marine Farming Development Plan October 1998, the leases in the Little Swanport Estuary (inter alia) are subject to:

"Management Controls
Appropriate measures are also required to satisfactorily manage and mitigate any negative effects which the draft plan might have. These measures are included in the requirements set out below.

1. General Controls for all Marine Farming Zones
.....

Shellfish

There must be no unacceptable environmental impact outside the boundary of the marine farming lease area. Relevant environmental parameters must be monitored in accordance with the requirements specified in the relevant marine farming licence.

1.1 Environmental Controls Relating to Carrying Capacity

Shellfish

(i) In all new lease areas used for the intertidal farming of oysters there must not be more than 1 km of stocked racking per hectare of lease area. When racking is next replaced in all existing lease areas used for the intertidal

farming of oysters there must not be more than 1 km of stocked racking per hectare of lease area.

(ii) Containers of oysters in intertidal lease areas must be clear of the seabed and there shall be no layering of containers on the racking.

(iii) In all new lease areas used for deepwater farming of shellfish there must not be more than 1.1 km of effective backbone longline per hectare of lease area. When longlines are next replaced in all existing lease areas used for deepwater farming of shellfish there must not be more than1.1 km of effective backbone longline per hectare of lease area.

(iv) All longlines and associated equipment for filter feeding shellfish must be maintained clear of the seabed.

[It should be noted that natural shellfish beds can and do occur in far greater densities per hectare than can be achieved under these management controls.]

.....

1.2 Environmental Controls Relating to Monitoring

Shellfish

(i) All marine lease areas for shellfish must comply with the Environmental Monitoring Program for shellfish as specified in the relevant marine farming licence.

(ii) Lessees will provide to the Marine Resources Division (DPIWE) estimated numbers or biomass of each species of shellfish, being farmed, in a lease area for which a marine farming licence is held as requested or otherwise on an annual basis.

(iii) Environmental data are to be collected and analysed to specified standards at each shellfish lease area by persons approved and authorised by the Marine Resources Division (DPIWE). The monitoring requirements for collection, reporting and analysis are specified in the relevant marine farming licence.

(iv) For all new lease areas being established, and for all expansions greater than 10% to existing marine farming leases, a baseline survey is required before marine farming operations commence. Assessment of this information will be used to determine future management and monitoring requirements of the area.

(v) For all new lease areas being established, and for all expansions greater than 10% to existing marine farming leases, the composition of benthic communities will be assessed to determine whether the area to be farmed contains any rare and endangered species or any unusual habitat.

(vi) All bivalve shellfish lease areas must comply with the requirements of the Tasmanian Shellfish Quality Assurance Program and with any directions from the Minister of Health and Human Services.

(vii) In areas where the growth rates of shellfish have declined and questions arise over the carrying capacity of a growing area, lessees, when required by Marine Resources Division (DPIWE) to do so, must regularly measure the growth of samples of shellfish and provide results to the Marine Resources Division (DPIWE).

.....

1.3 Chemical Controls

All chemical use must comply with the requirements of the *Agricultural and Veterinary Chemicals (Control of Use) Act 1995.*

1.4 Controls on Waste

Wastes from harvesting or processing of produce from marine lease areas and from the removal of fouling organisms from marine farming structures and equipment such as nets, must be disposed of in a manner that does not affect the ecology of the marine environment or nearby shorelines.

1.5 Disease Controls

(i) Any suspected disease must be notified to the Department of Primary Industries, Water and Environment in accordance with the *Animal Health Act 1995.*
(ii) The lessee shall comply with the appropriate industry health surveillance programs and health control measures.
(iii) Farmed shellfish must not be intentionally released into State waters unless authorised in the relevant marine farming licence.

1.6 Visual Controls

Lessees must ensure that all marine farming structures and equipment on marine farming lease areas conform to the following conditions in order to reduce visual impact as far as practicable:

(i) All buoys, netting and other floating marine farming structures and equipment on the sea must be grey to black in colour, or be any other colour that is specified in the marine farming licence. Existing marine lease areas have five years to conform. All new lease areas must conform immediately on commencement.
(ii) Wherever possible, marine farming structures and equipment must be low in profile and be of a uniform size and shape. Existing marine lease areas have five years to conform. All new marine lease areas must conform immediately on commencement.
(iii) Posts on each section of racking on intertidal lease areas must be trimmed to be of consistent height.
(iv) Row markers on intertidal lease areas are to be trimmed to be of consistent height.
(v) Redundant or dilapidated marine farming structures and equipment must be removed from the lease area at the request of the Secretary (DPIWE). The lease area must be kept neat and tidy in a manner required by the Secretary (DPIWE).
(vi) Floating storage huts, grading facilities and shelters must not be located within a lease area unless authorised under the relevant marine farming licence.
(vii) Care is to be taken with the aiming and brightness of security and spot lights so as not to cause unnecessarily adverse effects on the amenity of residential properties.

(viii) Where possible lights are to be shielded from all but essential directions. Spot lights must be positioned as high above the water as practicable to maximise penetration and minimise reflection.

(ix) The general flood lighting of areas is discouraged except in emergency situations. Bright lights must not be shone seaward so that they interfere with navigation.

(x) Anchors and mooring lines that extend outside the lease area must be at least 5 m below the surface at the boundary of the lease area.

1.7 Access Controls

(i) Lessees must mark the external boundaries of the lease area in whatever manner is required by the Secretary (DPIWE) and by the relevant authority under the provisions of the *Marine Act 1976.*

(ii) Lessees must identify the lease area in a manner specified by the Secretary (DPIWE).

1.8 Other Controls

(i) Lessees must comply with any other Act or regulations that may affect the lease area or the marine farming operations in that lease area.

(ii) Lessees must ensure that marine farming operations meet the Department of Primary Industries, Water and Environment guidelines on noise levels, as required under the *Environmental Management and Pollution Control Act 1994.*

(iii) If any part or parts of marine farming structures or equipment break away from the lease area, lessees must take action as soon as reasonably possible to return the marine farming structures and equipment to the lease area, to secure the marine farming structures and equipment and to tidy up any area affected by the debris.

(iv) Lessees must ensure any predator control of protected species is conducted with the approval of the Parks and Wildlife Service of the Department of Primary Industries, Water and Environment.

(v) Lessees must permit the Minister, or persons authorised by the Minister, to enter into and inspect the lease area at all reasonable times.

(vi) Lessees must comply with all lawful written requirements of the Minister."

Licence conditions, reviewed annually after annual marine farm inspections allow for the imposition of further controls relative to performance and monitoring.

Further to all of the above controls, if a marine farming licence holder commits prescribed offences to the extent that demerit points are accrued (by penalty) to the sum of 200 or more over a period of 5 years, the licence holder loses their farm (under the provisions of the *Marine Farming Planning Act 1995* and the *Living Marine Resources Management Act 1995*).

Sustainability

In that way, and at that rate of management and planning, oyster farming in the Little Swanport Estuary has been developed in a sustainable manner simultaneously with protecting the natural and physical resources on which it relies.
That is, other than the fresh water component of the estuary and other catchment management practices/impacts which gravitate to the estuary, and over both of which it has no control.

Balance – Benefits v Detriments

The Food and Agriculture Organisation of the United Nations (FAO), which reviews and updates 'aquaculture' regularly, in 1995 stated, on environmental impacts, "In recent years, concern about the environmental impacts of aquaculture has become a major issue. Aquaculture has both detrimental and beneficial effects. Detrimental effects have been demonstrated in a number of well documented cases, but the range and severity of the negative impacts of aquaculture may have become exaggerated, possibly due to the high visibility of the sector. Failure to distinguish between actual and hypothetical hazards, inadequate coverage of its beneficial impacts and/or the impacts of the environment (other user effects) on it (aquaculture). This has some times resulted in bad publicity for the industry and scepticism about its potential.....

The impact of aquaculture on the environment is not all negative. Extensive aquaculture can prevent eutrophication by removing nutrients....."

A mounting body of scientific evidence states that marine farming of filter feeding shellfish can assist in mitigating the adverse impacts that land based activities cause (elevated and/or excess nutrients).

"The literature on the role of bivalve molluscs in estuarine ecosystems shows that they are an essential part of healthy estuaries around the world" (Gottlieb, S.J. and Mona Schweighofer, 1996).

The farming of oysters in the Little Swanport Estuary has replaced the natural filtering function lost with the decimation (without recovery) of the native oyster population in this estuary (covered previously)

The significance of the loss of this natural filtering function is best illustrated by Newell's study of Chesapeake Bay, U.S.A., where the native oyster population was also devastated by overfishing, siltation and disease. "He determined that prior to major harvesting (pre 1870), oysters theoritically filtered the entire water column in 3.3 days, while in 1988 the turnover time would have been 325 days." (Gottlieb, S.T. and Schweighofer, M.E. 1996). The same researchers concluded, "revitalisation of a bivalve population is imperative to the restoration of ecosystem function."

North Carolina Blue Ribbon Advisory Council on Oysters 1995 *"Findings on Ecology"* state, "Shellfish mariculture is an estuarine activity initiated by humans that improves the natural environment and its water quality. Important ecological functions of maricultured oysters such as fishery nursery habitat and natural water filtration have beneficial effects on the surrounding marine environment but are not officially recognised by the State as public benefits. The public is not well educated about these benefits."

Some American States have gone one step further and enshrined in legislation statements such as (or similar to), "The legislature finds and declares that it is in the interest of the people of the State that the practice of (oyster) mariculture be encouraged

in order to provide increased seafood supplies, expand employment, promote economic activity, enhance water quality, increase natural fishery resources for commercial and recreational fishing and better use the public trust resource of the State."

Quality Management

Tasmanian Shellfish Quality Assurance Program (TSQAP)

TSQAP is a Water Quality Based Surveillance Program. Under the program/management plan, when water quality/conditions are unsuitable for the safe harvest of shellfish for human consumption, the shellfish farms are closed (prohibited from harvesting).

The human health/food safety aspects of shellfish farmed in Little Swanport are managed under the TSQAP administered by the Department of Health and Human Services (DHHS), the majority of the costs of the program being funded by marine farmers. TSQAP is a world best practices program subject to continual review, recognised internationally as meeting export/import standards, and is based on the United States Food and Drug Administration (USFDA)/Canadian program.

The program has been in operation since the mid 1980's in the Little Swanport Estuary. There has been no case of human sickness from the consumption of freshly harvested Tasmanian shellfish recorded by DHHS Tasmania (pers. comm. Ray Brown, Manager TSQAP).

A Brief Description of TSQAP

DESCRIPTION OF HARVESTING AREA
- Location map
- Description of area
- Harvesting practices
- History of harvesting area classification
  - *Date of last survey*
  - *Previous classification/maps*

POLLUTION SOURCE SURVEY
- Summary of sources and location
  - *Map*
  - *Table of pollution sources cross referenced to map*
- Identification and evaluation of pollution sources
  - *Domestic wastes*
  - *Storm water*
  - *Agricultural waste*
  - *Wildlife areas*
  - *Industrial wastes*

HYDROGRAPHIC AND METEOROLOGICAL CHARACTERISTICS
- Tides
  - *Type*
  - *Amplitude*
- Rainfall
  - *Amount*
  - *Seasonality*
  - *Frequency*
- Salinity
  - *Normal range*

Variation
Link to rainfall
Winds
Seasonality
Effects on dispersion
River discharges
Volumes
Seasonality
SUMMARY DISCUSSION CONCERNING ACTUAL OR POTENTIAL EFFECTS ON TRANSPORT OF POLLUTION TO THE HARVEST AREA
WATER QUALITY STUDIES
Map of sampling stations
Sampling plan and justification
Sample data analysis and presentation
Tables
Graphs
INTERPRETATION OF DATA IN DETERMINING CLASSIFICATION
Inter-relationships between environmental factors and bacterial loading
Tides
Rainfall
Salinity
Winds
River discharges
CONCLUSIONS
Classification maps with closure lines
Management plan
Recommendations

Pacific Oyster Health Surveillance Program

Tasmanian oyster culture depends on shellfish movement. Brood stock is obtained from local waters, spat is hatchery-reared then distributed through nurseries to farms throughout the state, and part grown stock is transferred between farming areas for on-growing and finishing.

In these circumstances no oyster farm is isolated from others. It was recognised that a previously unidentified disease on one farm or in a hatchery, or the incursion of and exotic disease, could affect the whole Tasmanian industry. A continuing surveillance program was therefore considered essential to monitor oyster health on a state wide basis and to ensure a rapid diagnostic and management response to any unusual mortality.

In 1994 a program was trialed, developed and is ongoing, and is principally funded by industry. It is a co-operative program between industry (through the Tasmanian Oyster Research Council) and the Fish Health Unit of DPIWE at Mount Pleasant. It is formalised through a Heads of Agreement between TORC and DPIWE.

Quality Management System

Currently, a Tasmanian Shellfish Quality Management System program with third party audit is being developed and trialed by Tasmanian shellfish growers to consolidate existing systems, to provide a means of certifying standards of Tasmanian shellfish growers, and to work towards the vision of,

"To be the leader in the Australian shellfish industry, recognised for the quality and safety of our product, our sustainable management practices and our customer service."

One company operating in the Little Swanport Estuary has already received accreditation and certification of their management system under this trial.

Benefits to the State and Beyond from Oyster Farming in the Little Swanport Estuary

With the advent of the successful hatchery breeding of oyster spat came the need for land-based nursery facilities to on-grow the hatchery spat to a size suitable for sale to oyster farmers. After extensive trials throughout the State by government and industry (through Shellfish Culture Pty. Ltd. – the hatchery company) to find the best site for such facilities, the location on the shore of the Little Swanport Estuary proved itself to be superior to other sites in terms of the baby oysters thriving (growth rates/water quality). As a result, in late 1985 Shellfish Culture's permanent land-based nursery was established on Crown land approximately 3.5 kilometres upstream of the mouth of the estuary on the northern shore.

- This nursery and its associated lease and sub-lease near the mouth of the estuary, can rightfully be described as the cornerstone of both the Tasmanian and South Australian oyster farming industries, which together had a farm gate value of $25,500,000 for the fiscal year 2000/2001 (ABARE).

- Shellfish Culture Ltd. (previously Pty. Ltd.) provides upwards of 70% of the annual spat requirements of both the Tasmanian and South Australian oyster farming industries.

- All of that spat, prior to being forwarded to the farmers, spends varying periods of time growing both in the land-based nursery and on the nursery leases in the Little Swanport Estuary.

- Southern Cross Marine Culture grows oysters from spat to plate size on their Little Swanport lease, and provisions their 5 other farms throughout the State with partly grown stock from that farm.

- Oyster Bay Oysters Pty. Ltd. grows oysters from spat to plate size on their two Little Swanport leases, and encompasses Shellfish Culture's nursery sub-lease.

- The oyster farms in the Little Swanport Estuary produce gross returns of approximately $31,500 per hectare per annum, which equates to (in round figures) $1,500,000 feeding back into the community each year, one way or another (consumables, services, wages, rates, rents, taxes, transport, freight etc.).

- Collectively, the oyster farming operations in Little Swanport have traditionally employed 17 to 20 people.

- Given also the structure of the companies mentioned above, the multiplier effect of the benefits into other regions, including interstate, is obvious and significant.

- Oyster farming operations at Little Swanport and/or the estuary itself, have been and continue to be the subject of:

  - scientific studies and publications,

- theses for Ph. D.'s,
- numerous international television documentaries and magazine articles done by various countries,
- national television documentaries,
- food and tourism promotions – films, magazines and posters,
- media releases, and
- scrutiny by international, interstate, state and federal politicians and bureaucrats either searching for or showing off a prime example of how sustainable development works legislatively and on the ground,
- visits by international, national and state business persons and chefs, and
- accommodates work experience students.

As a result of all those people visiting the area, there are other obvious regional spin-offs such as the injection of 'outside' dollars with money spent on accommodation, food and beverages, car hire, fuel, souvenirs and mementos etc., and free word of mouth promotion for the state.

Other local social/community and environmental benefits which stem from the presence of oyster farming in the estuary include improved navigational markers, estuary clean ups, rescue of boats and those in trouble with boating mishaps.

The Strategy for the Management of Rice Grass in Tasmania was initiated, developed and put into practice as a result of environmental observations in the Little Swanport Estuary. Rice grass is a purposely introduced, vigorous and invasive saltmarsh and intertidal zone weed which, left unchecked and with the right environmental conditions, had the capacity to trap silt and 'reclaim' in excess of one third of the estuary. This would have resulted in a dramatic alteration to the hydrology of the estuary, affecting the volume of water and its exchange in the estuary, the delivery and cycling of nutrients, and a dramatic change in the ecology. The area based management objective of eradication of this weed from the little Swanport Estuary is close to being realised. The Strategy is recognised as 'world's best practice' and is being copied in other countries after internationally acclaimed scientists and researchers visited Little Swanport to investigate its conception and success.

The Tasmanian Rice Grass Advisory Group (chaired by a Little Swanport Catchment community member) was recognised for its initiative and excellence in developing and implementing the Strategy to deal with a complex water resource management issue, in winning the Australian Water Association Tasmanian Water Environment Merit Award 2000/2001.

All this was made possible through the drive of the local community, the willingness of the State government to cross/erase boundaries of responsibility and allow true integration of planning and management, and considerable funding through the Commonwealth government's NHT processes.

The on ground outcome of the elimination of rice grass infestations throughout the Little Swanport Estuary (totalling 10 hectares), has allowed the return of water birds, fish, crustaceans etc., to those previously infested areas. This is a great source of pride and enjoyment to those involved, and is the motivating force behind the necessary monitoring program in place to locate any future isolated plants.

LOCAL KNOWLEDGE BASED ON MANY YEARS OF OBSERVATION

Since establishing a permanent presence in and on the shores of the Little Swanport Estuary (through the acquisition of Marine Farming Lease 52 for the purpose of oyster farming, and land for the land-based operations of that farm) in 1983, we have witnessed a gradual change in the estuary from a predominantly estuarine ecology, to an ecology which is markedly influenced for the majority of years by marine incursions.

Oysters filter feed on naturally occurring microscopic organisms and detritus, and cannot be fed with supplements. Therefore, to be a successful oyster farmer, one has to observe the variations within and without the estuary, and within and between seasons to establish a greater degree of predictability of unit productivity, sustainability and economic security.

Our observations over many years of oyster farming have linked the estuarine change directly to decreasing fresh water availability from the catchment to the estuary, for one reason or another. This link will be further explained throughout this document.

Allowing this trend to continue is a direct threat to the integrity of the whole estuarine system (chemical, physical and biological properties), and clearly not sustainable. This threat is of great concern, as estuaries are significant in terms of their economic, social and environmental value.

Defining an Estuary

One dictionary (Funk and Wagnalls) definition of an estuary is, "The wide mouth of a river where it is met and invaded by the sea, especially in a depression of the coast."
The United States Environmental Protection Agency describes an estuary as being a partially enclosed coastal body of water where fresh water from the land measurably dilutes salt water from the ocean. This mixture of water types creates a unique environment that is critical for the survival of many species of fish, birds, and other wildlife. They provide safe spawning grounds and nurseries for fish and shellfish, ideal nesting, resting and refuelling places for endemic and migratory birds, and habitat for many reptiles, amphibians and mammals. Marshes and other wetlands, which often fringe estuaries, protect marine life and water quality by filtering sediment and pollution from upstream sources. Estuaries also create natural protection to coasts and shorelines from damaging storm waves and floods.

The recently (March 19th 2002) released Australia State of the Environment (Report) 2001 states (at p. 21, Coasts and Oceans),
"A current National Land and Water Resources Audit project (Commonwealth of Australia 2001a) is assessing the condition of all Australian estuaries and will provide management recommendations for estuaries. The project is being undertaken because there has been very little focus on environmental aspects of estuaries in the past. For example, there is no nationally acceptable definition of 'estuary'."

The Little Swanport Estuary has been classified as a,
"Class C. (estuary) *Moderate conservation significance* (34 estuaries) – Estuary and associated catchment area are affected by human habitation and land clearance, but have not been badly degraded. Class C estuaries should be made available for a variety of recreational and commercial purposes."
(Edgar, G. *et al.*, 1999).

The processes of estuary hydrodynamics are complex and affected by changes in flow regime with (nutrient through fine sediments, silt, mud) deposition being determined by floculation processes, which are related to salt water intrusions, chemical reactions at the interface between fresh and saline waters, and mixing of fresh and saline water. These factors can be affected by changes in estuary hydrodynamics and freshwater inputs. (after Brizga *et al.*, 2000.)

"Difficulties in identifying biological consequences of human activities are not confined to the effects of increased siltation within estuaries. The effects of changes to the hydrological regime that follow upstream developments are also extremely difficult to quantify without data collected prior to development. Although little information exists on the effects of dams on estuarine ecosystems in Australia, overseas experience suggests that dams and water diversions can cause the decline of some coastal fisheries, and ecosystems may change substantially as a consequence of reduced freshwater flows (Adam *et al.*, 1992; Schlacher and Wooldridge, 1996a). These effects are largely mediated by changes to oxygen and nutrient levels, turbidity, estuarine flushing rates, water temperatures, heavy metal and H_2S loadings, breeding stimuli such as flood flows, and by restriction on movement of diadromic species (Kennish, 1992).
The majority of anthropogenic threats, including land clearance (Brodie, 1995), dam construction (Rosenburg *etal.*, 1995), siltation (Newcombe & Jensen, 1996), eutrophication (McComb & Lukatelich, 1986; Lavery et al., 1991; Cloern, 1996), foreshore development(Whitfield, 1986), dredging (van Dolah *et al.*, 1984), mining (Adam *et al.*, 1992) and marine farming (Ritz *et al.*, 1989; DeFur & Rader, 1995; Grant *et al.*, 1995; Tsutsumi, 1995), affects individual estuaries and can be controlled by changing management practices." (G. Edgar et al., 1999).

Natural Variations and Predictions of Rainfall

The Little Swanport catchment falls within an area covering the two lowest rainfall areas in Tasmania (Bureau of Meteorology, Average Annual Rainfall 1961 to 1990), with the majority of rainfall being generated from an easterly weather pattern.

To enable us to study and establish rainfall patterns in the catchment over an extended period, the Weather Bureau selected five stations (Buckland, Little Swanport, Orford South, Ravensdale and Triabunna – all influenced by easterly weather patterns) with sufficient long term data to produce findings. All these stations reveal a trend towards a lower than mean rainfall since 1970. This trend is compatible with the findings of (Associate Professor) Manuel Nunez's study,."Tasmanian Precipitation: A global change perspective" (School of Geography and Environmental Studies, University of Tasmania), which incorporated Bureau of Meteorology data, CSIRO models for Forecasts for Precipitation, Forecasts of Air Temperature for the Australian Region for the years 2030 and 2070, and the General Circulation Output Run. The conclusion reached for the east coast of Tasmania (including Little Swanport catchment) was, "Clear long term drop in yearly rainfall." (See attachment 2.)

Correlation Between Lack of Fresh Water Input to the Little Swanport Estuary and Less Than Optimum Estuarine Environmental and Oyster Farming Conditions

Through our normal activities of marine farming in this estuary, we have experienced two extended periods (1989 to 1992 and 1997 to 2000) when we observed the incursion of marine species (scallops, juvenile crayfish, sea urchins, sea anemones, large octopi, oceanic crabs etc.) in the estuary, e.g. scallops near our boat ramp, which is approximately 4.5 kilometres upstream from the river mouth. Those periods correspond

with periods of low fresh water flow/availability to the estuary, and further correspond directly with our experiencing low unit productivity on the oyster farms.

We have graphed (see attachment 1) the rainfall data from the Bureau of Meteorology's records (from the 5 previously named stations) to give their combined average annual rainfall for the years 1970 to 2001 (shown in the vertical in blue and red).

Given that 1989 corresponded with:

- low unit productivity on the oyster farms, indicating estuarine environmental stresses,
- marine incursions into the estuary,
- lower rainfall (538.2mm) than the mean (629.9mm), (a difference of 91.7mm), and was
- a year for which flow data for the Little Swanport River was recorded,

the average rainfall (538.2mm) across the five stations for that year (1989) was chosen as an indicative start point to demonstrate the relationship between and recurrence of estuarine stress levels, low unit productivity on the oyster farms, and lack of fresh water input (environmental flow) to the estuary.

On the graph, red with no blue above represents a 'poor' (less than optimum) year for the estuarine environment with regard to fresh water and nutrient
input, and red with blue above it represents 'good' years.
It should be noted here that the terminologies 'poor' and 'good' are derived from our observations over many years, along with data collected and correlated by us. They are not claimed to be absolutely categoric or scientifically proven.

Equally, it also needs to be said that it is widely recognised that the scientific community cannot at present identify with any accuracy, the fresh water requirements for estuarine ecosystems and their processes and functioning, albeit that estuaries are identified as important fresh water dependent ecosystems.

Our graph is merely meant to demonstrate clear trends that have emerged over time.

The eighteen (18) year period from 1972 to 1989 on the graph, and for which period stream flows were recorded for the Little Swanport River show that:

- 6 out of 18 years were 'poor', (or put other ways)
- one could expect that, on average, 1 year in every 3 years would be 'poor', or
- there was a 33% chance of any one year being 'poor'.

The twelve (12) year period from 1990 to 2001 on the graph shows that:

- 7 out of the12 years were 'poor', or
- one could expect that, on average, 1 year in every 1.71 years would be 'poor',or
- or there was a 58% chance of any one year being 'poor'.

These examples clearly demonstrate a deterioration in the fresh water availability for ecological water requirements for the estuarine ecosystem, which would indicate that the estuary may have already 'progressed' to a point where it is at an unacceptable level of risk, and which is contrary to the National Principles For The Provision Of Water For Ecosystems 1996, and the Draft Revised Principles of November 2001 .

We suggest that the reasons for this deterioration would include the historic decrease in rainfall, which decrease is predicted to continue (both previously identified), and the

proliferation of water takes (dams and other extractions) over time, or put another way, the cumulative effects of all water takes from the catchment.

Knowledge of Actual Taking of Water From the Little Swanport Catchment Water Resource

In order to be able to make meaningful representation/comment in response to the advertisements re four (4) in-stream dam permit/water licence applications (which would dam off approximately 20% of the Little Swanport River catchment), we needed to update our knowledge of the total existing taking of water, to be able to reasonably assess what impacts the proposed increase in that taking, and the dams may have on the fresh water ecosystem/environmental needs of both the Little Swanport River and the Little Swanport Estuary.

The *Water Management Act 1999* defines 'taking' and 'dam' as follows:

"taking", in the case of water from a water resource, includes –

(a) taking water by pumping or syphoning the water; and
(b) stopping, impeding or diverting the flow of water over land (whether in a watercourse or not) for the purpose of collecting or storing the water; and
(c) diverting the flow of water in a watercourse from the watercourse; and
(d) releasing water from a lake; and
(e) permitting water to flow under natural pressure from a well, unless the water is flowing from a natural opening in the ground that gives access to ground water; and
(f) permitting stock to drink from a water course, a natural or artificial lake, a dam or reservoir;

"dam" means a permanent or temporary structure, the main purpose of which is the storage or holding back of water and includes –

(a) any spillway or similar works for passing water around or over the structure; and
(b) a pipe or similar works for passing water through or over the structure; and
(c) water stored or held back by the structure and the area covered by that water –

but does not include –

(d) associated works used in the generation of electricity; or
(e) a tank, reservoir or pool unless –
    (i) the storage of water involves flooding natural ground; or
    (ii) the tank, reservoir or pool is on a water course;

Our search for current information re the above began with:

1. A request of the Water Management Branch DPIWE, for the number of existing dams in the Little Swanport Catchment. They replied by supplying:

- one sheet of information headed "Dams Listed as Existing in the Little Swanport Catchment", which listed eighteen (18) dams with a total capacity of 254 megalitres, and
- another sheet headed "Dams Listed as Proposed in the Little Swanport Catchment", which listed eleven (11) proposed dams with a proposed capacity of 1500 megalitres.

2. A request for a list of the existing licences to take fresh water from the Little Swanport Catchment. They forwarded:

- Copies of "WIMS Register pages for Little Swanport and tributaries showing water allocations within the catchment", which shows a total of 2535.5 megalitres having been allocated for irrigation purposes.

3. On procuring and viewing the DPIWE Report Series WRA 01/ December 2001 titled "Environmental Water Requirements for The Little Swanport River", we found that it states:

- "There are currently 26 licensed on-stream dams within the catchment and a further 6 proposed dams (2 off-stream and 4 on-stream)", and further,
- "Water usage within the catchment includes riparian (stock and domestic) and irrigation for agricultural purposes. Annual water takes for riparian and irrigation purposes total 2866 megalitres of which 2644 megalitres is for winter storage (May to October) and the remainder (222ML) for stock and domestic purposes.

4. We counted the number of dams and impoundments shown on the 1:25000 series maps for the Little Swanport Catchment (some dated 1985, and some dated 1992), and found a total of 1158.
5. From our local knowledge we knew that there had been a proliferation of dams since 1985 and 1992, so the number of impoundments would in fact be considerably more than the 1158 shown.
6. We conducted a check survey (by personal observation from a helicopter) to update the number (from those shown on the 1:25,000 series maps) of impoundments in the Little Swanport Catchment, for a developed area we are familiar with, and within a 7 kilometre radius of the Little Swanport Estuary.

- Within that 7 kilometre radius we observed that an extra 56 dams had been constructed (over and above those shown on the maps), five (5) of which appeared to be of a capacity greater than one megalitre, with some of those appearing to be of capacities in the tens of megalitres, and none of which are cited on the aforementioned lists.
- We have not established whether or not this observed increase is consistent across other developed areas of the catchment.

7. From the above we make the observation that the actual total taking of water from the catchment is:
    - not really known,
    - not readily identifiable,
    - nor easily calculated,

and that certainly does not provide a reasonable (fair and orderly) basis from which well balanced water management decisions can be made, particularly in regard to the mandatory taking into account of the water needs of water dependent ecosystems, and ascertaining effects on other users, as per Section 8, subsection (2) of the *Water Management Act 1999,*

"When making a decision under this Act that is based wholly or partly on an assessment of the quantity of water available or the period or periods during which water is available from a water resource, the Minister must take into account –

(a) the needs of the ecosystems that depend on that water resource for water; and

(b) any effect that the decision may have on the commercial operations of major users of water from that water resource".

To gauge what has happened throughout the state in regard to new dam constructions since the commencement of the *Water Management Act 1999* (1st January, 2000), we asked the following questions of the Water Management Branch, DPIWE:

"Would you please furnish the following information:

Under the *Water Management Act 1999*, how many dam applications have been approved/refused, both by ACDC and by delegation:"

Question	Answer
a) in stream	282 approved
b) off stream	76 approved
c) total	358
d) number refused	1
e) date of last decision	7th March 2002
In stream dams under assessment	118
Off stream dams under assessment	25
Total under assessment	143

So, in the 116 weeks since the commencement of the Act, an average of 3 dams per week have been approved, and incredibly, only one rejected. This is being done despite:

- there being no Water Management Plans completed, and
- in light of the Tasmania:State of the Environment Report 1997 Recommendation 25, "It is recommended that the proposed water management policy package includes provisions which will ensure that on stream dam construction of water storage is avoided wherever possible and that existing on stream storage does not compromise water quality and quantity for downstream users or for the environment."

The total number/volume of water allocations/licences (dams and other forms of extraction) is not known to us.

Understanding Environmental Water Provisions For Water Dependent Ecosystems

We have observed that the general public does not have a good understanding of the importance of, nor the priority given to, the provision of water to water dependent ecosystems, (defined as):

"WATER DEPENDENT ECOSYSTEMS are those parts of the environment, the species composition and natural ecological processes of which are determined by the permanent or temporary presence of standing or flowing water. The instream area of rivers, riparian vegetation, springs, wetlands, floodplains and estuaries are all water dependent ecosystems." (National Principles For The Provision Of Water For Ecosystems, part of the COAG Water Reforms)

The National Principles also contain (under Provision of Water for Ecosystems), Principle 3, which says, "Environmental water provisions should be legally recognised."

The *Water Management Act 1999* partly reflects Principle 3 at Section 8 (2)(a) (cited above), under the functions and duties of the Minister when assessing the quantity of water available from a water resource; and also partly at Section 94, where, when there are restrictions on the taking of water (either with or without a water management plan), a surety and priority for the provision of the fresh water needs of ecosystems dependent on the water resource, is established, and management decisions must flow according to those priorities.

With the current ad hoc process of allocating water from a resource (in the absence of water management plans), there is no transparency as to the giving of recognition of provisions of water for the many dependent ecosystems inextricably linked to that water resource. Some appear to be relegated to the status of getting the 'left overs', yet, Principle 6 says,
"Further allocation of water for any use should only be on the basis that natural ecological processes and biodiversity are sustained (i.e. ecological values are sustained)."

A Tasmanian Draft Water Management Plan gives priority to environmental water provisions second only to stock, domestic and essential town water supplies.

"Permanent Allocations and Surety Levels

The surety of permanent surface water allocations, in descending order of priority, will be as follows:

Surety 1 – Stock and domestic and essential town water supplies
Surety 2 – Environmental water provisions
Surety 3 – Any Prescriptive Rights converted to a licence allocation under the Act
Surety 4 – Special Licences
Surety 5 – (i) Commissional Water Rights (CWRs) and CWRs converted to water licences under the Act, and non-essential town water supplies; and
(ii) All new allocations issued outside the period December to April"
(Source - Great Forester Catchment Draft Water Management Plan 2002)

Sustainability and Water Reforms

Having lived through the 1940's,'50's and 60's, we know that the principal limiting factor to development was a lack of financial (capital) resources. In 2002, we know that the limitations on development are lack of natural capital – for example, living marine resources (fish), forests, fresh water, and other natural and physical resources capable of development. Thereby, by necessity, the focus worldwide has shifted to 'sustainable (use) and development'.

In 1972 at the United Nations Stockholm Conference, the phrase 'sustainable development' was endorsed as the guiding principle for future use and development of the Earth's natural resources.
The World Conservation Strategy produced in 1980 developed the concept further. The Strategy set out the need for protecting the Earth's ecological systems if the planet was to continue to support human-kind's economic and social welfare.
In 1987, the World Commission of Environment and Development published "Our Common Future" (known also as the Brundtland Report), which revealed that the needs of the environment were intrinsically linked to the economic and social well-being of the world's societies. That document triggered the negotiation and ratification of a number of international treaties and conventions regarding the environment and development issues.
In 1992 at the United Nations Conference on Environment and Development (UNCED), the Rio Declaration and Agenda 21 (to both of which Australia is a signatory) were adopted as the guidelines for sustainable development throughout the 21st century. Chapter 18 of Agenda 21 deals with protection of the quality and supply of fresh water resources, and the application of integrated approaches to the development, management and use of water resources in a sustainable manner.

From the above, one can see how and why the COAG Strategic Framework for Water Reform 1994 was developed, and as part of that process, this State's *Water Management Act 1999*, as both are based on the contents of Chapter 18, Agenda 21.

It has long been recognised that human-kind is organised into three basic facets – communities, governments and economies, and those organisations now recognise that, not only are they inter-related, but that each is dependent on the environment, thus the agreement to its sustainable development and use.

"The services of ecological systems and the natural capital stocks that produce them are critical to the functioning of the Earth's life-support system. They contribute to human welfare, both directly and indirectly, and therefore represent part of the total economic value of the planet. We have estimated the current economic value of 17 ecosystem services for 16 biomes, based upon published studies and a few original calculations. For the entire biosphere, the value (most of which is outside the market) is estimated to be in the range of US$16 – 54 trillion ($10^{12}$) per year, with an average of US$33 trillion per year. Because of the nature of the uncertainties, this must be considered a minimum estimate. Global gross national product total is around US$18 trillion per year." (Robert Costanza et. al., 1997)

"Ecosystem Services and Functions

Number	Ecosystem Service	Ecosystem Functions	Examples
1	Gas regulation	Regulation of atmospheric chemical composition.	CO_2/O_2 balance, O_3 for UVB protection, and SO_x levels
2	Climate regulation	Regulation of global temperature, precipitation, and other biologically mediated climatic processes at global or local levels.	Greenhouse gas regulation, DMS production affecting cloud formation
3	Disturbance regulation	Capacitance, damping and integrity of ecosystem response to environmental fluctuations.	Storm protection, flood control, drought recovery and other aspects of habitat response to environmental variability mainly controlled by vegetation structure.
4	Water regulation	Regulation of hydrological flows	Provisioning of water for agricultural(such as irrigation) or industrial (such as mining) processes or transportation.
5	Water supply	Storage and retention of water.	Provisioning of water by watersheds, reservoirs and aquifers.
6	Erosion control and sediment retention	Retention of soil within an ecosystem	Prevention of loss of soil by wind, runoff, or other removal processes, storage of silt in lakes and wetlands.
7	Soil formation	Soil formation processes	Weathering of rock and the accumulation of organic material.
8	Nutrient cycling	Storage, internal cycling, processing and acquisition of nutrients.	Nitrogen fixation, N,P and other elemental or nutrient cycles.
9	Waste treatment	Recovery of mobile nutrients and removal or breakdown of excess or xenic nutrients and compounds	Waste treatment, pollution control, detoxification.
10	Pollination	Movement of floral gametes	Provisioning of pollinators for the reproduction of plant populations.
11	Biological control	Trophic-dynamic regulations of populations	Keystone predator control of prey species, reduction of herbivory by top predators
12	Refugia	Habitat for resident and transient populations	Nurseries, habitat for migratory species, regional habitats for locally harvested species, or overwintering grounds.
13	Food production	That portion of gross primary production extractable as food.	Production of fish, game, crops, nuts, fruits by hunting, gathering, subsistence farming or fishing.
14	Raw materials	That portion of gross primary production extractable as raw materials.	The production of lumber, fuel or fodder.
15	Genetic resources	Sources of unique biological materials and products.	Medicine, products for materials science, genes for resistance to plant pathogens and crop pests, ornamental species (pets and horticultural varieties of plants).
16	Recreation	Providing opportunities for	Eco-tourism, sport fishing, and other

		recreational activities.	outdoor recreational activities.
17	Cultural	Providing opportunities for non-commercial uses.	Aesthetic, artistic, educational, spiritual, and/or scientific values of ecosystems.

*We include ecosystem 'goods' along with ecosystem services."

The Final Report to The European Commission, November 2000 – An Assessment of the Socio-Economic Costs & Benefits of Integrated Coastal Zone Management, under the headings,
"The Value of Europe's Coastal Zones - Ecosystem Biomes and Services"
says, "The sixteen biomes that have become increasingly accepted as a common basis for environmental and economic analysis and policy development are the results of an intensive workshop held in the National Centre for Ecological Analysis and Synthesis at the University of California at Santa Barbara in 1996."

The following are the biomes associated with the Little Swanport Catchment, and the value per hectare per annum of their ecosystem services. (Dollar values are in US$ at 1994 value.)

Open ocean	$ 252
Estuaries	$22,832
Seagrass/algae beds	$19,004
Continental shelf	$ 1,610
Temperate forests	$ 302
Grass/rangelands	$ 232
Tidal marshes/mangroves	$ 9,990
Swamps and floodplains	$19,580
Lakes and rivers	$ 8,498
Cropland	$ 92

(The other six biomes - - coral reefs, tropical forests, desert, tundra, ice/rock and urban, do not apply to this catchment.)

Using the Broad Vegetation Types of the Little Swanport Catchment Map (derived from digital data supplied by DPIWE, Environment Australia and Forestry Tasmania, and produced by Richard Hammond), which map includes the area in hectares of the various vegetation types, and using the above figures, we have loosely grouped categories identified from the map into the representative biomes, giving a broad indication of the value of the various ecosystem services provided per annum by the catchment environment.

Biome	Map categories	Area (Ha)	Value US$1994/Ha/Year Annual Ecosystem Services	Catchment Biome Value of Ecosystem Services per annum (US$1994)
Grass/rangelands	Agricultural Grasslands Exotic weeds	25,530 4,104 762 30,396	232	7,051,872
Temperate Forests	Forest Gully	50,147 184		

	Woodland	6,335 56,666	302	17,113,132
Lakes and Rivers	Wetlands Riparian	297 127 424	8498	3,603,152
Estuaries	Not shown	700	22,832	15,982,400

Australia State of the Environment 2001, Coasts and Oceans, in the Conclusions under Key Implications states,
"In Australia there has been a big emphasis on the management of land and the value of agriculture to our economy and our communities. There has been less emphasis on the value of wetlands, estuaries and other coastal environments. The issue to be addressed is the balance to be achieved between the value of the land and the value of coastal environment. A whole-of-catchment approach to resource management is worth pursuing. The danger is that the issue will become so hard that all stakeholders - managers, community, Indigenous people and industries – will retreat from a systemic view.
Marine management should in future look at the pressures and people's interactions with the environment, rather than strictly the management of the resource.
The quality of coastal and marine water is vitally dependent on land management practices and activities in the catchment. As point-source pollution is being tackled, the management of diffuse sources of pollution will become of greater importance.
The competition to use coastal and marine space will intensify. There may be competing environmental values in progressing alternative energy systems such as tidal power in coastal areas. Without a full account of environmental and economic values for any proposal, irreversible environmental changes may occur."

Another Water Dependent Ecosystem Within the Little Swanport Catchment

Riparian Vegetation

"As part of the State-wide documentation of riparian vegetation, it was found that the Little Swanport River has the highest diversity of riparian species in the State (87 native species). The large biodiversity of species includes many endemic species such as the South Esk Pine (Callitris oblonga) and rare species such as Pomaderris phylicifolia. It is believed that the diversity and abundance of native species is due to the unique characteristics of this east-flowing stream, including its intermittent nature (ephemeral) and the flood frequency and intensity. Any alteration to the natural flood cycles may reduce riparian biodiversity and thus alter the balance of invertebrates\insects and other fauna dependent on the vegetation for life-cycle." (Daley, E., 2002, pers. comm.) (Tasmania's Riparian Vegetation [Ph. D. Thesis in progress]).

"The overall findings of this research, together with those of previous studies and the theoretical literature, indicate that riparian vegetation has special requirements for management. While river reserves may dilute the effects of adjoining land use, upstream activities such as regulation will alter the landscape processes that are vital for maintaining the ecology of the vegetation. As a consequence, management should incorporate drainage basin structure and function, and use a network of reserves to maintain the landscape connectivity (Nilsson, 1991). Most importantly, riparian conservation revolves around the maintenance of hydrological processes, to effectively manage energy, material and species flows(Malanson,1993)." (Wintle, Bonnie C., 2002,

The Ecology of the Riparian Vegetation in Two East Coast River Catchments, Tasmania.) (Prosser and Little Swanport Catchments)

Land Use and Management Practices to Achieve Sustainability

As previously cited in this document, planning for sustainable development (and the consequent management controls and/or licence conditions of managing 'in a way or at a rate') have been applied to the aquaculture/marine farming, fishing and forestry industries, and some progress is being made towards the sustainable development and management of (fresh) water resources (used by multiple industries, inter alia). The common denominator is that all of the former are based on the use of publicly owned (principally) resources.
Much less progress has been made in implementing sustainable development and management of agricultural land, due partly to the breadth and depth of the complexity of issues involved (for instance, different types of agriculture, from extensive dry land farming, to cropping, irrigated crops and/or pasture, to intensive horticulture etc., and their various impacts on a range of public and other resources) and not the least of which is private ownership, not always accompanied by the necessary degree of stewardship.
The individual efforts of some farmers (across the various sectors) to embrace sustainable development on their unit of land is to be applauded, as an inherent quality of the concept of 'sustainable development' is the consciousness of the fact that the impacts of what they do on their land can go far beyond the boundary fence.
Those farmers are a great source of information, and are to be congratulated for their leadership.

Farming Action – Catchment Reaction

The CSIRO publication, "*Farming Action – Catchment Reaction, The Effect of Dryland Farming on the Natural Environment*, 1998" (commenced in 1994) has as its foreword, "Dryland farming has provided, and continues to provide, great wealth to Australians, particularly in the form of export earnings. However, it has also contributed to the degradation of Australia's natural resources by accelerating soil acidification, nutrient loss, erosion and damage to soil structure. Dryland farming has often also resulted in salinity and widespread loss of native plants and animals.

Furthermore, there can be 'off-site' effects of dryland farming. These include increased sediment and nutrient loads, and increased concentrations of salt and other pollutants, in rivers and streams.

The costs to Australia, although difficult to quantify, are considerable. The Land and Water Resources Research Development Corporation estimates that production losses associated with land and water damage could amount to around $1 billion a year. To this may be added the costs associated with the degradation and pollution of inland streams, rivers, lakes and storages, and coastal waters with their reefs and seagrass beds.

Land and water degradation has been the inevitable result of farming practices that have focussed on production, while not always appreciative of the effect on the ecosystem in which the farming operation is cast. If we are unable to take into account the complex interaction between plant and animal production and ecosystem processes, current farming practices will continue to degrade our natural resources. To prevent this, we need farming and management practices that consider production in terms of the environment in which it is occurring and the possible effects of management practices on

landscape processes. This new perspective must look beyond the single farm and take into account the effects practices can have in other parts of the catchment.

Many farmers began to integrate production and conservation long before it was 'acceptable practice,' let alone 'the accepted practice.' The rapid development of Landcare and local catchment management groups across Australia is evidence of farmers' awareness of the need to care for the natural resource base and for a more integrated approach to farming and natural resource management.

The CSIRO has supported the need for scientists to work with Landcare and catchment management groups to develop and adopt practices that allow both economic viability and natural resource sustainability. With sound scientific knowledge of the processes involved, changed management practice, however well intentioned, can fail to provide the desired remedies, or even lead to additional problems. As a result, CSIRO has given high priority to developing a research program to support Landcare and catchment management groups.
Established in 1994, the Dryland Farming Systems for Catchment Care Programs is building on research begun by CSIRO's Land and Water Care Program and other research programs focussed on farming systems and sustainable land management practices.

In supporting Landcare and catchment groups in developing integrated approaches to dryland farming and natural resource management, CSIRO recognised that the research program itself needed to be part of this integration, with active participation by Landcare and catchment management community. The program has involved representatives from the different sectors involved with land and catchment use and management. It has responded to their ideas and suggestions.

This has already taken the program in new directions. In May 1994, a workshop was held for participants drawn from the various groups with an interest in land and catchment management – farmers, catchment coordinators, consultants, government extension and planning staff, and scientists. Participants helped identify the procedures needed to establish a whole catchment management approach to research. They provided feedback on the four reviews commissioned for the workshop as part of the interactive procedure of developing an appropriate program.

A key component of this participatory approach is to facilitate learning together, sharing scientific knowledge and understanding how farming systems work and their impact on the environment. The information should be shared between Landcare and catchment groups, the rural community, and those agencies involved in natural resource management.

Farming Action – Catchment Reaction: The Effect of Dryland Farming on the Natural Environment makes available the information presented in the workshop reviews and brings together much of our current knowledge on four key areas:

- the perspectives of the various groups involved in catchment management, the role of science and how it is best undertaken in the framework of integrated catchment management;
- the indicators of catchment health – how we can monitor and evaluate the effect of dryland farming;
- the current technical understanding of farming practices and their effects on land and water; and

- the tools and models available for predicting the effects of dryland farming on land and water.

The book's editors, John Williams, Rosemary Hook and Hester Gascoigne, have assembled and edited the information presented at the Canberra workshop so that it not only retains the technical content but is available to a wider audience than the workshop participants. The added information boxes, illustrations and glossary help summarise the technical issues. Some new material has been introduced to provide additional insights into the development of systems of dryland farming. It describes CSIRO's involvement in finding solutions to the complex challenge of integrated catchment management and sustainable dryland agriculture. The issues are of key concern to Landcare groups, catchment managers and our entire community. They are fundamental in our quest to develop better farming systems that sustain both farming and our land resources."

Governance

The Parliament of the Commonwealth of Australia, House of Representatives Standing Committee on Environment and Heritage inquiry into: *Public Good Conservation: Our Challenge for the 21st Century. Interim report of the inquiry into the Effects upon Landholders and Farmers of Public Good Conservation Measures Imposed by Australian Governments*, September 2001, says of the inquiry background, at section 1.40,

"At the time, the Committee was conducting an inquiry into catchment management. The Committee found there were considerable linkages between the inquiries, and agreed that some of the matters arising from the catchment inquiry would be further addressed in the public good conservation inquiry."

The foreword of the *interim report of the inquiry* has this to say:

"There is little doubt that Australia faces an environmental crisis. There is also little doubt that the consequences of failing to act in an appropriate way will be crippling to our society and our economy.

The large cities of our country all depend upon the products of rural Australia. They rely upon the water generated in the nation's catchments and the eco-services our countryside provides. The entire nation derives economic benefit from the tourism industry that rests to a significant extent on the natural beauty inherent in our country's landscape.

The entire community must, therefore, act sooner rather than later to address the environmental problems facing the nation. The Committee reached this conclusion in its report *Co-ordinating catchment management* and affirms it in the present report.

Given the nature of the environmental problems facing the nation, all landholders will have to significantly change the way that they manage land. This process is already under way, but much more needs to be done.

A major part of this process is that landholders are, increasingly, required to undertake conservation works from which they can anticipate little or no immediate benefit. Even in the medium and longer terms, they may derive only limited benefits. The major beneficiaries will be 'off site' and usually will be the general community.

Conservation activities that a landholder undertakes, either voluntarily or as a requirement of managing land, which benefit someone other than the landholder undertaking the activities are public good conservation activities.
This inquiry was provided with evidence that public good conservation activities raised two major issues for landholders and ultimately for the entire community. These issues are not trivial matters and it was clear that they must be addressed at the highest levels of government.

First, a large number of landholders have often been required to meet a significant portion of the cost of public good conservation programs, even though they derived limited or no benefit from the activities. This has led to calls for financial assistance for landholders so that they can implement public good conservation programs.

Second, landholders are often required by one or other level of government to undertake public good conservation measures. The Committee was advised that such regulations are considered by some landholders to erode what they have been led to believe are their property rights. This has led to calls for compensation for the putative property rights that landholders believe have been taken from them.

The evidence the Committee received indicated that the present policy arrangements were not addressing these concerns. As a result, less public good conservation was occurring than was desirable given the depth of the environmental problems facing the nation. Moreover, the landholders who made submissions to the inquiry and who gave evidence indicated a high level of frustration and reported anger and resentment in the rural community as a result of what were perceived to be inappropriate policies.

The evidence suggested to the Committee that nothing short of a re-configuration of land use practices in Australia is required. Crops and products produced at present will need to be produced in different and more sustainable ways. New industries will need to be developed and new markets may well be created.

The major drivers of the re-configuration of Australian land use will be landholders.

This inquiry discovered that landholders in this country were eager to change their land use system, because they care about their land and they care about the future. Often, however, they do not have the resources to do so.

Evidence provided to the Committee indicated that if landholders do not possess the financial capacity to undertake the conservation works required, then the works are unlikely to occur and the environmental problems facing the nation will remain and only get worse.

Moreover, the Committee considers that the problems facing land use in Australia present opportunities to our farming community and the nation. Those opportunities will be realised only if the transition from dangerous land management practices to sustainable land use practices is managed sensibly and pragmatically.
The present inquiry found that this was not occurring to the extent required.

The Committee saw clearly that the challenge for governments is to ensure that the requirements on landholders and community are fair and equitable and that landholders have access to the necessary information and financial resources to make the transition. Furthermore, governments also have to ensure that their policies are practicable.

The recommendations in this report aim to attain these outcomes. For this reason, the present report is a companion report to the Committee's earlier report, *Co-ordinating catchment management.* In that report, the administrative structure required was set out and recommendations made. Moreover, the Committee recommended that the government examine the feasibility of using a national environmental levy to provide the public component of the financial resources that addressing environmental degradation required. The Committee affirms those recommendations.

In this report, further policy initiatives are recommended. The Committee believes the recommendations contained in the two reports provide a comprehensive system that will not merely halt and reverse environmental degradation, but revitalise rural Australia and provide employment opportunities to rural and urban Australians. Just as importantly, the recommendations in the two reports provide what Australians want and have come to consider theirs: a sustainable and environmentally responsible lifestyle unequalled anywhere in the world."

From the Committee's list of twenty (20) recommendations arising from the inquiry, it is interesting to note the trade off between the first two:
"Recommendation 1

The Committee recommends that when programs are designed that aim to promote public good conservation, the generally perceived moral rights of landholders are acknowledged and taken into account in the design of programs.

Recommendation 2

The committee recommends that:

- the Commonwealth seek agreement with the states and territories for a commonly accepted definition in principle of a landholders duty of care;
- this definition be that landholders have a duty of care to manage the land in their charge in a way that is ecologically sustainable, given the particular geographical location, and based upon latest scientific information;
- all legislation in all jurisdictions be amended to incorporate this duty of care, as a minimum standard of land management; and
- all Commonwealth funding for public good conservation activities and ecologically sustainable use of Australia's resources be dependent upon the recipient accepting this duty of care."

Salinity in the Little Swanport Catchment

Over the last 25 years salt scalds (evidence of salinity problems) have appeared on land in some areas of the catchment. The middle reaches of the catchment's water courses have low salinity readings. The middle reaches are different to the upper and lower reaches in geological structure and have far greater tree cover. Surveys of the upper and some lower catchment water courses have given readings of between 1 and 3.8 deci Siemens/m (dS/m) conductivity. 1 dS/m equates to 600 kilograms of salt per megalitre of water.
For irrigation water quality, any reading above 0.8 dS/m is regarded as being of high salinity.

Due to the high evaporation rate in the catchment, any impounded water becomes more saline, and may become unsuitable for irrigation. The problem then arises of how to dispose of such water, which may contain hundreds of tonnes of salt, without causing environmental harm to down-stream aquatic ecosystems and without adversely

impacting on other users/uses. Our investigations lead us to believe that to date there are no management controls or licence conditions in place to deal with this problem in Tasmania.

The process of assessing applications for dam construction/water allocation/licensing does not consider salinity, land capability or suitability for the use to which the impounded or taken water is to be put. Nor does the process take into account that the rainfall in the Little Swanport and Tunbridge regions deposits approximately 350 and 410 kilograms respectively of salt per hectare per annum onto the land.

Conclusion

Despite efforts toward water reform in this country, the current deficiencies in many areas of reform, including defining and meeting the needs of some water dependent ecosystems and the lack of management controls over the uses of allocated water, leave us (collectively) with many uncertainties. This is well articulated by Ticky Fullerton in her book *Watershed – Deciding Our Water Future, 2001* under:

"Choices

The unforgivable sin of Australian society is to be unaware of the hard choices we have to make about our water future. The most important knowledge we need is about the environment. We are running up a national debt in salinity, destroying the gene pools of precious plants and animals and messing up water quality. The way we are going will compromise both the lifestyle of our children and grandchildren and, in the longer term, the health of mankind. If Australians are to relegate the country's wetlands to the Discovery Channel, at least we should do it knowingly."

COLIN AND SUZANNE DYKE – Marine Farmers
Land Farmers and
Concerned Community Members April 2002

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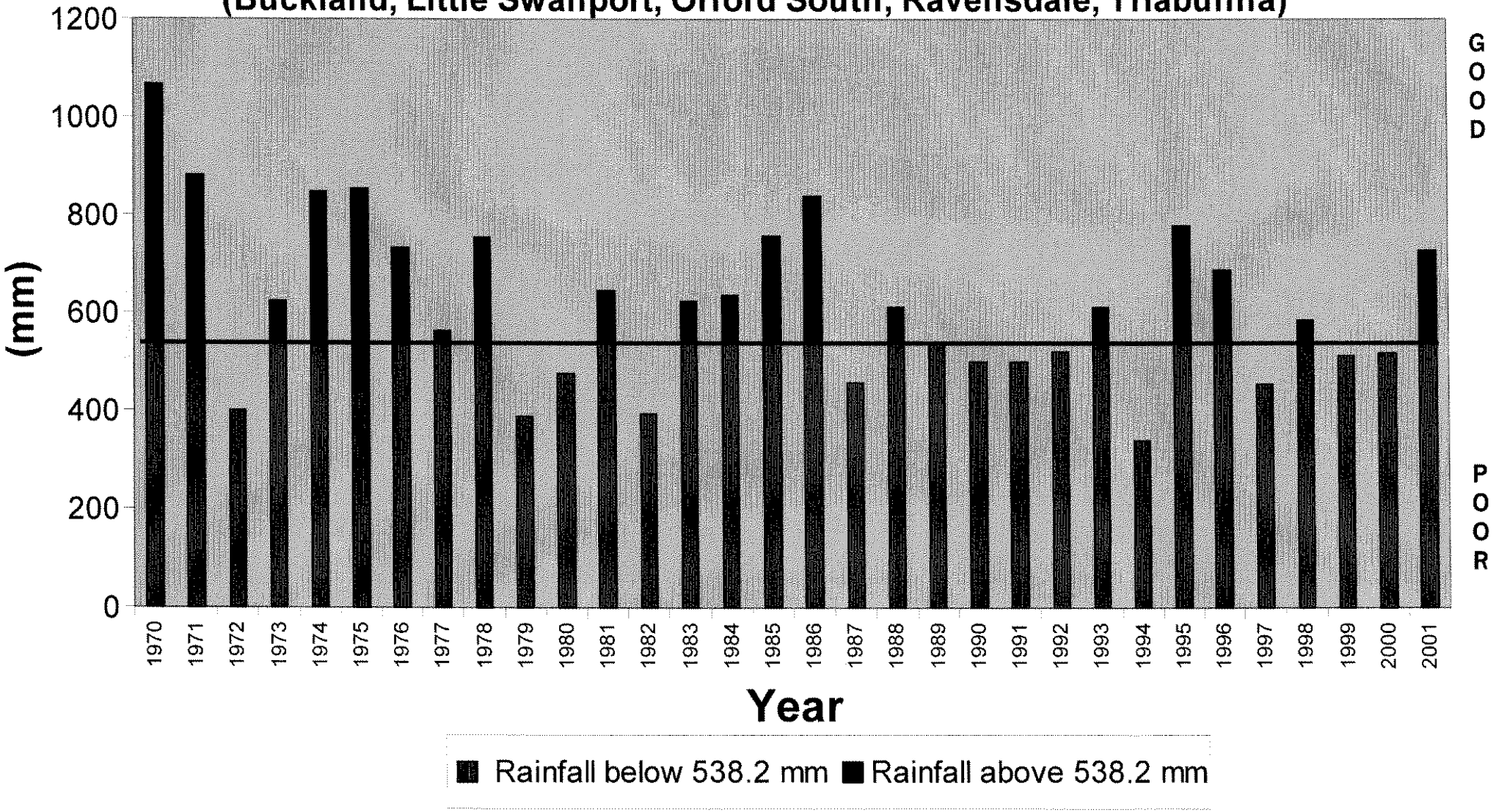
Attachment 1

Average Annual Rainfall (mm) East Coast Tasmania Across Five Recording Stations

(Buckland, Little Swanport, Orford South, Ravensdale, Triabunna)



Attachment 2