



Government of South Australia
Primary Industries and Regions SA

**REPORT SUPPORTING THE
*AQUACULTURE (ZONES – EASTERN SPENCER GULF)
AMENDMENT POLICY 2017***

Final Version

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1 INTRODUCTION

The State's total value of seafood production (landed) in 2014/15 was \$469 million, of which aquaculture contributed 49% (\$228m) with wild catch fisheries contributing the balance (\$241m) (EconSearch, 2016). South Australia produced 17% of Australia's aquaculture production value in 2014/15, the third largest aquaculture producer behind Tasmania and Western Australia. Australian aquaculture production value increased by 19% in 2014-15 to \$1.2 billion (ABARES, 2016). Worldwide expectations are that by 2022, aquaculture will produce 47% of global seafood production and 53% of global seafood production that is destined for human consumption (FAO, 2015).

The Aquaculture industry of South Australia has developed since the oyster industry began commercial production in the 1980's. South Australia is now home to the most diverse range of Aquaculture sectors in Australia. The largest single sector in the State's aquaculture industry is tuna, which accounted for almost 57% of the State's gross value of aquaculture production in 2014/15. Other key sectors include other¹ (14%), oysters (13%), marine finfish (8%) and abalone (5%) (EconSearch, 2016). Aquaculture operations undertaking tourism activities which offer the opportunity to swim with tuna and interact with other marine organisms, resulted in an estimated 9,732 participants in 2014/15 (EconSearch, 2016).

South Australia's aquaculture industry created an estimated 817 Full Time Equivalent (FTE) jobs (569 on-farm and 248 in downstream activities) through direct employment and 1,016 flow-on jobs, giving total employment of 1,833 FTE in 2014/15. Approximately 65% of these jobs were generated in regional South Australia (EconSearch, 2016).

Aquaculture Zone Policies

The Minister for Agriculture, Food and Fisheries (the Minister) may make aquaculture policies for any purpose directed towards furthering the objectives of the *Aquaculture Act 2001* (the Act). Aquaculture zone policies established under the Act, provide a multi-use spatial planning approach. They identify areas suitable for aquaculture development, while accommodating future innovation in all areas of operations, including the species being farmed, the infrastructure and technology used, including ecologically sustainable practices, and the markets into which products are sold. When used effectively, aquaculture zoning is a method of pro-active planning for sustainable growth and development of the aquaculture industry in a region.

Aquaculture zone policies recognise the aquaculture industry as a legitimate user of the State's marine resources, providing guidance and clarity regarding the aquaculture industry's access to these resources. There are currently 12 aquaculture zone policies established around the State. Government and public consultation processes allow for the design of zones to consider proximity to coastal reserves and national parks, Marine Parks, shipping channels, State heritage and Aboriginal heritage areas, important commercial and recreational fishing grounds and access for the boating community, among other considerations.

Since 2005, aquaculture in the Eastern Spencer Gulf region has been managed under the former *Aquaculture (Zones – Eastern Spencer Gulf) Policy 2005* (the 2005 Policy). Primary Industries and Regions SA (PIRSA) is has undertaken review of the 2005 Policy to ensure its ongoing relevance to government, industry, and community priorities and to seek to achieve optimal use of this marine resource.

The outcomes of the review and development of the *Aquaculture (Zones – Eastern Spencer Gulf) Amendment Policy 2017* (the Amendment Policy) has expanded the allowable species in a number of

¹ Other aquaculture production in 2014/15 was comprised of Algae, Silver Perch (including fingerlings and spat), Shortfin Eel and Barcoo Grunter production.

existing aquaculture zones, divided an existing zone into two zone areas and has also created two brand new zones to allow for aquaculture activity that is in the interest of the local Aboriginal community. PIRSA believes that the favourable environmental conditions present in the Eastern Spencer Gulf should allow for the development of a valuable, productive and, importantly, a diverse and resilient aquaculture industry in this area.

Table 1 summarises the zoning framework to be established under the Amendment Policy, including the classes of permitted aquaculture, leased area and biomass in the Eastern Spencer Gulf aquaculture zones as well as the aquaculture exclusion zones.

Table 1 – Summary of zoning framework established under the *Aquaculture (Zones – Eastern Spencer Gulf) Amendment Policy 2017*.

ZONE	LEASED AREA		CLASS	BIOMASS			
	Maximum total lease area allowed in the Policy	Lease area already allocated (1 April 2017)		Supplementally fed		Non-supplementally fed	
				(a) Farming of prescribed wild-caught tuna	(b) Farming of aquatic animals in a manner that involves regular feeding	(c) Farming of bivalve molluscs	(d) Farming of algae
Hardwicke Bay (Inner)	60 ha	0	b, c (molluscs only)	Nil	Determined by licence conditions	Determined by licence conditions	Determined by licence conditions
Hardwicke Bay (Middle)	60 ha	0	b, c (molluscs only)	Nil	Determined by licence conditions	Determined by licence conditions	Determined by licence conditions
Hardwicke Bay (Outer)	60 ha	0	b, c (molluscs only)	Nil	Determined by licence conditions	Determined by licence conditions	Determined by licence conditions
Wallaroo (East)	350 ha	150 ha	b, c, d	Nil	2,000 tonnes	Determined by licence conditions	Determined by licence conditions

ZONE	LEASED AREA		CLASS	BIOMASS			
	Maximum total lease area allowed in the Policy	Lease area already allocated (1 April 2017)		Supplementally fed		Non-supplementally fed	
				(a) Farming of prescribed wild-caught tuna	(b) Farming of aquatic animals in a manner that involves regular feeding	(c) Farming of bivalve molluscs	(d) Farming of algae
Wallaroo (West)	50 ha	0	b, c, d (no finfish or abalone)	Nil	Nil	Determined by licence conditions	Determined by licence conditions
Wallaroo Exclusion	Nil	Nil	Nil	Nil	Nil	Nil	Nil
Port Broughton Intertidal	65	0	c, d	Nil	Nil	Determined by licence conditions	Determined by licence conditions
Port Broughton Exclusion	Nil	Nil	Nil	Nil	Nil	Nil	Nil
Tickera Intertidal	40	0	c, d	Nil	Nil	Determined by licence conditions	Determined by licence conditions

ZONE	LEASED AREA		CLASS	BIOMASS			
	Maximum total lease area allowed in the Policy	Lease area already allocated (1 April 2017)		Supplementally fed		Non-supplementally fed	
				(a) Farming of prescribed wild-caught tuna	(b) Farming of aquatic animals in a manner that involves regular feeding	(c) Farming of bivalve molluscs	(d) Farming of algae
Tickera Subtidal	60	0	c, d	Nil	Nil	Determined by licence conditions	Determined by licence conditions
Port Hughes Exclusion	Nil	Nil	Nil	Nil	Nil	Nil	Nil
Point Riley Exclusion	Nil	Nil	Nil	Nil	Nil	Nil	Nil
Point Pearce (East)	20	Not applicable	c, d	Nil	Nil	Determined by licence conditions	Determined by licence conditions
Point Pearce (West)	40	Not applicable	b, c, d (no finfish or abalone)	Nil	Determined by licence conditions	Determined by licence conditions	Determined by licence conditions

2 AMENDMENTS FOLLOWING PUBLIC CONSULTATION PROCESS

A draft Aquaculture (Zones – Eastern Spencer Gulf) Amendment Policy 2016 (the draft Amendment Policy) and draft Amendment Policy Report were released for public consultation from 9 September 2016 until 9 November 2016. The public consultation process included two public meetings held on the Yorke Peninsula, one at Minlaton on 19 October 2016 and one at Wallaroo on 20 October 2016. Through the public consultation process, PIRSA received valuable feedback from many interested stakeholders on the draft Amendment Policy and draft Amendment Policy Report. Many of the comments and suggestions made by stakeholders have been incorporated into the final Amendment Policy and Policy Report.

Following is a list of amendments that were made to the draft Amendment Policy and draft Policy Report as a result of feedback received during the public consultation process:

- In relation to the Wallaroo (east) subtidal aquaculture zone, the Amendment Policy states that the biomass of finfish being farmed in the zone must not exceed 2 000 tonnes or, if some other amount is specified by the Minister by notice in the Gazette, that other amount. PIRSA amended the Policy Report to state that, if an increase in the maximum biomass is proposed, the Environment Protection Authority will be consulted on the proposal;
- In relation to the Tickera intertidal and subtidal aquaculture zones and the Port Broughton intertidal aquaculture zone, PIRSA amended the Amendment Policy to remove the addition of supplementary fed species from the Tickera and Port Broughton zone areas until such a time that industry demand and technical information is available to support this class of species to be considered in the zone;
- In relation to the new Point Pearce zone areas, PIRSA amended the Policy Report to include additional information regarding the reason and basis for development of these zone areas;
- In relation to the new Point Pearce zone areas, PIRSA amended the Policy Report to state that, in light of the limited technical information available during the zoning process, additional information may be requested from applicants at the lease/licence application stage to ensure that any aquaculture development that occurs in the area is situated appropriately; and
- The proposed Cape Elizabeth subtidal aquaculture zone was removed, as a result of benthic habitat mapping conducted by PIRSA showing that there was insufficient continuous suitable substrate for zoning purposes.

All stakeholders who made a submission to the review through the public consultation process received a response outlining how their feedback had been incorporated into the Amendment Policy and Policy Report.

3 AQUACULTURE ZONING FRAMEWORK

Aquaculture is permitted in all areas of the State other than areas that are prescribed as aquaculture exclusion zones or areas where aquaculture is not permitted for another reason (e.g. Marine Park Sanctuary Zones, and areas in close proximity to shipping and boating channels or sites of social or cultural significance such as shipwrecks). Aquaculture zones are areas where it has been established that aquaculture is appropriate to occur. Aquaculture within aquaculture zones can occur by obtaining a production lease. Aquaculture outside of an aquaculture zone must initially operate under a pilot lease, and after a period of three years, can be converted into a production lease. The approvals process is generally simpler and more cost effective inside aquaculture zones and the term of a production lease can be longer, because the area has previously been investigated and the prescribed activities established through the Zone Policy. Therefore, there are benefits for the aquaculture industry in conducting aquaculture operations inside an aquaculture zone.

The Minister may make aquaculture policies for any purpose directed towards furthering the following objectives of the Act:

- a) to promote ecologically sustainable development of marine and inland aquaculture;
- b) to maximise benefits to the community from the State's aquaculture resources; and
- c) otherwise to ensure the efficient and effective regulation of the aquaculture industry.

An aquaculture policy defines the broad framework for aquaculture management within defined aquaculture zones, including the prescribed criteria that apply to each aquaculture zone (refer to 2.1).

In accordance with the Act, the Minister must prepare a report in relation to a policy containing:

- An explanation of the purpose and effect of the policy;
- A summary of any background and issues relevant to the policy and of the analysis and reasoning applied in formulating the policy; and
- An assessment of the consistency of the policy with the Planning Strategy and any relevant Development Plan under the Development Act 1993; any relevant environment protection policy under the Environment Protection Act 1993; and any other relevant plans or policies.

This Eastern Spencer Gulf Policy Report (Policy Report) supports the Aquaculture (Zones – Eastern Spencer Gulf) Amendment Policy 2017 (Amendment Policy).

The Policy Report has been developed to inform and involve all stakeholders in the decision making process for the zoning of marine resources for aquaculture purposes. It has been referred to prescribed bodies and relevant public authorities as well as regional stakeholders, local indigenous communities, Native Title claimant groups, local government, industry, and the general public. The Amendment Policy and Policy Report was made publicly available for a period of two months for comment, as per the legislative requirements of the Act. Following this period of consultation, the content of the submissions received were considered, and consequential amendments to the Amendment Policy were made (see page 9 above).

As prescribed by the Act, following approval of the Amendment Policy by the Minister, the Amendment Policy will be referred to the Environment, Resources and Development (ERD) Committee of Parliament. The ERD Committee may approve the Amendment Policy, seek amendments to the Amendment Policy or object to the Amendment Policy.

Following gazettal of the Amendment Policy it is proposed that amendments be made to the Land Not within a Council Area (Coastal Waters) Development Plan in accordance with provisions under the *Development Regulations 2008* (refer section 9).

3.1 Aquaculture Zone Prescribed Criteria

Aquaculture zone policies set out considerations for aquaculture that are specific to the environmental, sociological or geographical characteristics of the zone area. Aquaculture zones prescribe the maximum hectares that can be developed and the class of species permitted for the purposes of aquaculture within a prescribed aquaculture zone. Dependent on the species considered, a maximum biomass in tonnes can also be prescribed. The prescribed criteria are determined by the physical and biological characteristics of the zone and the biological requirements and typical farming infrastructure of the species being considered for the zone. These are described further in 3.1.1 and 3.1.2.

3.1.1 Prescribed Class (Species) of Aquaculture

Prescribed classes of aquaculture relate to the feeding requirements of aquatic organisms i.e. whether the organisms are supplementary fed (e.g. wildcaught southern bluefin tuna and other finfish species) or non-supplementary fed (e.g. algae and bivalve molluscs such as oysters, mussels, scallops etc.). Grouping the classes of aquaculture to align with feed inputs focuses the policy on the risk posed to the environment, in particular the amount of nutrients that are released into or removed from the environment. Using this system of classification also provides greater flexibility to adaptively manage aquaculture activity through the conditions placed on individual licences.

The prescribed classes of aquaculture considered for the Amendment Policy have been tailored for each aquaculture zone and include:

- the farming of aquatic animals (other than specified animals) in a manner that involves regular feeding;
- the farming of molluscs;
- the farming of bivalve molluscs; and
- the farming of algae.

A change to the prescribed class (species) of aquaculture permitted within the aquaculture zones requires a review of the zone policy, which involves the same process used to amend the 2005 Policy during this review.

3.1.2 Prescribed Area (Hectares) Within Zone (Carrying capacity and assimilative capacity)

An aquaculture zone is the area in which farming activity is permitted, however the maximum hectare limit for farming activities prescribed within a zone policy reflects a conservative measure of the impact the prescribed species may have on the surrounding marine environment. The biological requirements of the Prescribed Class of species is used to determine the carrying capacity for farming of that species within an aquaculture zone and a conservative maximum hectare limit is set based on this and the underlying benthic environment's assimilative capacity to absorb the resulting nutrients from supplementary fed species. Similarly, the potential from nutrient removal resulting from bivalve molluscs is considered in calculating carrying capacity, and limitations on biomass can be conservatively set.

The concepts of 'carrying capacity' and 'assimilative capacity' are important and interrelated tools for natural resource management. Carrying capacity equates to the biomass (tonnage) of culture product that can be added to the environment at a rate that can be assimilated by the environment without significant environmental changes. Assimilative capacity refers to the extent to which the environment can cope with a particular activity without unacceptable change (O'Bryen and Lee, 2003).

Estimating carrying and assimilative capacities for finfish aquaculture is a relatively simpler task than for shellfish or algae. This is largely due to the additive versus extractive nature of finfish production compared to shellfish or algae production respectively. For finfish aquaculture, it is possible to determine, using mass balance equations of the type described by Beveridge (1987), the changes in

concentration of nitrate and ammonia in the water column. The level of confidence in these estimations reflects the empirical understanding of sources and sinks for these waste products and their interaction.

Due to physical and chemical differences in site characteristics among coastal areas where aquaculture occurs, such as water depth and ambient nutrient concentrations, it is necessary to determine carrying and assimilative capacities for each different area (Tanner *et al.*, 2007). Furthermore, it is necessary to have an understanding of the species' metabolism, used for calculations of aquaculture system oxygen requirements, fish energy requirements, environmental impact assessment, and species-specific physiological thresholds (Fitzgibbon *et al.*, 2007). This data exists for Yellowtail Kingfish and Mulloway cultured in SA (Clark and Seymour, 2007; Fitzgibbon *et al.*, 2007).

For shellfish or algae aquaculture, estimating carrying capacity is more complicated as potential production must be estimated from available nutrient and light resources. At present there are difficulties in confidently predicting potential production. Firstly, there is limited data to ascertain the availability of nutrients and light for shellfish or algae; and, secondly, processes such as shellfish filtration, excretion and respiration rates, algae nutrient uptake and photosynthetic rates and assimilation efficiencies need to be investigated within South Australian coastal conditions and compared to seasonally varying food concentrations and temperatures (PB and SARDI, 2003 and Mount *et al.*, 2007). Research currently being conducted into feed types and the feeding of oysters, mussels and cockles by the South Australian Research and Development Institute (SARDI) will assist to address some of these gaps, with this research expected to be completed in mid-2017. Both algae and shellfish aquaculture have been recommended as a means by which the negative effects of nutrient inputs from other activities may be minimised and the environmental impact of other aquaculture activities reduced (Chopin *et al.*, 2001; Buschmann *et al.*, 2007; Wiltshire *et al.*, 2015).

Where gaps or uncertainties in knowledge remain, PIRSA Fisheries and Aquaculture apply a conservative and precautionary approach to estimating and prescribing the area to be farmed within a zone, in addition to funding research that will assist to close these knowledge gaps (refer Appendix D4). Monitoring of environmental performance through PIRSA's aquaculture Environmental Monitoring Program (EMP) prescribed in the *Aquaculture Regulations 2016* (the Regulations) allows for adaptive management for sites located within an aquaculture zone. EMP requirements are sector based and can be tailored through the lease and licence assessment process, if required, to minimise the risks posed by the aquaculture activity occurring on the site.

The prescribed area of existing zones of the Current Policy will not be amended as part of this review, apart from minor adjustments through adoption of the Line of Mean High Water Springs in place of the Local Government Area coastline.

The prescribed area (Hectares) within the new zones is conservative when compared to other zones with similar prescribed classes of species located in other areas of the state. The relativity of area determines that of the total area prescribed within the zones for aquaculture activity (leasable hectares) equates to 9% of the total area designated as an aquaculture zone. When considering aquaculture exclusion zones in addition, this equates to 2% of the total area prescribed in the Amendment Policy, allocated for aquaculture activity (leasable hectares).

3.1.3 Prescribed Biomass Limits (Tonnage) of Species to be farmed

Control of the amount of nutrients released into or extracted from the environment is achieved at the aquaculture zone policy level by setting upper biomass limits for applicable species within each aquaculture zone i.e. the maximum biomass of organisms farmed under a particular class of aquaculture at any one time. Where biomass limits are not prescribed at the policy level, these are prescribed as conditions on the aquaculture licence granted within the bounds of the zone policy. Environmental impacts are also managed by monitoring impacts on an on-going basis, through the environmental monitoring and reporting requirements stipulated in the Regulations.

The impacts of overstocking systems with aquatic organisms that do not involve supplemental feeding are likely to be felt by industry (through decreased production) well before any potential environmental harm. For example, in the case of bivalve molluscs like oysters, production is self-limiting since industry performance overall will be determined by the amount of suitable food available in the water. As a result, the focus of PIRSA Fisheries and Aquaculture's regulatory activity for aquatic organisms (that do not involve supplemental feeding) is to meet the Government's undertaking "to maximise benefits to the community from the State's aquaculture resources" i.e. to ensure that an aquaculture zone is not overstocked to the ongoing detriment of licensees operating in the area.

The prescribed biomass of the Amendment Policy includes 2000 tonnes of finfish or equivalent of supplementary fed species for the Wallaroo (East) subtidal aquaculture zone. There is no maximum biomass prescribed in the Amendment Policy for all other prescribed class (species) of aquaculture, which is to be determined through licence conditions set by the Minister. This is consistent with other zone policies developed around the State.

The Amendment Policy allows for the Minister to alter the maximum biomass limits of all classes of aquaculture through notice in the South Australian Government Gazette. This provides a mechanism to enable flexibility in setting biomass limits for aquaculture zones/sectors and enables future research and environmental monitoring results to be taken into consideration as they become available over time. The South Australian Environmental Protection Authority (EPA) will be consulted as part of the process, if there is a proposed increase to the maximum biomass limits for finfish greater than the 2000 tonnes currently outlined for the Wallaroo (East) subtidal aquaculture zone in the future.

3.2 Aquaculture Exclusion Zones

An Aquaculture Zone Policy defines aquaculture zones within State waters where specified classes of aquaculture will be permitted and aquaculture zones where no aquaculture will be permitted, which are called aquaculture exclusion zones. Aquaculture exclusion zones are used to exclude aquaculture activity from areas considered to be: of environmental significance (i.e. Marine Park Sanctuary Zones and Restricted Access Zones and 1000 metres seaward of a National Park or Reserve boundary); of cultural significance (i.e. sites with Aboriginal heritage, historical artefacts, historical shipwrecks etc.); or necessary to maintain access (i.e. shipping routes, recreational and commercial boating channels, recreational and commercial fishing grounds etc.) among other considerations.

4 AQUACULTURE LEASE AND LICENCE FRAMEWORK

Once an aquaculture zone policy has been legislated at the end of the aquaculture zoning process, an aquaculture lease and licence is required in order to undertake farming activities within the zone. It is important to distinguish between aquaculture zoning and individual site allocation and management. Aquaculture zones establish areas in which aquaculture is deemed appropriate to occur, while controls relating to the performance of farm operations are applied through marine aquaculture leases, licences and the Regulations.

Applications for leases within an aquaculture zone must be allocated through a process approved by the Aquaculture Tenure Allocation Board (ATAB). If a zone is prescribed as a public call area within an aquaculture zone policy, a public call is made inviting applicants to submit their proposal on the required application form. These applications are assessed by the ATAB who then make a recommendation to the Minister on which applications should proceed. The successful applicant will be invited to submit an aquaculture licence application, which will be subject to a comprehensive Ecological Sustainable Development (ESD) assessment conducted by PIRSA Fisheries and Aquaculture and provision to mandatory referral agencies for comment. Applications submitted for aquaculture zones which are not prescribed as a public call area are still required to be assessed by the ATAB. Applications for pilot leases outside an aquaculture zone are not subject to a competitive allocation process.

The competitive allocation process ensures a fair and efficient means of allocating the State's marine aquaculture resources. The allocation process is used to determine which applicant will use the public resource at an optimum level in terms of the quality and quantity of output relative to the capacity of the environment.

More detailed considerations such as the size of each lease, the farming structures permitted on each licence and the individual stocking densities (biomass level) for different species is assessed and managed at the individual lease and licence level. Approval of leases and licenses in aquaculture zones will be subject to the provisions of the Act, the Regulations, and relevant lease and licence conditions. An assessment of individual site suitability (including an Environmental Sustainability Development assessment) and criteria outlined in the Aquaculture Tenure Allocation Policy are considered during the assessment. Ongoing environmental monitoring and adherence to the *Aquaculture Regulations 2016*, as well as relevant legislation relating to marine development provides information that is an important input to the adaptive management of aquaculture.

As stated in section 6.5.8 of this report, although all available technical information was used to inform the design of the aquaculture zones located adjacent to Point Pearce including DEWNR derived benthic mapping, satellite imagery and additional video surveys conducted at Point Pearce during the development of the Amendment Policy, there is currently limited technical information available as to the composition of benthic flora and faunal communities within the two new aquaculture zones. PIRSA will require further technical information to be submitted with an application for an aquaculture lease and licence within these zone areas to ensure the individual lease and licence are located in a suitable area of the zone. The conservative leasable hectare limits prescribed in the Amendment Policy for these two new zone areas were determined considering the limited technical information in the zone as part of the design process to ensure there is adequate space within the zone to appropriately locate any sites applied for in the future.

Further information about licensing is provided in Appendix D3.

5 ENVIRONMENTAL MONITORING AND MANAGEMENT

Environmental risks are managed both at the licence assessment stage (as previously described above) and through PIRSA Fisheries and Aquaculture's ongoing Environmental Monitoring Program (EMP), following the approval of a lease and licence. The EMP requirements are stipulated in the Regulations for each sector, and can be tailored through the lease and licence assessment process, if required. Once a licence is approved, the EMP is implemented to allow for the ongoing monitoring of a variety of physical and biological factors considered relevant to measuring the environmental effects of the aquaculture activity. This provides the information necessary to ongoing management of the regulatory aspects associated with a given licence, to ensure impacts remain manageable.

Following the introduction of the Regulations and a subsequent review of the EMP for aquaculture in South Australia, PIRSA will be releasing summary reports for aquaculture activity within the state. These reports will summarise regulatory and EMP information relevant to aquaculture in general, in addition to specific industry sectors when applicable. This will provide the public with information relevant to the environmental performance of the aquaculture industry for improved regulatory transparency.

5.1 Marine-Based Aquaculture

The annual EMP is adjusted depending on the sector or site, however may include monitoring of parameters such as minimum requirements as outlined in the Regulations:

- a report on the condition of the aquatic environment, including the sea floor (e.g. photographic or video footage of the sea floor and/or an assessment of benthic flora and fauna, including infauna if applicable) amount and type of supplemental feed (if applicable to the species farmed);
- estimate of number or biomass of aquatic organisms maintained on the site;
- aquaculture waste (securing, treating, recovering);
- use of chemicals (amount, frequency and purpose);
- farming structures (number, dimensions, spacing, location, securing, recovering); and
- interactions with seabirds and large marine vertebrates.

In addition Regulations provide for:

- notification and reporting of entanglement of certain animals;
- notification and reporting of escape of stock or damage that may lead to escape of stock; and
- notification and reporting of unusually high mortality rate and duty to isolate unaffected organisms.

Additional requirements to be monitored can be determined following the ESD risk assessment process and where results indicate that further monitoring is required to address a medium, high or extreme resultant risks. . The resultant EMP is developed on a case by case basis, using the minimum requirements outlined in the Regulations as a starting point, the outcomes of the ESD assessment on the licence application or based on the subsequent results of EMP reporting for a particular activity or sector.

5.2 Environmental Monitoring Program for proposed finfish aquaculture in the Wallaroo (East) subtidal aquaculture zone

The addition of finfish as a permitted species within the Wallaroo (East) subtidal aquaculture zone, with a prescribed maximum biomass limit of 2000T, is implemented in the Amendment Policy. Finfish aquaculture commenced in the mid-1990's in South Australia, with the first commercial Yellowtail Kingfish operation developed in late 2006 on the Western Spencer Gulf (Heaven et al. 2014) The infrastructure, stocking densities, feeding regimes and fallowing practices used for finfish and in

particular, Yellowtail Kingfish aquaculture are well developed and have been subject to a range of research projects, relating to both farming efficiencies and environmental monitoring programs in South Australia. Environmental Monitoring Programs, including benthic videos and benthic infauna completed in areas subject to finfish aquaculture to date in South Australia have not indicated a significant difference between impact and control points.

5.2.1 Predictive modelling results for proposed finfish activity in Wallaroo (East) subtidal aquaculture zone

Outcomes from research into finfish aquaculture and well established farming practices used in South Australia as previously described has allowed for hydrodynamic, wave and biogeochemical modelling to be conducted by the South Australian Research and Development Institute (SARDI) to assist in estimating cumulative effects of multiple nutrient sources on water quality within the Spencer Gulf and in particular the Wallaroo (East) subtidal aquaculture zone.

The models, previously developed by SARDI, were used to predict the outputs of a 3000T Yellowtail Kingfish operation consisting of three 100 hectare leases located in the Wallaroo (East) subtidal aquaculture zone. These models were used to understand the carrying capacity of the Spencer Gulf marine system and of the Wallaroo East subtidal aquaculture zone, which found that for all model scenarios, none exceeded the Australian National Water Quality Management Strategy (ANWQMS) water quality guidelines for dissolved inorganic nitrogen. This included examination of the cumulative effect of nutrient loads from aquaculture occurring in the Port Lincoln region, steelworks in Whyalla and three wastewater treatment plants located in the northern section of the Gulf, in addition to the aquaculture proposed for Wallaroo.

The modelling at the frequency provided did predict that modelling of ammonium and chlorophyll levels were in some instances higher, than those of background levels, which is considered a likely scenario, when modelling a 3000T finfish operation. High and low neap tides correlated to the peak nutrient and chlorophyll concentrations predicted in the Wallaroo region. In these instances, this did predict that, these peaks are likely to exceed the ANWQMS water quality guidelines. However, tidal mixing generally acted to lower nutrient and chlorophyll concentrations to levels consistent with background levels shown at the control sites.

Overall, the modelling supported that tidal currents and local circulation has the ability to dilute and disperse aquaculture related nutrient inputs away from the lease sites (Middleton *et al.*, 2015).

5.2.2 Proposed Environmental Monitoring Program for Finfish

It is known that seagrass is present in both the Wallaroo (East) subtidal aquaculture zone, (dominant species *Halophila* sp.) and the Wallaroo (West) subtidal aquaculture zone (dominant species *Posidonia* sp. and *Amphibolis* sp.). PIRSA Fisheries and Aquaculture has compiled benthic information, ground truthed by video to identify the species and densities of the seagrass within the Wallaroo subtidal aquaculture zone (refer to Figure 3). It is considered in the first instance that finfish sites located within the Wallaroo (East) subtidal aquaculture zone will be sited as to avoid areas with medium to high density beds of the seagrass *Posidonia* sp., which is in alignment with PIRSA's current practice. The design of the zone will be used to assist facilitate this, through largely avoiding areas where this species is present by separating the current *Wallaroo subtidal aquaculture zone* to include the Wallaroo (West) subtidal aquaculture zone, which does not permit finfish farming.

PIRSA will be working with Environment Protection Authority (EPA) to develop an Environmental Monitoring Program during the lease and licence application process for any proposed finfish activities in addition to monitoring requirements outlined in the *Aquaculture Regulations 2016*. PIRSA (in collaboration with any aquaculture operator proposing to farm finfish, the South Australian Research and Development Institute (SARDI) and the EPA) will be submitting a funding application to the Fisheries Research and Development Corporation, to better understand before and after effects of



finfish aquaculture within the vicinity of seagrass beds surrounding the Wallaroo (east) aquaculture zone following completion of the review. The EPA has already commenced sampling (only with no analysis undertaken to date) to inform this research project in the event that finfish is permitted within the zone and to establish the current state of the environment in the area prior to the introduction of finfish aquaculture. This project is proposed to be in addition to the site specific EMP that will be developed through the lease and licence assessment process outlined above, however data collected may be used to inform the EMP during and following its completion.

6 AQUACULTURE AND ZONING IN THE EASTERN SPENCER GULF

6.1 Current Aquaculture Activity

Three 50 hectare sites are leased in the *Wallaroo subtidal aquaculture zone* and licensed for the production of Blue mussels (*Mytilus galloprovincialis*). These sites were not successful as the expected growth rates were not achieved for this species, among other issues. Currently there is no production occurring on these sites.

A number of intertidal oyster sites have also been established along the Eastern Spencer Gulf, however over time these sites have expired or been cancelled, also as a result of growers experiencing problems growing and conditioning Pacific oysters (*Crassostrea gigas*). Maintaining bivalve molluscs as a prescribed species within all intertidal zones will allow for other filter feeding species to be considered. SARDI are currently conducting research into the feed types of different filter feeders, such as oysters, mussels, and cockles to improve our understanding of the relationship between food availability, competition for resources and farm production, among other aims.

6.2 Historic Aquaculture Management

Prior to the introduction of the Act, aquaculture in the Eastern Spencer Gulf region was managed under the Spencer Gulf Aquaculture Management Plan (Primary Industries South Australia, 1996) prepared under the *Fisheries Act 1982* (superseded by the *Fisheries Management Act 2007*). With the commencement of the Act, these Management Plans were used as guiding documents, but did not carry the statutory status of aquaculture zone policies under the Act. The Northern Yorke Peninsula Policy Area included waters adjacent to Port Broughton and extended to Cape Elizabeth, providing for 6 x 2 hectare sites for research in the Broughton Management Zone, 60 hectares for aquaculture within the Offshore Tickera Management Zone and 40 hectares of intertidal oyster culture in the Port Victoria Zone.

6.3 Current Zoning and 2005 Policy

Since 2005, aquaculture in the Eastern Spencer Gulf region has been managed under the *Aquaculture (Zones – Eastern Spencer Gulf) Policy 2005* (2005 Policy). The 2005 Policy was amended on the 26 March 2015 to reflect changes made to the Act in 2012 relating to public call areas and prospective zones.

The 2005 Policy provided for two prospective aquaculture zones, located adjacent to Point Pearce and Woods Point. The Act provided for prospective zones to allow for the identification of areas that were potentially suitable for aquaculture, to be in place for three years from commencement of the zone policy, during which time investigations of the potential to convert these zones into active aquaculture zones would be conducted. No interest was expressed in this area during this period. Amendments to the Act in 2012 removed prospective zones from the regulatory framework (amendments to the Current Policy made in 2015 removed references to prospective zones). The Prospective Point Pearce Aquaculture Zone was used for consideration of two new zones adjacent Point Pearce as described further in the this Policy Report.

The Current Policy prescribes 11 zones, comprising seven aquaculture zones and four aquaculture exclusion zones:

- three zones located in Hardwicke Bay, namely the Hardwicke Bay (outer) subtidal aquaculture zone, Hardwicke Bay (middle) subtidal aquaculture zone and Hardwicke Bay (inner) subtidal aquaculture zone;
- the Wallaroo subtidal aquaculture zone;

- three aquaculture zones located adjacent to Port Broughton, namely the Tickera intertidal aquaculture zone (consisting of two zone areas), Tickera subtidal aquaculture zone and Port Broughton intertidal aquaculture zone (consisting of two zone areas); and
- four aquaculture exclusion zones, namely the Wallaroo aquaculture exclusion zone, Point Riley aquaculture exclusion zone, Port Hughes aquaculture exclusion zone and the Port Broughton aquaculture exclusion zone.

6.4 Changes to the 2005 Policy

Extending the species within the Wallaroo, Port Broughton and Tickera aquaculture zones has the intent of generating further investment in aquaculture activity in the region. This follows an expression of interest for finfish to be considered as a prescribed species of aquaculture for the Wallaroo subtidal aquaculture zone, as well as interest from the broader regional community in the economic opportunities this interest may present. The amendment to the prescribed species of aquaculture for other aquaculture zones supports the intent to diversify the aquaculture industry within this region, and allows for future innovations to occur within the sector.

The two new aquaculture zones located within the former Point Pearce prospective aquaculture zone, have the intent to provide for aquaculture activities for the benefit of the Narungga People, who have traditional association with the Point Pearce areas. The two aquaculture zones established for this purpose are intertidal zones (refer to Figure 5). The zone prescribed criteria has been developed to provide for species considered of cultural significance to the Narungga People, as well as provide economic opportunity.

6.5 Summary of the Amendment Policy 2017 Aquaculture Zones

The Amendment Policy prescribes 14 zones, comprising 10 aquaculture zones and four aquaculture exclusion zones. The Amendment Policy provides for aquaculture in the Eastern Spencer Gulf area as follows:

6.5.1 Hardwicke Bay (inner) subtidal aquaculture zone

The Hardwicke Bay (inner) aquaculture zone incorporates an area of approximately 443 hectares and is depicted in Figure 1. The zone commences approximately 7.8 kilometres from the township of Hardwicke Bay and approximately 6 kilometres from the mainland and extends out into Hardwicke Bay. It is the Southern-most zone of the three zones in Hardwicke Bay.

The Hardwicke Bay (inner) aquaculture zone allows the farming of no more than 60 hectares of molluscs. There are currently 0 hectares allocated within the zone.

There is no prescribed biomass in the Amendment Policy, which is to be determined through licence conditions set by the Minister.

The Hardwicke Bay (inner) aquaculture zone boundaries prescribed in the 2005 Policy remain the same in the Amendment Policy.

6.5.2 Hardwicke Bay (middle) subtidal aquaculture zone

The Hardwicke Bay (middle) aquaculture zone incorporates an area of approximately 1,084 hectares and is depicted in Figure 1. The zone commences approximately 8.8 kilometres from the township of Hardwicke Bay and approximately 6 kilometres from the mainland and extends out into Hardwicke Bay. It is the middle zone of the three zones in Hardwicke Bay.

The Hardwicke Bay (middle) aquaculture zone allows the farming of no more than 60 hectares of molluscs. There are currently 0 hectares allocated within the zone. Under the 2005 Policy, farming in this zone is permitted only after successful and substantial development of aquaculture in the inner

zone unless otherwise agreed to by the Minister. There is no maximum biomass prescribed in the Amendment Policy, which is to be determined through licence conditions set by the Minister.

The Hardwicke Bay (middle) aquaculture zone boundaries prescribed in the 2005 Policy remain the same in the Amendment Policy. The Amendment Policy removes the requirement for aquaculture to be successful and substantially developed in the inner zone prior to development of the middle zone. This will provide potential applicants further flexibility in selecting a site located within one of the three zones, in addition to providing consistency with more recent zone policies.

6.5.3 Hardwicke Bay (outer) subtidal aquaculture zone

The Hardwicke Bay (outer) aquaculture zone incorporates an area of approximately 1,447 hectares and is depicted in Figure 1. The zone commences approximately 10.6 kilometres from the township of Hardwicke Bay and approximately 6 kilometres from the mainland and extends out into Hardwicke Bay. It is the Northern-most zone of the three zones in Hardwicke Bay.

The Hardwicke Bay (outer) aquaculture zone allows the farming of no more than 60 hectares of molluscs. There are currently 0 hectares allocated within the zone. Under the 2005 Policy, farming in this zone is permitted only after successful and substantial development of aquaculture in the middle zone unless otherwise agreed to by the Minister. There is no prescribed biomass prescribed in the Amendment Policy, which is to be determined through licence conditions set by the Minister.

The Hardwicke Bay (outer) aquaculture zone boundaries prescribed in the 2005 Policy remain the same in the Amendment Policy. The Amendment Policy removes the requirement for aquaculture to be successful and substantially developed in the middle zone prior to development of the outer zone. This will provide potential applicants further flexibility in selecting a site located within one of the three zones, in addition to providing consistency with more recent zone policies.

6.5.4 Former Wallaroo subtidal aquaculture zone

The former Wallaroo subtidal aquaculture zone encompasses an area of approximately 2,000 hectares and is depicted in Figure 1. The zone commences approximately 7 kilometres from the town of Wallaroo and 4 kilometres from the nearest mainland and extends west into the Spencer Gulf.

Technical investigations of the former Wallaroo subtidal aquaculture zone waters found that the physical characteristics were favourable for finfish, subtidal shellfish and algae aquaculture (PB and SARDI, 2003). SARDI has recently undertaken modelling to determine the biophysical parameters in the Wallaroo region with specific reference to finfish farming (Middleton *et al.*, 2015). This data will be used to assess the impacts associated with any application to farm finfish in the region (refer to section 5.2.1 for further information). Seagrass has been identified as the predominant benthic flora located within the current zone (refer to 7.1.2 for further information). *Halophila sp.* is present in the eastern area of the former Wallaroo subtidal aquaculture zone and *Posidonia sp.* located in the western area, with some crossover between these two species around the area where the Wallaroo (East) subtidal aquaculture zone and Wallaroo (West) subtidal aquaculture zone separate.

It is considered in the first instance that finfish sites located within the Wallaroo (East) subtidal aquaculture zone will be sited as to avoid areas with medium to high density beds of the seagrass *Posidonia sp.*, which is in alignment with PIRSA's current practice. As previously described in 5.2.2, a research project to study the before and after effects of finfish aquaculture on seagrass in the region has commenced and will be used to inform the EMP for finfish leases located in this area. As a result of the benthic environment of the zone, the Amendment Policy separates the former zone into two zones, namely, the Wallaroo (East) subtidal aquaculture zone (which covers approximately 1370 hectares) and Wallaroo (West) subtidal aquaculture zone (which covers approximately 490 hectares (refer to Figure 2)). There will be no amendments to the outer boundary of the former zone in the Amendment Policy. This will locate aquaculture activity involving the use of supplementary feed to the Wallaroo (East)

subtidal aquaculture zone only. Bivalve molluscs and algae will be the prescribed classes of aquaculture located in the Wallaroo (West) subtidal aquaculture zone. The zone design promotes the use of integrated multitrophic aquaculture (refer to section 7.2).

There are currently 150 hectares allocated within the Wallaroo (East) subtidal aquaculture zone, comprising of three 50 hectare sites (LA00040, LA00041 and LA00042) licensed to farm blue mussels (*Mytilus galloprovincialis*). No farming has occurred on these sites since 2011 as the blue mussels farmed did not yield expected growth results to make it a profitable aquaculture venture.

Wallaroo (East) subtidal aquaculture zone

The class of aquaculture for the Wallaroo (East) subtidal aquaculture zone includes the farming of aquatic animals (other than prescribed wild-caught tuna) in a manner that involves regular feeding (e.g. finfish, sea urchins, sea cucumbers etc.), bivalve molluscs and algae.

The prescribed criteria for the Wallaroo (East) subtidal aquaculture zone:

- Contain no more than 350 hectares of leased area:
 - 300 hectares allocated to finfish, filter feeders or algae; and
 - 50 hectares allocated to other species or also used for finfish only if integrated multi-trophic aquaculture is developed on this 50 hectares;
- Provide for a biomass of finfish not to exceed 2000 tonnes, or if some other amount is specified by the Minister by notice in the gazette; and
- Biomass of other species to be determined through licence conditions by the Minister.

In relation to the prescribed criteria that sets the maximum biomass for finfish at 2000 tonnes but allows a different amount to be set by the Minister, it is intended that, if an increase in the maximum biomass was proposed, the Environment Protection Authority will be consulted on the proposal. It is also intended that any such proposal would consider the results of environmental monitoring undertaken in the area.

Wallaroo (West) subtidal aquaculture zone

The class of aquaculture for the Wallaroo (West) subtidal aquaculture zone is to include the farming of bivalve molluscs and algae.

The prescribed criteria for the Wallaroo (West) subtidal aquaculture zone:

- Contain no more than 50 hectares of leased area; and
- Provide for a biomass to be determined through licence conditions set by the Minister.

6.5.5 Tickera intertidal aquaculture zone

The *Tickera intertidal aquaculture zone* comprises two zone areas encompassing 518 hectares and is depicted in Figure 1. The zone commences approximately 9 kilometres from Port Broughton and 1.5 kilometres from the nearest mainland (south-east of Port Broughton). The two areas extend southwest into the Spencer Gulf.

The Tickera intertidal aquaculture zone allows the farming of filter-feeding molluscs in no more than 40 hectares of leased area. There are currently 0 hectares allocated within the zone.

The Amendment Policy amends the class of aquaculture permitted to include the farming of algae, in addition to the permitted species of bivalve molluscs. The Amendment Policy provides for a biomass to be determined through licence conditions set by the Minister.

The Tickera intertidal aquaculture zone aquaculture zone boundaries prescribed in the 2005 Policy remain the same in the Amendment Policy.

6.5.6 Tickera subtidal aquaculture zone

The Tickera subtidal aquaculture zone encompasses 2,387 hectares and is depicted in Figure 1. The zone commences approximately 7 kilometres from Port Broughton and extends south along the coast.

The Tickera subtidal aquaculture zone allows the farming of filter-feeding molluscs in no more than 60 hectares of leased area. There are currently 0 hectares allocated within the zone.

The Amendment Policy amends the class of aquaculture permitted to include the farming of algae, in addition to the permitted species of bivalve molluscs.

The Amendment Policy removes the requirement that a licence holder must hold a licence authorising aquaculture in the Tickera intertidal zone to apply for a licence in this zone. This will enable applications to be received of which subtidal aquaculture is the sole intention of the proponent.

The Tickera subtidal aquaculture zone aquaculture zone boundaries prescribed in the 2005 Policy remain the same in the Amendment Policy.

6.5.7 Port Broughton intertidal aquaculture zone

The Port Broughton intertidal aquaculture zone comprises two zone areas, encompasses 420 hectares and is depicted in Figure 1. The zone commences 6 kilometres from Port Broughton, and less than 1 kilometre from the mainland on the coast west of Port Broughton, and extends northwards roughly parallel with the coastline.

The Port Broughton intertidal aquaculture zone allows the farming of filter-feeding molluscs in no more than 65 hectares of leased area. There are currently 0 hectares allocated within the zone.

The Amendment Policy amends the class of aquaculture permitted to include the farming of aquatic animals and algae, in addition to the permitted species of bivalve molluscs.

The Port Broughton intertidal aquaculture zone aquaculture zone boundaries prescribed in the 2005 Policy remain the same in the Amendment Policy.

6.5.8 Point Pearce intertidal aquaculture zones

A prospective aquaculture zone encompassing 23,849 kilometres and depicted in Figure 1 was provided for in the *Eastern Spencer Gulf Aquaculture Zone Policy 2005*. The zone extended from the coastline north-west of Maitland to the coastline south of Port Victoria and extended approximately 12 kilometres west into the Spencer Gulf. This was considered at the time for further exploration due to the oyster sites developed in the area and significance of this area to the Narungga People.

The Amendment Policy establishes two new aquaculture zone areas within the former Point Pearce prospective aquaculture zone adjacent to Point Pearce (Figure 4). The Point Pearce zone areas have been developed following consultation with the local Aboriginal community (the Narungga Nations Aboriginal Corporation (NNAC) and the Point Pearce Aboriginal Corporation (PPAC)) and the interest these groups raised in conducting aquaculture activities in the area. The Point Pearce zone areas have been developed to, among other things, support aquaculture opportunities for the aboriginal community and if implemented will require the support of the local aboriginal community to be used.

The Amendment Policy provides that, in determining applications for leases in these areas, the interests of the local Aboriginal communities (as may be represented by NNAC and PPAC) must be taken into account and Aboriginal traditions (including fishing traditions) must be preserved. Therefore, any proposals for aquaculture development in these new zone areas must be in the interests of, and supported by, NNAC and PPAC. The Point Pearce zone areas are being established to benefit the local Aboriginal community and the Amendment Policy aims to provide protection against the use of the

zone areas in a manner contrary to the wishes of the Aboriginal community by ensuring their interests and views are taken into account.

PIRSA is mindful that there may be a market for aquaculture stock that is produced by the local Aboriginal community and farmed or prepared according to traditional or culturally significant methods, in addition to the production of culturally significant species. There are other (agriculture/horticulture) food producers operating in South Australia that are successfully exploiting this market opportunity, including the unique branding of product and it may be possible for an aquaculture producer or the local aboriginal community to do the same. It may also be possible to create tourism opportunities around an Aboriginal aquaculture operation. PIRSA will work with NNAC and PPAC to explore any opportunities that may be of interest.

That said, the Amendment Policy does not prevent other current or future aquaculture operators from seeking to conduct aquaculture activities in the Point Pearce zone areas. The intention is that the Amendment Policy allow other aquaculture operators into the area if they form partnerships with, or obtain the support of, the Aboriginal community. These may be formal partnerships, for example, where NNAC or PPAC is the lease holder but a commercial operator is the licence holder.

Alternatively, these may be informal partnerships, for example, where a commercial operator obtains support from NNAC and PPAC by agreeing to employ a certain number of Aboriginal people, agreeing to farm and market aquaculture stock according to traditional or culturally significant methods or agreeing to reinvest a portion of income or profits back into the Point Pearce community (or, ideally, a combination of all of these). Other opportunities include considering the enhancement of wildcaught species such as sea urchins with supplementary feed that is conducted by the aboriginal community. It is intended that any commercial operator would also agree to locate the lease or infrastructure, or undertake farming activities, so as to minimise any adverse impacts on Aboriginal fishing activities in the area.

There have been aquaculture leases and licences located within the Point Pearce intertidal zone areas in the past for the farming of pacific oysters, this includes those owned by members of the local Aboriginal community.

As further described in 7.1.1 there is currently limited technical information regarding the benthic habitats of the Point Pearce zone areas. Although a conservative maximum limit in hectares has been set for the two new zone areas, it is considered that further technical information, particularly in regards to the benthic habitat types, may be required to complete the PIRSA ESD assessment for the licence application. This information will be used to avoid seagrass beds or rocky reef habitats, where aquaculture infrastructure or species selected poses a high risk of ecological impact to these habitats. PIRSA will work with the EPA, DEWNR and applicant to determine the extent of this additional technical information.

Point Pearce (east) intertidal aquaculture zone

The Point Pearce (east) intertidal aquaculture zone encompasses 135 hectares and is depicted in Figure 1. The zone commences 5.9 kilometres from Port Victoria, and approximately 300 m from Point Pearce.

The prescribed criteria for the Point Pearce (east) intertidal aquaculture zone is for the farming of bivalve molluscs and algae in no more than 20 hectares of leased area. There are currently no existing aquaculture sites located within the boundaries of the zone, however there have been oyster leases located within this area in the past.

The prescribed criteria outlined in the Amendment Policy requires that the Minister take into account aquaculture activity that is in the interests of the local Aboriginal communities (as may be represented

by the PPAC and the NNAC) and the preservation of Aboriginal fishing traditions or any other Aboriginal traditions (subject to a contrary view of the PPAC and NNAC).

Point Pearce (west) intertidal aquaculture zone

The Point Pearce (west) intertidal aquaculture zone encompasses 365 hectares and is depicted in Figure 1. The zone commences approximately 6.6 kilometres from Port Victoria and approximately 2.2 kilometres from Point Pearce. The zone is located approximately 220 m from Wardang Island and extends north along the coast of the island.

The prescribed criteria for the Point Pearce (west) intertidal zone is for the farming of supplementary fed organisms (excluding finfish and abalone), bivalve molluscs and algae in no more than 40 hectares of leased area. There are currently no existing aquaculture sites located within the boundaries of the zone.

The prescribed criteria outlined in the Amendment Policy requires that the Minister take into account aquaculture activity that is in the interests of the local Aboriginal communities (as may be represented by the PPAC and the NNAC) and the preservation of Aboriginal fishing traditions or any other Aboriginal traditions (subject to a contrary view of the PPAC and NNAC).

6.5.9 Exclusion Zones

The exclusion zone boundaries prescribed in the *Aquaculture (Zones – Eastern Spencer Gulf) Policy 2005* remain the same, apart from minor adjustments to those exclusions zones that abut the coastline. The Local Government Area was historically used to determine the boundary of zones which abutted the coastline, however this has been updated overtime, with the Line of Mean High Water Spring (LMHWS) now used to improve accuracy and to ensure consistency with other State Government agencies. As a result of using the LMHWS, there may be slight variation to the boundary of the aquaculture exclusion zones previously prescribed in the 2005 Policy.

6.5.10 Research and Education

The aquaculture sector in South Australia is characterised by a high level of innovation. These innovative ideas have been directed towards improved farming techniques, ecologically sustainable farming practices and value adding opportunities across the relevant aquaculture sectors. The 2005 Policy enables future research to occur in an effective manner through prescribed allocation of hectares for research purposes only, of which a research lease and licence can be granted by the Minister under the Act. By coupling this opportunity with environmental monitoring results could enable industry to improve farming techniques, diversify species production and increase productivity in a sustainable manner.

The 2005 Policy sets aside five hectares of area for the purpose of research or a business constituted of education. The Amendment Policy increases this allocation to ten hectares. These ten hectares may be allocated across the ten aquaculture zones. The Amendment Policy allows aquatic organisms, other than those classes of aquaculture permitted within the policy, for the purposes of research with authorisation of the Minister and only after consultation with other relevant Government departments. The Amendment Policy also permits the farming of species for an educational purpose, consistent with that provided for in other aquaculture zone policies.

7 CONSIDERATIONS INFORMING THE DESIGN AND PRESCRIBED CRITERIA OF THE AMENDED ZONES

To uphold the objectives of the Act, PIRSA Fisheries and Aquaculture have taken the following matters into account in reviewing the 2005 Policy. The following matters have been used to design and amend the prescribed criteria of the zones established or amended by the Amendment Policy.

7.1 Physical and environmental characteristics of the region

The Eastern Spencer Gulf region has a variety of coastal types including wide dune belts, limestone cliffs, rocky outcrops, tidal swamps and samphire flats (Petrusevics *et al.*, 1998). Warm and highly saline temperate waters from the upper regions of the gulf, mix with the cooler waters coming in from the Southern Ocean (DEWNR, 2012). The coastline south of Cape Elizabeth consists of a wide dune belt and a small section of limestone cliffs. Hardwicke Bay opens to the northwest and is sheltered from westerly and southwesterly winds. The southern coastline of Hardwicke Bay consists largely of rocky coastline and cliffs extending into the sea to form rocky reefs. From Port Hughes to Cape Elizabeth a wide dune belt is present followed by eroding clay cliffs. The Bays around Wallaroo are dominated by wide dune belts followed by aelonite and limestone cliffs. Tidal swamps with mangroves and samphire flats are located in the vicinity of Warburto Point. West and East Bird Islands are located near Warburto Point. Extensive areas of mangrove are located on the mudflats surrounding the islands (Petrusevics *et al.*, 1998). The Spencer Gulf Marine Bioregion encompasses the area of the Amendment Policy and changes from mangrove-lined flats and soft-bottom sedimentary ecosystems in the northern, more sheltered parts of the Gulf into rocky shorelines and reef structures which are interspersed with seagrass beds and bare sandy substrates throughout the middle and southern region of the Gulf (Northern and Yorke Natural Resources Management Board, 2008).

7.1.1 Hardwicke Bay/Point Pearce region

The Wardang biounit is located within the Central Spencer Gulf Region and extends from Island Point (north of Port Victoria) to Corny Point, which is situated on the south-western tip of Yorke Peninsula (refer to Figure 7). The biounit encompasses Hardwicke and Port Victoria Bays, Wardang Island and several small islands to the north known as the Goose Island Group. The Wardang biounit is predominantly a low to moderate wave energy area being largely protected by the foot of the Yorke Peninsula, however, some local regions experience moderate, or moderate to high wave energies (PB and SARDI, 2003). Wave energy ranges from low near Point Turton to moderate from Point Souttar to Corny Point and moderate to high in the northern sections of Hardwicke Bay and on the western coast of Wardang Island (PPK 2002).

Available information regarding water quality within the Wardang biounit is based on water samples collected by EPA in 2010 for the Aquatic Ecosystem Condition Report. Water samples taken from four locations (Corny Point, Point Souttar, Hardwicke Bay and Port Victoria) during April and September 2010 reported dissolved inorganic nitrogen levels of 0.013 mg/L, total nitrogen 0.2 mg/L, total phosphorus 0.011 mg/L and chlorophyll a levels of 0.430 ug/L (EPA, 2013).

Water depth in the subtidal Hardwicke Bay zones is 14-16 m and within the Point Pearce zones varies from 0.5 m close to shore and up to 4 m. The water depth between Wardang Island and the mainland is a maximum of 6m (refer to Figure 6).

Average water temperature in the Hardwicke Bay region ranges from 12°C in winter to 22.5°C in summer. Salinity ranges from 36.6 to 37.4 psu (mean 37 psu) (Middleton *et al.*, 2013).

Adjacent to the coastline, currents are moderate to strong. Along the western side of Wardang Island and in the southern parts of Hardwicke Bay, currents have been found to be approximately 1.25 knots (~60cm/sec) (Petrusevics *et al.*, 1998).

Sandy sediments in Hardwicke Bay and shallow areas surrounding Goose Island and Wardang Island are colonised by a variety of seagrass species including *Posidonia sinuosa*, *P. angustifolio* and *Amphibolus antarctica*. Benthic habitat within the aquaculture zones is sand and seagrass.

The Point Pearce intertidal zones range from 0.5 m in depth to a maximum of approximately 2 m in the Point Pearce (east) intertidal zone and from 0.5 m to a maximum of approximately 3 m in the Point Pearce (west) intertidal zone. The zone has been designed to avoid rocky reef environments that surround Point Pearce and Wardang Island and have been located over sandy substrate. A combination of benthic videos conducted by PIRSA in early 2016, satellite imagery available for this area, in addition to benthic mapping conducted by DEWNR to inform the placement of marine parks. Classes of species have been selected based on the benthic habitats presented in the intertidal zones, which includes bare sandy substrate and seagrass beds. Depending on the species and infrastructure proposed, seagrass beds located in the zone will be avoided when possible where aquaculture infrastructure, anchoring systems or species selected pose a high risk of ecological impact to these habitats. The amount of biomass permitted for each class of species prescribed in the Point Pearce intertidal zones will be controlled through licence conditions, which is in alignment with other aquaculture zones located in the state that permit similar species. Given that abalone and finfish are not allowed and biomass of new and novel supplementary fed organisms permitted in the Point Pearce intertidal west zone is currently unknown, the biological and physical requirements of the species applied for during the lease and licence application process will be used to inform biomass licence conditions.

There are no changes to the prescribed species, maximum tenure allocation or boundary of the three subtidal aquaculture zones located in Hardwicke Bay.

7.1.2 Wallaroo region

The Tiparra biounit spans from Wallaroo to Island Point just north of Port Victoria. The biounit encompasses the Wallaroo (East) subtidal aquaculture zone and Wallaroo (West) subtidal aquaculture zone. The Tiparra biounit consists of long sandy beaches and shore platforms backed by a single dune system, as common features along the coastline. In some areas clay or limestone cliffs are present. Around Warburto Point tidal swams with mangroves and samphire communities occur (Petrusevics *et al.*, 1998). The bays around Wallaroo are dominated by wide dune belts followed by aeolian and limestone cliffs.

Average water temperature in the Wallaroo coastal area ranges from 12°C in winter to 23°C in summer (Petrusevics *et al.*, 1998, Middleton *et al.*, 2015). South-westerly winds prevail in the Wallaroo region for most of the year (PB and SARDI, 2003). Salinity in the Wallaroo region is approximately 38 psu, much fresher than the head of the gulf (39.5 psu) (Middleton *et al.*, 2013).

Available information regarding water quality within the Tiparra biounit is based on water samples collected by EPA in 2010 for the Aquatic Ecosystem Scorecard. Water samples taken from three locations (Moonta Bay, Cape Elizabeth and Wallaroo) during April and September 2010 reported dissolved inorganic nitrogen levels of 0.009 mg/L, total nitrogen 0.19 mg/L, total phosphorus 0.011 mg/L and chlorophyll a levels of 0.526 µg/L (EPA, 2013).

Water depths within the Wallaroo (East) subtidal aquaculture zone range between 16 and 19 m, whilst depth in the Wallaroo (West) subtidal aquaculture zone is shallower at 11 m. The water depths located within the Wallaroo (West) subtidal aquaculture zone are considered shallow for finfish farming in this area. The tidal pattern is semi-diurnal with a marked inequality between the two daily tides. Whilst timing of the tides is largely predictable, the tidal range is very variable due to local winds, barometric pressure and general weather patterns. A fortnightly pattern of double tides (days in which there is little or no tidal variation) occurs in the region. Maximum tidal flows in the coastal waters off Wallaroo range from 50 to 75 cm/s (Petrusevics *et al.*, 1998).

Currents in the Wallaroo region are (in order of importance) driven by tides, winds and the thermohaline circulation (changes in sea temperature and salinity) (Middleton *et al.*, 2015). The Wallaroo region experiences strong currents with mean and maximum current speeds ranging between approximately 0.20 - 0.25 and 0.60 - 0.70 m/s (Middleton *et al.*, 2015).

Oceanographic modelling demonstrated that across the seasons mean and maximum significant wave heights in the Wallaroo aquaculture zone were typically less than 1.0 and 2.4 m, respectively. Wave height was typically less than 1.5 m in the warmer months (i.e. November – April) and greater than 1.5 m. in the cooler months (May to September) (Middleton *et al.*, 2015).

Species of the seagrasses *Posidonia* sp., *Amphibolis* sp. and *Halophila* sp. are prevalent on subtidal sandy substrates along the western Yorke Peninsula. Seagrasses are particularly dense in the Wallaroo-Moonta Bay area. The predominant benthic flora within the Wallaroo (East) subtidal zone consists of *Halophila* sp., with *Posidonia* sp. in the Wallaroo (West) subtidal aquaculture zone (PIRSA unpublished data 2016 – refer to Figure 3).

Sites which can be considered for aquaculture development are those with the least sensitive habitats, namely bare sand. Although the eastern area of the zone comprises of bare sand areas, this is interspersed with areas dominated by the seagrass *Halophila ovalis*. *Halophila ovalis* is considered to be an adaptive, fast growing species that can be transient in its distribution and therefore less susceptible to the impacts of aquaculture when compared to slower growing species such as *Posidonia* sp (PB and SARDI, 2003). This species has also been shown to grow under conditions of low light and high sediment disturbance whereby 50% of the leaf biomass can be covered under sediment (Erftemeijer and Stapel, 1999). *Halophila ovalis* was determined to be of 'Least Concern' when the likelihood of extinction was determined under the International Union for Conservation of Nature (IUCN) categories and criteria. The species of seagrass identified as 'Least Concern' were considered to be species with large and wide-ranging distributions and through consensus of expert opinion that '*many are resistant to heavy disturbance, are fast growing, or have rapid recruitment rates*' (Short *et al.*, 2011). These aspects allow it to inhabit disturbed sites and for existing meadows to recover from perturbations given their opportunistic character (Erftemeijer and Stapel, 1999). These types of habitats are located towards the northern and eastern end of the former Wallaroo subtidal aquaculture zone and informed the design of the Wallaroo (East) subtidal aquaculture zone for the addition of finfish as a prescribed species. More sensitive species of seagrass such as *Posidonia* sp. and *Amphibolis* sp. are located in the western end of the former Wallaroo subtidal aquaculture zone, with the design of the Wallaroo (West) subtidal aquaculture zone incorporating these areas and where finfish and other supplementary fed species have been excluded.

The outer boundaries of the former *Wallaroo subtidal aquaculture zone* have not been amended as part of this review. The zone was originally identified for finfish and shellfish aquaculture due to its good access to well flushed areas and the availability of shore-based facilities (Petrusevics *et al.*, 1998). The zone has been internally divided into two zones to minimise the risk posed to the benthic environment by the aquaculture of finfish in the Wallaroo (East) subtidal zone only as previously described. The maximum biomass of finfish for the Wallaroo (East) subtidal zone is set at 2000 tonnes as a precautionary measure until environmental monitoring results determine whether an incremental increase can be supported within the zone. Modelling of a 3000 tonne Yellowtail kingfish farm, supported that tidal currents and local circulation has the ability to dilute and disperse aquaculture related nutrient inputs away from the lease sites (Middleton *et al.*, 2015).

7.1.3 Tickera/Port Broughton region

The Yonga Biounit encompasses the upper Spencer Gulf, extending from Victoria Point (north of Franklin Harbor) to Point Lowly on the Eyre Peninsula to Ward Point and Point Riley on the Yorke Peninsula. The Yonga Biounit encompasses the Port Broughton and Tickera aquaculture zones (refer to Figure 7). These subtidal and intertidal areas have benthic habitats of sand interspersed with seagrass.

The benthic communities of the Port Broughton Intertidal aquaculture zone are characterised by bare sand in the inshore areas, intermediate areas are characterised by mixed seagrass species including *Posidonia sp.* and *Heterozostera sp.* and offshore areas are characterised by extensive *Posidonia sp.* meadows.

The *Tickera (inner) intertidal aquaculture zone* has broad intertidal flats approximately one to five kilometres wide. Inshore areas are characterised by bare sand, intermediate areas are characterised by mixed seagrass species including *Posidonia sp.* and *Heterozostera sp.* and offshore areas are characterised by extensive *Posidonia sp.* meadows. The *Tickera (Outer) subtidal aquaculture zone* is characterised by extensive *Posidonia sp.* beds interspersed with large sandy patches.

Available information regarding water quality within the Yonga biounit is based on water samples collected by EPA in 2012 for the Aquatic Ecosystem Scorecard. Water samples taken from a number of points, with those located closest to the aquaculture zones existing including Fisherman's Bay Inner, Webbling Point, Tickera Bay Inner during April and October 2012 ranged from 0.03 to 0.35 mg/L for total nitrogen, 0.009 to 0.019 mg/L for total phosphorus and 0.24 to 0.52 ug/L for chlorophyll a levels (EPA AECR Report Website).

Water depth rarely exceeds 2 m in the intertidal zones and varies between 4-12 m in the subtidal zone.

The most promising sites for aquaculture located in the Port Broughton and Tickera aquaculture zones are those with the least sensitive habitats of those outlined above, namely bare sand. More sensitive species, such as *Posidonia sp.* that are dispersed throughout the zone boundaries have been considered when determining the classes of species prescribed for each zone. Through the lease and licence assessment process and depending on the species and infrastructure proposed, seagrass beds located in the zone will be avoided when possible where aquaculture infrastructure, anchoring systems or species selected pose a high risk of ecological impact to these habitats. The amount of biomass permitted for each class of species prescribed will be controlled through licence conditions, which is consistent with other aquaculture zones located in the state that permit similar species.

For the Tickera intertidal and subtidal zones and Port Broughton intertidal zone the only change is for the inclusion of algae as a prescribed species, in addition to bivalve molluscs. The boundaries of the four aquaculture zones located adjacent to Port Broughton have not been amended.

7.2 Integrated Multitrophic Aquaculture

For the purposes of the Amendment Policy, Integrated Multitrophic Aquaculture (IMTA) has been defined as 'an aquaculture farming system whereby two (or more species) are farmed together and waste products of one species are recycled as feed for another species' (by 'together' this can be adjacent to one another). IMTA can foster the sustainable expansion of the aquaculture industry in South Australia by utilising dissolved inorganic waste from one species to grow other species (Wiltshire et al., 2015). This can provide both an environmental benefit through reduction of nitrogen inputs, economic benefit through diversification into other aquaculture products and increased social acceptability (Troell et al., 2009). Extractive species such as filter feeders and seaweed can grow faster in integrated systems (Wiltshire et al., 2015). Other species that can also be considered are deposit feeders such as sea cucumbers and sea urchins that can take up heavier particulate matter that is released under aquaculture infrastructure from supplementary fed organisms (Hannah et al., 2013 and Soto, 2009).

IMTA systems used to date have included farming systems with all species farmed within the same infrastructure and also independent aquaculture sites with monoculture (single species aquaculture) of different species located adjacent to and spaced at a predetermined distance apart to the main nutrient releasing aquaculture system to ensure efficiency of the IMTA system (Soto, 2009). IMTA development in Australia is limited and the Wallaroo (East) subtidal aquaculture zone encourages the adoption of

IMTA practices within the South Australian aquaculture industry to ensure its ongoing sustainability. There are two macroalgal species that have been identified that showed the greatest potential for aquaculture in South Australia. These were a carrageenan-producing red seaweed and the common kelp, which met criteria such as being local, cultivation technology available and established or potential market value (Wiltshire *et al.*, 2015).

The Wallaroo (East) subtidal aquaculture zone proposes that 350 hectares of finfish farming can only be conducted if 50 hectares of this allocation is used for the purpose of IMTA. If IMTA is not implemented within the zone, then only 300 hectares of finfish monoculture (single species aquaculture) will be permitted. The Wallaroo (West) subtidal aquaculture zone also provides for IMTA to be considered using this zone, which is restricted to bivalve molluscs and algae, if physical characteristics of the water body are conducive to an extractive aquaculture farm in this location to be considered in conjunction with finfish farming in the Wallaroo (East) subtidal aquaculture zone. Alternatively an aquaculture farm of up to a maximum allocation of 50 hectares is permitted to occur in isolation to the operations being conducted in the Wallaroo (East) subtidal aquaculture zone. The prescribed classes of species include extractive species such as bivalve molluscs (i.e. scallops, cockles, native oysters etc.) and algae.

7.3 Native Title

PIRSA Fisheries and Aquaculture acknowledges and recognises the native title rights and interests of South Australian Aboriginals. It is further recognised that it is essential to the well-being of Aboriginal people in the communities that their traditional values and practices are respected and their heritage and native title interests considered when aquaculture developments are planned for a particular area. PIRSA Fisheries and Aquaculture facilitates the involvement of local Aboriginal representatives in its process for developing and amending aquaculture policy and zoning. The Amendment Policy recognises the Narungga People's aspirations in relation to aquaculture by proposing three aquaculture zones, including both intertidal and subtidal waters to enable the development of Aboriginal aquaculture activity or aquaculture that benefits the local Aboriginal community as represented by the NNAC and PPAC.

There is one Indigenous Land Use Agreement (ILUA) registered in this area. This is the Narungga Local Government ILUA which was entered into in 2005 and deals with local government and future acts but does not deal with fishing and aquaculture (it does, however, extend to the low water mark).

The Narungga Nation native title claim (Federal Court Number: SAD62/2013) was registered on the 8 May 2013. The claim includes the whole of the Yorke Peninsula and extends 5 kilometres seaward from the coast and any islands located within the 5 kilometres coastal area. Members of the native title group claim the right to possess, occupy, use and enjoy the lands and waters covered by the application and over areas where a claim to exclusive possession cannot be recognised, the non-exclusive rights to use and enjoy the land and waters in accordance with traditional laws and customs.

7.4 Aboriginal Heritage

The Narungga People have traditional associations with the coastal areas of the Yorke Peninsula, which provide food and resources, and still hold strong cultural significance today. There are extensive Aboriginal sites along the western Yorke Peninsula coast as described further below.

The Amendment Policy seeks to locate aquaculture development to avoid potential impacts on sensitive Aboriginal sites. Aboriginal heritage sites in the region are located in a number of clusters along the coast. There is a cluster of twelve sites stretching from Warburto Point southwards about five kilometres along Moonta Bay. The next main cluster of sites stretches from Cape Elizabeth to Point Turton with ninety-two sites. The current high density of recorded archaeological features along this coastline suggests this area was widely used pre-European contact and it is highly likely that further archaeological investigation will identify additional sites.

Applicants who seek to conduct ground or sea disturbing works should at a minimum conduct a search of the Central Archive, which includes the Register of Aboriginal Sites and Objects (the Register), administered by the Department of State Development, Aboriginal Affairs and Reconciliation (DSD-AAR). The Register is not a comprehensive record of all Aboriginal sites and objects in South Australia. Sites or objects may exist in the development area, even though the Register does not identify them. All Aboriginal sites and objects are protected under the *Aboriginal Heritage Act 1988*, whether they are listed in the Register or not. Land within 200 metres of a watercourse (particularly the River Murray, coastal dunes and overflow areas) in particular, may contain Aboriginal sites, objects or remains.

Proponents intending to develop land and sea areas that may contain Aboriginal sites, objects or remains are advised that early contact and consultation with interested Aboriginal parties is highly recommended. Depending on the outcomes of those discussions, proponents may wish to avail themselves of DSD-AAR's Risk Management guidelines that provide suggestions as to appropriate heritage management practices. Such management practices may include seeking to conduct archaeological or anthropological surveys of the area in conjunction with interested Aboriginal parties.

It is an offence to damage, disturb or interfere with any Aboriginal site or damage any Aboriginal object or remains (registered or not) without the authority of the Minister for Aboriginal Affairs and Reconciliation. If the planned activity is likely to damage, disturb or interfere with a site, object or remains, authorisation of the activity must be first obtained from the Minister for Aboriginal Affairs and Reconciliation under section 23 of the *Aboriginal Heritage Act 1988*. Section 20 of the *Aboriginal Heritage Act 1988* requires that any Aboriginal sites, objects or remains, discovered on the land or water, need to be reported to the Minister for Aboriginal Affairs and Reconciliation. Penalties apply for failure to comply with the *Aboriginal Heritage Act 1988* (AHA).

The *Aboriginal Heritage (Miscellaneous) Amendment Act 2016* came into operation on 24 March 2016. The amendments to the AHA included provision for the establishment of Registered Aboriginal Representative Bodies (RARBS) and local heritage agreements that can include agreements about aquaculture. It is anticipated that the first RARBs may be appointed by the end of 2016, thus potentially providing an additional avenue for consultation with interested Aboriginal parties.

If any Aboriginal sites, objects or remains are encountered during community engagement, PIRSA Fisheries and Aquaculture will advise the Minister for Aboriginal Affairs and Reconciliation and, where possible, avoid the heritage object or apply for relevant authorisations as necessary.

7.5 Non-indigenous and Natural Heritage Sites

Heritage sites are recorded under the register of *Heritage Places Act 1993* and may include dwellings, industrial works, jetties, wharves, lighthouses and places designated as archaeologically significant such as whaling and sealing sites. A search of the State Heritage Register (5/7/16) identified four registered sites along the Eastern Spencer Gulf. These included three registrations classed as natural which are further described in section 6.7, including Register Number 14298 – Wardang Island, Port Victoria, Register Number 6885 – Goose Island and Register Number 6773 – Bird Island Conservation Park, Warburto Point and one classed as historic which is Register Number 6850 – Port Victoria Jetty, Main St. The Port Victoria Jetty was one of the busiest ports for grain trade windjammers in the area and used to predominantly trade wheat, barley and oats.

All registrations are located outside of the aquaculture zones prescribed in the Amendment Policy.

7.6 Marine Parks

The Wallaroo, Tickera and Port Broughton aquaculture zones, are located outside of any marine park declared under the *Marine Parks Act 2007*. The three Hardwicke Bay zones are all located within a General Managed Use Zone of the Southern Spencer Gulf Marine Park. The Point Pearce intertidal

zones are located within a Habitat Protection Zone of the Eastern Spencer Gulf Marine Park (refer to Figure 8).

Marine Parks are the principal tool under the *Marine Parks Act 2007* for managing both current and future activities that take place in marine parks. The Amendment Policy and aquaculture activities in the Spencer Gulf Marine Parks are integrated to achieve multiple-use outcomes, in accordance with the objects and the four types of zones established by the *Marine Parks Act 2007*.

The Southern Spencer Gulf Marine Park includes the sheltered gulf waters of Hardwicke Bay as well as the rugged coastline that runs around the toe of the Yorke Peninsula toward Marion Bay. The Park includes several offshore islands and takes in the deep waters of Investigator Strait and the rugged north coast of Kangaroo Island (DEWNR, 2012).

The mixing of cold and warm waters in the park produces dynamic ecosystems and contributes to the rich marine life, with the park hosting many known spawning, nursery and feeding grounds, particularly for King George Whiting. Access to the Southern Spencer Gulf Marine Park is from Marion Bay, Point Turton, Corny Point and Innes National Park (DEWNR, 2012).

The Eastern Spencer Gulf Marine Park is located on the eastern side of the Spencer Gulf, just north of Port Rickaby and extends to Cape Elizabeth, the park encompasses the islands and waters of Goose Island Conservation Park and Goose Island Aquatic Reserve. An abundance of reef fish species surround Wardang Island, while seagrass meadows provide an important habitat for protected pipefish and other species. Access to Eastern Spencer Gulf Marine Park is from Cape Elizabeth, Balgowan and Port Victoria (DEWNR, 2012).

The *Marine Parks Act 2007* makes provision for the following types of marine park zones:

- a) A general managed use zone – is a zone established so that an area may be managed to provide protection for habitats and biodiversity within a marine park, while allowing ecologically sustainable development and use. Aquaculture activity is deemed a compliant activity within such a zone. Within this zone aquaculture farming activities are deemed a compatible activity that is permitted to be undertaken.
- b) A habitat protection zone – is a zone primarily established so that an area may be managed to provide protection for habitats and biodiversity within a marine park, while allowing activities and uses that do not harm habitats or the functioning of ecosystems. Within this zone aquaculture farming activities are deemed a compatible activity that is permitted to be undertaken.
- c) A sanctuary zone – is a zone primarily established so that an area may be managed to provide protection and conservation for habitats and biodiversity within a marine park, especially by prohibiting the removal or harm of plants, animals or marine products.
- d) A restricted access zone – is a zone primarily established so that an area may be managed by limiting access to the area.

As stated above, the three Hardwicke Bay zones are all located within a General Managed Use Zone of the Southern Spencer Gulf Marine Park and, as such, aquaculture farming is deemed to be a compatible activity that is permitted to be undertaken in the area.

The Point Pearce intertidal zones are located within a habitat protection zone of the Eastern Spencer Gulf Marine Park and, as such aquaculture farming is deemed to be a compatible activity that is permitted to be undertaken in the area. Aquaculture in Habitat Protection Zones will be managed under the *Aquaculture Act 2001* to ensure that all reasonable and practicable measures are taken to achieve the definition of this zone. There are no prescribed aquaculture zones located within a Sanctuary zone or Restricted Access Area in accordance with the *Marine Parks Act 2007*.

7.7 Reserves and Conservation Areas

Three conservation parks and one aquatic reserve are located in the region. There are no nationally significant wetlands within 10 kilometres of the region. Bird Island Conservation Park is located 3 kilometres to the south of the Wallaroo zone and is listed on the Australian Heritage Database through the Register of the National Estate. The area comprises of two islands near Warburto Point, less than 1 kilometre offshore. The area has been declared a conservation park to protect the breeding habitats of seabirds (such as Pied Cormorants, Crested Terns, Caspian Terns, Pacific Gulls and Silver Gulls) and mangrove swamp fringing the islands. The park is enclosed in the Port Hughes aquaculture exclusion zone.

Goose Island Conservation Park is also listed on the Australian Heritage Database through the Register of the National Estate. It consists of several small islands and was declared a conservation park in recognition of the breeding colonies of Black-faced Cormorants, Pied Cormorants, Hooded Dotterel and Silver Gull. Within the Goose Island Conservation Park, the Goose Island Aquatic Reserve was established to provide a conservation area where teaching institutions may conduct classes and scientific research on marine biology and ecology and to protect the habitat of the seal colony situated on White Rocks. It also allows for scientific research, education and conservation. Goose Island Aquatic Reserve provides a habitat for Australian sea lions (*Neophoca cinerea*) and a nesting site for fairy penguins, crested terns and other sea birds. This area is more than 38 kilometres north of the Hardwicke Bay (outer) aquaculture zone, 53 kilometres south of the Wallaroo aquaculture and 3.5 kilometres northwest of the Point Pearce aquaculture zones.

Leven Beach Conservation Park is located approximately 9 kilometres south-west of the Hardwicke Bay aquaculture zones. The park was proclaimed in 1988 to conserve remnant drooping she-oak (*Allocasuarine verticillata*).

In addition to these conservation parks and aquatic reserves the following are listed on the Register of the National Estate:

- Balgowan Sand Dunes - because the area supports an open heath / scrub coastal plant association that is poorly conserved in other parts of the Yorke Peninsula (Australian Heritage Commission, undated).
- Wardang Island – in recognition of its well preserved exposure of a wide variety of geologic and geomorphological features (Australian Heritage Commission, undated).
- Peesey Swamp – in recognition of the area of marshy saline flats of mid-recent high sea level extending from Hardwicke Bay to Sturt Bay. Low ridges of cemented shells and shell sand of marine origin extend parallel to the swamp (Australian Heritage Commission, undated).

The aquaculture zones in the Amendment Policy are located a minimum of 1000 m seaward of a proclaimed National Park or Reserve as required under the Land Not Within a Council Area (Coastal Waters) (LWCA(CW)) Development Plan.

7.8 Matters of National Environmental Significance

The *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act) addresses the protection of matters of national environmental significance.

Data was obtained from the Department of Environment, Water, Heritage and the Arts online database tool that reports on the EPBC Act, (<https://www.environment.gov.au/epbc/protected-matters-search-tool>) accessed 8 December 2015.

There are 27 listed threatened species (20 bird, 3 mammal, 3 reptile, and 1 shark species) and 27 listed migratory species (16 bird and 11 marine species) that may occur or have habitat that may occur in the

waters of the eastern Spencer Gulf. The following species are known to occur in the area and been listed as endangered and migratory - the Southern right whale (*Eubalaena australis*), Leatherback turtle (*Dermochelys coriacea*) and Loggerhead turtle (*Caretta caretta*).

Other rare or uncommon taxa that exist in the area include:

- Macroalgal species, *Champia parvula*. It has two known varieties, one of which (*C. parvula* var. *amphibolis*) has been found growing only epiphytically on *Amphibolis* sp., on Tiparra Reef in Spencer Gulf (Womersley, 1996 as cited in Baker, 2004).
- The Spotted Snake-blenny, *Ophiclinops paradalis*, may be endemic to South Australia. It is a small-fish species that has been recorded in the Port Victoria area.
- South-eastern Spencer Gulf provides habitat for the unusual pelagic octopus, *Argonauta nodosa* (Zeidler and Norris, 1989 as cited in Baker, 2004).
- A colonial ascidian, *Leptoclinides* sp.1, of limited known distribution, occurs at Tiparra Reef. It may be endemic to South Australia.
- A rarely recorded tropical nudibranch, *Crosslandia viridis* has been reported near Point Turton.
- Both Leafy and Weedy Seadragons have been reported from the Moonta/Port Hughes/Tiparra area; the Port Victoria/Wardang area and from a number of sites in the Hardwicke Bay area (Baker, 2004). Both species are protected species in South Australia and the Leafy Seadragon is also listed under the *Commonwealth EPBC Act 1999*.

The data outlined above is derived primarily from general distribution maps for each species and therefore at least some of the species described will not occur within zones or individual lease and licence areas if granted in the future. Further assessment is conducted at the lease and licence assessment stage of aquaculture development as this will largely depend on the species and type of infrastructure applied for within the zone and likely impact on the species described above (i.e. mussel lines versus finfish cages versus benthic structures).

Table 2 – The vulnerable or endangered species listed by the Department of the Environment for the Spencer Gulf region including Port Broughton, Wallaroo and Hardwicke Bay (as at 8 December 2015).

Common Name(s)	Species	Status	Type of Presence
Antipodean Albatross	<i>Diomedea exulans antipodensis</i>	Vulnerable	Foraging, feeding or related behaviour likely to occur within area
Australasian Bittern	<i>Botaurus poiciloptilus</i>	Endangered	Species or species habitat may occur within area
Australian Fairy Tern	<i>Sternula nereis nereis</i>	Vulnerable	Breeding likely to occur within area
Australian Painted Snipe	<i>Rostratula australis</i>	Endangered	Species or species habitat may occur within area
Australian Sea-lion	<i>Neophoca cinerea</i>	Vulnerable	Foraging, feeding or related behaviour likely to occur within area
Black-browed Albatross	<i>Thalassarche melanophris</i>	Vulnerable	Species or species habitat may occur within area
Blue Petrel	<i>Halobaena caerulea</i>	Vulnerable	Species or species habitat may occur within area
Bryde's Whale	<i>Balaenoptera edeni</i>		Species or species habitat may occur within area
Campbell Albatross	<i>Tahlassarche melanophris impavida</i>	Vulnerable	Species or species habitat may occur within area
Caspian Tern	<i>Sterna caspia</i>		Breeding known to occur within area
Curlew Sandpiper	<i>Calidris ferruginea</i>	Critically endangered	Roosting known to occur within area
Dusky Dolphin	<i>Lagenorhynchus obscurus</i>		Species or species habitat may occur within area

Common Name(s)	Species	Status	Type of Presence
Eastern Curlew	<i>Numenius madagascariensis</i>	Critically endangered	Roosting known to occur within area
Fairy Prion (southern)	<i>Pachyptila turtur subantarctica</i>	Vulnerable	Species or species habitat likely to occur within area
Flesh-footed Shearwater	<i>Puffinus carneipes</i>		Foraging, feeding or related behaviour likely to occur within area
Fork-tailed Swift	<i>Apus pacificus</i>		Species or species habitat likely to occur within area
Great White Shark	<i>Carcharodon carcharias</i>	Vulnerable	Foraging, feeding or related behaviour known to occur within area
Green Turtle	<i>Chelonia mydas</i>	Vulnerable	Foraging, feeding or related behaviour known to occur within area
Halbury Greenhood	<i>Pterostylis lepida</i>	Endangered	Species or species habitat likely to occur within area
Hooded Plover (eastern)	<i>Thinornis rubricollis rubricollis</i>	Vulnerable	Species or species habitat known to occur within area
Humpback Whale	<i>Megaptera novaeangliae</i>	Vulnerable	Species or species habitat likely to occur within area
Killer Whale, Orca	<i>Orcinus orca</i>		Species or species habitat may occur within area

Common Name(s)	Species	Status	Type of Presence
Leatherback Turtle, Leathery Turtle, Luth	<i>Dermochelys coriacea</i>	Endangered	Foraging, feeding or related behaviour known to occur within area
Little Tern	<i>Sterna albifrons</i>		Species or habitat may occur within area
Loggerhead Turtle	<i>Caretta caretta</i>	Endangered	Species or species habitat known to occur within area
Northern Giant Petrel	<i>Macronectes halli</i>	Vulnerable	Species or species habitat may occur within area
Northern Royal Albatross	<i>Diomedea epomophora sanfordi</i>	Endangered	Foraging, feeding or related behaviour likely to occur within area
Painted Snipe	<i>Rostratula benghalensis</i> (sensu lato)	Endangered	Species or species habitat may occur within area
Plains-wanderer	<i>Pedionomus torquatus</i>	Critically endangered	Species or species habitat may occur within area
Porbeagle, Mackerel Shark	<i>Lamna nasus</i>		Species or species habitat likely to occur within area
Pygmy Right Whale	<i>Caperea marginate</i>		Species or species habitat may occur within area
Shy Albatross, Tasmanian Shy Albatross	<i>Thalassarche cauta cauta</i>	Vulnerable	Foraging, feeding or related behaviour likely to occur within area
Soft-plumaged Petrel	<i>Pterodroma mollis</i>	Vulnerable	Species or species habitat may occur within area
Sooty Albatross	<i>Phoebastria fusca</i>	Vulnerable	Species or species habitat may occur within area

Common Name(s)	Species	Status	Type of Presence
Southern Giant Petrel	Macronectes giganteus	Endangered	Species or species habitat may occur within area
Southern Right Whale	Eubalaena australis	Endangered	Breeding known to occur within area
Southern Royal Albatross	Diomedea epomophora epomophora	Vulnerable	Foraging, feeding or related behaviour likely to occur within area
Tristan Albatross	Diomedea exulans exulans	Endangered	Species or species habitat may occur within area
Wandering Albatross	Diomedea exulans (sensu lato)	Vulnerable	Foraging, feeding or related behaviour likely to occur within area
White-capped Albatross	Thalassarche cauta steadi	Vulnerable	Foraging, feeding or related behaviour likely to occur within area

7.9 Commercial and Recreational Fishing

Aquaculture zones should be sited in a manner that minimises unnecessary impact on commercial and recreational fishing activities.

Western King Prawn is the major single species commercial fishery in the Eastern Spencer Gulf area. The Spencer Gulf prawn fishing industry contributed \$74.5 million to gross state product in 2014/15 and directly employed 268 people (Econsearch, 2016a).

There is also an extensive marine scalefish fishery in the region which targets, among other species, Snapper, King George Whiting and Blue Swimmer Crab. The region is of major importance for the marine scalefish fishery, representing one of the most significant fishing grounds in South Australia. The SA Marine Scalefish Spencer Gulf/Coffin Bay fishing industry contributed \$15.8 million to gross state product in 2014/15 and directly employed 154 people (Econsearch, 2016b).

The abalone fisheries in this area form a major part of the Central Zone Abalone Fishery. The Central Zone SA Abalone fishing industry contributed \$5.6 million to gross state product in 2014/15 and directly employed 17 people (Econsearch, 2016c).

The Charter Boat fishing industry in this area form a part of the Spencer Gulf/Coffin Bay region, which contributed \$2.7 million to gross state product in 2014/15 and directly employed 23 people (Econsearch, 2016d) of a total gross state product of \$10.3 million and direct employment of 62 people.

Recreational fishing is important for the local community and tourism value of Yorke Peninsula. Recreational fishing in Eastern Spencer Gulf includes shore fishing and boat fishing for a variety of species. Recreational fishing in Eastern Spencer Gulf focuses on line fishing for King George whiting, sand flathead, yelloweye mullet, Australian salmon, snapper, garfish, tommy rough, and southern calamari. Pot fishing for blue swimmer crab also occurs in this area.

PIRSA undertook a South Australian Recreational Fishing Survey in 2013/14. The survey found that more than 277,000 South Australians participated in recreational fishing during the survey and that the greatest proportion of recreational fishing (37%) took place in the Spencer Gulf region.

There are no changes to the outer boundaries of the zones outlined in the 2005 Policy and zones located at Point Pearce have been designed to continue to provide access to key recreational and commercial fishing locations, in addition to maintaining vessel transport routes for these activities. Areas within the zone can still be accessed by both recreational and commercial fishing vessels, however access to an area granted under an aquaculture lease is at the discretion of the lease holder to protect infrastructure and stock from damage caused by other vessel operators. Conservative limits for aquaculture activity (leasable area) within the aquaculture zones in addition, will provide for continual access to the majority of the aquaculture zone area and with permission from lease holders, access to leased areas. Of the total area covered by aquaculture zones, 9% is provided for aquaculture activity (leasable area) and of the total area covered by the by the Amendment Policy only 2% is allocated for aquaculture activity.

7.10 Historic Shipwrecks

One of the Principles of Development Control in the Land Not Within a Council Area (Coastal Waters) (LNWCA(CW)) Development Plan requires that "marine aquaculture development must be located at least 550 metres from a proclaimed shipwreck". Whilst aquaculture within an aquaculture zone delineated within the LNWCA(CW) Development Plan is excluded from the definition of development (Schedule 3, clause 16 *Development Regulations 2008*), this minimum distance will be maintained in relation to any aquaculture operations in all aquaculture zone policies.

Any shipwreck or relic that is older than 75 years is protected under the Commonwealth *Historic Shipwrecks Act 1976*, which covers water off the South Australian coast from the low water mark or the agreed baselines but does not include State internal waters – i.e. the River Murray, Gulf St. Vincent, Spencer Gulf, Encounter Bay, Lacedpede Bay, Rivoli Bay and Anxious Bay – which are covered under the *Historic Shipwrecks Act 1981* (SA).

No historic shipwrecks are recorded in any of the aquaculture zones and all zones are located a minimum of 550 m from registered shipwrecks within the region, with the exception of the existing aquaculture exclusion zones which will serve to further protect any shipwreck found within those zones.

7.11 Shipping and Navigation

There are no boundary changes to the Hardwicke Bay, Wallaroo or Port Broughton zones, of which shipping and navigation was considered during the development of the 2005 Policy. The *Wallaroo aquaculture exclusion zone* encompasses the route of the passenger ferry between Wallaroo and Lucky Bay.

Shipping and navigation have been considered in the design of the Point Pearce aquaculture zones. There were no major shipping channels identified within the vicinity of these zones. The zones have been located to not impede the navigation of recreational and commercial vessels travelling between Point Pearce and Wardang Island. The closest accessible launch site at Port Victoria and navigation north, west and south within the Spencer Gulf was also considered in the siting of both zones (refer to Figure 5).

Considering the potential of future aquaculture within the zones it should be noted that it is a condition of aquaculture leases and licenses that navigation marks be installed whenever structures are located in the leased area and the *Aquaculture Regulations 2016* stipulate the requirement to mark-off an area and maintain structures used to mark-off an area in a good working condition. For any new site or movement of an existing site, concurrence must be granted by the Minister responsible for the *Harbours and Navigation Act 1993*, prior to a lease and licence being issued. Therefore aquaculture infrastructure within the aquaculture zone should not pose a navigational hazard.

As stated above, access to the zone area not under a lease is permitted by all vessel types, however it is at the discretion of the lease holder as to whether access to an aquaculture lease area is permitted at anytime to protect infrastructure and stock from damage caused by other vessel operators.

7.12 Tourism

With over 700 kilometres of spectacular coastline, Yorke Peninsula is a popular tourism destination for fishers, surfers, divers, campers, bushwalkers, nature-lovers and holiday makers. Yorke Peninsula attracts many recreational fishers, offers some of the state's best surfing beaches and is home to Innes National Park.

Yorke Peninsula's mild climate and relaxed lifestyle means it is also becoming a popular residential area for retirees and people seeking a lifestyle change or "seachange". Therefore, Yorke Peninsula is also attracting new, high-volume residential development that capitalises on the amenity of the area and caters to this market. Examples include the Copper Cove Marina and Wallaroo Shores developments.

In terms of creating jobs and gross regional product, tourism (and also commercial fishing) industries are important to the local economy (Econsearch, 2012).

The Eastern Spencer Gulf aquaculture zones have been situated so that visual and recreational amenity is maintained where possible.

The ecotourism industry within the eastern Spencer Gulf is still in its infancy, with proposed growth expected, however, it is unlikely to become a large industry given natural limitations of rough seas and cold water (Econsearch, 2012).

Concerns relating to sharks can be raised when aquaculture zones are proposed within a region. Sharks are known to frequent the eastern Spencer Gulf area. A workshop discussing shark interactions with aquaculture was held in Adelaide in October 2004. Representatives from industry, aquaculture manufacturing companies, the South Australian Government and other State Government agencies (including SARDI and fisheries and aquaculture staff), met to discuss the current issues associated with shark interactions in southern Australia and what methods are in place to reduce and deal with these interactions. A discussion paper “Workshop on Shark Interactions with Aquaculture” (Murray-Jones *et al.*, 2004) recorded the details and outcomes of the discussions held.

Some of the key points from this workshop include:

- Aquaculture infrastructure do not appear to attract sharks to a region.
- The main factor triggering attacks is the presence of freshly dead fish in cages – this is a husbandry issue.
- Interactions with bronze whaler sharks are more frequent than with great white sharks. Interactions vary with site, season and operator.
- More research into shark populations and behaviour (particularly interactions with aquaculture cages) is needed (Note: further research into shark interactions and aquaculture cages commenced in South Australia in 2015).
- Since this workshop, the requirement for all marine based aquaculture licensees to submit and adhere to strategies regarding the interactions of farming operations with seabirds and large marine vertebrates have been introduced to the *Aquaculture Regulations 2016*.

In addition, husbandry practices of aquaculture operators have improved as the business of aquaculture has evolved and become more commercially focussed. Some of these husbandry practices include increased frequency of diver removal of dead fish from the cages, checking for holes in nets and introducing false bottoms to nets to increase the distance from the bottom of the cages to fish outside the cages—this decreases the opportunity for predators to get to dead fish in cages.

Marine Innovation South Australia (MISA) and SARDI employ a shark and seal expert to explore South Australia’s capacity to research shark and seal behaviour and population movements. This follows on from research work completed by SARDI on seal interactions with finfish farms (Goldworthy *et al.* 2009). PIRSA Fisheries and Aquaculture considers the results of this research when zoning for aquaculture.

Scientists from SARDI have also analysed the catch and effort data from the commercial shark fishery in Spencer Gulf on both annual and monthly basis. There appears to be a seasonal (i.e. natural) trend in movement of whaler sharks into the gulf and west coast waters during the warmer months of the year. Additionally, there are some areas where sharks are already present, for example in the Spencer Gulf. Sharks are present in the area primarily because the main sea lion breeding colony is located at Dangerous Reef.

Sharks, if present naturally, may visit aquaculture facilities in that area, however fish mortalities are routinely removed and consequently no reward is presented to the sharks. As such, it is considered unlikely that aquaculture attracts additional sharks to an area, or keeps sharks close to the area

7.13 Sites of Scientific Importance

There is one geological monument in the 2005 Policy, namely Wardang Island (monument number 1147) (Geological survey of South Australia, 2009).

7.14 Mineral Tenements

The *Mining Act 1971* addresses the grant of exploratory and production mining tenements in South Australia and is administered by the Department of State Development.

Data was obtained from the online South Australia Resources Information Geodatabase tool that describes where mining tenement applications and licences are located in the State, (http://minerals.statedevelopment.sa.gov.au/online_tools/free_data_delivery_and_publication_download/sariq) accessed 8 December 2015.

The Point Pearce (west) intertidal aquaculture zone is located within the mining exploration licence application area of 2010/00048, the Point Pearce (east) intertidal aquaculture zone is located within the mining exploration licence application area of 2010/00120, the existing *Wallaroo subtidal aquaculture zone* is located within the mining exploration licence application area 2008/00054 and the Tickera and Port Broughton aquaculture zones are located within the mining exploration licence application area 2011/00027.

7.15 Biosecurity

The health status of farmed and wild stock in the area, with particular emphasis on the occurrence of diseases listed as notifiable under the *Livestock Act 1997*, is taken into consideration. In addition the Regulations require licensees to report unusually high mortality rates.

Disease reporting requirements as stipulated in the Regulations and *Livestock Act 1997* are considered adequate to survey and adaptively manage any emerging production disease risks. Biosecurity risks will be further assessed during the lease and licence application process to consider those risks that are specific to the species and operational aspects of the farming system being used.

8 REGIONAL IMPACT ASSESSMENT

Matters raised in the Amendment Policy may:

- Directly affect a region or regions;
- Indirectly affect a region or regions;
- Affect or relate to regional issues; or
- Treat or affect regional and metropolitan areas differently.

Accordingly, it is considered appropriate to fully assess the effects of the Amendment Policy within the region. This section contains an assessment of the expected effects of the Amendment Policy on the Yorke Peninsula Region.

8.1 Stakeholders

The main issues raised by stakeholders during consultation on the development of aquaculture zones are the perceived or actual encroachment of the aquaculture zone on other resource uses, for example recreational and commercial fishing (including prawn fishing and abalone fishing), and concerns around the potential for interactions with sensitive species and habitats.

The following groups may be affected by the Amendment Policy:-

- The Aquaculture industry, local community, native title claimants and other indigenous groups, local government, recreational and professional fishers, Government agencies, conservation groups and other Non-Government Organisations, research organisations, boards and other relevant planning and natural resource management bodies, recreational users, tourists and the tourism industry, the recreational boating sector and commercial shipping.

PIRSA sought input and guidance from these parties throughout the consultation process.

8.2 Consultation Undertaken in Relation to Regional Issues

Following preparation of the Amendment Policy and Policy Report, the Minister is required to refer both documents to prescribed bodies and to any public authority whose area of responsibility is, in the opinion of the Minister, likely to be affected by the Amendment Policy (section 12(4)(a) of the Act).

The following bodies are prescribed:

- Conservation Council of South Australia Incorporated;
- Local Government Association of South Australia;
- RecFish SA;
- South Australian Aquaculture Council;
- South Australian Native Title Services Ltd;
- Wildcatch Fisheries SA Incorporated;
- Any registered representatives of native title holders or claimants to native title in land comprising or forming part of an aquaculture zone or area to which the policy applies;
- Any person holding an aquaculture licence or aquaculture lease over an area comprising or forming part of a zone or area to which the policy applies;
- Any regional NRM Board (within the meaning of the *Natural Resources Management Act 2004*) responsible for a region comprising or forming part of an aquaculture zone or area to which the policy applies; and

- Economic development agencies.

In addition to prescribed bodies, PIRSA Fisheries and Aquaculture consulted with the following parties:

- Industry leaders, EPA, Department for Planning, Transport and Infrastructure, SA Tourism Commission, SARDI, DEWNR, Department of Health, Aboriginal Affairs and Reconciliation Division, Native Title Unit, Community and Local Government Relations, Regions SA, Regional Development Australia Yorke and Mid North, PIRSA Legal Unit, Fisheries Compliance Services, Rural Solutions SA, District Council of Copper Coast, Yorke Peninsula Council, Central Local Government Region of South Australia, and relevant Yorke Peninsula Community groups.

The Amendment Policy and Policy Report describing the zoning proposal was distributed to key stakeholders as the basis for consultation. These documents were available on the PIRSA Fisheries and Aquaculture website for 2 months.

Public notices were placed in *The Advertiser* and the *Yorke Peninsula Country Times* seeking comment from members of the public.

To provide stakeholders with the opportunity to speak directly with PIRSA Fisheries and Aquaculture Officers, public briefings in the region were held during the consultation period.

Additionally, all existing lease and licence holders in the aquaculture zone area were advised during the 2 month consultation period by letter.

The following stakeholder group meetings and discussions have been held to date:

Date	Name of Meeting	Attendees
5 August 2015	Finfish aquaculture consultation/planning meeting	Industry representatives, Environment Protection Authority, South Australian Research and Development Institute, PIRSA Fisheries and Aquaculture.
15 September 2015	Finfish aquaculture consultation/planning meeting	Industry representatives, Environment Protection Authority, PIRSA Fisheries and Aquaculture.
3 March 2016	Yorke Peninsula Council	Yorke Peninsula Council elected and staff members, PIRSA Fisheries and Aquaculture.
3 March 2016	District Council of the Copper Coast	District Council of the Copper Coast elected and staff members, RDA Yorke & Mid North, PIRSA Fisheries and Aquaculture.
10 March 2016	Regions SA	Regions SA, PIRSA Fisheries and Aquaculture.

7 April 2016	Narungga Area ILUA Liaison Committee	Yorke Peninsula Council CEO, District Council of the Copper Coast CEO, District Council of Barunga West CEO, Wakefield Regional Council CEO, Narungga Nation Aboriginal Corporation leadership group, PIRSA Fisheries & Aquaculture.
20 May 2016	Point Pearce Aboriginal Corporation	Various
8 June 2016	Narungga Nation Aboriginal Corporation and Point Pearce Aboriginal Corporation	South Australian Native Title Services, Various
20 September 2016	Spencer Gulf and West Coast Prawn Fishermen's Association	Spencer Gulf and West Coast Prawn Fishermen's Association, PIRSA Fisheries and Aquaculture.
31 January 2017	Northern and Yorke Natural Resources Management Board	Northern and Yorke Natural Resources Management Board, PIRSA Fisheries and Aquaculture.

8.3 Potential Effects

The Amendment Policy defines aquaculture zones within State waters where specified classes of aquaculture will be permitted and aquaculture zones where no aquaculture will be permitted (i.e. aquaculture exclusion zones) for the waters within the Amendment Policy area. Aquaculture has a number of potential economic, social and environmental effects. These are included in the following section.

Eastern Spencer Gulf has a number of advantages over potential alternative locations where developers might seek to expand or initiate operations. It is understood that efforts to develop regional economies are most successful when they focus on building on areas of relative strength or specialisation. Businesses can also use a region's comparative advantage to build a competitive advantage, which is also developed through a combination of factors such as knowledge, resources, skills and the ability to innovate (DRALGAS, 2013).

Specific favourable attributes of the Eastern Spencer Gulf aquaculture zone include:

- Suitable physical characteristics such as high tidal flows close to shore, and water depths that vary across all zones to allow for finfish, algae, intertidal or subtidal shellfish aquaculture.
- Local industry support services including boat launching.
- Excellent infrastructure including a marina at Wallaroo, wharf facilities at Wallaroo for loading/unloading aquaculture product, boat ramp facilities, roads, electricity & telecommunications.

For existing farmers in the area, favourable factors include:

- Familiarity with local waters, infrastructure, institutional conditions, and commercial networks.
- Proximity to Adelaide, reducing travel and communications costs.
- Established relationships with service, input providers and workforce participants.

Without relevant and up to date zoning, aquaculture development may occur in an ad-hoc manner (albeit subject to the Development Plan policy) and the full economic potential of the industry is unlikely to be achieved. Aquaculture zone policies should provide for regional growth and expansion of the industry. If zone policies are not updated and do not provide for growth, new development must rely on the pilot lease process. This is not a strategic planning process and is less streamlined for industry participants. If zone policies are not updated, future development opportunities may be stifled.

8.3.1 Economic and Employment Factors

The aquaculture industry plays an important role in creating wealth and prosperity for South Australia, particularly in regional communities (Herreria *et al.*, 2004; EconSearch, 2016). The aquaculture industry in South Australia has recorded strong growth in volume and product range during the past decade and this trend is set to continue. Aquaculture is evolving, with more environmentally sustainable farming systems and practices now available such as; inland ventures using recycled water, emerging filter feeding species such as cockles, razorfish and native flat oysters, integrated multi-trophic aquaculture and aquaponic-type production systems.

Aquaculture can provide significant investment and employment opportunities to rural and regional economies. A report completed by EconSearch (2016) estimated the direct output of aquaculture in South Australia in 2014/15 to be \$272.6m (\$227.82 on-farm and \$44.7m in downstream activities). Direct employment was estimated to be in excess of 817 full time equivalent positions (FTE) in 2014/15 with 1,016 flow-on jobs, giving total employment of 1,833 FTE, with around 65% of these jobs generated in regional South Australia.

Most evidence of the economic benefits of aquaculture zoning is qualitative rather than quantitative. One of the key determinants of long-term regional economic growth is recognised to be integrated regional planning. Coordinating cross-sectoral actions and government policies reduces the likelihood that policies are implemented in a fragmented manner and minimises duplication at different levels of government (DRALGAS, 2013). Aquaculture zoning is one such form of regional planning that effectively achieves these objectives.

In particular, aquaculture zoning has a range of potential economic benefits, including:-

- Facilitating industry growth – zoning provides a framework that facilitates the sustainable development of aquaculture activities, therefore helping to promote significant investment and to enhance employment opportunities in rural and regional economies.
- Optimising the use of the sea – zoning helps to ensure that maximum benefits are derived from the use of the sea by encouraging activities to take place where they bring most value, and do not devalue other activities.
- Reducing costs – zoning can reduce the cost of regulation, planning and decision making, and can eliminate duplication in approval processes, for example, by removing the need to obtain planning approval where the aquaculture zone has been included in the Land Not Within A Council Area (Coastal Waters) Development Plan.

The provision of tenure for aquaculture will provide the opportunity for investors and farmers to create a sustainable aquaculture industry in the region.

The Wallaroo (East) subtidal aquaculture zone sets a limit of 2,000 tonnes of finfish that can be farmed. The benefits that an industry of the size allowed under this policy could have has not been modelled.

However, the economic analysis of 2,000 tonnes of finfish aquaculture offshore of Edithburgh calculated a (base case production) direct impact of \$14.1 million including fish processing and transport. An additional \$8.9 million could potentially be generated through flow-on effects, mostly in property and business services, trade, manufacturing, transport and other sectors. This would result in an annual boost to the region of \$23 million. It is also estimated that an industry of this size would directly create approximately 90 FTE in the aquaculture industry and a further 74 flow-on jobs to other occupations, resulting in a total of 164 FTE within the state (EconSearch, 2002). It is important to note, however, that these employment figures were calculated prior to development of a significant finfish aquaculture industry and as such should be interpreted with caution.

Establishing aquaculture around developing species such as sea urchin, sea cucumber and algae may also benefit the industry and the region by contributing to the diversification and resilience of the industry and/or the economy and generating flow-on effects for employment and business services. If these species are considered for integrated multitrophic aquaculture systems, this also can increase the ecological sustainable practices of the aquaculture producer and possible alternative income streams.

8.3.2 Social Effects

The majority of the small communities on Yorke Peninsula were established to service the agricultural industry. The impact of the rural downturn and employment opportunities provided by the mining boom has led to a drain of its youth to the metropolitan areas and to mining centres (DRALGAS, 2013).

One of the challenges for both government and the local community is to manage the economic and social changes that will result from an expansion in aquaculture development. Social impacts resulting from zoning may include loss of resource access and amenity, noise and visual impacts, and concerns about the loss of identity, remoteness, naturalness and aesthetic values of a region.

However, these have been considered in the location of the aquaculture zone areas in that they are situated to minimise noise and visual impacts. There has been a history of aquaculture and seafood production in other areas in South Australia and this has benefited local communities through jobs and direct income.

On balance, it is also expected that:

- Additional business and capital may be attracted to the region.
- The population size/demographics of Yorke Peninsula may be affected.
- Investment may be required to improve infrastructure such as boat ramps and roads (private/public partnerships are a common practice to meet the new requirements where aquaculture is a heavy user of infrastructure).
- The scope for young people to get entry-level training and jobs may increase.

8.3.3 Environmental Effects

The Amendment Policy prescribes conservative biomass limits for finfish, following broadscale technical assessment of the environmental credentials of the Wallaroo aquaculture zone area. Carrying capacity models developed by SARDI are used so that no more than what the environment can assimilate will be farmed in the area (Tanner *et al.*, 2007). A recently completed research project to model the oceanographic parameters has been used to estimate the carrying and assimilative capacity for Spencer Gulf (specifically the Wallaroo region) and in turn setting biomass limits to mitigate adverse regional impacts to water quality (Middleton *et al.*, 2015).

It should be noted that regional impacts to water quality that affect seagrass are difficult to measure and even more difficult to attribute to the source(s), therefore the proposed research project aims to better

understand before and after effects of finfish aquaculture within the vicinity of seagrass beds surrounding the Wallaroo (east) aquaculture zone.

The farming of filter feeding bivalves and macro algae has the potential to offset some of the soluble nutrient waste streams from finfish farming. Currently there is no empirical data to calculate the magnitude of this offset. The *Wallaroo (west) subtidal aquaculture zone* allows for multitrophic integrated aquaculture using multiple species to offset potential impacts.

Risks posed by the aquaculture activity are assessed at the time of a licence application through the ESD and Risk Assessment process, consistent with the National ESD Framework (Fletcher *et al.*, 2004). These assessments consider the risk of a variety of impacts to the environment at both the site and regional level. Additionally, the environmental impacts of aquaculture are monitored as part of an Environmental Monitoring Program specific to the class of aquaculture undertaken and stipulated in the *Aquaculture Regulations 2016*. The Minister for Agriculture, Food and Fisheries can alter the maximum biomass limits of all classes of aquaculture through notice in the South Australian Government Gazette. This provides a mechanism to enable flexibility in setting biomass limits for aquaculture zones and sectors and enables future research and environmental monitoring results to be taken into consideration as they become available over time.

9 SUBSEQUENT DEVELOPMENT PLAN AMENDMENTS

The Amendment Policy falls within the waters covered by the Land Not within Council Area (Coastal Waters) Development Plan (LNWCA(CW)DP). The Amendment Policy is consistent with the provisions contained in this Development Plan as it seeks to ensure the ecologically sustainable development of the aquaculture industry, whilst recognising and respecting other users of the marine resource. The aquaculture zones as outlined in the 2005 Policy have been incorporated into the LNWCA(CW)DP's maps (Figures 9-12).

Therefore, subject to the approval of the Minister for Planning, any changes to the aquaculture zones as outlined in the Amendment Policy will be incorporated into the LNWCA(CW)DP's maps, specifically the Point Pearce aquaculture zones.

Aquaculture is not considered "development" under the *Development Act 1993* if it is located within an aquaculture zone and within the LNWCA(CW)DP. Thus, aquaculture development located within a prescribed aquaculture zone will not be subject to further development approval under the *Development Act 1993*.

10 REFERENCES

- ABARES (2016). Australian Fisheries and Aquaculture Statistics 2015, Canberra, December 2016.
- Australian Government, Department of the Environment. Interactive Map for Environmental Report Tool [online]. [Accessed 8 December 2015]. Available from World Wide Web: <<http://www.environment.gov.au/erin/ert/epbc/imap/map.html>>
- Baker, J. (2004). Towards a System of Ecologically Representative Marine Protected Areas in South Australian Marine Bioregions – Technical Report. Prepared for Coast and Marine Conservation Branch, Department for Environment and Heritage, South Australia. p613, 635, 678.
- Beveridge, M. (1987). Cage Aquaculture. 352pp. Fishing News Books Ltd, Farnham.
- Buschmann, A., Varela, D., Hernández-González, M., Henríquez, L., Correa, J., Flores, R. and Gutierrez, A. (2007). The development of an integrated multi-trophic activity in Chile: the importance of seaweeds. World Aquaculture Society. Aquaculture 2007 conference proceedings, pg. 136.
- Chopin, T., Buschmann, A., Halling, C., Troell, M., Kautsky, N., Neori, A., Kraemer, G., Zertuche-Gonzalez, J., Yarish, C. and Neefus, C. (2001). Integrating seaweeds into marine aquaculture systems: a key toward sustainability. Journal of Phycology 37: 975-986.
- Clark, T. and Seymour, R. (2007). Energy expenditure of the Yellowtail Kingfish (*Seriola lalandi*) at different swimming speeds: developing a bioenergetics model for Australian aquaculture. In: Tanner, J.E., Clark, T.D., Fernandes, M. and Fitzgibbon, Q. (2007) Innovative Solutions for Aquaculture: Spatial Impacts and Carrying Capacity – Further Developing, Refining and Validating Existing Models of Environmental Effects of Finfish Farming. South Australian Research and Development Institute (Aquatic Sciences), Adelaide, 126pp. SARDI Aquatic Sciences Publication Number F2007/000537.
- Department of Environment, Water and Natural Resources (DEWNR)(2012) Eastern Spencer Gulf Marine Park: Management Plan 2012. Prepared by the Department of Environment, Water and Natural Resources.
- Department of Regional Australia, Local Government, Arts and Sport (DRALGAS)(2013). Framework for Regional Economic Development. Regional Australia Standing Council.
- Department of State Development. South Australian Resources Information Geoserver. [Accessed 8 December 2015]. Available from World Wide Web: <http://minerals.statedevelopment.sa.gov.au/online_tools/free_data_delivery_and_publication_downloads/sarig>
- EconSearch (2002). The Economic Impact of Finfish Aquaculture at Offshore Edithburgh. A report prepared for PIRSA Aquaculture.
- Econsearch (2012). Eastern Spencer Gulf Marine Park Regional Impact Statement. A report prepared for Department of Environment, Water and Natural Resources.
- EconSearch (2016). The Economic Impact of Aquaculture on the South Australian State and Regional Economies, 2014/15. A report prepared for PIRSA Fisheries and Aquaculture.
- EconSearch (2016a). Economic Indicators for the Spencer Gulf Prawn Fishery, 2014/15.
- EconSearch (2016b). Economic Indicators for the SA Marine Scalefish Fishery, 2014/15.
- EconSearch (2016c). Economic Indicators for the SA Abalone Fishery, 2014/15.
- EconSearch (2016d). Economic Indicators for the SA Charter Boat Fishery, 2014/15.

Environment Protection Authority. Aquatic Ecosystem Condition Reports [Online] [Accessed 8 December 2015]. Available from World Wide Web: <
<https://www.waterconnect.sa.gov.au/Systems/EPAWQ/SitePages/Map.aspx>>

Environmental Protection Authority (EPA)(2013) Nearshore Marine Aquatic Ecosystem Condition Reports – Lower Spencer Gulf bioregional assessment report 2010. Authored by Gaylard S, Nelson M and Noble W.

Erftemeijer, P. and Stapel, J (1999). Primary production of deep-water *Halophila ovalis* meadows. *Aquatic Botany* 65: 71–82

FAO (2015). The State of World Fisheries and Aquaculture: Opportunities and challenges. Rome. 2014.

Fitzgibbon, Q., Strawbridge, A. and Seymour, R. (2007). Metabolic scope, swimming performance and the effects of hypoxia in the mulloway (*Argyrosomus japonicus*). In: Tanner, J.E., Clark, T.D., Fernandes, M. and Fitzgibbon, Q. (2007) Innovative Solutions for Aquaculture: Spatial Impacts and Carrying Capacity – Further Developing, Refining and Validating Existing Models of Environmental Effects of Finfish Farming. South Australian Research and Development Institute (Aquatic Sciences), Adelaide, 126pp. SARDI Aquatic Sciences Publication Number F2007/000537

Fletcher, W., Chesson, J., Fisher M., Sainsbury, K., and Hundloe, T. (2004). National ESD Reporting Framework: The 'How To' Guide for Aquaculture. FRDC Project 2000/145.1, Canberra, Australia 75 pp

Goldsworthy, S., Page, B., Shaughnessy, P., Hamer, D., Peters, K., McIntosh, R., Baylis, A. and McKenzie, L. (2009). FRDC project 2004/201 – Innovative Solutions for Aquaculture Planning and Management: Addressing Seal Interactions in the Finfish Aquaculture Industry. SARDI Research Report Series Number 288. Pp291.

Hannah, L., Pearce, C., and Cross S. (2013). Growth and survival of California sea cucumbers (*Parastichopus californicus*) cultivated with sablefish (*Anoplopoma fimbria*) at an integrated multi-trophic aquaculture site. *Aquaculture*, 406–407: 34–42.

Heaven, C., Rodda, K., Lauer, P., Davison, J., Fraser, L. and Clarke, S. (2014). Chapter 25: Aquaculture in South Australia. Pp 347-358 In *Natural History of Spencer Gulf* (ed. Shepherd, S., Madigan, S., Gillanders, B., Murray-Jones, S. and Wiltshire, D.). Royal Society of South Australia Inc. The Printing Hub, Adelaide. Publication Number ISBN-978-0-9596627-6-4.

Herrería, E., Woodhead, A, Tottenham, R, Magpantay, C. (2004). Social profile of people employed in the Agriculture, Forestry and Fishing industries. Rural Industries Research and Development Corporation Publication No 04/122.

Middleton, J., Doubell, M., James, C., Luick, J. and van Ruth, P. (2013). PIRSA Initiative II: carrying capacity of Spencer Gulf: hydrodynamic and biogeochemical measurement modelling and performance monitoring. Final report for the Fisheries Research and Development Corporation. South Australian Research and Development Institute (Aquatic Sciences), Adelaide. SARDI Publication No. F2013/000311-1 SARDI Research Report Series No. 705. 97pp.

Middleton, J., James, C., Doubell, M., and. Malthouse, P. (2015). Oceanographic observations of currents and temperature in the Wallaroo aquaculture zone. Final report prepared for Clean Seas Tuna Ltd. South Australian Research and Development Institute (Aquatic Sciences), Adelaide. SARDI Publication No. F2015/000364-1. SARDI Research Report Series No. 842. 14pp.

Mount, G., Fernandes, M. and Cheshire, A. (2007). Evaluation of waste management strategies for the Southern Bluefin Tuna industry. In Aquafin CRC - Southern Bluefin Tuna Aquaculture Subprogram: Tuna Environment Subproject – Evaluation of Waste Composition and Waste Mitigation. Technical report, Aquafin CRC Project 4.3.2, FRDC Project 2001/103. SARDI Publication No. RD03/0037-9.

SARDI Research Report Series No. 207, Aquafin CRC, FRDC and SARDI Aquatic Sciences, Adelaide, pp. 257–280.

Murray-Jones, S., Fisheries Research and Development Corporation and the South Australian Department for Environment and Heritage (2004). Proceedings of the Shark Interactions with Aquaculture Workshop and Discussion paper on great white sharks. Department for Environment and Heritage, Adelaide.

National Native Title Tribunal, Commonwealth of Australia. Indigenous Land Use Agreements [online]. [Accessed 21 March 2016]. Available on World Wide Web: <<http://www.nntt.gov.au/ilua/>>

Northern and Yorke Natural Resources Management Board. (2008). Northern and Yorke Regional NRM Plan: Volume A: State of the Region Report 2008. Prepared by the Northern and Yorke Natural Resources Management Board.

O'Bryen, P. and Lee, C. (2003). Management of aquaculture effluents workshop discussion summary. *Aquaculture* 226(1):227-242.

Parsons Brinkerhoff and SARDI Aquatic Sciences (PB and SARDI)(2003). Technical review for aquaculture management plans – phase 2. Volume B Central Spencer Gulf, 231 pp.

Petrusevics, P., Noye, J., Harbison, P. and Petrusevics, A. (1998). Key Sites for off-shore Aquaculture development in South Australia. Prepared for PIRSA (Aquaculture Group) March 1998.

Primary Industries South Australia (1996). Spencer Gulf Aquaculture Management Plan. pp 89.

Primary Industries and Regions South Australia (2016). Unpublished Data. Compilation of benthic transects conducted within the bounds of the *Wallaroo Subtidal Aquaculture Zone* between 2000 and 2012 from technical investigations, lease applications and environmental monitoring program reports.

Short, F., Polidoro, B., Livingston, S., Carpenter, K., Bandeira, S., Bujang, J., Calumpong, H., Carruthers, T., Coles, R., Dennison, W., Erftemeijer, P., Fortes, M., Freeman, A., Jagtap, T., Kamal, A., Kendrick, G., Kenworthy, W., Nafie, Y., Nasution, I., Orth, R., Prathep, A., Sanciango, J., van Tussenbroek, Vergara, S., Waycott, M. and Zieman, J. (2011). Extinction risk assessment of the world's seagrass species. *Biological Conservation* 144(7): 1961–1971.

Tanner, J., Clark, T., Fernandez, M. and Fitzgibbon, Q. (2007). Innovative Solutions for Aquaculture: Spatial Impacts and Carrying Capacity – Further Developing, Refining and Validating Existing Models of Environmental Effects of Finfish Farming. South Australian Research and Development Institute (Aquatic Sciences), Adelaide, 126pp. SARDI Aquatic Sciences Publication Number F2007/000537.

Troell M., Joyce, A., Chopin, T., Neori, A., Buschmann, A. and Fang, J. (2009). Ecological engineering in aquaculture - Potential for integrated multi-trophic aquaculture (IMTA) in marine offshore systems. *Aquaculture* 297: 1-9.

Wiltshire, K., Tanner, J., Gurgel, C. and Deveney, M. (2015). Feasibility study for integrated multitrophic aquaculture in southern Australia. Report to the Fisheries and Research & Development Corporation. South Australian Research and Development Institute (Aquatic Sciences), Adelaide. SARDI Publication No. F2015/000786-1. SARDI Research Report Series No. 883. 115pp.

APPENDIX A – GLOSSARY OF TERMS

Adaptive Management	Management involving active response to new information of the deliberate manipulation of fishing intensity or other aspects in order to learn something of their effects. Within a stock, several sub-stocks can be regarded as experimental units in which alternative strategies are applied.
Assimilative capacity	The capacity of a natural body of water to receive wastewaters without deleterious effects to aquatic life.
Benthic	Of or relating to or happening on the bottom under the ocean/lake.
Biodiversity	The variability among living organisms from all sources (including terrestrial, marine and other aquatic ecosystems and the ecological complexes of which they are a part) and includes: (a) diversity within species; and (b) diversity of ecosystems.
Biomass	<p>The total live weight of a group (or stock) of living organisms (e.g. fish, plankton) or of some defined fraction of it (e.g. spawners), in an area, at a particular time.</p> <p>Any quantitative estimate of the total mass of organisms comprising all or part of a population or any other specified unit, or within a given area at a given time; measured as volume, mass (live, dead, dry or ash-free weight) or energy (joules, calories).</p>
Bivalve mollusc	Any mollusc belonging to the taxonomic class Bivalvia, being characterised by a shell consisting of two hinged sections. Includes clams, cockles, mussels, oysters, pipis and scallops.
Broodstock	Aquatic organisms from which subsequent generations are intended to be produced for the purpose of aquaculture.
Carrying capacity	The maximum population of a given organism that a particular environment can sustain.
Closures	Prohibition of fishing during particular times or seasons (temporal closures) or in particular areas (spatial closures), or a combination of both.
Ecologically sustainable development (ESD)	<p>ESD is described in the <i>Aquaculture Act 2001</i> as:</p> <p>‘Development is ecologically sustainable if it is managed to ensure that communities provide for their economic, social and physical well-being while—</p> <ul style="list-style-type: none">(a) natural and physical resources are maintained to meet the reasonably foreseeable needs of future generations; and(b) biological diversity and ecological processes and systems are protected; and(c) adverse effects on the environment are avoided, remedied or

	<p>mitigated.</p> <p>In making decisions as to whether development is ecologically sustainable or to ensure that development is ecologically sustainable—</p> <p>(a) long-term and short-term economic, environmental, social and equity considerations should be effectively integrated; and</p> <p>(b) if there are threats of serious or irreversible environmental harm, lack of full scientific certainty should not be taken to justify the postponement of decisions or measures to prevent the environmental harm’.</p>
Ecosystem	A dynamic complex of plant, animal, fungal, and microorganism communities and the associated non-living environment interacting as an ecological unit.
Habitat	The place or type of site in which an organism naturally occurs.
Harvest	A productivity measuring technique relating to the yield of seasonal aquaculture produce.
Infauna	Aquatic organisms (animals only) that live within particulate media such as sediments or soil.
Marine Park	Means an area established as a marine park under Part 3 Division 1 of the <i>Marine Parks Act 2007</i> .
Marine protected area (MPA)	An area of land and/or sea especially dedicated to the protection and maintenance of biological diversity and of natural resources, and managed through legal or other effective means.
Integrated Multitrophic Aquaculture (IMTA)	An aquaculture farming system whereby two (or more species) are farmed together and waste products of one species are recycled as feed for another species.
Population	A group of individuals of the same species, forming a breeding unit and sharing a habitat.
Spatial	Of or relating to space.
Stakeholder	An individual or a group with an interest in the conservation, management and use of a resource.
Stock	A group of individuals of a species occupying a well defined spatial range independent of other groups of the same species, which can be regarded as an entity for management or assessment purposes.
Supplementary fed	Supplementary feeding is the giving of feed to aquatic organisms to supplement any naturally available food.

APPENDIX B – LIST OF ACRONYMS

AHA	<i>Aboriginal Heritage Act 1988</i>
Amendment Policy	<i>Aquaculture (Zones – Eastern Spencer Gulf) Amendment Policy 2017</i>
ATAB	Aquaculture Tenure Allocation Board
CRC	Cooperative Research Centre
DEWNR	South Australian Department of Environment, Water and Natural Resources
EMP	Environmental Monitoring Program
EPA	Environment Protection Authority
EPBC Act	<i>The Commonwealth Environment Protection and Biodiversity Conservation Act 1999</i>
ERDC	Environment, Resources and Development Committee
ESD	Ecological Sustainable Development
FTE	Full Time Equivalent
ILUA	Indigenous Land Use Agreement
IMTA	Integrated Multitrophic Aquaculture
LMHWS	Line of Mean High Water Springs
LNWCA(CW)DP	Land Not within Council Area (Coastal Waters) Development Plan
MPA	Marine Protected Area
NNAC	Narungga Nation Aboriginal Corporation
NPW Act	<i>National Parks and Wildlife Act 1972</i>
NRM	Natural Resource Management
PIRSA	Department of Primary Industries and Regions, South Australia
PPAC	Point Pearce Aboriginal Corporation
RARB	Registered Aboriginal Representative Bodies
SARDI	South Australian Research and Development Institute
SATC	South Australian Tourism Commission
The Act	<i>Aquaculture Act 2001</i>
The Minister	Minister for Agriculture, Food and Fisheries
2005 Policy	<i>Aquaculture (Zones – Eastern Spencer Gulf) Policy 2005</i>

APPENDIX C – MAPS

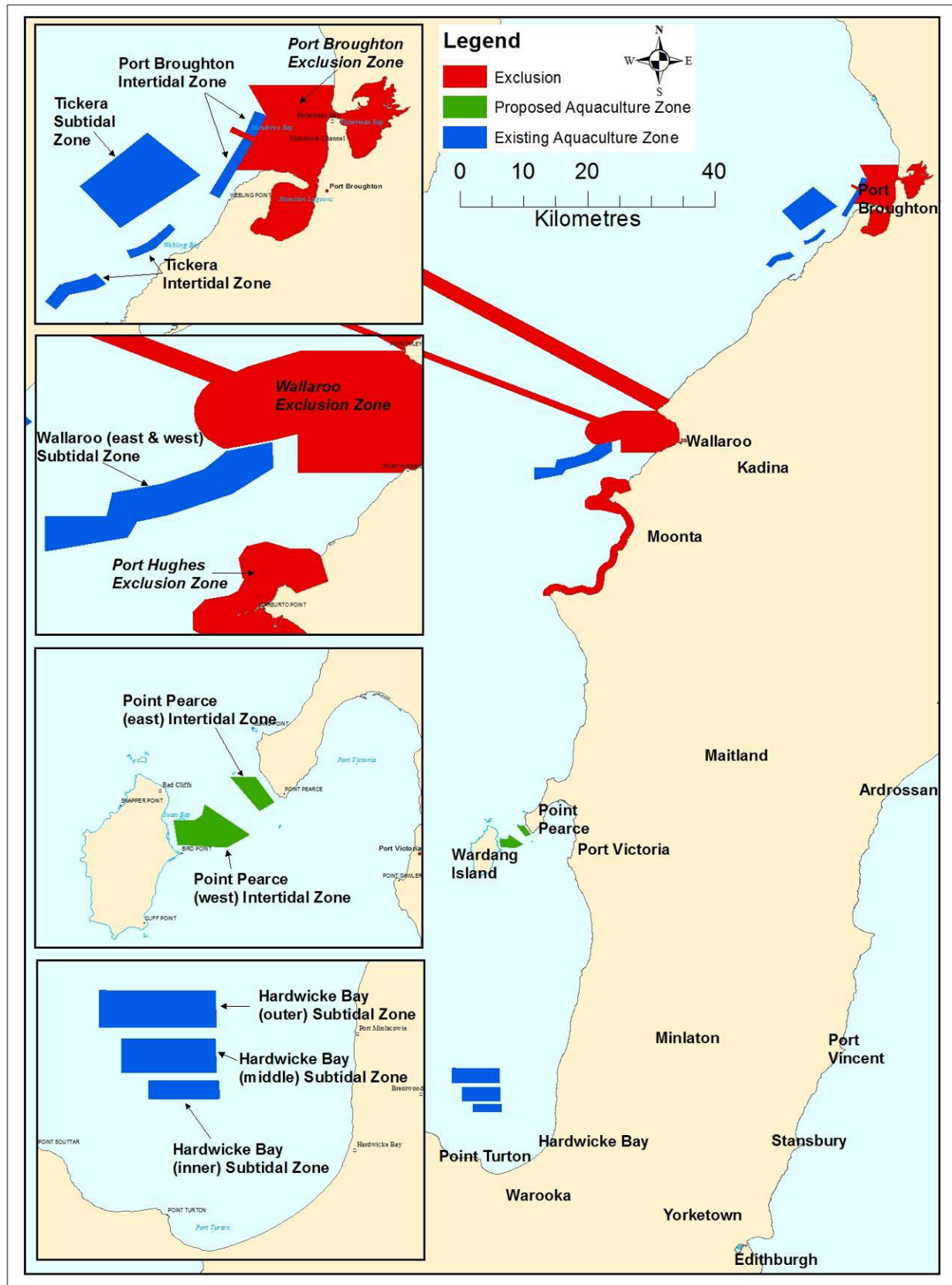


Figure 1 – Map of the existing aquaculture zones, existing aquaculture exclusion zones and new aquaculture zones outlined in the Aquaculture (Zones – Eastern Spencer Gulf) Amendment Policy 2017.

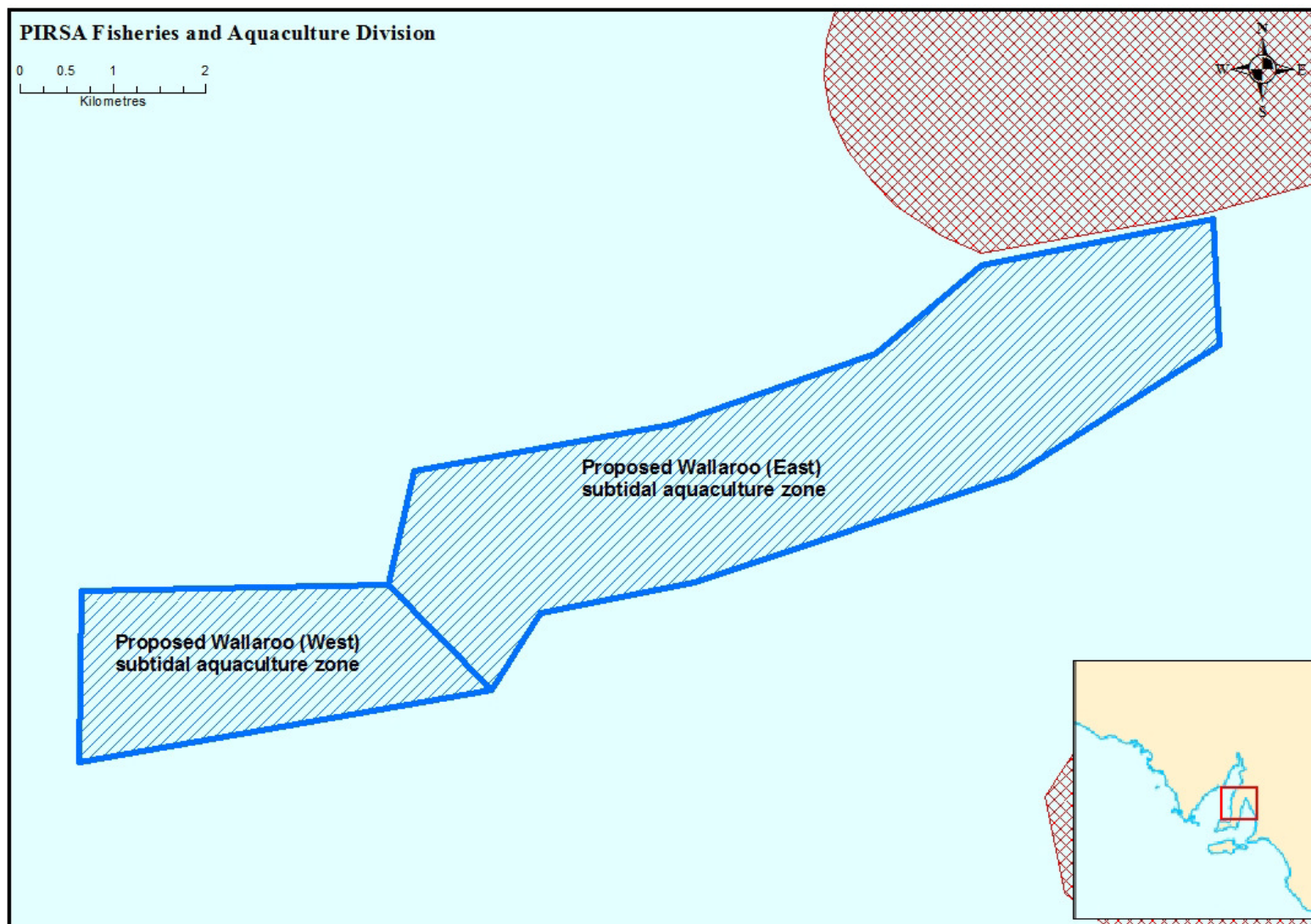


Figure 2 – Map of the new zone areas within the Wallaroo subtidal aquaculture zone.

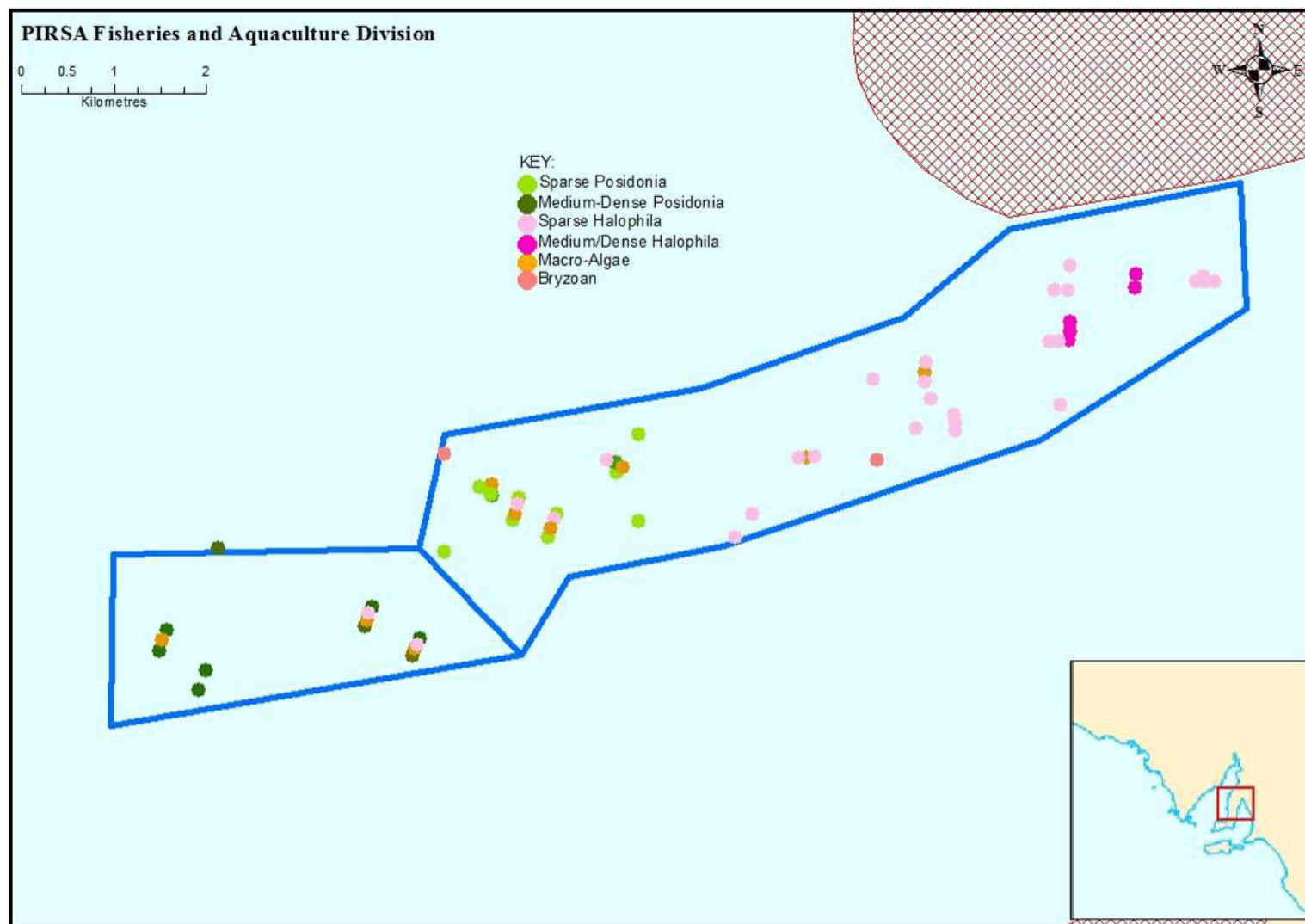


Figure 3 – Map of the distribution of seagrass across the Wallaroo east and west zones (data sources include EMP video results, zone technical investigations and aquaculture licence application videos).

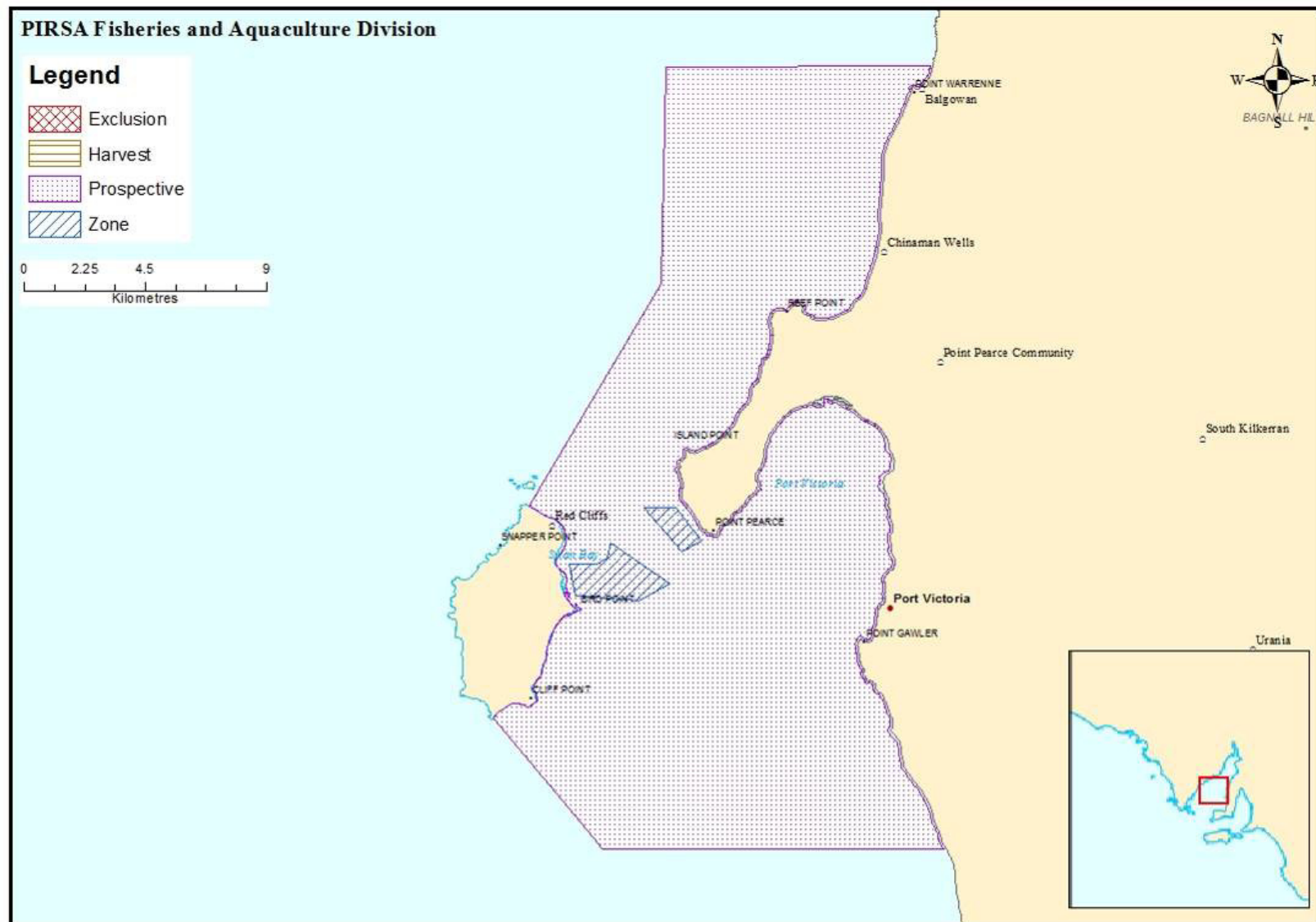


Figure 4 – Map of the superseded Point Pearce Prospective Aquaculture Zone and Point Pearce Intertidal Aquaculture Zones.

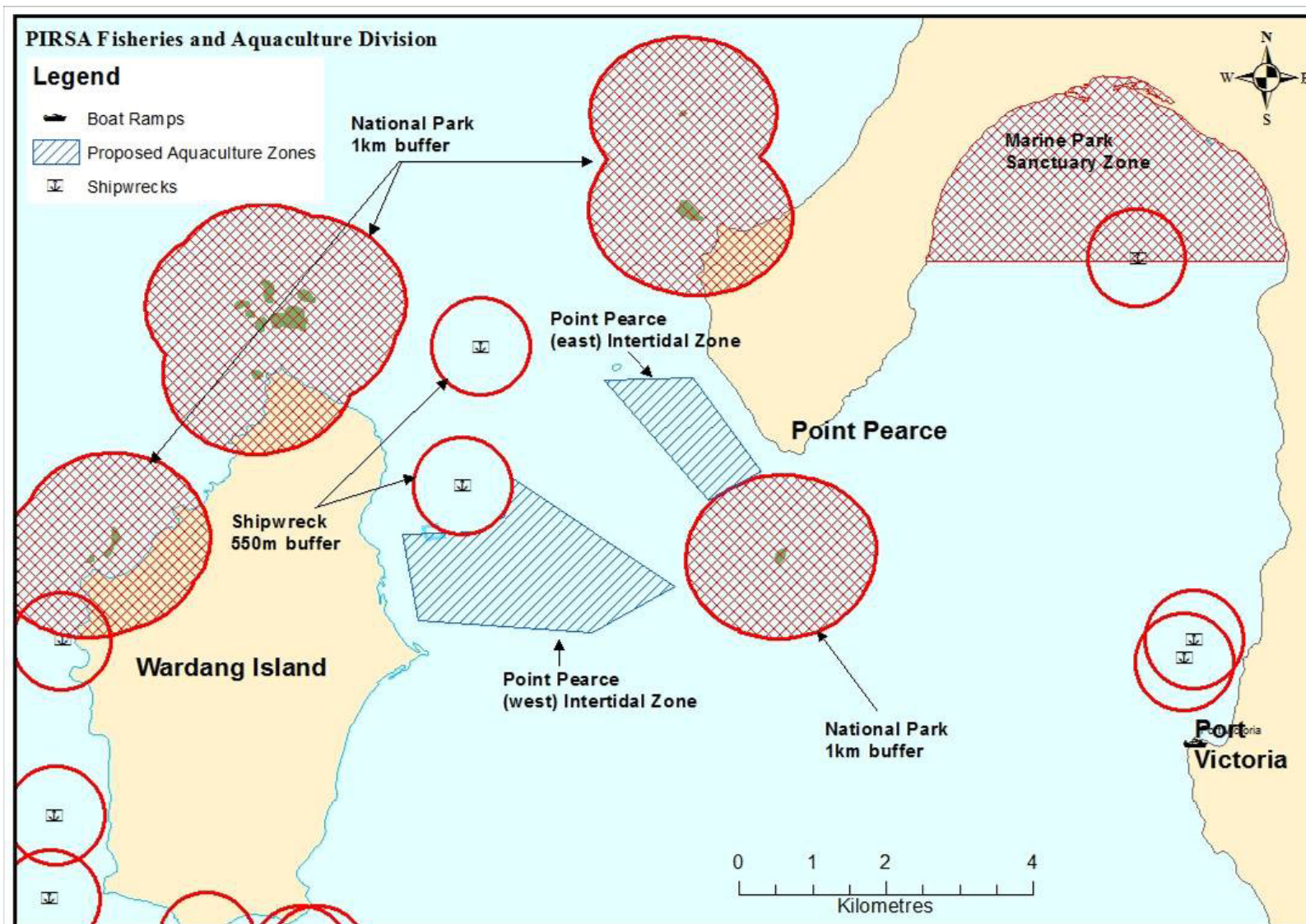


Figure 5 – Map of the new Point Pearce (west) intertidal aquaculture zone and Point Pearce (east) intertidal aquaculture zone.

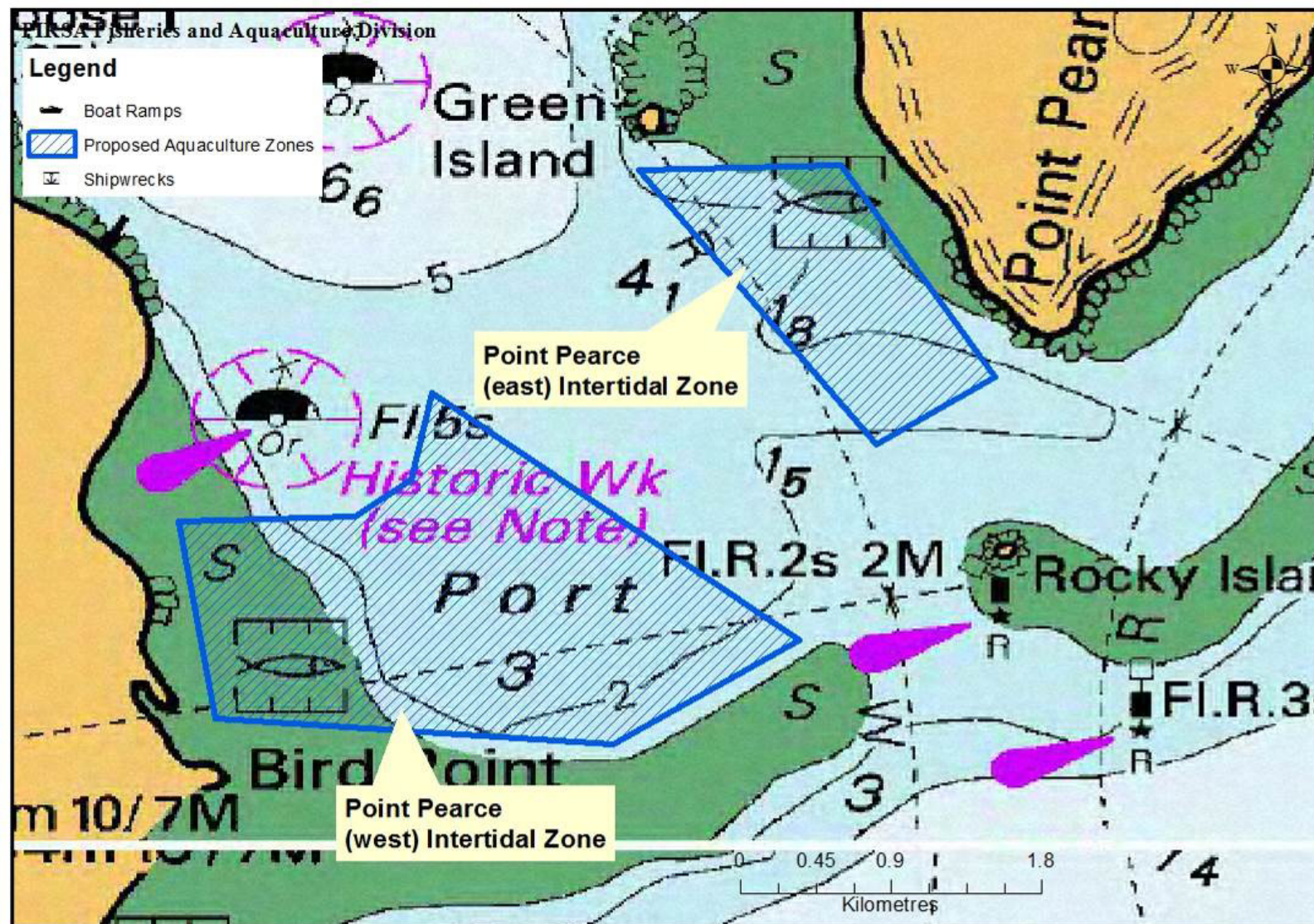


Figure 6 – Map of the hydrology of the Point Pearce (West) intertidal aquaculture zone and Point Pearce (east) intertidal aquaculture zone.

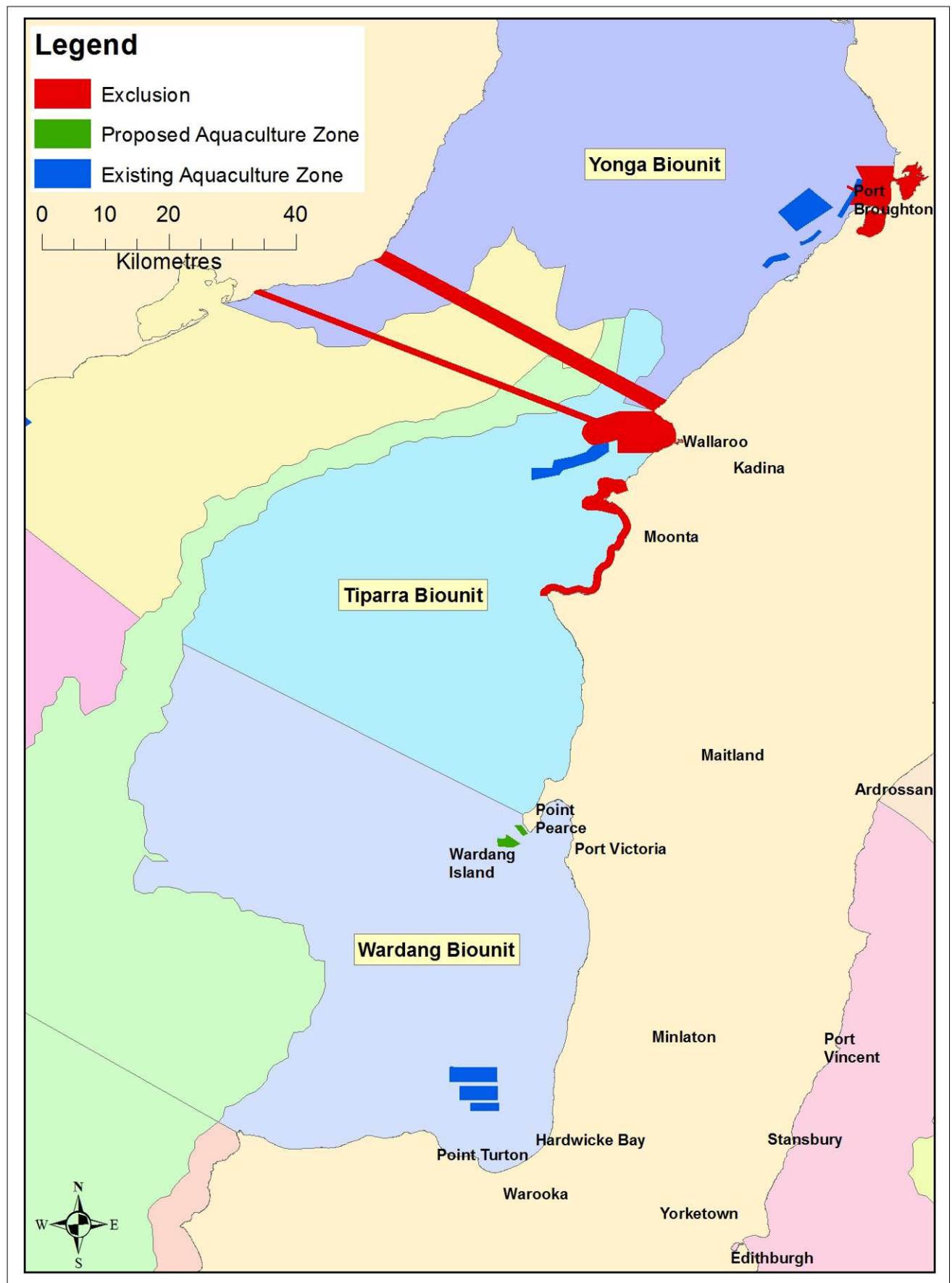


Figure 7 – Map of Biounits of the Eastern Spencer Gulf.

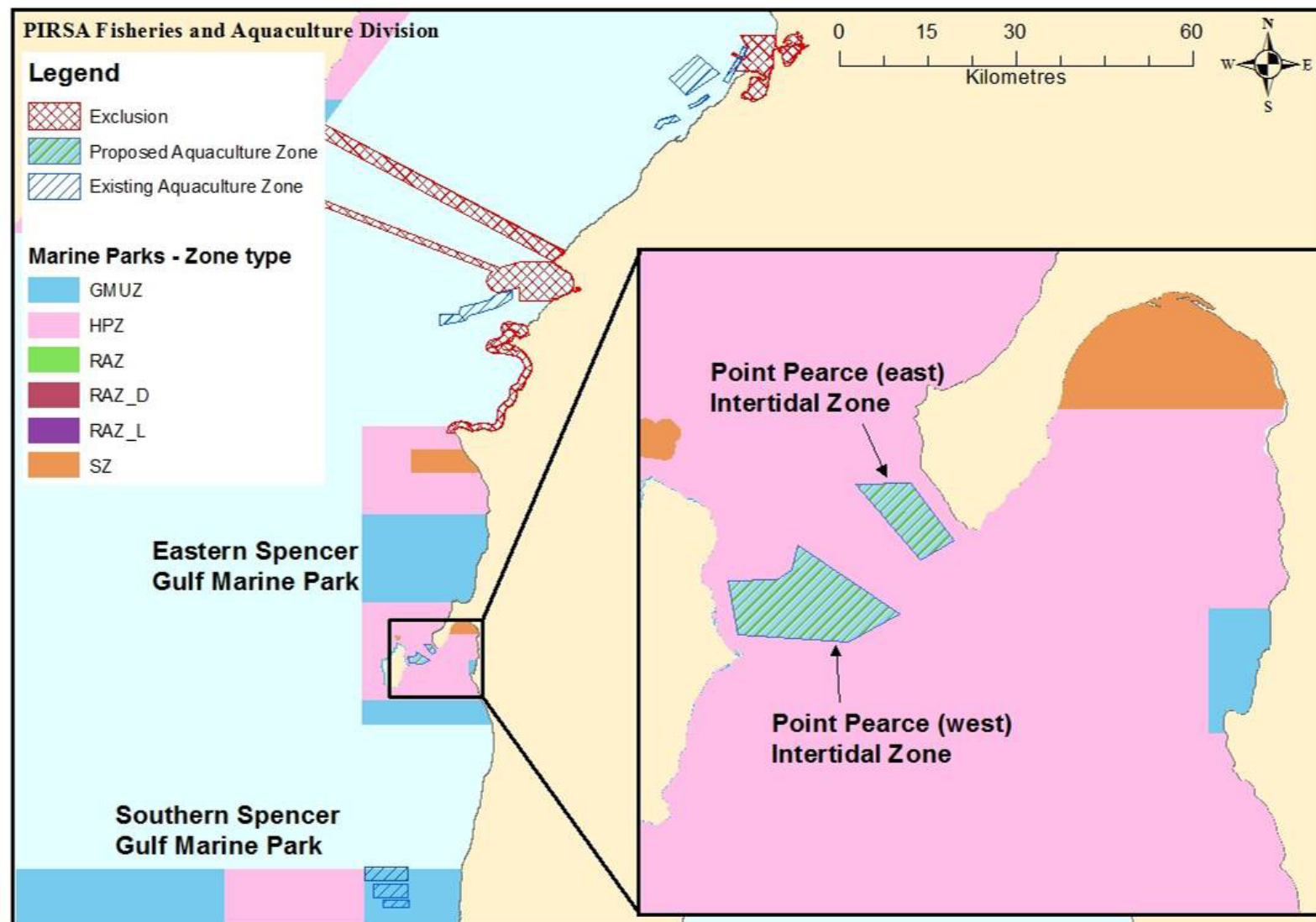
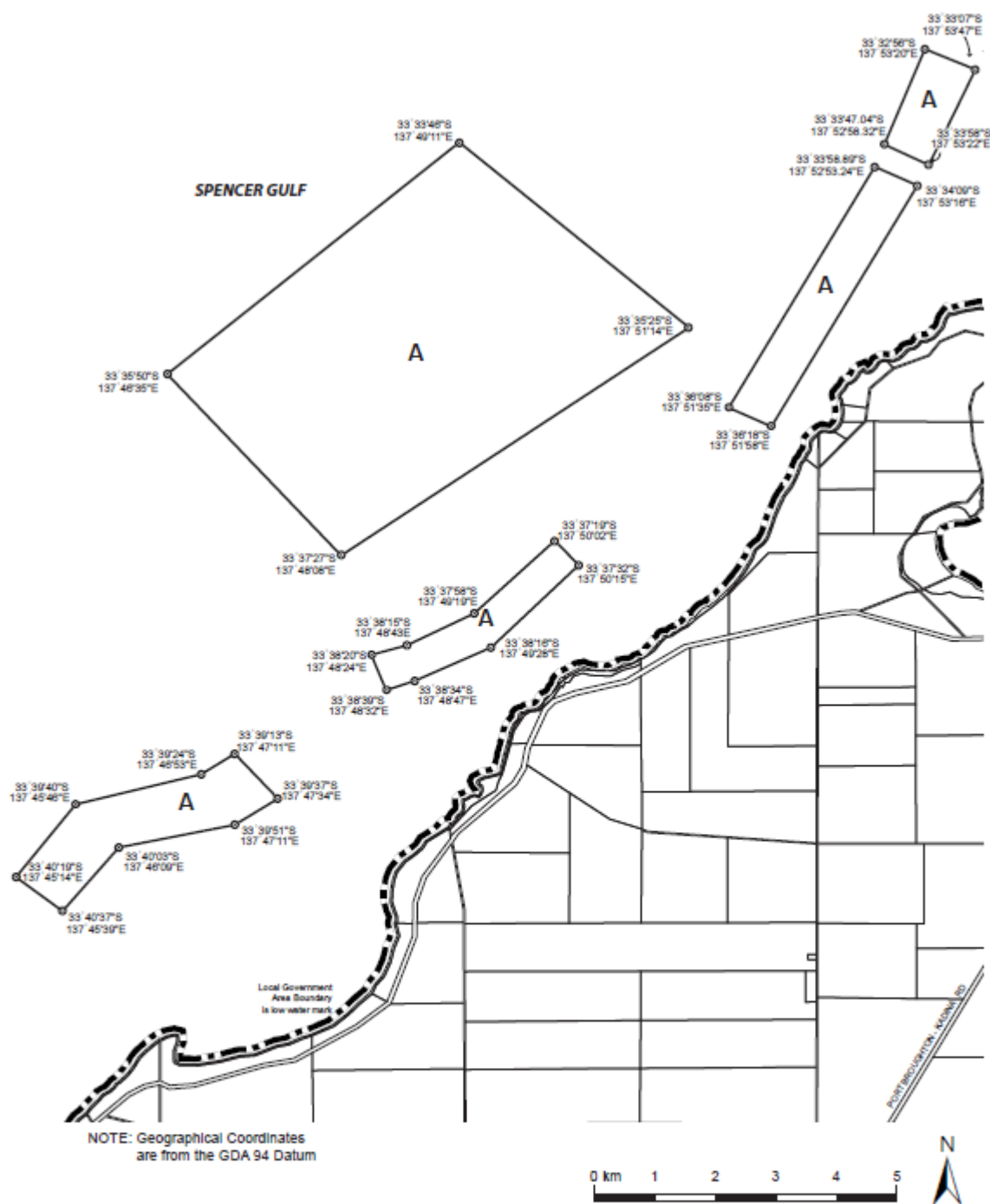


Figure 8 – Map of the Eastern Spencer Gulf current and new aquaculture zones and Marine Park Zones (GMZU – General Management Use Zone, HPZ – Habitat Protection Zone, RAZ - Restricted Access Zone and SZ – Sanctuary Zone)



**LAND NOT WITHIN A COUNCIL AREA
(COASTAL WATERS) ZONES
MAP LNWCA(CW)/1**

- A Aquaculture Zone
 — Zone Boundary
 - - - Development Plan Boundary

Figure 9 – Amended zoning map to delineate the extent of the Port Broughton intertidal aquaculture zone, Tickera intertidal aquaculture zone and Tickera subtidal aquaculture zone under the LNWCA(CA)DP.

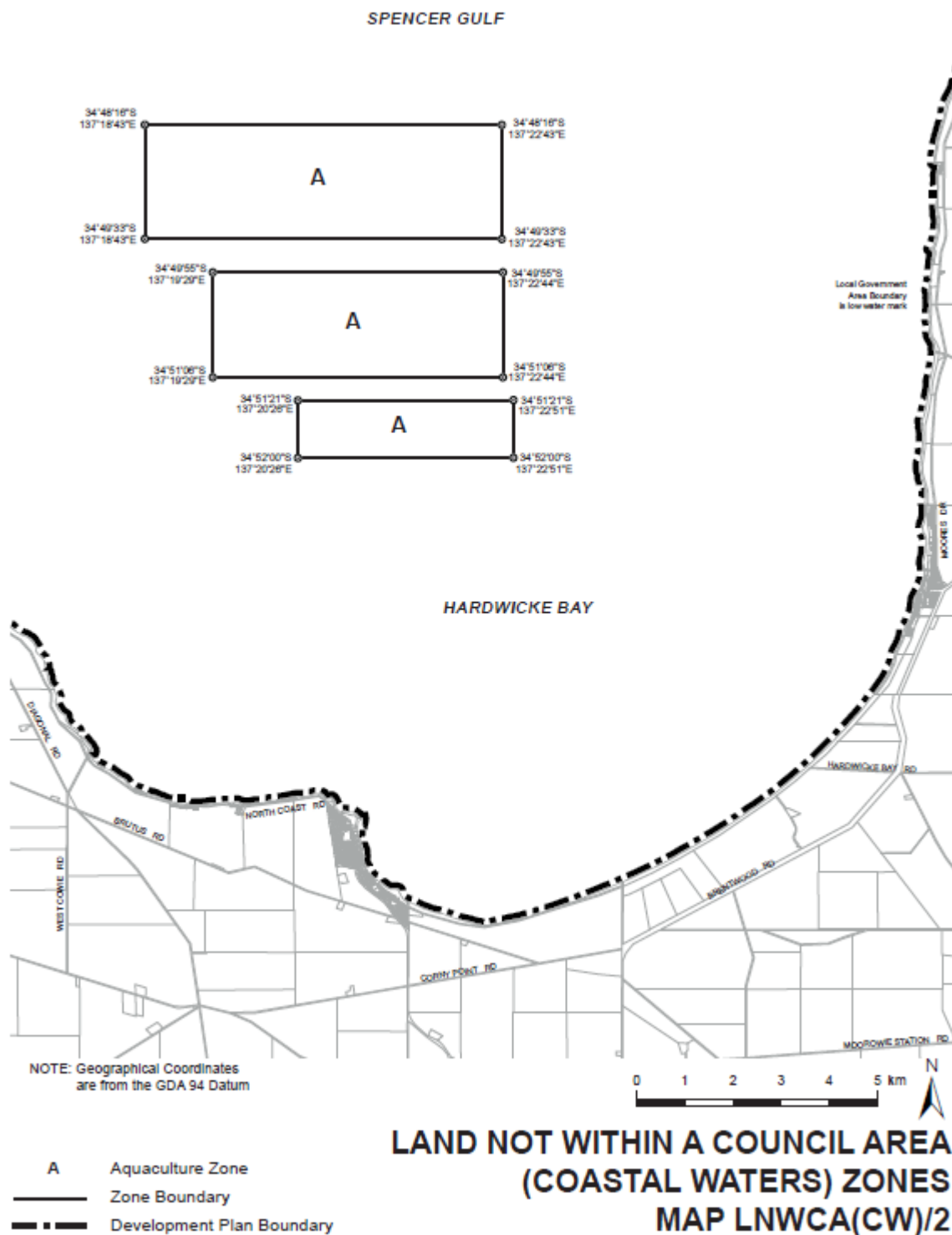


Figure 10 – Amended zoning map to delineate the extent of the Hardwicke Bay (inner) aquaculture zone, Hardwicke Bay (middle) aquaculture zone and Hardwicke Bay (outer) aquaculture zone under the LNWCA(CA)DP.

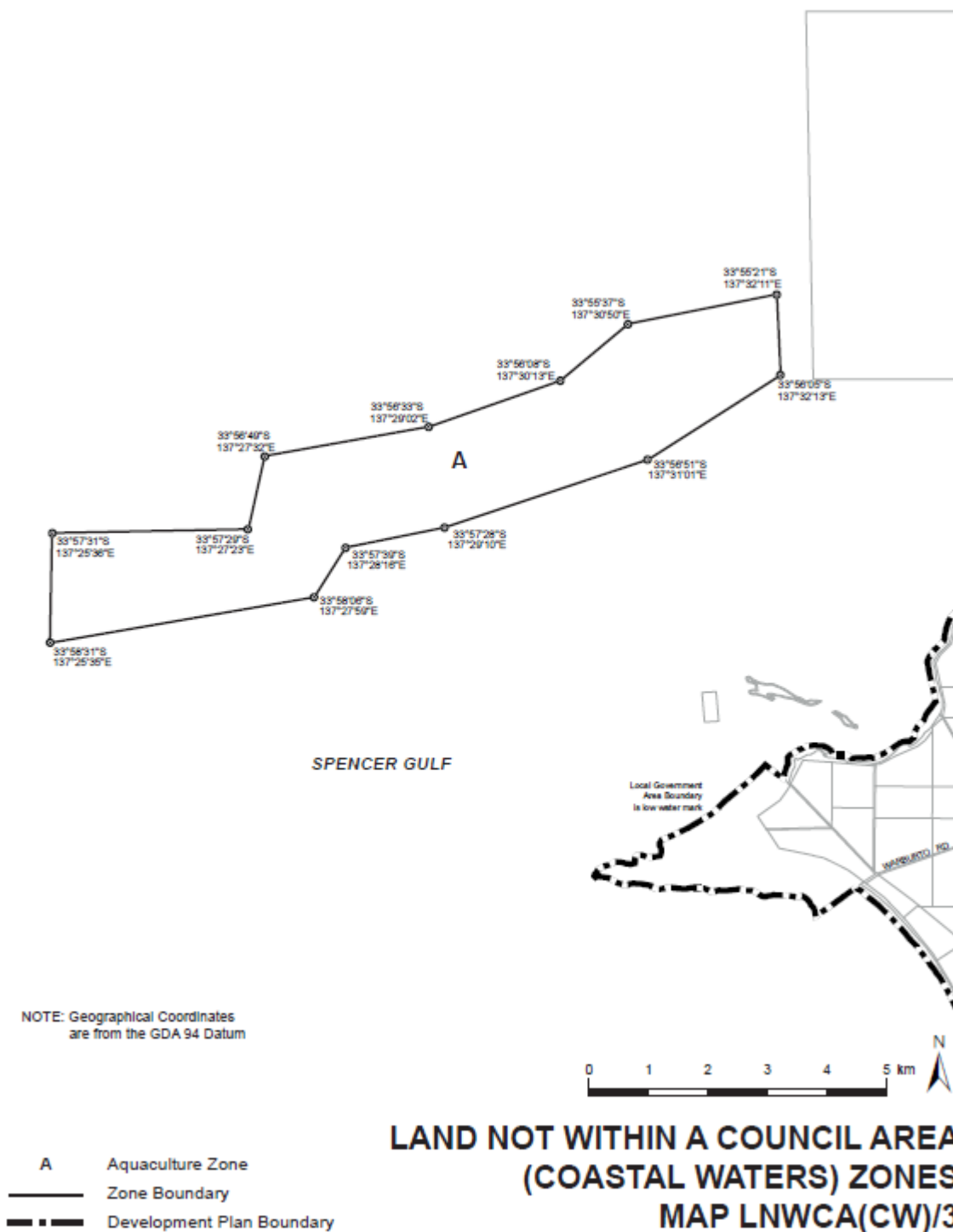
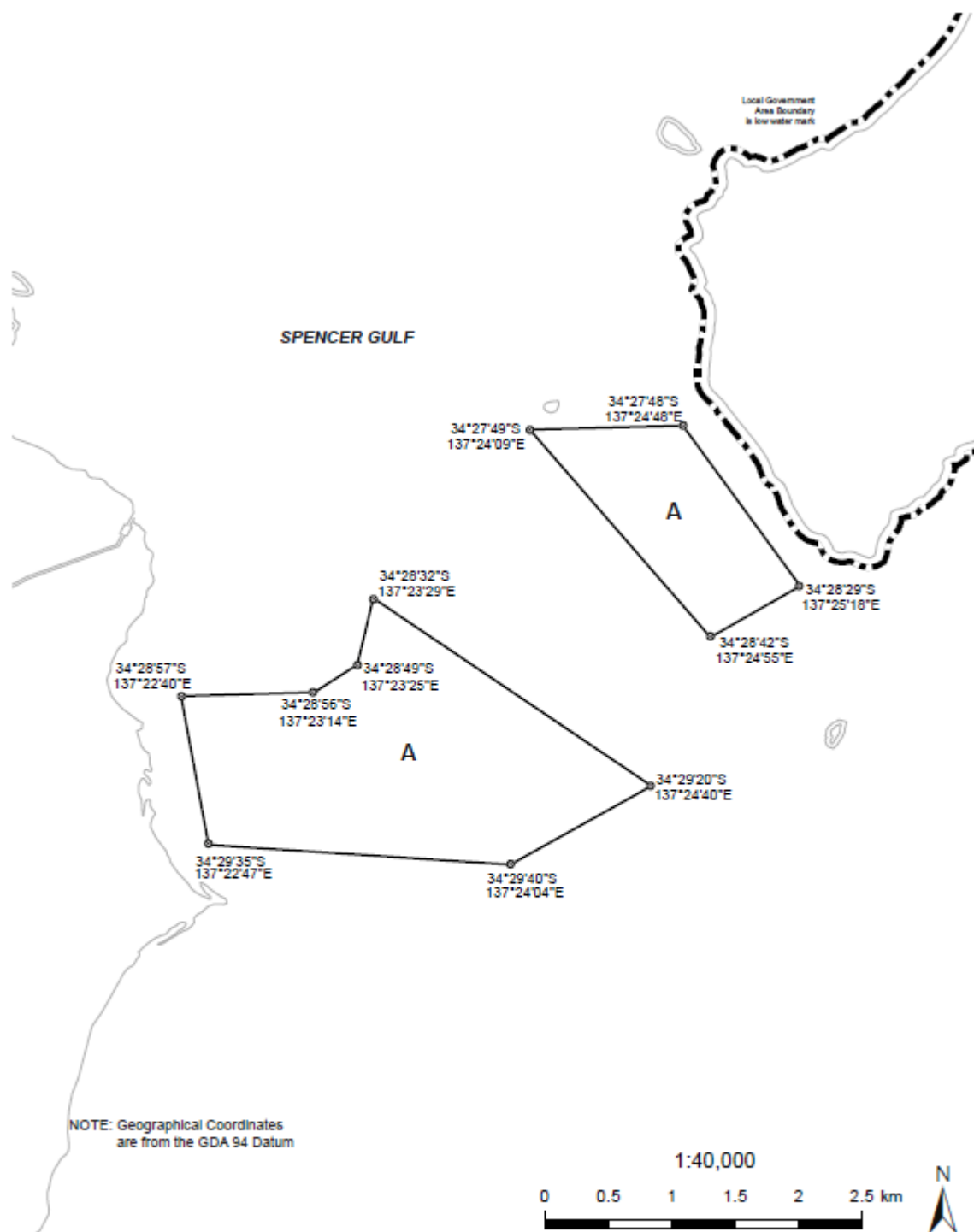


Figure 11 – Amended zoning map to delineate the extent of the Wallaroo (east) subtidal aquaculture zone and Wallaroo (West) subtidal aquaculture zone under the LNWCA(CA)DP. Please note for the purposes of the LNWCA(CW)DP, the two zone areas are not delineated in the map, with only the outer boundaries of these zones required to be shown.



- A** Aquaculture Zone
- Zone Boundary
- - - Development Plan Boundary

LAND NOT WITHIN A COUNCIL AREA (COASTAL WATERS) ZONES MAP LNWCA(CW)/27

Figure 12 – New zoning map to delineate the extent of the Point Pearce (east) intertidal zone and Point Pearce (west) intertidal zone under the LNWCA(CA)DP.

APPENDIX D1 – CONSISTENCY OF THE AMENDED ZONE POLICY WITH OTHER LEGISLATIVE REQUIREMENTS

Legislation / Policy	Objectives	Consistency
South Australia's Strategic Plan	South Australia's Strategic Plan is a commitment to making the state the best it can be – prosperous, environmentally rich, culturally stimulating, offering its citizens every opportunity to live well and succeed. The vision of the Strategic Plan is to keep our communities strong and vibrant, protect our rich environment and pursue shared economic prosperity for South Australians. The Plan is built on the following strategic priorities: Creating a vibrant city, safe communities, healthy neighbourhoods, an affordable place to live, every chance for every child, growing advanced manufacturing, realising the benefits of the mining boom for all and premium food and wine from our clean environment. The Plan contains 100 targets across the seven strategic priorities to measure progress towards achieving these goals.	<p>Aquaculture policies under the <i>Aquaculture Act 2001</i> provide the necessary policy framework to facilitate aquaculture development in South Australia. The new and developing aquaculture industry is greatly assisting economic development and will help meet these Strategic Plan targets:</p> <ul style="list-style-type: none"> • Target 33 – Government planning decisions • Target 35 – Economic Growth • Target 40 – Food industry • Target 46 – Regional population levels • Target 47 – Jobs
Plans for regional South Australia	The South Australian Planning Strategy includes plans for seven regional areas of the state, as well as the 30 year plan for greater Adelaide. The regional plans contain the state government's directions on land use and development, including policies relating to population growth and demographic changes among others.	The Amendment Policy is consistent with the strategies relating to the diversifying primary production into new areas to replace or complement existing activities and the integrated and sustainable management of natural resources in a manner that maintains ecological processes.
<i>Development Act 1993</i> <i>Development</i>	The <i>Development Act 1993</i> and <i>Development Regulations 2008</i> detail the processes for making and assessing development applications.	The Amendment Policy is consistent with these provisions in that it seeks to ensure the ecologically sustainable development of the

Legislation / Policy	Objectives	Consistency
<p><i>Regulations 2008</i></p> <p>Land Not Within A Council Area (Coastal Waters) Development Plan</p>	<p>'Development' is defined in the <i>Development Act 1993</i> to include:</p> <ul style="list-style-type: none"> • A change in the use of land or buildings • The creation of new allotments through land division (including Strata and Community Title division) • Building work (including construction, demolition, alteration and associated excavation/fill) • Cutting, damaging or felling of significant trees • Specific work in relation to State and Local Heritage Places • Prescribed mining operations • Other acts or activities in relation to land as declared by the Development Regulations. <p>The <i>Development Act 1993</i> requires there be a Development Plan for each Local Government Council. Development Plans guide development and inform assessment of development applications.</p> <p>Development Plans contain the zones, maps and written rules ('policies') which guide applicants as to what can and cannot be done in the future on any piece of land in the area covered by the Development Plan. These zones, maps and policies provide the detailed criteria against which development applications will be assessed.</p> <p>Section 29 (1) (b) of the <i>Development Act, 1993</i> allows the Minister for Planning to amend a Development Plan to include a plan, policy, standard, document or code, which is prepared under another Act and falls within a class prescribed by regulation 14 of the Development Regulations 2008. A policy under the <i>Aquaculture Act, 2001</i> is prescribed under this regulation.</p>	<p>marine-based aquaculture industry and recognises and respects other users of the marine resource.</p>

Legislation Policy	Objectives	Consistency
	<p>Schedule 3 (Acts and activities which are not development) within the <i>Development Regulations 2008</i> were varied to include Aquaculture Development within an Aquaculture Zone delineated by the LNWCA(CW). Development approvals are no longer required for aquaculture in such circumstances.</p> <p>However, aquaculture proposed outside of this zone will remain subject to full development assessment.</p>	
Aboriginal Heritage Act 1988	<p>The <i>Aboriginal Heritage Act 1988</i> provides for the protection and preservation of Aboriginal sites, objects and remains, whether registered or not, without an authorisation from the Minister for Aboriginal Affairs and Reconciliation pursuant to section 23. Section 20 of this Act requires that any Aboriginal sites, objects or remains discovered on land, be reported to the Minister for Aboriginal Affairs and Reconciliation.</p>	<p>The Amendment Policy seeks to locate aquaculture development to avoid potential impacts on sensitive Aboriginal sites. If any Aboriginal sites, objects or remains are encountered during community engagement, PIRSA Fisheries and Aquaculture will advise the Minister for Aboriginal Affairs and Reconciliation and, where possible, avoid the heritage or apply for relevant authorisations as necessary.</p>
Native Title Act 1993	<p>The <i>Native Title Act 1993</i> (Cth) provides for the recognition by Australian law that some Indigenous people have rights and interests that come from their traditional laws and customs (National Native Title Tribunal (NNTT) 2009).</p> <p>In particular, the <i>Native Title Act 1993</i> may validate past acts; provide for future acts; extinguish native title either in full or part; provide a process to determine native title; provides three approaches to negotiating native title, including Indigenous Land Use Agreements (ILUA); and, provides for a range of other matters including the establishment of a land trust and the National Native Title Tribunal.</p>	<p>The Native Title Unit of the Attorney General's Department are consulted during the development of aquaculture zone policies to establish if there are any registered ILUA's in the area or if there are any in negotiation that need to be considered. Additionally, advice is sought from the Native Title Unit to determine who are the appropriate Native Title Groups to consult during the development of the policy.</p> <p>As part of the individual lease application process (within and outside of aquaculture</p>

Legislation / Policy	Objectives	Consistency
		zones) details of the application are referred to the Aboriginal Legal Rights Movement and the appropriate Claimant groups pursuant to section 24HA of the <i>Native Title Act 1993</i> (Cwth).
Australia's Ocean Policy (Cth)	<p>Australia's Oceans Policy sets in place a framework for integrated and ecosystem-based planning and management for Australia's marine jurisdictions. It promotes ecologically sustainable development of the ocean resources and encourages internationally competitive marine industries, whilst ensuring the protection of marine biological diversity. The key tool is Regional Marine Planning i.e., planning based on large areas that are ecologically similar, and seeks to integrate the use, management and conservation of marine resources at the ecosystem level.</p> <p>Marine Plans establish an overarching strategic planning framework to guide State and local government planners and natural resource managers in the development and use of the marine environment. Fundamental to these Marine Plans is an ecologically based zoning model. Each of these zones is supported by goals and objectives.</p>	This policy is consistent with the Australia's Ocean Policy as it seeks to avoid aquaculture development over unique and sensitive ecosystems, and provides for orderly, sustainable and internationally competitive marine industries.
Marine Parks Act 2007	<p>The <i>Marine Parks Act 2007</i> provides the legislative framework for the dedication, zoning and management of South Australia's marine parks.</p> <p>South Australia's marine parks are zoned for multiple-use to protect coastal, estuarine and marine ecosystems, while also providing for continued ecologically sustainable use of suitable areas. This means that most activities, including aquaculture operations, will still be allowed within a marine park. However, some activities will not be permitted in particular zones. Areas with high conservation values will be designated as either Restricted Access Zones or Sanctuary Zones to provide the necessary level of protection for habitats, species, ecological and geological features. Both of these zones preclude commercial fishing, recreational fishing and aquaculture operations.</p>	It is widely recognised that Aquaculture is an important and growing industry in this State that provides significant benefits to South Australia. The needs of the industry have been considered with commitments to accommodate, as far as possible, existing aquaculture operations. This has resulted in whole-of-government policy commitments that support the relationship and likely interactions between proposed marine parks and aquaculture developments in South

Legislation / Policy	Objectives	Consistency
		<p>Australian waters and enable DEWNR and PIRSA to work together to address key targets from South Australia's Strategic Plan. These include increasing the value of South Australia's export income by \$25 billion by 2020 (Target 37) and maintaining the health and diversity of South Australia's unique marine environments (Target 71) and such that each is given optimal effect without detriment to the other.</p> <p>The Policy has been prepared having regard to Marine Park objects and boundaries and in accordance with the agreement between DEWNR and PIRSA.</p>
<p>Natural Resources Management Act 2004</p> <p>Yorke Peninsula Natural Resources Management Plan</p>	<p>The intent of the <i>Natural Resources Management Act 2004</i> is to establish an integrated system of natural resource management that will assist in achieving sustainable natural resource management in South Australia. Regional Natural Resources Management Plans are underpinned by ecologically sustainable development principles and are required to recognise best practice by an industry sector.</p>	<p>The <i>Aquaculture Act 2001</i> and its supporting policies are also underpinned by ecologically sustainable development principles.</p> <p>The Amendment Policy falls within the area of responsibility of the Northern and Yorke Natural Resources Management Board. The Amendment Policy must take into account issues raised within the Northern and Yorke Natural Resources Management Plan (NRM Plan). As the aquaculture zone relates only to marine aquaculture there are no matters of water allocation, groundwater or surface water, specific to the aquaculture zone. The Amendment Policy is consistent with the</p>

Legislation / Policy	Objectives	Consistency
		Northern and Yorke NRM Plan.
<p>Environment Protection Act 1993</p> <p>Environment Protection (Water Quality) Policy 2015</p>	<p>The <i>Objects of the Environment Protection Act 1993</i> (EP Act) include the promotion of the principles of ecologically sustainable development, and to ensure that all reasonable and practicable measures are taken to protect, restore and enhance the quality of the environment having regard to the principles of ecologically sustainable development. The Objects of the Act also include ensuring that continual improvement obligations, the precautionary and polluter-pays principles, and appropriate monitoring requirements are applied to polluting activities.</p> <p>Of particular relevance to sea-based aquaculture is the <i>Environment Protection (Water Quality) Policy 2015</i> (Water Quality Policy), which aims to further the Objects of the Act in relation to water quality. The Water Quality Policy:</p> <ul style="list-style-type: none"> • applies the waste management hierarchy (as an element of the General Environmental Duty under s.25 of the Act) to all activities that impact water quality • without limitation, declares certain forms further defines of environmental harm in relation to waters • provides for the management and control of point and diffuse sources of pollution • outlines obligations relating to particular activities • defines environmental values for waters and specifies listed pollutants • provides for trigger levels for various indicators based on the ANZECC Water Quality Guidelines • allows for the setting of discharge limits for pollutants into defined areas of water 	<p>The Amendment Policy is consistent with the provisions of the EP Act and the Water Quality Policy as it seeks to define areas of state waters that are considered appropriate for aquaculture in that they prevent, reduce, minimise and where practicable, eliminate harm to the environment, whilst considering the principles of ecologically sustainable development.</p>

Legislation Policy	Objectives	Consistency
Harbors and Navigation Act 1993	<p>The <i>Harbors and Navigation Act 1993</i> sets out the following objectives:</p> <ul style="list-style-type: none"> To provide for the efficient and effective administration and management of South Australian harbors and harbor facilities for the purpose of maximising their use and promoting trade; To ensure that efficient and reliable cargo transfer facilities are established and maintained; To promote the safe, orderly and efficient movement of shipping within harbors; To promote the economic use and the proper commercial exploitation of harbors and harbor facilities; To provide for the safe navigation of vessels in South Australian waters; To provide for the safe use of South Australian waters for recreational and other aquatic activities; and Insofar as this Act applies to the Adelaide Dolphin Sanctuary, to further the objects and objectives of the <i>Adelaide Dolphin Sanctuary Act 2005</i>. 	<p>The Amendment Policy is consistent with the provisions of the <i>Harbors and Navigation Act 1993</i> as it seeks to define areas of state waters that are considered appropriate for aquaculture, and have regard to other resource users; including operators of recreational and commercial vessels. This includes the prescribed Wallaroo to Cowell Ferry route which has been zoned as an aquaculture exclusion zone.</p> <p>Section 20 of the <i>Aquaculture Act 2001</i> provides that the grant of aquaculture leases is subject to the concurrence of the Minister responsible for administration of the <i>Harbors and Navigation Act 1993</i>.</p>
Coast Protection Act 1972	<p>The <i>Coast Protection Act 1972</i> establishes the Coast Protection Board. The functions of the Board are:</p> <ul style="list-style-type: none"> To protect the coast from erosion, damage, deterioration, pollution and misuse; To restore any part of the coast that has been subjected to erosion, damage, deterioration, pollution or misuse; To develop any part of the coast for the purpose of aesthetic improvement, or for the purpose of rendering that part of the coast more appropriate for the use or enjoyment of those who may resort thereto; 	<p>The Amendment Policy is consistent with the provisions of the <i>Coast Protection Act 1972</i> as it seeks to protect the coast by minimising any risk of erosion, damage, deterioration, pollution and misuse of the resource, through appropriate siting of aquaculture zones and aquaculture exclusion zones, the specification of appropriate types and levels of aquaculture development.</p>

Legislation Policy	Objectives	Consistency
	<ul style="list-style-type: none"> • To manage, maintain and, where appropriate, develop and improve coast facilities that are vested in, or are under the care, control and management of the Board; • To report to the Minister upon any matters that the Minister may refer to the Board for advice; • To carry out research, to cause research to be carried out, or to contribute towards research, into matters relating to the protection, restoration or development of the coast; and • To perform such other functions assigned to the Board by or under this or any other Act. 	
Native Vegetation Act 1991	<p>The objects of the <i>Native Vegetation Act 1991</i> are:</p> <ul style="list-style-type: none"> • The conservation, protection and enhancement of the native vegetation of the State and, in particular, remnant native vegetation, in order to prevent further - • Reduction of biological diversity and degradation of the land and its soil; and • Loss of quantity and quality of native vegetation in the State; and • Loss of critical habitat; and • The provision of incentives and assistance to landowners to encourage the commonly held desire of landowners to preserve, enhance and properly manage the native vegetation on their land; and • The limitation of the clearance of native vegetation to clearance in particular circumstances including circumstances in which the clearance will facilitate the management of other native vegetation or will facilitate the sustainable use of land for primary production; and 	<p>The Amendment Policy is consistent with these objectives as it seeks to minimise impacts on native vegetation through appropriate siting of aquaculture zones and appropriate selection of prescribed species classes to within a zone. The establishment of aquaculture exclusion zones around sensitive habitats is also applied where relevant.</p>

Legislation Policy	Objectives	Consistency
	<ul style="list-style-type: none"> The encouragement of research into the preservation, enhancement and management of native vegetation; and The encouragement of the re-establishment of native vegetation in those parts of the State where native vegetation has been cleared or degraded. 	
<p>Historic Shipwrecks Act 1976 (Cth)</p> <p>Historic Shipwrecks Act 1981 (SA)</p>	<p>Any shipwreck or relic that is older than 75 years is protected under the <i>Historic Shipwrecks Act 1976</i> (Cth), which covers water off the South Australian coast from the low water mark or the agreed baselines but does not include State internal waters – i.e. the River Murray, Gulf St. Vincent, Spencer Gulf, Encounter Bay, Lacepede Bay, Rivoli Bay and Anxious Bay – which are covered under the <i>Historic Shipwrecks Act 1981</i> (SA).</p> <p>If there are declared historic shipwrecks in the vicinity of aquaculture development, the developer is advised that a 550 metre radius buffer zone applies around the historic shipwreck, and that no aquaculture development should take place within this area.</p> <p>It should also be noted that while a shipwreck may not currently be protected, the 75 year rolling protections date means that it will be at some future time.</p>	The Amendment Policy is consistent with these requirements and provides for a greater distance from historic shipwrecks of 550 metres which is requirement of the Land Not Within A Council Area (Coastal Waters) Development Plan under the <i>Development Act 1993</i> .
National Parks and Wildlife Act 1972	An Act to provide for the establishment and management of reserves for public benefit and enjoyment; to provide for the conservation of wildlife in a natural environment; and for other purposes.	The Amendment Policy is consistent with these requirements and provides for a greater distance from National Parks and Reserves of 1000 metres seaward of the park/reserve boundary which is a requirement of the Land Not Within A Council Area (Coastal Waters) Development Plan under the <i>Development Act 1993</i> .
Fisheries Management Act 2007	An Act to provide for the conservation and management of the aquatic resources of the State, the management of fisheries and aquatic reserves, the regulation of fishing and the processing of aquatic resources, the protection of aquatic habitats, aquatic mammals	To minimise adverse interactions with seabirds and large marine vertebrates, section 18 of the <i>Aquaculture Regulations</i>

Legislation / Policy	Objectives	Consistency
	and aquatic resources and the control of exotic aquatic organisms and disease in aquatic resources; to repeal the <i>Fisheries Act 1982</i> and the <i>Fisheries (Gulf St. Vincent Prawn Fishery Rationalisation) Act 1987</i> ; to make related amendments to other Acts; and for other purposes.	2016 requires a licensee to have a written strategy approved by the Minister, which includes avoiding or minimising adverse impacts on/or adverse interactions with, seabirds or large marine vertebrates. In addition, risks posed by the aquaculture activity are assessed at the time of licence application through the ESD Assessment process, consistent with the National ESD Framework (Fletcher <i>et al.</i> , 2004).

APPENDIX D2 – PROTECTED SPECIES FRAMEWORK

The *National Parks and Wildlife Act 1972* (NPW Act) provides the legislative framework dealing with native fauna and flora in this State. Most native mammals, reptiles and birds are protected in South Australia. Under the provisions of the NPW Act, it is an offence to kill, hunt, catch, restrain, injure, molest or harass a protected animal. Rare, vulnerable and endangered species are listed in Schedules 7, 8 and 9 of the NPW Act.

The *Fisheries Management Act 2007* (FM Act) provides offence provisions for the taking, injuring or harming of an aquatic mammal or aquatic resource of a protected species. Under the provisions of section 71(1)(a) of the FM Act, a person must not kill, injure or molest, or cause or permit the killing, injuring or molestation of, a marine mammal. Furthermore, it is an offence to take protected species. A statutory defence exists in cases where the defendant proves that the alleged offence was not committed intentionally and did not result from any failure on the part of the defendant to take reasonable care to avoid the commission of the offence.

Seabirds may be adversely affected by activity around any feeding, roosting or nesting sites in the area. To minimise adverse interactions with seabirds and large marine vertebrates, regulation 18 of the *Aquaculture Regulations 2016* requires a licensee to have a written interaction strategy approved by the Minister. In addition, risks posed by the aquaculture activity are assessed at the time of licence application through the ESD Assessment process consistent with the National ESD Framework (Fletcher *et al.*, 2004).

Syngnathid fish are protected under the provisions of section 71 of the FM Act. Syngnathid fish are likely to be present, especially in the seagrass, algal and reef assemblages. The risk of adverse impacts to these species is low as aquaculture will not be placed over dense seagrass beds, reef or algal assemblages.

APPENDIX D3 – LESSEE AND LICENSEE OBLIGATIONS

The *Aquaculture Act 2001* is the main piece of legislation governing the management, control and development of the aquaculture sector. The *Aquaculture Act 2001* includes provisions giving the Minister for Agriculture, Food and Fisheries the powers to grant aquaculture leases (with the concurrence of the Minister for Transport and Infrastructure) and licences and the power to make decisions on licence conditions, with the EPA's approval, as well as conditions and terms of leases.

The *Aquaculture Regulations 2016* establishes an environmental assessment, monitoring and management framework for all sectors of aquaculture.

The *Aquaculture Act 2001* provides for an integrated licensing and tenure system and provides a flexible approach to the granting of rights to occupy State waters. Under the *Aquaculture Act 2001*, a licence may not be granted for aquaculture in State waters unless the area is subject to a lease granted by the Minister. The *Aquaculture Act 2001* allows for four types of lease, namely pilot, production, research and emergency leases.

Management obligations are those requirements an aquaculture operator must undertake according to the *Aquaculture Act 2001* and other relevant legislation. Penalties for a failure to comply with the requirements include expiation fines and suspension or cancellation of the lease and/or licence.

Ecologically Sustainable Development

PIRSA Fisheries and Aquaculture's Ecologically Sustainable Development (ESD) risk assessment guidelines for aquaculture licenses is based on the National ESD Framework: The 'how to' Guide for Aquaculture (Fletcher *et al.*, 2004), underpinned by the Australian and New Zealand Standard (AS/NZS ISO 31000:2009) for risk management (Standards Australia and Standards New Zealand, 2009). The assessment process considers risks to aquatic habitats associated from individual aquaculture facilities (both marine and land-based) through to accumulative risks of the industry at the regional scale. Using these guidelines, aquaculture licence applications are assessed to determine the likely environmental, social and economic risks the proposed licence may have if approved.

The environmental risk assessment component considers the nature of the specific activity relative to the environment in which it will be undertaken at different spatial scales, namely; at the level of the individual site and at the regional level. Risks are calculated semi-quantitatively using a likelihood by consequence methodology. PIRSA Fisheries and Aquaculture's management of ESD risks can result in the amendment of site location or application of licence conditions, including (but not limited to) stocking rates, farming systems, legislative and environmental monitoring requirements or refusal of an application. It should be noted that, in accordance with section 52 of the *Aquaculture Act 2001*, the Minister may vary licence conditions at any time to prevent or mitigate significant environmental harm or the risk of significant environmental harm.

This licence assessment is then formally referred to the EPA for their approval (as stated in section 50(3)(c) of the *Aquaculture Act 2001*).

Marine and Other Animal Interactions

The requirement to report interactions (such as entrapments or entanglements of seabirds and large marine vertebrates) form part of licence conditions and the Regulations. If interactions occur then modifications to farming practices may be required.

A licensee must have a written strategy approved by the Minister for minimising adverse interactions with seabirds and large marine vertebrates resulting from aquaculture carried on under the licence (see the *Aquaculture Regulations 2016*, Regulation 18).

The strategy must explain what procedures the licensee will implement to minimise these risks to a level considered acceptable by the Minister. Operators may be audited against the operating practices detailed in their strategy at any time. Failure to comply with the strategy may result in an expiation fee or fine.

Aquatic Animal Health Controls

A range of controls are included in the management of licensed aquaculture activities to prevent or mitigate against diseases or parasites. All applications for new aquaculture licences are assessed for aquatic animal health risks as part of the ESD assessment (potential for disease, proximity to other farming sites or wild populations, culture technique, technology and specific environment of the application). Regulations under the *Aquaculture Act 2001* require that operators report to PIRSA any significant increases in background mortality and must not move any animals showing signs of clinical disease without Ministerial approval. Requirements designed to manage other on-farm activities are included in a variety of legislation and policy.

Diseases of particular concern and those that are regarded as posing particular threats to environmental, economic or social processes are listed as notifiable under the *Livestock Act 1997*. It is an offence under this Act to fail to report the occurrence, or suspected occurrence, of a notifiable condition.

Translocation of organisms is managed through a process of Import Risk Analysis. The outcomes of these analyses, which include factors to reduce risk of disease or pest introduction and consideration of genetic integrity, are included in Orders under the *Livestock Act*, including the *Livestock (Restrictions on Entry of Aquaculture Organisms) Notice 2014*.

Use of any therapeutants or treatments can be conducted only under a Ministerial approval (for off-label use as defined by the *Veterinary Practice Act 2003*), or under conditions specified by the Australian Pesticides and Veterinary Medicines Authority, either on the label of registered products or included in Minor Use Permits.

Exotic Species

There are potential risks associated with the introduction of organisms not from the local environment. For the protection of the aquaculture industry, and of the natural environment, controls must be maintained on the introduction and movement of aquatic organisms, bearing in mind the potential risks involved with the introduction of disease and potential for genetic manipulation.

The primary concerns associated with the introduction of non-native organisms are that they may form feral populations, which may compete for habitat and reduce the availability of nutrients to local organisms.

Potential issues associated with exotic species are addressed as part of the ESD risk assessment and licence application process.

Site Decommissioning

There will be times when an aquaculture site in the aquaculture zone is no longer being used. In this case the lease contract requires that the site be rehabilitated by the lessee at the expiry of the lease to the satisfaction of the Minister. The lease also requires the operator to be party to an approved indemnity scheme or bank guarantee which the Minister may draw upon if the lessee fails to clear and rehabilitate the site.

Stock Escapes

The potential for escape of aquaculture stock from a site is considered during the ESD risk assessment of the application. This assessment considers the level of risk presented by the species under

consideration and the technology used. Regulations under the *Aquaculture Act 2001* require operators to have an approved strategy to minimise and mitigate against the risk of escapes and outline the requirements that must be followed in the event of an escape.

Licensees are also required to submit a strategy relating to the escape of stock from the constraints of the licensed infrastructure and the lease area (see the *Aquaculture Regulations 2016*, Regulation 18). This strategy is required by the Minister to prevent and control the risk of escaped stock to the wild.

The strategy must explain what procedures the licensee will implement to minimise these risks to a level considered acceptable by the Minister. Operators may be audited against the operating practices detailed in their strategy at any time. Failure to comply with the strategy may result in an expiation fee or fine.

APPENDIX D4 – RESEARCH AND ADAPTIVE MANAGEMENT

Evidence based policies require robust research to inform the decision making process. As such PIRSA Fisheries and Aquaculture has initiated several projects with the Fisheries Research and Development Corporation (FRDC) to improve our knowledge and inform our policies, in particular, the PIRSA/FRDC Innovative Solutions for Aquaculture Planning and Management Program (IS). This suite of projects aims to develop tools to ensure a sustainable and competitive aquaculture industry for South Australia. These tools will:

- Identify more effective ways to manage aquaculture;
- Minimise the regulatory burden on industry; and
- Ensure that environmental considerations for South Australian aquaculture remain a clear priority.

Innovative Solutions (IS-1) Program

The following research projects have been completed under the IS-1 program:

- Environmental audits of marine aquaculture* – The project examined the shading effects of intertidal shellfish long-line farming infrastructure at South Spit, Stansbury. While the relative area and degree of shading effects on seagrass meadows is low, a number of recommendations were made to reduce any potential lethal and sub lethal impacts. Overall, this project provides the basis for the enhancement of current environmental monitoring programs.
- Addressing seal interactions* – The project has provided comprehensive appraisal of the status of the Australian sea lion population in southern Spencer Gulf and the Nuyts Archipelago, including identification of several new breeding populations. Extensive tracking in the Nuyts Archipelago from 6 different colonies showed that there were marked inter-colony differences in foraging behaviour, and evidence of two broadly different foraging patterns - inshore (shallow) and offshore (deep) foragers.
- Spatial impacts and carrying capacity of aquaculture stock* – The project studied the nutrients released from Yellowtail Kingfish aquaculture in Fitzgerald Bay, and based on this data two models were produced that assist environmental management decisions. At the site scale, a seafloor deposition model was developed that predicts that areas of high sedimentation are localised around individual pens. At a more regional level, a carrying capacity model has been developed that can be used to predict the level of increased nutrient loadings in the water column associated with increases in Yellowtail Kingfish production. The outcomes of this work allowed PIRSA Fisheries and Aquaculture to make more informed decisions on total allowable biomass within the Fitzgerald Bay aquaculture zone and other zones that farm supplementary fed stock.
- Assessment of novel monitoring and modelling techniques to measure gill and skin fluke infestation* – A reliable and consistent means of measuring the level of gill and skin fluke infestation of farmed kingfish has been developed based on a computer driven scanning system. This novel technology is faster and more cost-effective than current methods, and will greatly enhance industry's ability to monitor and therefore control fluke infestations, through more precisely timing the application of control measures.
- Development of rapid environmental assessment and monitoring techniques* – The project was an extension of previous work undertaken to improve the tuna environmental monitoring program. The project aimed to determine similarities and differences in the DNA of benthic infaunal communities associated with finfish farming at Fitzgerald Bay, Arno Bay and Boston Bay. The number of individuals and the types of species of benthic infauna that live in the seafloor sediments are used to monitor the biological health of the environment around finfish farms. The outcomes of this project have decreased the time taken for an assessment of the condition of the environment and improved the accuracy of the

assessment. Information from this project is used to standardise the finfish environmental monitoring program in line with the tuna environmental monitoring program.

f) *Extension, communication and adoption of the outputs from the PIRSA and FRDC initiatives* – Through effective relationship building, communication strategies, and extension programs, outputs of the IS projects have been communicated to a range of stakeholders including government and industry groups. Effective communication and extension of Innovative Solutions research outcomes has facilitated the integration of research driven management practices with greater public and stakeholder awareness and acceptance.

g) Innovative Solutions (IS-2) Program

A second suite of projects under Innovative Solutions (IS-2) have been completed recently or are currently underway. The IS-2 suite of projects has been designed to provide information aimed at further supporting PIRSA's on-going efforts to improve its ecosystems-based approach to aquaculture resource management.

The following IS-2 projects have been completed:

a) *Biosecurity risk assessment and development of standardised mitigation for tuna and finfish aquaculture* – This project undertook a biosecurity hazard identification, risk analysis and audit for South Australia's marine finfish and tuna aquaculture sectors, including population of generic risk trees for biosecurity from Fletcher *et al.*, (2004), development of a generic framework including checklists for assessing biosecurity risks and evaluation of current standards and practices, identification of risks and development of risk mitigation strategies, guidelines for surveillance, industry practices and identification of critical control points for audit purposes.

b) *Carrying Capacity of Spencer Gulf: Hydrodynamic and biogeochemical measurement modelling and performance monitoring* – The ability to obtain accurate estimates of spatial and temporal variability in carbon cycling and other macro-nutrients through the ecosystems in Spencer Gulf will provide important information about potential risks and impacts of increased aquaculture activities in the Gulf. This need will be met through the development of calibrated hydrodynamic and bio-geochemical models for Spencer Gulf that will also determine more accurate carrying capacity estimates for aquaculture areas, including the concurrent use of both supplementary and non-supplementary fed organisms within each area.

c) *A review of South Australia monitoring of aquaculture* - This external review was conducted to review existing monitoring programs in South Australia. Implementation of recommendations is underway, including industry workshops with a revised environmental program for each aquaculture sector being developed. *Investigations to address key policy gaps associated with the development of clam farming in South Australia: genetic and health issues aligned to translocation and stock identification* – This project aims to characterise the genetic population structure of the clam, *Katelysia rhytiphora* in South Australia in order to determine the feasibility of this species for aquaculture. The project seeks to identify and evaluate method(s) for differentiation between farmed and wild clams and to identify potential biosecurity issues relating to commercial clam aquaculture. Results from this project will inform policy development for clam aquaculture in South Australia.

d) *Feasibility study for integrated multitrophic aquaculture in southern Australia* – This project investigated the potential aquaculture of native seaweed species and following identification of potential candidates trialled the first offshore seaweed aquaculture trials located adjacent finfish farms in South Australia. The results showed that a carrageenan producing red seaweed and a common kelp showed the greatest aquaculture potential of the tested species for the development of IMTA in South Australia.

The following IS-2 projects are currently underway:

- e) Application of high-resolution tracking technologies to understand movement and residency of pelagic sharks in southern Spencer Gulf: resolving spatial overlaps with marine industries, community activities and natural foraging areas – The project will inform the development of industry best-practice guidelines and management strategies around shark interactions with aquaculture and fisheries activities. In addition, the project will assist in the identification of public awareness and perceptions around shark interactions which will also inform management decisions.
- f) Pacific oyster feeds and feeding in South Australian waters: towards ecosystem based management – This project will (1) identify the feeding requirements of Pacific oysters, cockles and mussels (2) address the factors influencing food availability and (3) improve our understanding of the relationship between food availability, competition for resources and farm production. Outcomes from this project will inform management strategies for the relevant industries.
- g) In addition, PIRSA Fisheries and Aquaculture supports studies commissioned by the Australian Seafood Cooperative Research Centre (ASCRC) and its predecessor Aquafin CRC involving six research programs for the Port Lincoln-based Southern Bluefin tuna (*Thunnus maccoyii*) aquaculture industry including; production, value-adding, environment, technology transfer and commercialisation, and education and training.