Tasmania

DEPARTMENT *of*
PRIMARY INDUSTRIES,
WATER *and* ENVIRONMENT

Marine Farming Development Plan

Port Sorell Estuary

May 2001

Prepared by Inspiring Place Pty Ltd for the Food, Agriculture & Fisheries Division,
Department of Primary Industries, Water and Environment, Tasmania

Some comments expressed in this document have arisen out of discussions with stakeholders in the study area and an examination of departmental files. To the best knowledge of the Department of Primary Industries, Water and Environment, the views of these stakeholders have been correctly incorporated.

The Crown in right of the State of Tasmania gives no warranty, either express or implied, that the marine farming zones identified in this marine farming development plan are suitable for marine farming activities.

Persons considering marine farming within a zone contained within this plan are solely responsible for establishing the suitability or otherwise of the zone for that purpose.

CAUTION: The maps shown throughout this document are not to be used for navigation. For navigation purposes appropriate hydrographic charts should be used. The coastline detail shown is reproduced from a 1:25000 scale giving a horizontal accuracy within 12.5 metres of true position.

It should be noted that at the stage of the public exhibition and comment period this Plan remains a draft plan and only becomes a marine farming development plan on the approval of the Minister for Primary Industries, Water and Environment.

Foreword

The Tasmanian Government recognises the need to guide the management of the State's coastal resources on a sustainable basis. The coastal zone of Tasmania is both vulnerable and valuable, which Government has recognised with initiatives to ensure that there is a long-term strategy for the management of this zone.

One important economic use of Tasmania's coastal zone is marine farming. This industry has grown rapidly in Tasmania since the establishment of shellfish culture in the 1960s and finfish farming in the 1980s. In 1995 the Tasmanian Government introduced specific legislation known as the *Marine Farming Planning Act 1995* (MFPA), to facilitate sustainable and integrated growth of marine farming in the State.

The MFPA establishes mechanisms for the preparation and approval of marine farming development plans. The plans use zoning principles to identify specific areas where developments may occur while taking into consideration other uses and values of the region. The plans also prescribe the operational constraints to which marine farming activities must adhere. The Act also requires periodic reviews of approved development plans to ensure that the objectives of resource management, having regard to any relevant changing circumstances, are achieved to the maximum extent possible.

An important component of marine farming development in Tasmanian is an extensive environmental monitoring program to ensure that the industry operates in an environmentally sustainable way. This will help to ensure that the Plans are consistent with "sustainable development", a key component of the State's Resource Management and Planning System, and a specific objective of the MFPA under which this Plan has been prepared.

This Marine Farming Development Plan for the Port Sorell Estuary has been prepared by the Department of Primary Industries Water and Environment in accordance with section 15 of the MFPA.

This document is in two parts: Part A, an environmental impact statement in relation to the use of the area for marine farming activities and Part B, development proposals and management controls.

FOREWORD

PART A ENVIRONMENTAL IMPACT STATEMENT

Part A Environmental Impact Statement

1 Introduction

This Environmental Impact Statement has been prepared by the Department of Primary Industries Water and Environment (DPIWE) in accordance with the provisions of section 23 of the MFPA which prescribes that the environmental impact statement must:

- disclose any available information relating to the environmental impact of the proposal, except if there are reasons of confidentiality; and
- contain information appropriate to the significance of the plan or amendment to the environment and likely public interest.

1.1 Purpose

The purpose of this Environmental Impact Statement is to provide a basis for the Marine Farming Planning Review Panel to consider the environmental aspects of marine farming in the Plan area in order to determine the nature of any proposals which are appropriate for that area and the management controls which are appropriate to manage activities within that area.

When read in conjunction with the Part B, *Marine Farming Zones* and associated Management Controls it will provide information to interested individuals and groups on the environmental, planning and management aspects of the proposals contained within the Plan.

1.2 Public Consultation

The Port Sorell Marine Farming Development Plan will be subject to a two month period of public exhibition and comment. During this time a person may submit representations relating to the proposals contained within the Plan.

Members of the community interested in making representation in relation to the Plan should do so to the Secretary, DPIWE, GPO Box 44A, Hobart, 7001, by 26 November 2001.

At the end of the public consultation period the DPIWE is required to forward a copy of each representation received and a report on representations

received to the Marine Farming Planning Review Panel. The Panel may hold a public hearing in relation to the proposals contained within the Plan.

It should be noted that unless confidentiality is requested, representations will be available for perusal by any member of the public. The Department's response to those representations as required by Section 28 of the MFPA, will also be available for public perusal.

Whilst it is proposed that representations will be available for perusal at the Marine Farming Branch, DPIWE, it should be noted that individual Freedom Of Information (FOI) requests made to the Department will attract appropriate FOI fees.

It should also be noted that while the DPIWE is required to make information available through the FOI process, decisions and actions of the Marine Farming Planning Review Panel are not subject to the provisions of FOI.

2 Statutory Policy and Planning Context

2.1 Resource Management Planning System

Tasmania's environmental planning and management system is guided by a suite of laws, policies and procedures integrated under the Resource Management and Planning System (RMPS). The RMPS is based on the principles of sustainable development that are set out in Schedule 1 of each of the key pieces of legislation. These objectives are as follows:

(a) to promote the sustainable development of natural and physical resources and the maintenance of ecological processes and genetic diversity; and

(b) to provide for the fair, orderly and sustainable use and development of air, land and water; and

(c) to encourage public involvement in resource management and planning; and

(d) to facilitate economic development in accordance with the objectives set out in paragraphs (a), (b) and (c); and

(e) to promote the sharing of responsibility for resource management and planning between the different spheres of Government, the community and industry in the State.

In clause 1(a), "sustainable development" means managing the use, development and protection of natural and physical resources in a way, or at a rate, which enables people and communities to provide for their social, economic and cultural well-being and for their health and safety while:

- sustaining the potential of natural and physical resources to meet the reasonably foreseeable needs of future generations; and
- safeguarding the life-supporting capacity of air, water, soil and ecosystems; and
- avoiding, remedying or mitigating any adverse effects of activities on the environment.

2.2 Specific Legislation covering marine farming activities

To plan and regulate the growth of the marine farming industry the State Government has developed and implemented specific legislation, the MFPA and the *Living Marine Resources Management Act 1995* (LMRMA). Both Acts include the objectives of the RMPS as Schedule 1 of the Acts.

2.2.1 Marine Farming Planning Act 1995

The MFPA makes provision for:

- zoning areas of State waters, by way of marine farming development plans, where future marine farming operations may occur;
- preparation of an environmental impact statement in relation to the proposed use of the Plan area for marine farming activities;
- management controls to regulate marine farming activities within marine farming zones and mechanisms for enforcement; and
- allocation of lease areas within marine farming zones.

Under section 21 (1) of the MFPA a marine farming development plan for an area must:

- further the objectives of resource management within the area covered by the plan;
- designate any area to be covered by the plan as a marine farming zone;
- be coordinated with any marine farming development plan applying to any adjacent area;
- have regard for the use and development of the region as an entity in environmental, economic, recreational and social terms;
- ensure a co-ordinated approach with respect to any matter affecting adjacent land under the jurisdiction of the Marine and Safety Authority or council;

- have regard to the biological and physical requirements of fish species to be farmed in that area;
- provide for any other matter which this Act requires to be included in a marine farming development plan; and
- contain any matter the Panel requires.

Under section 21 (2) of the MFPA a marine farming development plan may:

- make any provision which relates to the use, development, protection or conservation of any thing in the area;
- provide for the maximum area within a marine farming zone for which a lease may be granted;
- set out policies and specific objectives;
- require specified things to be done to the satisfaction of the planning authority, Panel or relevant agency;
- apply, adopt or incorporate any document which relates to the use, development or protection of State waters;
- provide that any use or development of any state waters is conditional on an agreement being entered into with a relevant agency;
- require the use of an area to comply with any condition, restriction or code of practice; and
- provide for an application to be made to bring an existing use of land into conformity, or greater conformity, with the marine farming development plan.

The *Marine Farming Planning Act 1995* commenced on 30 May 1996.

2.2.2 Living Marine Resources Management Act 1995

The LMRMA places responsibility on the Government to manage the State's living marine resources in a sustainable manner. The legislation has clear objectives for management of fish and their habitats in a sustainable way for

the enjoyment of all "users" - such as commercial wild fishers, recreational fishers, marine farmers, divers and marine observers.

The Act contains powers to protect the marine environment and powers of enforcement. It retains the mechanism for research to be undertaken by way of Permits. This research includes investigation into wild fisheries and habitat management and new marine farming technologies, in existing or new locations.

Licences for marine farming activities are allocated under this Act (together with other licences for such activities as fish processing or commercial wild fishing). Marine farming licences issued pursuant to the LMRMA and management controls contained within marine farming development plans, are the principal instruments for controlling specific marine farming activities. Licences are reviewed on an annual basis.

2.3 Other Relevant Legislation and State Policies

2.3.1 Marine and Safety Authority Act 1997

The *Marine and Safety Authority Act 1997* (MSAA) provides provisions for the establishment of the Marine and Safety Authority Tasmania (MAST) which has jurisdiction in and over: the waters of all inland lakes, rivers and streams; coastal waters; any vessel; and any facility under the control of the Authority.

The functions of the Authority are to: ensure safe operation of vessels; provide and manage marine facilities; and manage environmental issues relating to vessels. The Authority has the power do anything necessary or convenient to be done in connection with the performance of its functions. The Authority also has the powers to delegate any of its functions or powers to any person or body.

2.3.2 National Parks and Wildlife Act 1970

The *National Parks and Wildlife Act 1970* (NPWA) makes provisions for the establishment and management of National Parks and other reserves and with respect to the conservation and protection of the fauna and flora of the State, and to make provision for incidental and consequential matters.

In exercising the provisions of the Act regard must be had for the objectives of the RMPS.

The Act provides for the reservation of land and water for the purposes of conservation and the development of management plans for those areas.

Development within reserved land will be guided by the management objectives of a class of reserve or a management plan made pursuant to the Act.

2.3.3 Narawntapu National Park, Hawley Nature Reserve – Management Plan 2000

A management plan has been prepared for the Narawntapu National Park and Hawley Nature Reserve. The managements objectives for Narawntapu National Park are:

- To conserve natural biological diversity;
- To conserve geological diversity;
- To preserve the quality of water and protect catchments;
- To conserve sites or areas of cultural significance;
- To encourage education based on the purpose of reservation and the natural or cultural values of the national park, or both;
- To encourage research, particularly that which furthers the purpose of reservation;
- To protect the national park against, and rehabilitate the national park following, adverse impacts such as those of fire, introduced species, diseases and soil erosion on the national park's natural and cultural values and on assets within and adjacent to the national park;
- To encourage and provide for tourism, recreational use and enjoyment consistent with the conservation of the national park's natural and cultural values;
- To encourage cooperative management programs with Aboriginal people in areas of significance to them in a manner consistent with the purpose of reservation and the other management objectives.

The managements objectives for Hawley Nature Reserve are:

- To conserve natural biological diversity;
- To conserve geological diversity;
- To preserve the quality of water and protect catchments;

- To conserve sites or areas of cultural significance;
- To encourage education based on the purpose of reservation and the natural or cultural values of the national park, or both;
- To encourage research, particularly that which furthers the purpose of reservation;
- To protect the national park against, and rehabilitate the national park following, adverse impacts such as those of fire, introduced species, diseases and soil erosion on the national park's natural and cultural values and on assets within and adjacent to the national park;
- To encourage cooperative management programs with Aboriginal people in areas of significance to them in a manner consistent with the purpose of reservation and the other management objectives.

2.3.4 Threatened Species Protection Act 1995

The *Threatened Species Act 1995* (TSPA) is described in its long title as "an Act to provide for the protection and management of threatened native flora and fauna and to enable and promote the conservation of native flora fauna". The provisions of the Act relate to the threatened species that are listed in the Appendices to the Act. These species are categorised according to their status, as endangered, vulnerable or rare.

Once a species is listed, the Act allows steps to be taken to protect it or its critical habitat. These may include the development of recovery plans and threat abatement plans, or land management plans or agreements.

2.3.5 Aboriginal Relics Act 1995

All Aboriginal sites in Tasmania are protected under the *Aboriginal Relics Act 1975*. Section 14 (1) of the Act states that to damage, destroy, remove, conceal or interfere with an Aboriginal relic requires a permit from the Minister for National Parks and Wildlife. Relics need not have been formally identified in order to be covered by the provisions of this Act. The provisions of the Act apply to all land tenures.

2.3.6 Environmental Protection and Biodiversity Conservation Act 1999

The *Environmental Protection and Biodiversity Conservation Act 1999* (EPBCA) provides provisions for the protection of the environment and the conservation of biodiversity, and for related purposes.

The Act provides the head of power for the Commonwealth to assess and approve or reject actions that are likely to have an impact on a matter of national environmental significance.

Matters of national environmental significance are listed as:

- World Heritage properties;
- Ramsar wetlands of international importance;
- listed threatened species and communities;
- migratory species protected under international agreements
- nuclear action; and
- the Commonwealth marine environment

The Act requires the person proposing to take an action, which is likely to have a significant impact on a matter of national environmental significance, to refer the proposal to the Commonwealth Minister for Environment. The Minister must make a decision on whether the Act is triggered within 20 business days. An action requiring the Minister's approval must be assessed. There are five assessment options:

- assessment on preliminary documentation;
- public environmental report;
- environmental impact statement;
- public inquiry; or
- an accredited process (ie. accreditation on a project by project basis).

The Commonwealth Environment Minister must decide on an assessment approach within 20 business days of receiving a referral of the proposed action. After the assessment process is complete, the Minister has 30 business days to decide whether to grant approval.

The proposals contained within the Port Sorell MFDP have not been referred to the Commonwealth. Any future proponent of actions within marine

farming zones will need to consider the particular proposal against the provisions of the EPBCA.

2.3.7 State Policies and Projects Act 1993

The *State Policies and Projects Act 1993* provides for the making of State Policies. State Policies are statutory documents which are intermediate between the provisions of an Act and policies and provisions of planning schemes and other mechanisms identified in relevant legislation.

Current State Policies relevant to the development of marine farming development plans are the State Coastal Policy 1996 and the State Policy on Water Quality Management 1997.

2.3.8 State Coastal Policy

The State Coastal Policy is governed by the sustainable development objectives of the RMPS. The outcomes of the policy are guided by three main principles: the protection of the natural and cultural values of the coast; sustainable development and use of the coast; and the shared responsibility of the management of the coastal zone.

Specific Policy Outcomes that relate to marine farming development plans state:

- "*Marine farming will be planned, developed and conducted in the coastal zone having regard to sustainable development considerations and in accordance with the MFPA and other relevant terrestrial and marine resource management and planning legislation and consistent with this Policy*."

- "*Marine farming development plans will be prepared, approved and gazetted under the MFPA and consistent with the objectives, principles and outcomes of this Policy.*"

2.3.9 State Policy on Water Quality Management 1997

The State Policy on Water Quality Management 1997 purpose is "to achieve sustainable management of Tasmania's surface water and groundwater by protecting or enhancing their qualities while allowing for the sustainable development in accordance with the objectives of Tasmania's RMPS."

The State Policy on Water Quality Management 1997 requires that Protected Environmental Values be determined by agreement between the Board of Environmental Management and Pollution Control and the DPIWE, as a

Planning Authority, for marine farming zones prescribed within marine farming development plans.

Protected Environmental Values (PEV) are values or uses of the environment for which it has been determined that the environment should be protected. Following the setting of PEV for marine farming zones through this planning process, the Board of Environmental Management and Pollution Control will define water quality objectives which will be used to determine if PEV are being met, over time.

The PEV for the marine farming zones identified in the Port Sorell MFDP are described in *section 3.1.7 – Protected Environmental Values.*

2.3.10 Land Use Planning and Approvals Act 1993

The *Land Use Planning and Approvals Act 1993* (LUPAA) sets out the process for the preparation, approval and amendment of planning schemes. This Act requires that planning schemes:

- must seek to further the objectives of the RMPS and of the planning process established by LUPAA (Schedule 1 Objectives Part 2);
- must be prepared in accordance with State policies;
- may provide for the use, development, protection or conservation of land; and
- must have regard to the strategic plan of a council.

LUPAA requires coordination between planning schemes and consideration of the region as an entity in environmental, economic, recreational and social terms. LUPAA also requires "*sound strategic planning and co-ordinated action by State and local government".*

The Act provides for councils to exercise planning controls over use and development within defined areas. Planning controls may be extended below low water mark for development which is related to or affects the use of adjacent land except in the case of marine farming and fishing in State waters.

2.3.11 Latrobe Council Strategic Plan 2000 – 2005

The Latrobe Council Strategic Plan 2000 - 2005 establishes a vision and a set of values for the municipality. The Plan lists a number of objectives and strategies to achieve these objectives.

2.3.12 Planning Schemes

The land adjacent to the Port Sorell Estuary MFDP falls within the boundaries of the Latrobe Municipality, which is covered by the Latrobe Planning Scheme 1994.

Shore based facilities associated with marine farming operations may be located a considerable distance from on water operation. Shore based facilities are however essential to on water operations. The jurisdiction of this Plan does not cover land based facilities. Existing or potential marine farmers wishing to develop shore based facilities will require the appropriate approvals from the relevant authorities. Generally these authorities consist of local and/or state government organisations.

2.4 Development proposals

A total of 5 marine farming zones are identified in the area covered by the Port Sorell Estuary MFDP Plan May 2001.

There are two existing lease areas within the Plan area, marine farming Lease No. 145 is located in the Rubicon River and Lease No. 95 in two parts is located in South East Arm. Currently only a small portion of the oyster lease areas can be effectively farmed due to continuing problems with suitable water depth.

The marine farming zones identified in this Plan are considered to be more suited for the culture of Pacific oysters. The zones are considered to have cleaner waters, less siltation, firmer sandy substrate, good tidal and sub-tidal conditions and good water flow.

Subject to the provisions of the MFPA the zones will allow the potential relocation of some of the existing lease areas.

The investigations into the opportunities and constraints for rationalising the existing marine farming lease areas and finding suitable growing areas identified:

- Scope to significantly reduce the size of marine farming Lease No. 95 to remove waters not suited to shellfish farming;
- Establish a new small zone north of marine farming Lease No. 95 that provides an opportunity for sub-tidal farming;
- Alter the boundaries of marine farming Lease No. 145 to remove waters not suited to shellfish farming and extending the lease northwards to include areas with better growing conditions and

- Establish a new zone north of marine farming Lease No. 145 that offers a good intertidal area and deeper water near the channel.

The combined maximum leasable area for zones 1 and 2 in the Rubicon River is 15 hectares, which is a reduction of 3.01 hectares from the current area of Lease No 145. It is the planning intention, subject to the provisions of the MFPA, that 7 hectares of marine farming Lease No. 145 be relocated within zone number 1 and 8 hectares of marine farming Lease No. 145 be relocated to within zone number 2.

The combined maximum leasable area for zones 3,4 and 5 in South East Arm has been set at 9.55 hectares which is a reduction of 21.369 hectares from the current area of Lease No. 95. It is the planning intention, subject to the provisions of the MFPA, that 0.55 hectares of marine farming Lease No. 95 be relocated to within zone number 3, that 6 hectares of Lease No. 95 be relocated to within zone 4 and that 3 hectares of Lease No. 95 be relocated to within zone 5.

A maximum leasable area for each zone has been set which indicates the maximum area available for marine farming within a particular zone. The combined maximum leasable area for the zones is 24.5 hectares. The existing lease areas are shown on Map A5.1 on page 39 of the Plan.

3 The Existing Environment

3.1 Plan area

The Port Sorell Estuary is situated on the north of Tasmania, centred on 41° 13' south 146° 35' east. The Estuary is approximately 17 km east of the city of Devonport.

The area covered by this Plan consists of all that area within the Port Sorell Estuary to the high water mark south of an imaginary line drawn across the Estuary from Taroona Point to Griffith Point and finishing at an imaginary line drawn across the Rubicon River at the bridge carrying the main road from Harford to Frankford and an imaginary line drawn across the parallel of latitude of the southern most point of Devil's Nut Island situated in the Franklin Rivulet downstream of the bridge carrying the main road from Harford to Frankford. The area of the Plan is approximately 1710 hectares. Map A3.1 on page 15 shows the Plan area.

3.1 The Physical Environment

3.1.1 Climate

The Port Sorell area receives a cool, temperate maritime climate with an average summer maximum temperature range of 20 – 21°C and average summer minimum temperature range of 11-12°C recorded at East Devonport. This is generally cooler than inland areas as a result of influencing maritime conditions. During colder months the annual average temperature ranges between 5-15°C (June to August). The area experiences frosts and occasional fogs.

The mean annual rainfall is 900 mm with rain occurring in all months but generally higher during June - August and lowest during January - February. Rainfall does however vary with location and altitude. Narawntapu National Park receives about 750 mm of rain per annum whereas Frankford receives a mean rainfall of 1071 mm. The prevailing winds are predominantly from the north west and south west and can generate choppy wave conditions on the Estuary.

3.1.2 Vegetation

Vegetation on land adjacent to the Port Sorell Estuary is mainly native sclerophyll forest or has been cleared for agriculture. There has been substantial development of forestry plantations in the Port Sorell Estuary catchment area.

3.1.3 Geological History and Environment

Port Sorell Estuary is the drowned valley of the Rubicon River and has been subjected to recent geological and coastal forces. The Estuary is characterised by the formation of a baymouth spit with parallel sand ridges that were formed by windblown sands during the last interglacial period.

3.1.4 Bathymetry

The Port Sorell Estuary is typically less than 3 metres deep over much of the area. Depths of up to 8 metres are found in channels at the mouth of the Estuary.

3.1.5 Hydrology

The main river systems draining into Port Sorell are the Rubicon River and the Franklin Rivulet. A number of smaller catchments are found along the western and eastern side of the Estuary but can have intermittent flows (e.g. Little Branches Creek, Marshalls Creek, Little Browns Creek, Pantana Rivulet and Greens River).

The Estuary is tidal to the bridge on Frankford Road. The tide range is 3 metres and the water depth is typically very shallow (less than 3 metres) across much of the Estuary. The Estuary contains many sandbanks/mudbanks and rock outcrops and these are exposed at low tide. Deeper water is found at the mouth of the Estuary and channels have formed through sandbanks carrying much of the river flow. The Estuary also contains a number of islands, several of which are included within the Narawntapu National Park (including Penguin Island, Rabbit Island, Shell Islands).

Dunn (1997) reviewed available information on river flows for the Rubicon River and this research indicated:

- the long term average flow at the tidal limit is about 2.3 m^3/sec (based on data from 1968-1994);

- the average annual flows varies greatly from year to year (maximum flows of 5.2m^3/sec and minimum flows of 0.5m^3/sec have been recorded);
- the maximum flows typically occur in winter months whilst summer flows can be excessively low, due in part to the withdrawal of water supply for irrigation within the catchment;
- there can be low flows for several months in succession, indicating possible stress on the ecological values along the river system; and
- there can be flows below average for a number of years.

The decline in the water flows has been a major issue within the community given the competing interests for the use of the water for landowners, irrigation, recreational fishing and protecting environmental values.

3.1.6 Water quality

Dunn (1997) refers to the findings of a catchment survey of the Rubicon River by the Department of Environment and Planning (1991) which identified a number of possible factors affecting water quality in the Rubicon River. These factors were:

- streamside erosion, turbidity and faecal contamination as a result of allowing stock access to streams;
- infestations by willows, which alter river, flow and create erosion impacts;
- low water flows in summer resulting from water abstraction and dam management within the catchment;
- removal of streamside vegetation;
- introduced trees altering stream habitat and nutrient cycles;
- high nutrient levels caused by leaching of fertilisers from farms and forest operations and animal excrement; and
- increased turbidity from soil erosion following storm events and flooding.

The Estuary is prone to frequent flooding events, which increase turbidity for extended periods. The harvesting of oysters for sale during such times is not permitted due to reduced water quality and high bacterial loads.

Dunn (1997) also refers to investigations of Pantana Rivulet (Waterwatch 1995) that identified increased nitrate, phosphate and coliform bacteria levels in the Rivulet.

Wastewater from the Council's waste treatment is treated to secondary stage before being released into the Estuary. All the major sewage treatment plants and industries operate under licenses from DPIWE and are required to meet targets and objectives set out in Environmental Improvement Programs (EIP).

There are also a number of stormwater outlets at Freers Beach in Port Sorell and Hawley Beach that drain into Port Sorell Estuary.

There has been substantial vegetation clearance for farming along the western side of the Estuary, whilst much of the eastern side of the Estuary largely retains native vegetation. In recent years there has also been substantial development of forest plantations on both private land and State Forest lands within the Port Sorell catchment area.

3.1.7 Protected Environmental Values

The Following PEV have been set for all marine farming zones prescribed by the Port Sorell Estuary Marine Farming Development Plan March 2001 under Part 3-Water Quality Objectives 7.1A, B and E of the State Policy on Water Quality Management 1997:

A: Protection of Aquatic Ecosystems
- (ii) Modified (not pristine) ecosystems
  - (a) from which edible fish, crustacea and shellfish are harvested;

B: Recreational Water Quality and Aesthetics
- (i) Primary contact water quality (where permitted)
- (ii) Secondary contact water quality
- (iii) Aesthetic water quality;

E: Industrial water supply – (Aquaculture in Marine Farming Zones)

3.1.8 Substrates

The Tasmanian Aquaculture and Fisheries Institute has undertaken a number of initial environmental assessments of specific areas within the Port Sorell Estuary (Mitchell 2000). A general overview of substrate information is given below. More detailed site specific information is given in section 4 *Marine Farming Zone Areas*.

Surveys of the lower Rubicon River showed sediments ranging from fine sand to a fine sandy silt/clay, olive brown to olive/grey in colour. Variable amounts of shell and shell debris were found.

Surveys of the region to the east of Lades Tongue in South East Arm found sediments characterised as medium-fine sand, dark yellowish brown in colour, with dense shell debris. In contrast the region surveyed further upstream from this site was a more depositional area with reduced current flows. Sediment within this area was finer sand, olive brown in colour, with little shell debris present and greater depth of softer sediment.

3.1.9 Geoconservation

A number of sites of geoconservation significance are located in the Port Sorell Estuary region. Details of the sites are described below.

Griffith Point Dolerite
Griffith Point has three sills or horizontal bodies of dolerite within Cambrian dolomite. The dolerite has been assigned a Cambrian age of 500 to 600 million years and is therefore relatively unusual in Tasmania.

North East Arm Structure
Part of type area for Port Sorell formation, a lower Palaeozoic melange or mix of rocks. The physical character of the rock and complex structure suggest the formation was deposited in an active margin or accretionary complex (where rock material is being added to a continental plate) and tectonically emplaced (formed when continental plates collide) in the late Cambrian period.

North East Arm Shell Bed
Bed of extremely abundant sub-fossil (material which has not quite hardened to form a rock hard fossil), ironstained marine shells exposed by coastal erosion of thin hard pan.

3.1.10 Marine vegetation

The only vegetation found during zone surveys of the lower Rubicon River (Mitchell 2000) were small plants of Rice grass (*Spartinia anglica*) identified in one sample. The intertidal mudflats in the upper reaches of the Estuary, and especially the Rubicon River have been severely colonised by rice grass (*Spartina anglica).* It has been reported that rice grass is occupying 109 ha of the Estuary (Anon 1997). The rice grass can cover intertidal vegetation, alter the habitat values, accelerate siltation and change water flows. It may pose a management problem to the long term sustainability of the Estuary and the successful operation of a marine farm.

Fragments of seagrass (*Heterozostera tasmanica)* were found in a sample collected at South East Arm (Mitchell 2000).

3.1.11 Marine Fauna

Benthic Fauna

Surveys of the Lower Rubicon River (Mitchell 2000) found several crab burrows, one with a live crab (*cf Macrophthalmus latifrons*).

Fish

Table 1 - Fish species found in the Port Sorell Estuary

Scientific Name	Common Name
Galaxias brevipinnis	climbing galaxias
Galaxias cleaveri	Tasmanian mudfish
Galaxias maculatus	jollytail
Galaxias truttaceus	spotted galaxias
Geotria australis	pouched lamprey
Lovettia sealii	Tasmanian whitebait
Prototroctes maraena	Australian grayling
Pseudaphritis urvillii	sandy, freshwater flathead
Retropinna tasmanica	Tasmanian smelt
Aldrichettaforsteri	Yellow eye mullet
Arripis trutta	Eastern Australian salmon
Caesioperca lepidoptera	butterfly perch
Cyttus australis	silver dory
Galeorhinus galeus	school shark
Gymnapistes marmoratus	soldierfish
Hippocampus sp	seahorse
Syngnathus sp.	pipefish
Mustelus antarcticus	gummy shark
Myliobatis australis	eagle ray
Parablennius tasmanianus	blenny
Platycephalus bassensis	sand flathead
Pseudocaranx dentex	silver trevally
Pseudophycis bachus	red cod
Raja whitleyi	whitley's skate
Rhombosolea tapirina	greenback flounder
Urolophus cruciatus	banded stingaree
Dasyatis brevicaudatus	smooth stingray
Raja lemprieri	thornback skate
Genypterus tigerinus	rock ling
Hyporhamphus melanochir	south Australian garfish
Atherinosoma presbyteroides	silverfish
Platycephalus laevigatus	rock flathead
Acanthopegasus lancifer	sculptured sea moth
Latridopsis forsteri	bastard trumpeter
Sillago bassensis	school whiting
Mugil cephalus	sea mullet
Thyrsites atun	king barracouta
Ammotretis elongatus	elongate flounder
Haletta semifasciata	blue rock whiting
Heteroclinus sp.	weedfish
Gobiidae species	goby
Torquigener glaber	smooth toadfish

Shark nursery

Port Sorell Estuary was one of a number of sheltered bays and estuaries that were designated shark nursery areas in the early 1960s where the taking of either school shark (*Galeorhinus galeus*) or gummy shark (*Mustelus antarcticus*) has been prohibited (Williams and Schaap, 1992).

There has been considerable research undertaken on school shark within the Port Sorell Estuary from as early as the 1940s to as late as 1997, primarily due to concerns in relation to falling catch rates indicating over exploitation of the fishery. (Olsen, 1954, 1984, Stevens and West 1997, FRDC 91/23).

Female school shark move into the Port Sorell Estuary to pup mainly during November and December with the juvenile shark moving into deeper waters from March onwards (Olsen, 1954). Catch rates of juveniles were documented between 1948 and 1952 with an apparent declining trend in catch rates attributed to a decline in stock size resulting from heavy fishing pressure (Olsen, 1954).

In 1997 the CSIRO completed a FRDC research project which investigated school and gummy shark nursery areas in south eastern Australia. The inshore waters of Tasmania and Victoria were sampled from 1991 to 1997. Data showed catch rates were much lower at all sites including Port Sorell (Stevens and West, 1997).

3.1.12 Rare, endangered and threatened species

There are a number of rare, endangered or threatened species found in the Port Sorell region. Some of these species have a close association with the marine environment including two species of bird and a fish, the Australian grayling *Prototroctes maraena. Prototroctes maraena* is listed as vulnerable under the TSPA and the EPBCA.

Fairy terns breed around most of the coast of Tasmania apart from the central north. Terns use a range of habitats for breeding; sand or shingle beaches, unvegetated sites near estuaries and lakes and estuarine or offshore islands. Terns dive straight into the water to feed on fish and crustaceans (Bryant *et al* 1999).

The Hooded plover is found right around the coast of Tasmania where it frequents sandy beaches, breeding on oceanic beaches between August and March. The Hooded plover feeds mainly on small invertebrates found living beneath rotting seaweed or driftwood (Bryant *et al* 1999).

The Australian grayling live in the middle and lower reaches of rivers and streams that open to the sea. Spawning occurs in fresh water with the larvae

probably being swept to sea and return as whitebait after four to six months (Bryant *et al* 1999).

Rare, endangered or threatened species found in the Port Sorell Estuary region and listed under the TSPA and the EPBCA are outlined in table 2 below.

Table 2 - *Rare, endangered & threatened fauna in the Port Sorell region.

Common name	Species name	Status
Australian grayling	*Prototroctes maraena*	Vulnerable (TSPA) Vulnerable (EPBCA)
Fairy tern	*Sterna nereis*	Rare (TSPA) Not listed (EPBCA)
Grey goshawk	*Accipiter novaehollandiae*	Rare (TSPA) Not listed (EPBCA)
Hooded plover	*Thinornis rubricollis*	High con. sig. (TSPA) Vulnerable (EPBCA)
Swift parrot	*Lathamus discolor*	Vulnerable (TSPA) Endangered (EPBCA)
New Holland mouse	*Pseudomys novaehollandiae*	Rare (TSPA) Not listed (EPBCA)
Green and Gold Frog	*Litoria raniformis*	Vulnerable (TSPA) Not listed (EPBCA)
Wedge tailed eagle	Aquila audax fleayi	Vulnerable (TSPA) Endangered (EPBCA)

*Tasmania's Threatened Species Handbook Bryant & Jackson 1999

3.1.13 Introduced species

A list of introduced species found in the Port Sorell region are included in the table below.

Table 3 – Introduced species found in the Port Sorell region.

Common name	**Species name**
European shore crab	*Carcinus maenas*
Brown trout	*Salmo trutta*
Rainbow trout	*Oncorhynchus mykiss*
Pacific oyster	*Crassostrea gigas*

Centre for Research on Introduced Marine Pests, Technical Report Number 5, A Guide to the Introduced Marine Species in Australian Waters, Dianne M. Furlani.

3.1.14 Birds

The waters and coastline of the Port Sorell Estuary contain important habitat for bird species. Within Port Sorell Estuary and surrounding area, a number of bird species occur which have been listed on the Japan/Australian Migratory Bird Agreement (JAMBA), which is a treaty to protect migratory birds and their environment. There are also a number of bird species listed on the China/Australia Migratory Bird Agreement (CAMBA). Some of these migratory bird species that occur within the Port Sorell region are also listed under the EPBCA as matters of national environmental significance.

Two species of birds the white-bellied-sea eagle and little penguin are listed as having high conservation significance under the TSPA.

White-bellied sea eagles have a wide distribution from India to Australia. White-bellied sea eagles nest and feed close to the coast but can also be found in the vicinity of large rivers and lakes. Nesting habits are the same as wedge-tail eagles with nests located in secluded old growth trees. White-bellied sea eagles feed on fauna located in surface waters as well as land based lizards, mammals and carrion (Bryant *et al* 1999).

Little penguins breed in colonies located on the coastline. They return to burrows in the colonies around dusk or during darkness. Little penguins normally lay between two and five eggs, both parents help raise the chicks. They feed on small shoaling fish. Little penguins spend several months at sea returning for two to three weeks to moult (Bryant *et al* 1999).

Table 4 shows bird species found in the Port Sorell Estuary.

Table 4 - Bird species found in the Port Sorell Estuary

Common name	Scientific name
Acanthiza chrysorrhoa	yellow-rumped thornbill
Acanthiza ewingii	tasmanian thornbill
Acanthiza pusilla	brown thornbill king island
Acanthorhynchus tenuirostris	eastern spinebill
Accipiter cirrhocephalus cirrhocephalus	collared sparrowhawk
Accipiter fasciatus fasciatus	brown goshawk
Accipiter novaehollandiae	grey goshawk
Alauda arvensis	common skylark
Anas castanea	chestnut teal
Anas rhynchotis rhynchotis	australasian shoveler
Anas superciliosa superciliosa	pacific black duck
Anthochaera chrysoptera tasmanica	little wattlebird
Anthochaera paradoxa	yellow wattle bird
Anthus novaeseelandiae	richards pipit
Aquila audax fleayi	wedge-tailed eagle
Ardea novaehollandiae	white-faced heron
Ardeola ibis	cattle egret
Artamus cyanopterus cyanopterus	dusky woodswallow
Cacatua roseicapilla	galah
Biziura lobata	musk duck
Cacomantis flabelliformis prionurus	fan-tailed cuckoo
Calidris ruficollis	red-necked stint
Calyptorhynchus funereus xanthanotus	yellow-tailed black cockatoo
Carduelis carduelis	european goldfinch,goldfinch
Carduelis chloris	european greenfinch
Charadrius bicinctus	double-banded plover
Charadrius ruficapillus	red-capped plover
Chrysococcyx basalis	horsfields bronze-cuckoo
Chrysococcyx lucidus plagosus	shining bronze-cuckoo
Cinclosoma punctatum dovei	spotted quail-thrush
Circus approximans gouldi	swamp harrier
Colluricincla harmonica harmonica	grey shrike-thrush

Columba livia	feral pigeon
Coracina novaehollandiae	black-faced cuckoo-shrike
Corvus tasmanicus tasmanicus	forest raven
Coturnix ypsilophora ypsilophorus	brown quail,swamp quail (ssp. of brown quail)
Cracticus torquatus cinereus	grey butcherbird
Cuculus pallidus	pallid cuckoo
Cygnus atratus	black swan
Dacelo novaeguineae novaeguineae	laughing kookaburra
Emblema bella	beautiful firetail
Ephthianura albifrons	white-fronted chat
Eudyptula minor	little penguin
Falco berigora tasmanica	brown falcon (tasmanian),brown falcon
Falco peregrinus macropus	peregrine falcon
Fulica atra australis	eurasian coot
Gallinula mortierii	tasmanian native hen
Glossopsitta concinna	musk lorikeet
Gymnorhina tibicen hypoleuca	australian magpie (white-backed ssp.),australian magpie
Haematopus fuliginosus fuliginosus	sooty oyster catcher
Haematopus longirostris longirostris	pied oystercatcher
Haliaeetus leucogaster	white-bellied sea-eagle
Hirundapus caudacutus	white-throated needletail
Hirundo neoxena	welcome swallow
Hirundo nigricans nigricans	tree martin
Larus novaehollandiae novaehollandiae	silver gull
Larus pacificus pacificus	pacific gull
Leucocarbo fuscescens	black-faced shag
Lichenostomus flavicollis	yellow-throated honeyeater
Lathamus discolor	swift parrot
Malurus cyaneus cyaneus	superb fairy wren,blue wren
Manorina melanocephala melanocephala	noisy miner
Melanodryas vittata	dusky robin
Melithreptus affinis	black-headed honeyeater
Melithreptus validirostris	strong-billed honeyeater
Morus serrator	australasian gannet
Myiagra cyanoleuca	satin flycatcher
Neophema chrysostoma	blue-winged parrot
Ninox novaeseelandiae leucopsis	southern boobook (tasmanian),southern boobook
Numenius madagascariensis	eastern curlew
Oxyura australis	blue-billed duck
Pachycephala olivacea	olive whistler
Pachycephala pectoralis	golden whistler
Pardalotus punctatus	spotted pardalote
Pardalotus striatus striatus	striated pardalote
Passer domesticus	house sparrow
Petroica multicolor boodang	scarlet robin
Petroica phoenicea	flame robin
Petroica rodinogaster	pink robin
Phalacrocorax carbo novaehollandiae	great cormorant
Phalacrocorax melanoleucos melanoleucos	little pied cormorant
Phaps chalcoptera	common bronzewing

Phaps elegans	brush bronzewing
Phylidonyris novaehollandiae	new holland honeyeater
Phylidonyris pyrrhoptera	crescent Honeyeater
Platycercus caledonicus	green rosella
Platycercus eximius diemenensis	eastern rosella (tasmanian),eastern rosella
Pluvialis dominica	lesser golden plover
Podargus strigoides strigoides	tawny frogmouth
Poliocephalus poliocephalus	hoary-headed grebe
Porphyrio porphyrio melanotus	purple swamphen
Porzana tabuensis plumbea	spotless crake
Rhipidura fuliginosa albiscapa	grey fantail
Sericornis humilis	white-browed scrub wren,tasmanian scrub wren
Sterna bergii	crested tern
Sterna caspia	caspian tern
Sterna nereis nereis	fairy tern
Strepera fuliginosa	black currawong
Strepera versicolor arguta	grey currawong (clinking)
Sturnus vulgaris	common starling,starling
Thinornis rubricollis	hooded plover
Turdus merula	blackbird
Tyto novaehollandiae castanops	masked owl (tasmanian)
Vanellus miles novaehollandiae	masked lapwing
Vanellus tricolor	banded lapwing
Zoothera lunulata	bassian thrush,whites thrush
Zosterops lateralis lateralis	silvereye

3.2 Reservations, Land Tenure, Zoning and Residential Development

The land adjacent to the Plan area has a number of areas that have been reserved specifically for conservation and recreation. The values of these areas are listed below.

3.2.1 Narawntapu National Park

The Narawntapu National Park is located on land adjacent to the north east of the Estuary. It covers an area of 4349 hectares and extends 17 kms along the coastline to Greens Beach. The Park includes adjacent islands in the Port Sorell Estuary but does not include marine or estuarine waters. Narawntapu National Park can be compared with a Category II Protected Area under the International Union for the Conservation of Nature (IUCN). Under the IUCN Category II reserves are mainly for the protection of ecosystems and recreation.

Narawntapu National Park has high biodiversity in a relatively natural state. Vegetation in the Park has great diversity consisting of predominantly dry sclerophyll plant communities, heathlands and coastal vegetation. The Park has high densities of marsupials and wetlands located at Springlawn are some

of the best in the region (Narawntapu National Park, Hawley Nature Reserve Management Plan 2000).

3.2.2 Hawley Nature Reserve

Hawley Nature Reserve is located on the outskirts of Port Sorell. The Reserve has a healthy range of biodiversity and viable populations of indigenous species. (Narawntapu National Park, Hawley Nature Reserve Management Plan 2000).

3.2.3 Port Sorell Conservation Area

The Port Sorell Conservation Area covers 70 hectares of foreshore, tidal mudflats and woodland from Panatana Rivulet to Squeaking Point and includes Grass Island. The Conservation Area protects important native flora and fauna habitats. The Conservation Area contains or is frequented by several vulnerable, rare and endangered species. These include the fairy tern, hooded plover, little penguin and the white-bellied sea eagle.

3.2.4 Land tenure

The majority of land surrounding the Port Sorell Estuary consists of private holdings. A Crown foreshore reserve extends around most of Port Sorell Estuary, including the foreshore areas closest to the existing marine farm zones.

The north eastern section of the Estuary bounds the Narawntapu National Park. The Port Sorell Conservation Area is located on the western side of the Estuary south of Port Sorell.

3.2.5 Local Government Planning Schemes

Latrobe Planning Scheme1994

The Latrobe Planning Scheme 1994 covers all land adjacent to the Port Sorell Estuary MFDP. Under the provision of this planning scheme Aquaculture is a discretionary use within land zoned Open Space and Rural A.

3.2.6 Residential developments

The principal settlement in the region is located at the town of Port Sorell and is physically linked to Shearwater (residential development centred around the Shearwater Country Club and Golf Course) and Hawley Beach.

There are also extensive areas of rural residential development along the coastal land between Port Sorell and Squeaking Point;

An old 35 lot subdivision is located at Marana Drive near North East Arm.

3.3 Maritime uses

3.3.1 Navigation

Marine farming equipment in the water will have limited impact on the navigation of vessels (mainly recreational) in an area. Consultation with a range of recreational users indicated that the upper parts of the Port Sorell Estuary (where the marine framing zones are located) attracted very limited use due to the shallow waters and limited potential for undertaking recreational activities. However the area between The Tongue and Eagle Point (including Eagle Point Beach) is often used for water skiing, recreational fishing and anchoring of vessels.

The control of navigation and boating activities within the Port Sorell Estuary falls under the jurisdiction of MAST. Consultation with MAST indicated that there were no recognised navigation channels within the upper part of the Estuary.

3.3.2 Commercial Fishing

There are currently two commercial fishing licenses issued for the waters of the Port Sorell Estuary with one fisherman having a long family history associated with fishing the Estuary waters. Over time the number of commercial fishermen and catches have declined.

The main species fished by the commercial fishermen are flounder, salmon, cod, mullet, barracouta, silver trevally and whiting. Floundering occurs along the shallow sandflats and mudflats in the lower part of the Estuary, with nets being set at low tide and retrieved at high tide. Commercial fishermen are able to use nets in the lower Estuary up to The Tongue with no commercial fishing allowed south of The Tongue. Trolling for fish is also undertaken.

3.3.3 Recreational Fishing

Recreational fishing is also a major leisure pursuit undertaken within the Port Sorell Estuary and is recognised as a popular fishing location for flounder, flathead, salmon, trevally and bream. Boat ramp facilities are found at Port Sorell, Pantana Rivulet, Bakers Point, Hawley and Squeaking Point. The Port Sorell Estuary is a no recreational netting area.

3.3.4 Recreational

The Port Sorell Estuary is a major recreational destination for the north west region of the State offering sheltered estuarine waters for a number of aquatic

activities such as watersking, shallow-bottom yachting, recreational fishing, kayaking, jet ski boating, windsurfing, boat cruising and canoeing. These recreational activities are growing in use with the increased local population at Port Sorell and because the Estuary also attracts users from a large area (including Devonport).

3.3.5 Boating

It is reported that the Port Sorell boat ramp can have up to 80 trailers parked near the ramp on busy days. Up to 30 boats can be parked around Springlawn Beach for day activities including water-skiing. MAST has requested water-skiers to take off in a north west direction from Springlawn Beach to better manage the high level of use. Water-skiing occurs mainly in the waters from Springlawn Beach towards North East Arm and along the shoreline to the east of Rabbit Island. Another popular area is around Eagle Point Beach to the north of The Tongue.

3.3.6 Sailing, jet skis and kayaks

Sailing (shallow-bottom boats) and boat cruising occurs within the Estuary. This occurs mainly in the lower part of the Estuary but a few boats may occasionally use the shallow waters of the Rubicon River and South East Arm beyond The Tongue. Some of the more popular anchorages are Springlawn Beach, Eagle Point, Marshalls Point and Rabbit Island. The Port Sorell Cruising Club advised that their members used most of the Estuary and would want to continue to navigate these waters in the future.

Jet skiers frequently use the Hawley Beach to Springlawn Beach area whilst windsurfers tend to make more use of Port Sorell Beach, Freers Beach and Hawley Beach.

The sheltered waters near Springlawn Beach are also popular for people using kayaks and canoes. A number of Tasmanian schools have week long outdoor education and recreation camps at Springlawn Beach and often undertake canoeing as part of the adventure program.

3.4 Aboriginal Heritage

For the past 40,000 thousand years Aboriginal people have lived in Tasmania, and during this time Aboriginal people have harvested the shellfish, hunted native animals, gathered plant foods and utilised many coastal areas for every day living. Evidence of this lifestyle can be seen in the Aboriginal sites and artifacts that have been found around the coastline and inland across Tasmania. The Aboriginal community believes that all Aboriginal heritage sites are important as they give meaning to the landscape within which they

exist. Aboriginal heritage surveys can often be required as part of the development approval process for assessing the impact of land based developments.

3.5 Social and Economic Description

3.5.1 Population

Table 5 indicates the population trends for Port Sorell since 1976. There has been a substantial increase in population that has been well ahead of the population growth rates for the Municipality and northwest region (Mersey Lyall region).

Table 5 Population Trends in Settlements of Port Sorell, Latrobe Municipality and Mersey Lyall Region 1976-1996

Settlement	Pop 1976	Pop 1981	Pop 1986	Pop 1991	Pop 1996	Pop Change 1976-96
Port Sorell	772	859	1173	1494	1818	135.5%
Latrobe Municipality	5438	5521	6172	6763	7801	43.5%
Mersey Lyall Region	101426	106021	108115	111967	110209	8.7%

Source : ABS Urban Centre and Localities : Tasmania

The Port Sorell area has many attractions for residential living including an attractive coastal location, being in close proximity to Devonport City and it's facilities, relaxed 'holiday' atmosphere and lifestyle, favourable climate, available town facilities and services and strong sense of community. It has become a popular location for people to retire to, and also for young families seeking to maintain a lifestyle outside of the city and suburbs.

3.5.2 Economic description

The local economy is made up of tourism along with commercial fishing, agriculture, an industrial sand extraction operation at Eagle Point; and forestry in the form of large tree plantations within the foothills beyond the eastern part of the Port Sorell Estuary.

3.5.3 Tourism

Due to its location, climate, environment and amenities Port Sorell is a major recreational destination for the North West Coast. Over the summer period

there is a major influx of holiday makers. Current use of the Springlawn /Bakers Beach located in the Narawntapu National Park is in the vicinity of 31,000 visitors per year (Narawntapu National Park, Hawley Nature Reserve Management Plan 2000).

4 Marine Farming Zone Areas

4.1 Zone 1 and 2 – (at the Rubicon River)

Zone 1 is located in the upper region of the Port Sorell Estuary approximately 1 km north east of The Point, approximately 40 metres from the coastline at the closest point. Zone 2 is located in the upper region of the Port Sorell Estuary to the south west of The Tongue, and to the east of Grass Island, approximately 4 metres from the coastline at the closest point.

Zone 1 has an area of approximately 13.75 hectares with a maximum leasable area of 7 hectares. Zone 2 has an area of approximately 12.34 hectares with a maximum leasable area of 8 hectares.

Map A4.1 on page 34 shows the zones with Australian Mapping Grid Zone (AMG) Co-ordinates for the boundary of the zone listed on page 58 and 59.

4.1.1 Environmental Conditions

An environmental assessment of marine farm zones in the Port Sorell Estuary was conducted in August 2000 (Mitchell 2000) a summary is provided below.

Water depths within the region surveyed ranged from approximately 2 - 4.5 metres at high water. Some variation in sediment was noted within the area sampled with greater amounts of shell debris observed in samples collected at some sites along the eastern boundary of the region. The sediment was characterised as ranging from fine sand to a fine sandy silt/clay, olive/brown to olive/grey in colour. Variable amounts of shell and shell debris were collected with *Katelysia scalarina, Tellina cf deltoidalis* and *Salinator cf fragilis* the predominant species readily identified. Several crab burrows, one with a live crab (*cf Macrophthalmus latifrons*) were found in the sediment from one site (site 2). Small plants of Rice grass (*Spartinia anglica*) were identified in the sample from Site 1. Dense stands of this species were observed along the adjacent western shoreline and are found extensively in the upper reaches of this Estuary.

4.1.2 Adjacent Marine Use

Marine activities in the lower reaches of the Rubicon River are limited by water depth. Activities generally consist of the occasional vessel navigating up the channel for recreational purposes.

4.1.3 Adjacent Land Use

The land adjacent to the zone falls within the Latrobe Planning Scheme 1994 and is zoned Rural A. There is a foreshore reserve extending the full length of the shoreline that is zoned Open Space.

4.2 Zone 3, 4 and 5 - (at South East Arm)

Zone 3 is located in the upper region of the Port Sorell Estuary in South East Arm approximately 1 km south of The Tongue, following the highwater mark at the closest point. Zone 4 is located in the upper region of the Port Sorell Estuary in South East Arm approximately 1.5 km south of The Tongue, following the highwater mark at the closest point. Zone 5 is located in the upper region of the Port Sorell Estuary in South East Arm approximately 2 km south of The Tongue, approximately 30 metres from the coastline at the closest point.

Zone 3 has an area of approximately 0.61 of a hectare with a maximum leasable area of 0.55 of a hectare. Zone 4 has an area of approximately 11.00 hectares with a maximum leasable area of 6 hectares. Zone 5 has an area of approximately 5.41 hectares with a maximum leasable area of 3 hectares.

Map A4.1 on page 34 shows the zones with Australian Mapping Grid Zone (AMG) Co-ordinates for the boundary of the zones listed on page 60, 61 and 62.

4.2.1 Environmental Conditions

An environmental assessment of marine farm zones in the Port Sorell Estuary was conducted in August 2000 (Mitchell 2000) a summary is provided below.

Depths within the region near Zone 3 ranged from approximately 4 - 7 metres at high water with a relatively deep channel close to the shoreline. The deeper water depths are most likely due to the relatively narrow constriction within this reach of the river. Strong tidal currents and turbulent flows were noted which made it difficult to hold station and hence use the underwater video camera to view the substrate. Results from the sediment samples reflected the influence of strong flows within this region with considerable shell debris collected. The sediment was characterised as medium-fine sand dark yellowish brown in colour with numerous bivalve valves, predominantly of the species *Katelysia scalarina* and *Tellina cf deltoidalis*. Similarly, dense accumulations of shell debris of these species were observed further downstream near the tip of Lades Tongue peninsula.

The region surveyed to the west of the existing lease area in Zone 4 is a more depositional region with reduced current flows. Sediment within this area was

characterised as a very fine sand olive brown in colour with little shell debris present. Fragments of seagrass (*Heterozostera tasmanica*) were found in the sample collected. The sub-surface of the sediment contained some black mottling with a hydrogen sulphide odour indicating localised anoxic conditions associated with seagrass rhizomes.

4.3 Adjacent Marine Uses

Marine activities in the lower reaches of the Rubicon River are limited by water depth. Activities generally consist of the occasional vessel navigating up the channel for recreational purposes.

4.4 Adjacent Land Use

The land adjacent to the zone falls within the Latrobe Planning Scheme 1994 and is zoned Rural A. There is a foreshore reserve extending the full length of the shoreline that is zoned Open Space.

5 Development Description

5.1 Marine farming techniques & operations

Currently marine farming activities carried out in the Port Sorell Estuary consist of the culture of Pacific Oysters using intertidal methods. This Plan allows some limited scope for the use of subtidal shellfish culture methods.

5.1.1 Intertidal shellfish culture

Intertidal shellfish culture involves the farming of shellfish (Pacific oysters) in areas where the rise and fall of the tide covers and exposes the oysters and farming structures. Bivalve shellfish such as Pacific oysters are filter feeders, extracting phytoplankton and detritus from the surrounding water column and do not need supplementary feeding. However excretions can accumulate directly under areas where the oysters are held. When an oyster is not feeding (such as when exposed at low tide) it closes its shell, opening back up when able to feed again at a higher tide. This opening and closing of the shell develops a strong adductor muscle that promotes a longer storage life once harvested.

The structures predominantly used for intertidal culture are timber "racks" or wire "fence" systems known as "BST". The timber racking is made up of a series of posts supporting parallel rails. Placed on top of the rails are plastic mesh baskets enclosed in timber frames or "sets" and secured with large rubber bands. The BST system involves posts supporting tensioned wire from which oyster baskets are suspended.

Intertidal shellfish farms are generally serviced at low tides using either an aluminium barge with outboard motor(s) or an "aquatractor", (a large tractor with increased ground clearance enabling it to be driven in shallow water). Once out on the lease area, a group of sets will be systematically removed and taken back to the shore-based depot for grading or final harvesting. After the oysters have been graded and sorted into groups of uniform size they are returned to the lease area. This cycle can be repeated up to eight times over the 18 – 24 month life of cultured oysters prior to harvesting.

A typical intertidal shellfish farm would consist of a series of timber racks 2 metres wide. The spacing between the racks is normally around 10 metres, giving a total of 1 kilometre of racking per hectare over an average sized lease area of 5 hectares. At low tide most of these structures will be visible along with a punt or tractor used for servicing the lease. At high tide however the racking will not be visible with only the navigation markers prescribed by

MAST above the water surface. These markers normally consist of a post 1.8 metres high with a yellow cross on each corner of the lease area.

5.1.2 Subtidal shellfish culture

Subtidal shellfish culture involves farming in areas that are never exposed at low tide and can be used for a wide variety of species such as Pacific oysters, Blue mussels and Scallops. The basic layout of a subtidal farm includes a main submerged longline that is moored at each end. To this main line shorter lines are connected to both surface and sub-surface buoys. A series of "droppers" are then hung beneath the main line with the cultured species held at the end of each dropper. The method of containment off the droppers varies depending upon the species grown with "trays" or "modules" used for oysters, cages or barrels (abalone), lantern nets (scallops) or attached directly to the droppers in the case of mussels. The longlines are serviced by a vessel pulling up alongside and raising the line clear of the water. The modules or cages can then be removed from the droppers enabling stock to be graded or harvested.

Like Pacific oysters, mussels and scallops are filter feeders and do not require further feeding, however waste from sub-tidal shellfish culture can accumulate on the substrate underneath the droppers. In the case of Pacific oysters that are able to feed much of the time, generally growth rates are superior to those grown in intertidal areas. However, the shelf life is reduced due to a weaker adductor muscle. Both culture techniques complement each other and it is advantageous for marine farmers to be able to transfer stock between intertidal and subtidal areas.

A typical subtidal shellfish farm would consist of a series of submerged longlines supported by surface buoys, some of which would be visible depending upon the size and colour used. Dark coloured, low profile buoys are generally used, spaced approximately 5 metres along each longline. This would amount to approximately 200 buoys per hectare given a spacing of 10 metres between each longline. Corner markers as prescribed by MAST (normally a buoy/pole with flashing light) must also be installed. A single vessel will occasionally be seen servicing the lease area and as operators are not dependant upon a low tide, servicing the lease may occur at any time throughout the day.

5.2 Existing Land Based Infrastructure

Currently one operator holds the existing marine farming leases. A shore base facility for the servicing of these leases is located on a crown land lease south of the Tongue in East Arm. The shore base facility is used to grade and package oysters and consists of launching facilities, sheds and areas for the storage and drying of marine farming equipment. Given the Plan proposes a

reduction in maximum leaseable area it is not anticipated that there will be an increased demand for shore base facilities.

5.3 Marine Farming Developments

Tasmania relies much on its primary industries for employment and the generation of earnings through export, both to the mainland and overseas. The development of marine farming in the State has created new economic employment opportunities.

Marine farming has become an important addition to the fishing industries. At national level in 1998-99, aquaculture production comprised 30% of Australia's total seafood production, which had a value of $1985 million (ABARE, 1999). Within Tasmania, the marine farming industry in 1999/2000 provided approximately 35% of the State's total seafood production. It is anticipated that this will increase with changing technology and new species to be farmed.

In Tasmania marine farming has concentrated on the production of high value products with international and domestic appeal. In the past ten years this has led to the rapid development of the marine farming industry. Its 1999/2000 annual farm-gate value was $100 million, made up primarily of Atlantic salmon and Pacific oysters. Other species produced in the State include ocean trout, mussels, scallops, sea horses and abalone. Research is currently being undertaken into the culture of rock lobster and other finfish species. The industry creates direct employment for around 560 people and substantial indirect employment has been created in associated industries.

Coastal marine and estuarine waters provide the basis for most of the marine farming undertaken in Tasmania. It takes place on 183 separate leases covering a total area of approximately 2393 hectares. The majority of this area is located in the south east of the State. The cooler waters, range of sheltered inlets, and proximity to markets, airports, other facilities and services are some of the reasons for the concentration of the industry in that region.

The industry has grown rapidly since its beginnings and has indicated potential for further growth with the State promoting its "clean green" image for domestic and export markets. The Tasmanian Industry Audits conservatively estimates the total contribution from expansion of the industry by 2005 at $300 million and 1000 full-time employment equivalents.

The Port Sorell Estuary currently holds 2 marine farming lease areas, operated by a single leaseholder and occupying an area of 48.929 hectares. The farm

currently has 2 permanent employees. Map A5.1 on page 39 shows the existing marine farming lease areas.

In addition to the above direct economic impacts of the marine farms, there are also a range of indirect impacts that are commonly referred to as the "multiplier effect". The indirect employment effect of every 10 hectares of fully developed water would be around 3 to 4 persons. These persons would be employed in spat production, processing plants and the supply of electricity, transport services, ice, ropes, anchors, buoys, surveying, fuel, boats, etc (UNITAS, 1996)

Infrastructure costs to establish an intertidal farm including racking, seed trays, baskets etc is estimated at around $70 000 for 6 km (UNITAS, 1996). The cost of on shore facilities such as sheds, sorting tables, sieves, tractors, boats is estimated at $66 000 for a farm containing 3 km of racking (UNITAS, 1996).

6 Potential Impacts and Mitigation Measures

The impacts of marine farming vary in their nature and intensity. Many impacts will be of a beneficial nature, none more evident than the creation of wealth and employment to the State economy as discussed in Section 5 – *Marine Farming Developments*.

The negative impacts of marine farming also require consideration. There are the more obvious impacts to the human environment such as the alienation of lease areas from general use, and the visual and noise impacts arising from the operation of a marine farm. They include farm infrastructure, such as buoys or racks in the water, and more people and boat traffic in the area.

The impacts on the natural environment in the vicinity of marine farms are not so obvious, and coastal communities are concerned that long-term ecological damage may occur.

In general terms the main impacts of marine farming have been well documented overseas, (Gowen & Rosenthal 1993, Baird *et al* 1996). There has also been some limited research on the impacts of shellfish culture on the local environment. The impacts of shellfish culture are discussed below.

6.1 Impacts on the natural environment

6.1.1 Water Quality

There are two issues in relation to marine farming activities and water quality. The first is the impact of marine farming activities on the water quality of the region. The second is the impact of a regions water quality on marine farming operations.

Impacts of marine farming on water quality

Because filter feeding shellfish feed on microscopic algae and detritus obtained from the waters they are growing in they do not require additional feeding (input of nutrients). The impacts of marine farming these species of shellfish on the water quality of a region are therefore considered minimal. In fact extensive marine farming of filter feeding shellfish has the potential to have a beneficial impact in highly eutrophic estuaries where nutrient enrichment has occurred due to land based activities, resulting in dense algal blooms. The shellfish feed on the algae thus improving the water quality and some of the excess nutrients are removed from the system when the shellfish are harvested (Newell, 1989, FAO, 1995).

The concentration of large numbers of shellfish may however result in the build up of excretions from the shellfish in the sediments under holding containers. The degree of deposition will depend on stocking densities and current flows in a particular region. At stocking densities practised in Tasmania, build up is not significant. The potential impacts of excessive build up from excretions are discussed in section 6.1.2 *Substrates*.

Marine farmers regularly monitor water quality parameters at their lease areas, which can provide an early indication of water quality problems in a region. Marine farming activities therefore have the potential to increase awareness of resource managers to the importance of ensuring that appropriate requirements are met in relation to activities that may affect water quality.

Impacts of water quality on marine farming activities

Land based development, agricultural and forestry activities occurring within catchment areas adjacent to the Plan area have the potential to impact on water quality in the Port Sorell estuary. These impacts have the potential to occur from a number sources, including wastewater, run-off of silt and dirt from road surfaces, litter dumping, fertiliser run-off from agricultural land and oil spills from road run-off.

Commercial and recreational marine activities may also impact on water quality in a region. Impacts have the potential to occur from release of waste from vessels or the introduction of exotic species and the use of toxic antifoulants.

Issues that may affect water quality and subsequently shellfish marine farming operations may include bacteria and viruses, phytoplankton blooms, suspended sediments and introduced species.

Primary sources of bacteria and viruses may include agricultural runoff and wastewater disposal from septic tanks, sewage plants and storm water. The affects of the introduction of bacteria and viruses into the marine environment are of particular significance for marine farming operations culturing filter feeding shellfish. Bacteria may be ingested by shellfish, which may cause food poisoning if subsequently consumed by humans. Viruses may also be passed on to humans by the consumption of contaminated shellfish.

Phytoplankton blooms are a natural occurrence. Elevated nutrient levels however may increase the frequency and density of blooms. Filter feeding shellfish feed on phytoplankton, however if shellfish ingest toxic algae, toxins may be passed on to humans by the consumption of those shellfish.

An industrial sand extraction plant is located at Eagle Point on the eastern shore of the Port Sorell Estuary. Minor impacts to marine farming could

occur if the holding dams used to store water from the washing process were to overflow into the estuary. This may result in increased turbidity.

Adverse Impacts and Mitigation Measures

The impacts on water quality from the culture of filter feeding shellfish are considered to be minimal given that the densities of shellfish are regulated by management controls within this Plan.

There are currently a range of measures being undertaken by relevant authorities to reduce the effects of land based activities on water quality. These measures include the setting of protected environmental values and water quality objectives for regions under the State Policy on Water Quality Management 1997, council strategic plans and catchment management plans.

State and local government authorities control the issue of effluent disposal within the Port Sorell Estuary by way of a range of legislation and management practices.

The management objectives of the Forestry Tasmania, Mersey Forest District Forest Management Plan, August 1999 prescribe the protection of water quality and protection of catchments. Forestry Tasmania conforms to the State Policy on Water Quality Management (1997) (Mersey Forest District Forest Management Plan).

The Department of Health and Human Services under the Tasmanian Shellfish Quality Assurance Program (TSQAP) undertake Sanitary surveys and regular monitoring of shellfish farming areas within the Port Sorell Estuary. Depending upon the results of a survey, a classification is given to that particular area which controls the harvesting of shellfish directly for human consumption. Existing farms in the Port Sorell Estuary have been regularly monitored since 1986.

The industrial sand extraction plant is a level 2 activity currently monitored by the Industrial Environmental Operations section of DPIWE. Washing of substrates in the daily operations uses water from on site dams. This water is recirculated therefore having little effect on water quality in the Port Sorell Estuary. There are no reagents used in the washing process.

There is a range of legislative controls currently in place and management practices currently undertaken to ensure that water quality in relation to marine farming operations is maintained from a species and human health perspective.

6.1.2 Substrates

There are a number of potential changes that can be caused by shellfish farming in the immediate and surrounding sediments. The primary effect may be an increase in nutrient concentrations in sediments underneath the cultured shellfish.

Filter feeding shellfish feed on microscopic algae (phytoplankton) and detritus obtained from the waters they are growing in. They do not require any additional feeding. Even so, shellfish farming may result in the build-up of some excretions below the holding containers on racks or longlines.

The material digested by the oysters is converted to shell and meat, which is harvested by the marine farmer, and faeces and pseudofaeces which is deposited into the environment. The deposited material is utilised by microorganisms and benthic fauna present in the area. Utilisation of this material will vary according to the amount deposited, number and types of microorganisms and benthic fauna present, as well as current flow in the area (Mitchell, 1999). In fact the degree to which an impact is considered significant often relates to changes in the structure of biological communities.

Potential environmental problems may occur if deposits are excessive and the utilisation rate is exceeded by supply, causing a depletion of oxygen in the area. Such conditions are detrimental to the growth of shellfish and have not been a problem in Tasmania, most probably due to stocking densities, current flows and farm management (Mitchell, 1999).

The ecological impacts of shellfish culture have been outlined in Hecht and Britz (1992), who state that organic sediment can build up under mussel longlines and rafts. This build up would be negligible compared with current finfish culture, primarily because the shellfish make use of the plankton and particulate organic matter existing in the water. The effect is, moreover, unlikely to be significant at stocking densities presently practised in Tasmania, which is much lower than some overseas countries.

The installation of marine farming equipment provides substrate that in many cases may not have previously existed in an area. A number of animal and plant species are able to settle on this equipment where previously they would be unable to do so. Disposal and decomposition of these fouling organisms in the water could increase organic compounds in the sediments. Similarly, removal of organisms from the shellfish during harvesting and processing operations could result in substantial organic build-up if they are thrown back into the water.

The use of wheeled vehicles to service marine farms may, overtime result in the compaction or suspension and redistribution of sediments within marine farming operations. Such impacts may effect benthic fauna in the region.

Adverse Impacts and Mitigation Measures

This Plan contains management controls to restrict the density of shellfish held on farms by limiting the amount of stocked racking, post and wire and longlines per hectare. Marine farmers will also be required to undertake a monitoring program, the results of which will be used to track environmental conditions and determine future licence conditions.

Management controls within this Plan restrict the manner in which fouling material can be disposed.

6.1.3 Geoconservation

The establishment of marine farming structures such as oyster racking has the potential to disturb significant geological features in the marine environment if located directly on those sites. Geological features of significance on the coastline may be disturbed by the establishment of shore base facilities or access across the coastline to marine farming operations in the marine environment.

Adverse Impacts and Mitigation Measures

The location of significant geological features has been considered in the siting of marine farming zones in this plan. The zones have not been sited over any identified geological feature.

The NPWA contains provisions for the maintenance of geodiversity. Relevant authorities will need to consider this issue in any future approval of land based developments.

6.1.4 Marine vegetation

Impacts of marine farming on marine vegetation

Marine farming operations have the potential to impact on marine vegetation if those operations are sited over or adjacent to marine flora. Physical damage may be caused by the placement of marine farming structures directly on top of vegetation. Such structures could include racking or moorings. Shading from marine farming structures may reduce light to an extent where the growth or survival of marine vegetation is impacted. Deposition of effluent may occur to an extent where vegetation is smothered.

No studies have been undertaken in Tasmania on the impacts of marine farming activities on surrounding vegetation. Anecdotal evidence is contradictory, suggesting that the vegetation has increased in some areas where marine farms have been sited over or adjacent to seagrass beds, but in other areas they have shrunk. Results from a South Australian Research and Development Institute Shellfish Monitoring Program (Hone, 1996) showed that no detectable changes in seagrass communities were measured within marine farms, except for some localised loss associated with seed trays due to shading.

Marine vegetation readily survives between rows and underneath racking in intertidal marine farming operations. Where baskets are placed over racking there may be an impact directly beneath the racking from shading. The degree of this impact will depend on the time that the baskets are in place. Many marine farmers report that when baskets are removed from racking that impacted vegetation returns to a healthy state. Physical damage may occur to vegetation from the servicing of intertidal farms. Damage may be caused by the operators walking on the vegetation or by the use of outboard motors.

Impacts of marine vegetation on marine farming activities

The intertidal mudflats in the upper reaches of the Estuary, and especially the Rubicon River have been severely colonised by rice grass (*Spartina anglica)*. The rice grass can cover intertidal vegetation, alter the habitat values, accelerate siltation and change water flows. It may pose a management problem to the long term sustainability of the Estuary and the successful operation of a marine farm.

Adverse Impacts and Mitigation Measures

Initial environmental surveys have been undertaken for new marine farming zones within this plan. Site specific baseline surveys will be required prior the commencement of marine farming operations. This information is assessed and measures taken to protect significant marine vegetation if considered appropriate. Management controls within this plan require regular monitoring of the effects of marine farming operations.

Given the low densities of vegetation described by Mitchell *et al* within the region it is considered that the impacts to marine vegetation from the zones within the Port Sorell Estuary will be minimal.

The management of ricegrass infestations in the Port Sorell Estuary is currently restricted to areas north of Eagle Point. Review of the ricegrass management practises plan in the future may reconsider management objectives for the areas to the south of Eagle Point. The reduction in leasable area and the relocation of two areas is designed to help mitigate impacts of rice grass infestation.

6.1.5 Removal of Suspended Food Material

Pacific oysters are filter feeders, feeding primarily on microalgae filtered out of the water that is flowing past them. Because filter feeding shellfish are totally reliant on the food available in the water, the production of algal food in the growing area is important in determining how many shellfish can be grown. If there are too many shellfish in a particular growing area, there may not be sufficient microscopic algae to feed all the farmed shellfish and the other filter feeding invertebrates.

Thorne (1997) studied fauna communities within intertidal lease areas and references sites located outside lease areas, at four marine farming locations around Tasmania (Thorne, 1997). Results found that the diversity of species, number of individuals and species was higher in the culture areas. It appeared from the results that the benthic community response was indicative of low levels of organic enrichment.

Research undertaken by the South Australian Research and Development Institute (Hone, 1996) measured growth rates and densities of native filter feeding shellfish within marine farms. The results indicted that there was no significant effect on competing filter feeding shellfish providing stocking rates were controlled.

Adverse Impacts and Mitigation Measures

The Port Sorell Estuary Marine Farming Development Plan contains management controls to restrict the density of shellfish held on farms by limiting the amount of racking or post and wire per hectare. In areas where shellfish production may become a concern marine farmers may be required to monitor the growth rates of shellfish.

6.1.6 Release and Settlement of Pacific Oyster Larvae

An effect of the culture of Pacific oysters in Tasmania has been the release and settlement of the species outside of farming areas. As the Pacific oyster is an introduced species, there is the potential for these to affect native species. Settlement of Pacific oysters on adjacent shorelines may be perceived by some people as a nuisance, due to the sharp nature of their shells whilst others may consider these oysters a delicacy and a recreational or commercial resource to be harvested.

Research has been undertaken by the University of Tasmanian in relation to the effects of feral Pacific oyster on the structure of macroinvertebrate communities. While results of this research have not been finalised,

preliminary results show that total densities and species diversity of macroinvertebrates are lower on Pacific oyster reefs established on soft sediment than in adjacent soft sediment areas without oysters. This pattern arises despite that Pacific oyster reefs support an assemblage of epifauna living on the surface oysters that is not present in inter reef areas. The largest differences between oyster reef and inter-reef areas are reflected in the infauna, and the causative mechansim appears to be the effect of oyster reefs in accumulating finer sediment than is found in inter-reef areas. (Prof. C Johnson, pers. Comm.).

Pacific oysters generally spawn seasonally, triggered by an increase in water temperature and other factors such as salinity, dissolved oxygen, pH and various chemical substances in the seawater (Hone, 1993). In Tasmania this usually occurs during the warmer summer months when water temperatures rise above approximately 18°C for several consecutive days. In the Port Sorell Estuary the marine farmer has found that Pacific oysters usually spawn between January and February.

Spawning may consist of several events over a period of hours or weeks depending on environmental conditions (Hone, 1993). Each female releases millions of eggs into the water, and those that are successfully fertilised by sperm from male oysters hatch into larvae after about 24 hours. The oyster larvae float in the water column for around 3 weeks before they metamorphose and settle on the bottom as juvenile oysters. During this 3 week period the oyster larvae can move long distances if strong currents are present, and their survival is totally dependent on a range of environmental conditions and on currents moving the larvae to areas suitable for settlement.

Pacific oysters were introduced into Tasmanian waters in the late 1940s and 1950s by the CSIRO in an attempt to expand oyster cultivation in Australia. Port Sorell was considered a good prospect for oyster spawning and spat settlement due its higher summer temperatures, consequently Pacific oysters were transferred from the south of the State to the North East Arm section of the Estuary and despite some setbacks, the oysters flourished and a number of mass spawnings and successful spat settlements were recorded (Sumner 1991).

Pacific oysters were first cultured using current techniques in Port Sorell in 1986. Since the time of the first introduction and marine farming of Pacific oysters within the Estuary, considerable sections of the Estuary have been colonised by Pacific oysters on suitable substrata. Some consideration has been given to managing the harvesting of these ‘wild’ oysters as a job creation scheme for the area. Collection of wild Pacific oysters in the Port Sorell Estuary has occurred under Permits issued by DPIWE.

Adverse Impacts and Mitigation Measures

The release of larvae from cultured Pacific oysters is an unavoidable impact in the culture of the species in the Port Sorell Estuary.

The Port Sorell Estuary holds considerable numbers of wild settled and cultured Pacific oysters. Each mature oyster has the potential to release millions of larvae into the surrounding waters at spawning. Water flows in the region have the potential to distribute these larvae widely throughout the Estuary. Given the wild settlement in the region it is considered that settlement, in Port Sorell, depends on a range of suitable environmental conditions conducive for settlement, rather than the abundance of larva available for settlement.

6.1.7 Shark nursery

As discussed in *Section 3.2.13 – Marine Fauna* of this Plan the CSIRO investigated school and gummy shark nursery areas in south eastern Australia. The inshore waters of Tasmania and Victoria were sampled from 1991 to 1997 (Stevens and West, 1997).

Port Sorell is a nursery area for shark and the management of the Estuary in relation to marine resources has been structured to protect shark. Therefore it is important that consideration be given to the potential impacts of marine farming operations on shark. Potential impacts may occur if marine farming structures restrict access of females to pupping areas or the restriction of juvenile shark to feeding areas.

There have not been any studies undertaken on impacts of marine farming infrastructure and operations on juvenile shark species. Marine farms may well attract some species providing shelter and protection from predators. Anecdotal reports suggest that a wide range of marine species are regularly found within marine farming operations; these include some of the larger species such as skates and rays which are known to feed on juvenile oysters.

Adverse Impacts and Mitigation Measures

The majority of marine farming areas within this Plan are located on shallow sand/silt flats within the Estuary. It is envisaged that marine farming infrastructure will consist of posts and racking or wire farming methods with the servicing of these farms most likely to occur during periods of low tides as is the normal industry practise.

The adult school and gummy sharks are most likely to inhabit the deeper channels of the Port Sorell Estuary. However it is considered probable that the juveniles feed on the shallow sand flats of the Estuary during periods of

high tides, retreating back to the deeper channels on the low tides (Olsen pers comm).

It is considered that the infrastructure associated with shellfish farming will not exclude juvenile school shark from the area and that juveniles would still be able to feed underneath and between farming equipment during times of high tides (Olsen pers comm). The servicing of marine farms is unlikely to impact on the juvenile shark as this essentially occurs during periods of low tide when the shark retreat to the deeper channels within the area (Olsen pers. comm.).

6.1.8 Birds

The establishment of marine farming operations may alter habitats for bird species. Marine farming activities may create disturbance by noise and human activity. Some species more sensitive to human activity may seek habitat in other areas. Some species may tolerate or benefit from some operations. Farming activities sited on important intertidal habitat for shore birds or deepwater operations in close proximity to important coastline for birds may impact on feeding, roosting and nesting activities if adequate buffers are not maintained. The significance of potential impacts will depend on site specific conditions, such as numbers and species in an area and proximity to sensitive habitat.

Adverse Impacts and Mitigation Measures

In the siting of marine farming zones consideration has been given to buffer zones between identified significant bird reserves and areas of marine farming. It is considered that the marine farming zones will have minimal impact to bird species. Narawntapu National Park is located approximately 3.5 kilometres from the closest marine farming zone. The Panatana Rivulet and Squeaking Point sections of the Port Sorell Conservation area are located approximately 2 kilometres from the nearest marine farming zone.

The Grass Island section of the Port Sorell Conservation area is located approximately 100 metres from the closest marine farming zone, this is a site frequented by little penguins. Little penguins are listed as having a high conservation value under the TSPA. It is considered that 100 metre buffer between marine farming operations and Grass Island will mitigate potential impacts to Little Penguins.

6.1.9 Rare endangered and threatened marine species

There are a number of species listed as rare, endangered or threatened under TSPA and EPBCA as identified in *Section 3.1.12 – Rare, Endangered and Threatened Species*. Marine species that may be impacted upon by marine farming operations consist of birds, which have been discussed in *Section*

6.1.8 - Birds, and the Australian grayling *Prototroctes maraena* which is listed as vulnerable.

Australian Grayling live in the middle and lower reaches of rivers and streams that open to the sea. Spawning occurs in fresh water with the larvae probably being swept to sea and return as whitebait after four to six months (Bryant *et al* 1999). Potential impacts of marine farming operations on *Prototroctes maraena* may include interference with feeding activities and the return of juveniles.

Adverse Impacts and Mitigation Measures

It is considered unlikely that the installation of post and racking and wire marine farming equipment will interfere with the feeding habits of Australian grayling or the return of juveniles.

6.2 Impacts on the built environment

6.2.1 Visual

Visual impacts are subjective and difficult to quantify. Attitudes and perceptions vary considerably, so that two observers often perceive their views to be differently impacted by the same facility. Marine farming operations are commonly placed in open water where no permanent man made structures exist. These structures alter views from adjacent vessels and may alter views from adjacent land areas.

The general appearance of marine farming operations will vary with the species farmed and the management strategies of the operator. Intertidal shellfish farms will consist of racking or posts and wire, the degree of visibility of this equipment will alter depending on tide levels. Deep-water shellfish leases will usually consist of parallel rows of buoys within a marked lease area, frequently offshore.

A wide range of variables will effect the visibility and prominence of marine farming equipment in estuarine scenery. Particular vistas created by natural lines and features in each view of the landscape will be important. Coastlines, water channel flow lines (seen especially in calm conditions) as well as vegetation edges will influence viewing direction and emphasis. These in combination affect which part of the scene is especially targeted in viewing. Lighting (direction, intensity etc.) and wind conditions (reflective or patterned water surfaces) will also affect the degree of visual contrast and thus the prominence that marine farming facilities will have against the surrounding water surface (Chetwynd, 1998).

The impact of lighting used on a marine farm will vary with the type of farm and the marking requirements of the relevant Marine Authority. There may be navigation lights on the corners of the lease or spotlights for security.

Poor placement of high-intensity lights can have a considerable impact on the amenity of nearby residents. Flashing navigation lights are required to be visible from considerable distances under maritime laws, and may be intrusive to some people. The reflective surface of calm waters could exacerbate light problems.

Adverse Impacts and Mitigation Measures

The existing marine farming equipment in Port Sorell Estuary is visible from a number of areas on the adjacent coastline. The Plan will to decrease the overall area available for marine farming activities in the Port Sorell Estuary. It does however allow the potential to relocate some of the existing marine farming lease areas. This may increase the potential visual impact from marine farming equipment being viewed over a larger area.

However the new marine farming areas in Port Sorell Estuary will be visible from limited locations accessible to the general public. There are few residences that directly overlook the zones.

Marine farming activities within the zones outlined by this Plan will result in visual impacts to adjacent vessels in the region and some views from adjacent land areas this is an unavoidable impact. Management controls contained within this Plan regulate the nature of marine farming equipment to mitigate the level of impact.

Land based infrastructure associated with marine farming developments fall outside the scope of this Plan. There is however a range of management mechanisms which control siting and development on land.

6.2.2 Navigation

Marine farming equipment on the water like any moored floating structure will have some impact on the navigation of vessels in that area. The level of impact will depend on the siting of the equipment. If structures are sited in established navigation channels, narrow channels, or where boats would be unable to navigate around them the impacts will be significant.

The placement of marine farming operations in identified anchorages so as to restrict manoeuvrability into and the use of anchorages may impact on mariners safety, in particular in inclement weather conditions when mariners may need to seek shelter.

If marine farming operations are not adequately marked or lit or made visually unobtrusive they may become a significant safety hazard especially at night or during inclement weather.

Structures that may break free from marine farming operations, usually during severe weather conditions could become a hazard to navigation.

Adverse Impacts and Mitigation Measures

There are no recognised navigational channels in the upper parts of the Port Sorell estuary but recreational users will typically follow the deeper channel and avoid the oyster racks. The zones identified in this Plan will maintain navigational access for the general public with a minimum of 50 metre access strip being provided. The strip is provided around the zones and includes the deeper channel.

The zones will not impact on the use of any safe anchorage.

Management controls within this Plan require marine farming operations to be marked in a manner as specified by MAST.

6.2.3 Commercial and Recreational Fishing

Since marine farming operations occupy space in the water, there is the potential for commercial and recreational fishing activities to be displaced if marine farms are sited in prime fishing areas. The results of this displacement may reduce commercial and recreational catch and the recreational fishers' enjoyment of fishing activities. Whilst many marine farmers around the State allow may recreational fisherman within marine farming lease areas, lessees are granted exclusive occupation of a lease area and could restrict access should he/she choose to do so.

Marine farming operations may also have a positive impact on recreational fishing activities in the region. Marine farming structures in the water may act as artificial reefs attracting fish species.

Adverse Impacts and Mitigation Measures

It is considered that the marine farming zones within this Plan will have limited impact on recreational fishing within the Port Sorell Estuary. No commercial fishing is allowed south of The Tongue. Netting by recreational fishers is not permitted in Port Sorell south of Griffiths Point.

Marine farming operations within a marine farming zone will not exceed the maximum leasable area set for that zone. Navigation and recreational activities will still be allowed within the zone area.

6.2.4 Aboriginal Heritage

All Aboriginal sites in Tasmania are protected under the *Aboriginal Relics Act 1975*. Section 14 (1) of the Act states that to damage, destroy, remove, conceal or interfere with an Aboriginal relic requires a permit from the Minister for National Parks and Wildlife. This applies to all land tenures. The State Coastal Policy 1996 also applies to the protection of Aboriginal heritage.

As many Aboriginal sites are found on the coastal strip, activities undertaken in this area have the potential to impact those sites. Aboriginal heritage issues should therefore be taken into consideration prior to any works or other activities on the coastal strip

Adverse Impacts and Mitigation Measures

Marine farming zones within this Plan occur below the highwater mark. It is predicted that marine farming operations within these zones will not impact on known aboriginal sites. Any shore based facilities resulting from the location of marine farming zones will be obligated to address the above legislative requirements.

6.2.5 Recreation

Marine farmers are granted exclusive rights to a lease area, which has the potential to impact on recreation by obstructing access to the shore or water areas traditionally used for recreation. Such recreational activities may consist of recreational fishing, diving, swimming and sailing.

Marine farming operations may also have a positive impact to recreational activities. Personnel from farms could provide assistance during boating emergencies.

Adverse Impacts and Mitigation Measures

Marine farming equipment in the water will have limited impact on the navigation of vessels (mainly recreational) in an area. Consultation with a range of recreational users indicated that the upper parts of the Port Sorell estuary (where the marine framing zones are located) attracted very limited use due to the shallow waters and limited potential for undertaking recreational activities. However the area between The Tongue and Eagle Point (including Eagle Point Beach) is often used for water skiing, recreational fishing and anchoring of vessels.

The maximum leasable area within this Plan of 24.55 hectares equates to approximately 1.4 % of the total area.

6.2.6 Noise

Potential noise impacts from marine farming operations will occur during the servicing of farms and incidental noise from personnel working on the site. Noise levels will vary depending on the equipment used, weather conditions and background noise.

Adverse Impacts and Mitigation Measures

Noise emissions in Tasmania are controlled by way of guidelines and regulations made pursuant to the *Environmental Management and Pollution Control Act 1997* (EMPCA). Management controls within this plan require marine farming activities to conform to the provisions of EMPCA.

6.2.7 Debris

There is a possibility, usually during extreme weather conditions, of structures breaking away from marine farms and littering the surrounding foreshore, whilst in the water this debris has the potential to pose a hazard to navigation.

Adverse Impacts and Mitigation Measures

Management controls within this Plan require lease holders to remove this equipment as soon as possible.

6.2.8 Predator Control

On occasion skates, birds and starfish may predate on shellfish cultured by marine farming operations.

Adverse Impacts and Mitigation Measures

The control of predators on oyster farms is usually limited to netting of baskets to exclude birds and skates, or the relocating of native starfish.

6.3 Conclusion

There are a number of impacts that may result from marine farming operations. As discussed there are the obvious impacts such as the alienation of lease areas from the general use and the visual and noise impacts arising from the operation of a marine farm. Consideration has been given to the location, size and operation of the zones within this Plan to mitigate these impacts.

The environmental and ecological changes are more difficult to predict and may be difficult to distinguish from the effects of on-land developments. The

results of research and environmental assessments within the Plan area have been used to consider these impacts and develop management controls to reduce and monitor the impacts.

Consideration has been given to sustainable development of marine farming in the Plan area. Management controls will specify those farming practices and stocking densities considered appropriate for general application in the Plan area so as not to adversely affect the existing marine farming operation.

The Plan area contains important habitat for a range of flora and fauna. Parts of the area have been designated as a Conservation Area and listed as a National Park. Consideration has been given to these values in the siting of the zones and it is considered that the impacts to flora and fauna will be minimal.

The economic benefit of farming in the area is considered positive. The relocation of farming area will assist in making this marine farming operation a more viable unit. There will be a responsibility on resource managers to ensure that water quality is maintained in the area and filter feeding shellfish may improve water quality.

As with the prediction of any impact on the environment, there are limited guarantees. The Plan contains a range of management controls to mitigate or ameliorate the possible negative impacts of marine farming activities. The management controls include provisions for collecting baseline environmental data and implementing on-going monitoring programs to detect possible changes to the marine environment as a result of marine farming operations.

The marine farming licensing system in Tasmania is based on annual licences, which permit marine farming operations within a lease area. Whilst the lease may be for a fixed period of years the imposition of a requirement for annual licences gives the planning authority the capacity and flexibility to impose annual environmental requirements which reflect the impact of farming operations on a year by year basis.

Thus the results of monitoring programs are incorporated in annual licence conditions, and drive requirements which produce an adaptive monitoring and management regime for marine farming operations so as to ensure sustainable development within the Plan area, a key requirement of the MFPA.