



Government of South Australia

Primary Industries and Regions SA

**REPORT
SUPPORTING THE
AQUACULTURE (ZONES—LOWER EYRE
PENINSULA) POLICY 2013**

Endorsed for Gazettal

The 26th Day of January 2013



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1 INTRODUCTION

Of South Australia's total seafood value of production, 48.9% originates from aquaculture product (EconSearch, 2011). This trend is reflected worldwide with expectations that, by 2020, aquaculture will produce 60% of the global seafood demand (FAO, 2009). South Australia's aquaculture industry body, the SA Aquaculture Council, has published industry targets; estimating that by 2013, aquaculture production in South Australia will generate a farm gate value of \$650 million.

South Australia produces 34% of Australia's aquaculture production and 26% of the national seafood production (ABARE, 2009).

The Minister for Agriculture, Food and Fisheries (the Minister) may make aquaculture policies for any purpose directed towards furthering the following objects of the *Aquaculture Act 2001* (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.

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. The policies are created to consolidate aquaculture activities in specific areas and to ensure the ecological sustainability of the existing and future industry.

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. The objectives of these Acts and policies and how aquaculture policies are consistent with, and reflective of them, are described at Appendix D1.

Aquaculture zone policies are developed to ensure that they are relevant to both community and industry needs. Where possible and appropriate, it is expected that issues raised are dealt with during the planning phase rather than during the individual aquaculture licence application process. Consequently, a report supporting the policy is drafted to inform and involve all stakeholders in the decision making process for the zoning of marine resources for aquaculture purposes. The policy and supporting report will be referred to prescribed bodies and relevant public authorities as well as regional stakeholders, local indigenous communities, Native Title claimant groups, local government and industry, and will be made available to the general public for a period of two months for comment.

The Minister will then consult with and consider the advice of the Aquaculture Advisory Committee (AAC) on all matters raised during the consultation period. As prescribed by the Act following approval of the policy by the Minister, the policy will be referred to the Environment, Resources and Development Committee (ERDC) of Parliament. The ERDC may approve the policy; seek amendments to the policy or object to the policy. In the event the ERDC objects to the policy, the policy will be presented to both Houses of Parliament where either House may disallow it.

As a result of consultation and gazettal of a policy it is proposed that amendments will be made to Land Not within a Council Area (Coastal Waters) Development Plan in accordance with provisions under the *Development Regulations 2008*.

This Report supports the *Aquaculture (Zones—Lower Eyre Peninsula) Policy 2013* (the 2013 Policy).

Table 1 summarises the zoning framework to be established under the 2013 Policy and summarises the classes of permitted aquaculture, the leased area and biomass permitted in the aquaculture zones and aquaculture exclusion zones (see Appendix D2).

Table 1. Summary of zoning framework established under the *Aquaculture (Zones—Lower Eyre Peninsula) Policy 2013*.

Aquaculture zone/sector	Leased Area (ha)		Class	Biomass (tonnes)			
	Maximum total lease area allowed in the 2013 Policy	Lease area allocated (as at 8 August 2011)		Supplementally fed		Non-supplementally fed	
				(a) Farming of prescribed wild caught tuna	(b) Farming of aquatic animals (other than prescribed wild caught tuna) in a manner that involves regular feeding	(c) Farming of bivalve molluscs	(d) Farming of algae
Boston Bay aquaculture zone	368	367		398	1,750	3,780	
Boston Bay sector	308	272	(a), (b), (c) & (d)	38 for research/educational/tourist	1750	2,980	Determined by licence condition
Boston Island (east) sector	149 for (c) in Boston Bay Sector 20 for (c) in Boston Island (east) sector	35	(a), (b), (c) & (d)	360		400	Determined by licence condition
Bicker Isles sector	60 20 for (c)	60	(b), (c) & (d)	Nil		400	Determined by licence condition
Buffalo Rock exclusion zone	Nil	Nil	Nil	Nil	Nil	Nil	Nil
Lincoln aquaculture zone	6,825	2,396	(a) & (d)	24,500	Nil	Nil	Determined by licence condition

Aquaculture zone/sector	Leased Area (ha)		Class	Biomass (tonnes)			
	Maximum total lease area allowed in the 2013 Policy	Lease area allocated (as at 8 August 2011)		Supplementally fed		Non-supplementally fed	
				(a) Farming of prescribed wild caught tuna	(b) Farming of aquatic animals (other than prescribed wild caught tuna) in a manner that involves regular feeding	(c) Farming of bivalve molluscs	(d) Farming of algae
Lincoln (inner) sector	1,825	1,725	(a) & (d)	10,500	Nil	Nil	Determined by licence condition
Lincoln (outer) sector	5,000	671	(a) & (d)	14,000	Nil	Nil	Determined by licence condition
Lincoln aquaculture exclusion zone	Nil	Nil	Nil	Nil	Nil	Nil	Nil
Louth Bay aquaculture zone	270	245	(b), (c) & (d)	Nil	1,020	3,100	Determined by licence condition
Louth Bay aquaculture zone*	500 265 for (b)	245	(b), (c) & (d)	Nil	4,000	6,200	Determined by licence condition
Louth Bay (south) sector*	140	130	(b), (c) & (d)	Nil	1,120	1,736	Determined by licence condition
Louth Bay (north) sector*	360	115	(b), (c) & (d)	Nil	2,880	4,464	Determined by licence condition

Aquaculture zone/sector	Leased Area (ha)		Class	Biomass (tonnes)			
	Maximum total lease area allowed in the 2013 Policy	Lease area allocated (as at 8 August 2011)		Supplementally fed		Non-supplementally fed	
				(a) Farming of prescribed wild caught tuna	(b) Farming of aquatic animals (other than prescribed wild caught tuna) in a manner that involves regular feeding	(c) Farming of bivalve molluscs	(d) Farming of algae
Murray Point aquaculture zone	2	2	(c) no mussels	Nil	Nil	No mussels	Nil
Proper Bay aquaculture zone	60	60	(c) & (d)	Nil	Nil	1,200	Determined by licence condition
Sir Joseph Banks exclusion zone	Nil	Nil	Nil	Nil	Nil	Nil	Nil
Tod River aquaculture zone	38	38	(c) no mussels	Nil	Nil	No mussels	Nil
All aquaculture zones	13 for research/ educational purposes		As per zone in which research being undertaken				

*Pending amendment by Gazette notice.

2 CURRENT AQUACULTURE

There are a total of 2,573 leased hectares available under the previous *Aquaculture (Zones – Lower Eyre Peninsula No 2) Policy 2007* (the 2007 Policy; Figure 1). Of the total leased hectares available, there is currently 2,437 ha (or 95%) already allocated.

The allocation of leased hectares distributed between licence types per sector and zone is shown in Table 2.

Table 2. Allocated hectares in Lower Eyre Peninsula region as at 8 August 2011.

Aquaculture Zone/Sector	Leased Hectares					
	Total	Intertidal	Finfish and abalone	Tuna	Subtidal Mollusc	Miscellaneous
Boston Bay	272		49		149	74
Boston Island East	35			15	20	
Bickers Isle	60		40		20	
Lincoln Offshore	1,725			1,725		
Louth Bay (outer)	245		90		155	
Proper Bay (outer)	60				60	
Tod River	38	38				
Murray Point	2	2				
Total	2,437	40	179	1,740	404	74

The 2007 Policy was gazetted on 20 December 2007 and established six zones:

- Boston Bay and Lincoln Offshore aquaculture zone;
- Lincoln aquaculture exclusion zone;
- Louth Bay (outer) aquaculture zone;
- Murray Point aquaculture zone;
- Proper Bay (outer) aquaculture zone; and
- Tod River aquaculture zone.

It is proposed to amend the Boston Bay and Lincoln Offshore aquaculture zone, Louth Bay (outer) aquaculture zone, and the Lincoln aquaculture exclusion zone in the manner described in Section 3 below.

There are no further changes proposed for the remaining zones and sectors as described in the 2007 Policy. However, as the 2007 Policy is being replaced by the 2013 Policy, the Report (this document) must contain all details referred to in the 2013 Policy and be available on the Primary Industries and Regions South Australia Fisheries and Aquaculture website:

http://www.pir.sa.gov.au/aquaculture/management_policies

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 leases, licences and aquaculture Regulations (see http://www.pir.sa.gov.au/aquaculture/public_register and <http://www.pir.sa.gov.au/aquaculture/legislation>).

3 PROPOSED AQUACULTURE ZONES

The effect of the 2013 Policy will be to:

- separate the existing Boston Bay and Lincoln Offshore aquaculture zone into two zones, proposed as the Boston Bay aquaculture zone and the Lincoln aquaculture zone;
- define the Lincoln aquaculture zone by the Lincoln (inner) sector (previously the Lincoln Offshore aquaculture zone) and the (newly created) Lincoln (outer) sector, located to the south-east of the Sir Joseph Banks group and approximately 50 km east of Port Lincoln;
- define the Louth Bay aquaculture zone (previously the Louth Bay (outer) aquaculture zone) by the Louth Bay (south) sector and the Louth Bay (north) sector;
- create the Sir Joseph Banks exclusion zone and the Buffalo Rock exclusion zone;
- amend the Lincoln aquaculture exclusion zone and Lincoln aquaculture zone boundaries to align the exclusion zone better with the shipping lanes established by the Minister for Transport (Notice to Mariners No 50 of 2010 former Notice No 21 of 2002);
- reduce the leasable area available for the aquaculture of bivalve molluscs other than mussels in the Murray Point aquaculture zone from 12 ha to 2 ha; and
- allow the Minister to divide the Louth Bay aquaculture zone into two sectors (Louth Bay (north) sector and Louth Bay (south) sector) and increase (a) the leasable area available for aquaculture from 270 ha to 500 ha, (b) the biomass of aquatic animals (other than prescribed wild caught tuna) in a manner that involves regular feeding from 1,020 tonnes to 4,000 tonnes and (c) the biomass of bivalve molluscs from 3,100 tonnes to 4,616 tonnes by amending the 2013 Policy by Gazette notice.

The scope of the 2013 Policy covers the Lower Eyre Peninsula area of the Eyre Peninsula as depicted in Figure 2.

The aquaculture zones and aquaculture exclusion zones established by this 2013 Policy are described in the following sections.

3.1 Boston Bay aquaculture zone

The Boston Bay aquaculture zone is 3,800 ha in size and defined by 3 sectors; Bicker Isles, Boston Bay and Boston Island (Figure 3). Each sector will retain the leasable area, maximum aggregate biomass and prescribed classes of aquaculture from the 2007 Policy.

The classes of aquaculture permitted in the Boston Bay and Boston Island (east) sectors are:

- the farming of prescribed wild caught tuna;
- the farming of aquatic animals in a manner that involves regular feeding;
- the farming of bivalve molluscs; and
- the farming of algae.

In the Bicker Isles sector the same classes of aquaculture are permitted except for the farming of prescribed wild caught tuna.

The total number of hectares of leased area allocated for aquaculture in the proposed Boston Bay aquaculture zone is 368 ha of which 367 ha is already allocated. This is divided amongst the sectors as follows:

- 308 ha for the Boston Bay and Boston Island (east) sectors of which 272 ha and 35 ha respectively are already allocated; and
- 60 ha for the Bicker Isles sector of which 60 ha is already allocated.

The total area allocated for bivalve mollusc farming is:

- 149 ha in Boston Bay sector;
- 20 ha in the Boston Island (east) sector; and
- 20 ha in the Bicker Isles sector.

The biomass of prescribed wild caught tuna must not exceed:

- 360 tonnes in the Boston Island east sector; and
- 38 tonnes for research, educational and tourism purposes in the Boston Bay sector.

The biomass of bivalve molluscs in the proposed Boston Bay aquaculture zone must not exceed 3,780 tonnes comprised of:

- 400 tonnes in the Bicker Isles sector;
- 400 tonnes in the Boston Island east sector; and
- 2,980 tonnes in the Boston Bay sector.

The Minister may increase the biomass of bivalve molluscs by notice in the Gazette if satisfied that such an increase would not compromise the overall productivity of bivalve mollusc aquaculture operations in the sector.

The biomass of aquatic animals farmed in a manner that involves regular feeding for the Bicker Isles sector, the Boston Island east sector and the Boston Bay sector combined, must not exceed:

- an amount that would, in the opinion of the Minister, have an environmental impact on the zone equivalent to the environmental impact that 1,750 tonnes of finfish would have on the zone; or
- if some other amount is specified by the Minister by notice in the Gazette, that other amount.

A biomass limit for algae is yet to be determined. No specific limits have been applied to the biomass or area for algae farming, given the industry is still in its infancy. PIRSA Fisheries and Aquaculture will monitor developments and consider the need for future regulation as the industry grows.

3.2 Buffalo Rock aquaculture exclusion zone

While there are concerns regarding the potential impact of aquaculture and the lack of documentation of its ecosystem, Buffalo Rock is not being considered for inclusion within the boundaries of the 19 gazetted Marine Parks being developed under the *Marine Parks Act 2007*. In any regular case, PIRSA Fisheries and Aquaculture would remain consistent with current buffering distances used by SA government around established National and Conservation Parks by establishing a minimum 1 km buffer, however in this instance, licence holders interested in undertaking development within this zone have indicated that for infrastructure reasons they cannot consider any site within 2 km of Buffalo Rock.

Therefore the creation of the 1,651 ha Buffalo Rock exclusion zone is proposed, offering a 2 km buffer zone around the Buffalo Rock ecosystem (Figure 4).

3.3 Lincoln aquaculture zone

In the 2007 Policy the Lincoln offshore sector is renamed the Lincoln (inner) sector and joined by a new Lincoln (outer) sector. Collectively these sectors form the Lincoln aquaculture zone and cover an area of 53,468 ha (Figures 5 and 6).

The creation of one zone with two sectors allows PIRSA Fisheries and Aquaculture to facilitate movement of leases between the two sectors where considered appropriate. Following commencement of the 2013 Policy, lease holders currently holding tenure within the Lincoln (inner) sector will be permitted to make an application to the Minister to move existing sites to the Lincoln (outer) sector. Any additional tenure would need to be granted through an allocation process approved by Aquaculture Tenure Allocation Board involving tendering or a similar competitive process (Section 33 of the Act).

The classes of aquaculture permitted in the Lincoln (inner) and Lincoln (outer) sectors are:

- the farming of prescribed wild caught tuna; and
- the farming of algae.

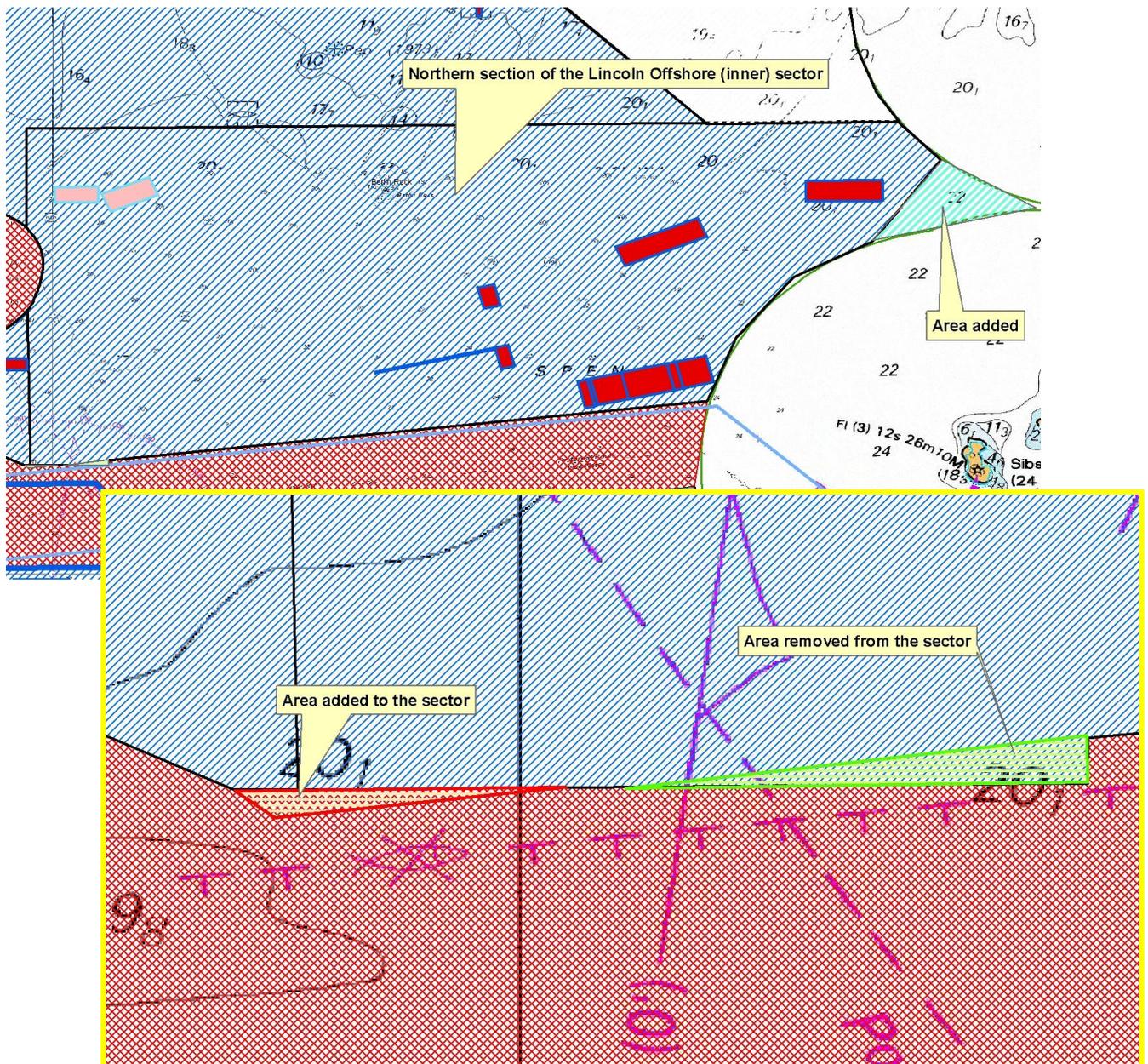
The total leased area allocated for aquaculture in the Lincoln aquaculture zone is 6,825 ha consisting of:

- 1,825 ha in the Lincoln (inner) sector; and
- 5,000 ha in the Lincoln (outer) sector.

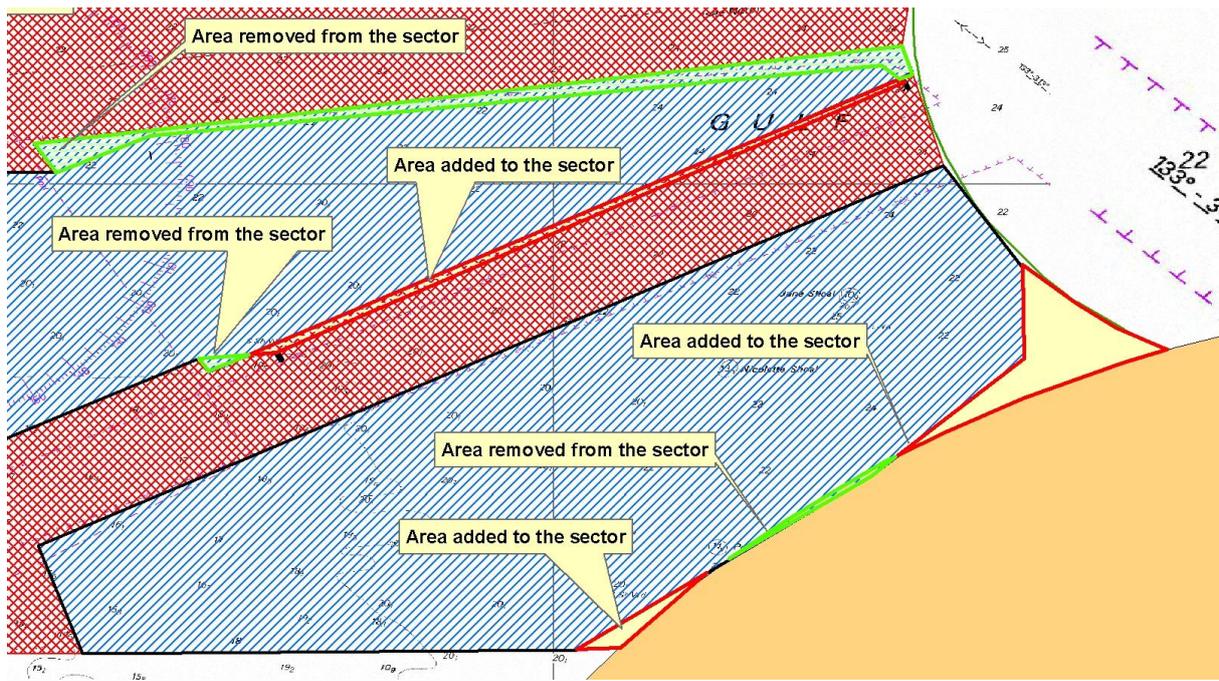
The Lincoln (inner) sector (Figure 5) was extensively reviewed as part of the *Aquaculture (Zones – Lower Eyre Peninsula) Policy 2007* that was gazetted on 18 January 2007.

There are minor changes to the proposed 18,444 ha Lincoln (inner) sector (previously known as the Lincoln offshore sector). Currently the leasable area, maximum aggregate biomass and prescribed classes of aquaculture will remain as described under the 2007 Policy; however the shape and size of this sector will change as follows:

- Northern section. A net addition of 260 ha in order to align the aquaculture zone more appropriately with the existing shipping lanes, removing the existing kinks in the shape of this section and allowing for a 100 m buffer between the aquaculture zone and the shipping lane;



- Middle and southern sections.
 - A net removal of 149 ha in the middle section, in order to align the aquaculture zone better with the existing shipping lanes, removing the existing kinks in the shape of this section and allowing for a 100 m buffer between the aquaculture zone and the shipping lane; and
 - a net addition of 231 ha in the southern section, including the removal of an area encroaching the sea lion colony buffer.



The eastern side of the Lincoln (inner) sector abuts the Sir Joseph Banks Group Conservation Park. The boundary of the park extends two nautical miles from the islands. A one-kilometre buffer seaward from the boundary of the Sir Joseph Banks Group Conservation Park has been introduced, based on discussion with the Department of Environment Water and Natural Resources (DEWNR). This is consistent with buffers established around all national and conservation parks in aquaculture zone policies.

The proposed Lincoln (outer) sector (Figure 6) covers an area of approximately 35,024 ha. This area is located to the east of the Sir Joseph Banks group of Islands (Appendix C; Figure 2). Technical investigations (Loo *et. al.*, 2011) of the region within which the Lincoln (outer) aquaculture zone was subsequently proposed, found that the physical characteristics were favourable for both finfish and algae aquaculture. Results from underwater video recordings indicated that most sites examined had predominantly bare sandy substrates. Substantial sponges were observed at some sites and as a result the proposed Lincoln (outer) aquaculture zone was modified to exclude them. The area is too deep for seagrass and it was not observed on any underwater video recordings. The proposal to allocate a maximum of 5,000 ha of leased area equates approximately 14% of the total area of the sector.

The maximum aggregate biomass of prescribed wild caught tuna for the Lincoln aquaculture zone must not exceed 24,500 tonnes consisting of:

- 10,500 tonnes in the Lincoln (inner) sector. The total biomass for this sector remains the same as the 2007 Policy (as this was extensively reviewed in 2006); and
- 14,000 tonnes in the Lincoln (outer) sector.

The maximum aggregate biomass of aquaculture to be farmed within the Lincoln (outer) sector was calculated using a predictive model for finfish aquaculture developed by the South Australian Research and Development Institute (SARDI) (Tanner *et. al.*, 2007). To enable the finfish model to be utilised the following values were ascertained: the area of the proposed aquaculture zone (km²); the average depth of site; and the flushing rate. A flushing rate of 10.4 was obtained (Luick and Middleton, 2010). This means that on average the Lincoln (outer) sector exchanges its volume once every 3.5 days or 104.3 times per year.

When the finfish model was run for the entire area of the proposed Lincoln (outer) zone a total biomass of 19,792 tonnes of farmed southern bluefin tuna was derived. PIRSA Fisheries and Aquaculture

proposed a more conservative limit of 14,000 tonnes of farmed southern bluefin tuna at any one time within the Lincoln (outer) zone.

A biomass limit for algae is yet to be determined. No specific limits have been applied to the biomass or area for algae farming, given the industry is still in its infancy. PIRSA Aquaculture will monitor developments and consider the need for future regulation as the industry grows.

The 2013 Policy will allow for the Minister to alter the maximum biomass limit through notice in the Gazette. This provides a mechanism to enable flexibility in setting initial biomass limits for the sector while enabling future research and environmental monitoring results to be taken into consideration as they become available over time.

3.4 Lincoln aquaculture exclusion zone

The Lincoln aquaculture exclusion zone covers an area of 27,385 ha (Figure 7). This is an increase of 123 ha from the area defined by the 2007 Policy and reflects the minor changes described in the previous Section 3.3.

3.5 Louth Bay aquaculture zone

The total area, classes of permitted aquaculture and prescribed criteria of the Louth Bay aquaculture zone will remain the same as the 2007 Policy. The area of the zone covers approximately 9,443 ha (Figure 8) and the classes of aquaculture permitted are:

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

No specific limits have been applied to the biomass or area for algae farming, given the industry is still in its infancy. PIRSA Fisheries and Aquaculture will monitor developments and consider the need for future regulation as the industry grows.

The total leased area allocated for aquaculture in the Louth Bay aquaculture zone is 270 ha of which 245 ha is already allocated (Table 2). The biomass of aquatic animals (other than prescribed wild caught tuna) being farmed in the zone in a manner that involves regular feeding must not exceed 1,020 tonnes and the biomass of bivalve molluscs must not exceed 3,100 tonnes.

At the Aquaculture Advisory Committee's 26 March 2012 meeting members agreed that a variation to the Louth Bay aquaculture zone proposed for the draft 2013 Policy be included in the 2013 Policy as an amendment by Gazette notice in Schedule 3.

The amendment creates two sectors (Figure 9); the Louth Bay (south) sector covering 1,719 ha and the Louth Bay (north) sector covering 7,724 ha. Creating two sectors avoids the concentration of leased area in the southern part of the Louth Bay aquaculture zone defined by the 2007 Policy,

The amendment will increase the area available for lease from 270 ha to 500 ha. This amount is approximately 5.3% of the total area and nearly half the area normally proposed for other zones. It represents an increase of 230 ha from the 2007 Policy of which 245 ha is already allocated. The area available for farming of aquatic organisms (other than prescribed wild caught tuna) in a manner that involves regular feeding in the amended Louth Bay aquaculture zone will be limited to 265 ha. This is to facilitate the farming of bivalve molluscs. The 500 ha of leased area available will be divided into:

- 140 ha in the Louth Bay (south) sector of which 130 ha is already allocated; and

- 360 ha in the Louth Bay (north) sector of which 115 ha is already allocated.

The aggregate biomass of the aquatic organisms (other than prescribed wild caught tuna) farmed in a manner that involves regular feeding must not exceed 4,000 tonnes and is divided between the two sectors as:

- 1,120 tonnes in the Louth Bay (south) sector; and
- 2,880 tonnes in the Louth Bay (north) sector.

This biomass is an increase from the 2013 Policy biomass limit of 1,020 tonnes for the same zone size and has been re-calculated using a predictive finfish model developed by SARDI (Tanner *et. al.*, 2007) and more recent data input variables.

For the amended zone, the finfish model indicated that the Louth Bay aquaculture zone could sustain 5,244 tonnes; however it was considered that a conservative figure of 4,000 tonnes of aquatic animals (other than prescribed wild caught tuna) being farmed in a manner that involves regular feeding be proposed. This amount will be divided between the northern and southern sectors of the amended 2013 Policy in the same proportion as the proposed allocation of leased area available. These quantities were derived using a flushing rate of 84.8 times per year (Luik and Middleton, 2010) for a body of water with an average depth of 18 m covering an area of 94.43 km². Water quality information from samples taken in Louth Bay by the EPA in 2010 were applied to determine the carrying capacity of the zone that would maintain water quality limits within ANZECC Guidelines for Fresh and Marine Water Quality 2000 (ANZECC and ARMCANZ, 2000).

The biomass of bivalve molluscs for the amended Louth Bay aquaculture zone must not exceed 6,200 tonnes and is divided into:

- 1,736 tonnes for the Louth Bay (south) sector; and
- 4,464 tonnes for the Louth Bay (north) sector.

This biomass is an increase from that recommended for the 2013 Policy of 3,100 tonnes. A shellfish model developed by SARDI and Parsons Brinckerhoff in 2003 (South Australian Research and Development Institute and Parson Brinckerhoff, 2003) was utilised to calculate carrying capacity for the amended Louth Bay aquaculture zone. The shellfish model used was developed for oysters; however, it is likely the same subsistence value would work as a first order approximation for mussels as well.

To enable the shellfish model to be utilised the following values were ascertained: the area covered by the Louth Bay aquaculture zone (km²); the average depth of site; and the flushing rate. In order to calculate the proportion of food available to shellfish, the following inputs were given (supplied in the SARDI/ Parsons Brinckerhoff model explanation):

- Food supply – amount of food within the site (particulate organic matter; POM) as a representation of food utilised by shellfish – 3.1 mg POM.L⁻¹;
- Time spent submerged (in this case 100% for subtidal molluscs); and
- Subsistence – a ration value, which determines the amount of food actually required by shellfish to maintain healthy growth – 76 mg POM oyster⁻¹ day⁻¹.

With the average depth for the Louth Bay aquaculture zone estimated to be 18 m, a flushing rate of 4.3 was obtained from Luick and Middleton (2010). This means that on average Louth Bay exchanges once every 4.3 days or 84.8 times per year.

When the shellfish model was run for the entire area of the Louth Bay aquaculture zone (94.43 km²) a total biomass value of 40,269 tonnes of mussels was produced. Given that PIRSA Fisheries and Aquaculture currently licence subtidal molluscs at length of backbone not exceeding 560 m per hectare

(or 12.5 tonnes of mussels per hectare) a maximum aggregate biomass of bivalve molluscs being farmed in the Louth Bay aquaculture zone at any one time must not exceed 6,200 tonnes. This provides some growth potential for the subtidal mollusc sector while still being well under the biomass total calculated by the model for the entire aquaculture zone. This amount will be divided between the northern and southern sectors of the amended 2013 Policy in the same proportion as the proposed allocation of leased area available.

Although these biomass limits are conservative, should Environmental Monitoring Program reports show any adverse impact, or any potential for adverse impact, from farming activities, the Minister will have the power in the policy to gazette an alternative biomass limit at any time.

The amended 2013 Policy proposes an increase in finfish biomass from 1,020 tonnes to 4,000 tonnes in the amended Louth Bay aquaculture zone. Although the increase is a conservative proportion of the output supported by the latest carrying capacity model, it is recognised that the release of tenure to access sites in this zone will be incremental, and under the control of the Minister in addition to restricting the maximum biomass of aquatic organisms (other than prescribed wild caught tuna) farmed in a manner that involves regular feeding. This will limit the potential for environmental harm. In other words, the Minister will decide on how many hectares will be made available to industry, when, and for what species, considering potential risks for adverse environmental impact from farming activities. An independent board, the Aquaculture Tenure Allocation Board (see Division 3 of the Act) advises the Minister (on its own initiative or at the request of the Minister) on any matter relating to the allocation of tenure for aquaculture. Once tenure has been allocated within the amended Louth Bay aquaculture zone, PIRSA Fisheries and Aquaculture will individually assess, monitor and regulate each licence application, including biomass limits that can be farmed at a site level, on an ongoing basis. Through adaptive management, site specific environmental monitoring programs will aim to identify and minimise the risk of significant environmental changes from aquaculture.

3.6 Murray Point aquaculture zone

The Murray Point aquaculture zone (Figure 10) is 72 ha in size and the maximum aggregate biomass and prescribed classes of aquaculture will remain as currently described under the 2007 Policy. However, the leasable area available is reduced from 12 ha to 2 ha, which is already allocated. The class of aquaculture permitted in the zone is the farming of bivalve molluscs other than mussels.

3.7 Proper Bay aquaculture zone

The Proper Bay aquaculture zone (Figure 10) accommodates an extension of the aquaculture exclusion zone around Murray Point to ensure aquaculture is not undertaken close to vessel slip yard activities. Other than the removal of the descriptor “(outer)” from the name of proposed aquaculture zone, the leasable area, maximum aggregate biomass and prescribed classes of aquaculture will remain as currently described under the 2007 Policy. The Proper Bay aquaculture zone is 2,356 ha in size.

The class of aquaculture permitted in the Proper Bay aquaculture zone are:

- the farming of bivalve molluscs; and
- the farming of algae.

The 2013 Policy does not allow for the farming of finfish in the zone. The amount of leased area available for aquaculture is 60 ha, which is already allocated.

The biomass of bivalve molluscs in the zone must not exceed 1,200 tonnes or, if some other amount is specified by the Minister by notice in the Gazette, that other amount.

3.8 Sir Joseph Banks exclusion zone

As the proposed Lincoln aquaculture zone will encircle the Sir Joseph Banks Conservation Park, it was consistent with existing legislation to make the entire conservation park a single aquaculture exclusion zone (Figure 4) with a 1 km buffer. The exclusion zone also partly includes the sea lion buffers established by the Marine Mammal-Marine Protected Areas Aquaculture Working Group. Furthermore, by the creation of this exclusion zone, the possibility of a pilot lease application being lodged in the area is removed, thereby eliminating any ambiguity.

3.9 Todd River aquaculture zone

The leasable area, maximum aggregate biomass and prescribed classes of aquaculture will remain as currently described under the 2007 Policy. The Todd River aquaculture zone is 747 ha in size (Figure 11).

The class of aquaculture permitted in the zone is the farming of bivalve molluscs other than mussels.

The amount of leased area allowed in the zone is 38 ha, which is already allocated.

4 CONSIDERATIONS

To uphold the objectives of the Act, PIRSA Fisheries and Aquaculture will take the following matters into account in creating the Policy and encourage comment or advice for each during the public consultation period.

4.1 Subsequent Development Plan Amendments

The 2013 Policy falls within the waters covered by the Coastal Waters Development Plan (Land Not Within A Council Area (Coastal Waters) Development Plan). It 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.

Therefore, subject to the approval of the Minister for Urban Development and Planning, the new aquaculture zone as outlined in the 2013 Policy (Figures 17 to 23) will be incorporated into the Coastal Waters Development Plan's maps.

Aquaculture is not considered "development" under the *Development Act 1993* if it is located within an aquaculture zone and within the Coastal Waters Development Plan. Thus, aquaculture development located within the 2013 Policy will not be subject to development approval under the *Development Act 1993*.

4.2 Physical Characteristics

The seabed of this region consists mostly of silty sand close inshore, with heavier sands further to sea. The tides are generally small as with the rest of the State, however there can be larger tides when strong winds or storms occur. During the summer period, winds generally blow towards the land from the southeast and out to sea across the zones from the northwest during winter. Strong wind events occur during all seasons, and the strongest wind events are able to create waves that would disturb the seabed to a depth of almost 16 m. Water circulation in the region is dominated by tidal influences, with wind making very little modification to circulation patterns. Incoming tides tend to push water northwards through the study region, and outgoing tides tend to move waters southwards (Sinclair Knight Merz, 2001).

Bicker Isles represent two small (about 250 m and 420 m at their widest) rocky outcrops located approximately midway between the southern extremity of Boston Island and the mainland. Water depths within the known aquaculture zone vary between 10 and 16 m, with the seafloor composed predominately of bare sand.

Boston Bay is a large, natural harbour created by Boston Island and lies at the bottom south western corner of Spencer Gulf. Boston Island, located centrally in the bay, is about 5 km long and about 2 km wide. The north-south aligned bay is approximately 15 km long and about 5 km wide and has a maximum depth of about 16 m to 17 m (Petrusevics, 1993). Water exchange between Boston Bay and Spencer Gulf occurs mainly through a channel about 4 km wide located north of Boston Island. Boston Bay is physically connected to the relatively shallower Proper Bay, Spalding Cove and Spencer Gulf. Boston Bay is sheltered from the predominately south westerly wind and swell and, as a result, has developed sandy beaches and few cliffs. The region supports extensive seagrass beds and biologically diverse communities of fish and invertebrates (Glover and Olsen, 1985).

Within the Lincoln (inner) sector, sediments are mostly composed of poorly sorted silts and fine sands, predominated by skeletal remains of carbonate-secreting organisms. The contribution of plankton to the organic matter remaining in the sediments has been calculated to be in excess of 80% using concentration-dependent stable-isotope mixing models (Fernandes *et. al.*, 2006). An erosional area has been identified south of Rabbit Island where sediments contain up to 50% siliciclastic¹ material, grain size distributions are better sorted and coarser, and organic carbon and total nitrogen contents are very low. In contrast, deeper waters north of Cape Donington have been identified as a depocentre for fine sediments, which contained organic matter levels twice those elsewhere in the region despite the extremely high carbonate contents (Fernandes *et. al.*, 2006).

Additional observations of the seafloor corresponding to the north-eastern section of the Lincoln (inner) sector using underwater video were conducted in November 2006 for PIRSA Fisheries and Aquaculture. In all, 8 transects were filmed, each depicting a relatively barren seafloor, characterised by medium to coarse sand, low to medium bioturbation (a subjective measure of benthic infaunal activity, notably from polychaete worms) and low undulation. The dominant epibenthic fauna observed were razorfish (*Pinna bicolor*) and small sponges. Despite the depth range of approximately 21 to 23 m, sparse seagrass (*Posidonia* species) was observed in 2 of the 8 transects. Transect 4 contained a single patch whereas seagrass was dispersed along approximately 20% of transect 8. The location of seagrass in these northern most transects probably corresponds to the small patches of seagrass originating from shallower waters to the south east of Point Bolingbroke as mapped by Sinclair Knight Merz in 2001.

The proposed Lincoln (outer) sector falls within both the Jussieu and Gambier Biounits but predominantly in the Gambier Biounit. The Jussieu Biounit extends from Cape Catastrophe on the Eyre Peninsula, north to Salt Creek (Tumby Bay). The Gambier Biounit comprises the Gambier Isles and Neptune Islands (Edyvane, 1999). It is an area of low wave energy with prevailing offshore winds (Edyvane, 1999). Water depths range from less than 20 m around the Sir Joseph Banks Group to in excess of 40 m (Parsons Brinckerhoff and SARDI Aquatic Sciences, 2003), with most of the proposed aquaculture sector being in water depths of 30 to 40 m, although there are some shoals present throughout the deeper area.

Currents are estimated at 35 to 40 cm per second south-east of Gambier Islands (Petrusevics *et. al.*, 1998). The area experiences surface water temperatures of between 16°C in the north to 16.3°C in the south during winter and 19.8°C to 21.8°C during summer (Petrusevics *et. al.*, 1998). Depth and time averaged circulation in lower Spencer Gulf is clockwise and generally weak, although areas of higher flow occur to the east of Spilsby Island, hence in the Lincoln (outer) sector, as well as through Thorny

¹ Siliciclastic rocks are clastic non-carbonate sedimentary rocks that are almost exclusively silica-bearing, either as forms of quartz or other silicate minerals.

Passage and between Tumbly Bay and the northern end of the Sir Joseph Banks group (Tanner and Volkman, 2009).

The South Australian Research and Development Institute undertook an investigation of the Lincoln (outer) sector area between September 2009 and November 2010. The Lincoln (outer) sector was developed to avoid areas of high biological diversity and focus in areas where the benthic fauna and flora is categorised as sparse. The total area selected for the technical investigation covers 906 km², of which approximately 480 km² was considered suitable for aquaculture. The sites with high sponge counts, coralline rubble and reef substrate were removed from the proposed aquaculture sector (Figures 12, 13 and 14). The video analysis depicted mostly barren sand with sea stars, sea cucumbers, solitary ascidians, gastropods, fish, crabs, bryozoans and bivalves in low abundance. Two sites also had scattered occurrences of sponges. The seafloor is dominated by fine to medium sand.

Louth Bay is a wide, carbonate rich bay open to the southeast, with water depths ranging from 10 to 20 m. The northern end of the bay is more exposed to southerly winds and ocean swell than the southern end of the bay, where occasional beach ridges are fronted by wide sand flats. Louth Island has a 1 km sand spit extending from the northern side with sea cliffs and shore platforms on the southern side (Sinclair Knight Merz, 2001). Seagrass meadows are present in Peake and Moonlight Bays. The Todd River is an important regional habitat being the only estuarine river on the Lower Eyre Peninsula, with mud flats adjacent to the mouth.

Proper Bay is a bedrock embayment containing 53 km of shoreline and extensive, dense seagrass meadows, with low energy sand flats in the southern portion which form relatively stable beaches backed by low, stable fore-dunes. Water depths range from one metre in the western end to approximately 10 m in the eastern end, which opens to the southern end of Boston Bay (Sinclair Knight Merz 2001). Hydrodynamic studies indicate that it can be considered separate from Boston Bay (Petruševics, 1993).

Sandy beaches run along Peake Bay, Louth Bay and North Shields. Seagrasses occur 500 to 1000 m offshore in the shallow protected waters of Peake Bay, Louth Bay and Proper Bay. The dominant seagrass species include *Posidonia australis* and *P. sinuosa* with lower levels of *Halophila australis* and *Amphibolis antarctica*. In more exposed areas like Point Boston, Point Bolingbroke and Cape Donington there are subtidal rocky shore macroalgal communities dominated by *Cystophora* species (Edyvane, 1999). North Shields has low, erosional cliffs and Proper Bay has sand flats. Offshore islands including the Sir Joseph Banks Group are low lying islands consisting of granite overlain by limestone. In depths over 15 m the bottom tends to be mainly bare, coarse sediment with undulations increasing in size with distance from the coast.

The Lower Eyre Peninsula area has a temperate climate characterised by cool, wet winters (average temperatures between 8 to 16°C) and warm dry summers (average temperatures between 15 to 25°C) with an average temperature range of 12 to 20°C and an average rainfall of 490 mm. The average annual evaporation (measured at Port Lincoln) is approximately 1,500 mm.

A major factor influencing the winds of the Lower Eyre Peninsula area is the seasonal migration of the subtropical high-pressure systems. During summer, the west to east migration of high pressure systems produces winds from different directions depending on the location of the centre of the high pressure system. When the centre of the system is located over the Great Australian Bight, south-easterly winds dominate over the area, however if the centre is located over the Tasman Sea, north-easterly winds prevail over the region. In summer, the effect of differential land-sea heating produces sea breezes that approach the coastline from the south-east. In winter, due to the tropical migration of the high pressure systems, north-westerly winds and associated transient south westerlies caused by the migration of west to east moving low pressure systems, prevail over the region (Sinclair Knight Merz, 2001).

Tidal elevations within the region are characterised by a Spring-Neap cycle of approximately fourteen days. Diurnal tidal influences are of similar magnitude to those of a semi-diurnal type, which provides a 'mixed' tidal signal for the region. During most of the Spring-Neap cycle, two tides per day can be expected but with diurnal inequalities so that the tidal range of the two events in a single day will be different. Near the Neaps, the diurnal influence dominates so that only one tide per day is experienced. The neap condition is commonly referred to, in local context as a 'dodge' tide. The tidal signal throughout the region (at Port Lincoln and Reevesby Island) shows a high correspondence, indicating that at a given time the same phase of tide will be found throughout the region. Disturbances of the sea level produced at distances remote from the region can induce positive and negative deviations to tidal predictions in the region. Residuals of up to +0.76 m and -0.44 m (with respect to Indian Springs Low Water (ISLW)) have been recorded at Port Lincoln (Sinclair Knight Merz, 2001).

The waters of Spencer Gulf are regarded as being low in inorganic nutrients compared with other coastal regions of the world, although there is a lack of data for much of the Gulf (Tanner and Volkman, 2009).

4.3 Indigenous Heritage and Native Title

PIRSA Fisheries and Aquaculture acknowledges and recognises the native title rights and interests of the South Australian Aboriginal people. 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 policy area falls within the Barngarla Native Title Claim (SAD6011/98) (National Native Tribunal website). This claim includes the Sir Joseph Banks Group, Dangerous Reef, Thistle Island and Jessieu Peninsula, which are incorporated into the proposed boundaries of the Lincoln (outer) sector.

An online search (conducted 22 July 2011) of the National Native Title Tribunal website (www.nntt.gov.au) found no native title applications, determinations of native title or registration test decisions in the Barngarla determination area.

A search of the Central Archive, which includes the Register of Aboriginal Sites and Objects, administered by the Department of the Premier and Cabinet-Aboriginal Affairs and Reconciliation Division (DPC-AARD), has multiple entries for Aboriginal sites in the Lower Eyre Peninsula area (Figure 15). Specific areas of significance include Poonindie and Tulka Fish Trap. Poonindie is socially and historically significant as a successful attempt to create an economically viable and socially relevant community for Aboriginal people after European settlement. Tulka Fish Trap is listed in the register of the National Estate. The other land based sites are located throughout the coastal zone adjoining the proposed aquaculture zone. It should be noted that individual site indicators do not reflect the actual area of the site; as this will vary from site to site, depending on the site information contained in the Central Archive. However, the Central Archive does not purport to be a comprehensive record of all Aboriginal sites, objects and remains in South Australia. Sites or objects may exist in the area even though they are not recorded.

If any Aboriginal significant areas are encountered during community engagement, PIRSA Fisheries and Aquaculture will advise the State Aboriginal Heritage Branch accordingly. The Department of Premier and Cabinet's Aboriginal Affairs and Reconciliation Division will then deal with Aboriginal Heritage clearance concerns in accordance with the *Aboriginal Heritage Act 1988*.

4.4 Non-indigenous and Natural Heritage Sites

The South Australian Heritage Register is a list of places of heritage value to the state. It includes places and related objects of state significance and records other categories of heritage places in South Australia (including local, national and world heritage places) which are protected under legislation.

In response to heritage survey recommendations or nominations from the public, and acting on advice from DEWNR, places deemed of state significance are entered in the South Australian Heritage Register by the South Australian Heritage Council. These places must satisfy one or more of the criteria outlined in the *Heritage Places Act 1993*. Places assessed of state heritage significance are first provisionally entered for three months, to allow a period for any public representations, and subsequently either confirmed or removed from the South Australian Heritage Register by the South Australian Heritage Council. The Department of Planning and Local Government's Heritage Places Database is an online database of heritage places in South Australia. The database includes information and location maps of the state's significant historic places. The Heritage Places Database provides data on state heritage places, local heritage places and contributory items, including mapping capability. An online search (conducted 22 July 2011) of the South Australian Heritage Places Database (www.planning.sa.gov.au/go/heritagesearch) for the Port Lincoln region showed 22 records (Table 3), none of which are overlapping with the proposed aquaculture zone.

4.5 Marine Parks

The proposed aquaculture zone lies within the boundaries of the Sir Joseph Banks Group Marine Park (Appendix C; Figure 8). Located in lower western Spencer Gulf and covering 2,627 km², the Sir Joseph Banks Group Marine Park includes part of the Eyre and Spencer Gulf Bioregions. The park is adjacent to Lower Eyre Peninsula and includes the islands of the Sir Joseph Banks Group and Dangerous Reef. This marine park overlays two other protected areas, including the Tumby Island Conservation Park and the Sir Joseph Banks Group Conservation Park (Department of Environment and Natural Resources, 2010). It should be noted that marine park management plans with appropriate zoning arrangements are expected to be completed by 2012.

Policy commitments made by the government to the aquaculture industry with respect to Marine Parks include the provision for future aquaculture activities in waters offshore from Lower Eyre Peninsula. PIRSA Fisheries and Aquaculture, with consideration for the objects of the *Marine Parks Act 2007*, have provided for an exclusion zone under the *Aquaculture Act 2001* to be placed over the Sir Joseph Banks Group of Islands and the major sea lion buffer (Figure 16).

The coastal wetlands around Lower Eyre Peninsula are particularly vulnerable and the seagrass meadows less resilient to physical disturbance. As such, the proposed aquaculture zone has been designed so as to minimise the risk of disturbing these sensitive and important habitats.

4.6 Reserves and Conservation Areas

The Lincoln (outer) sector is adjacent to the eastern side of the Sir Joseph Banks Group Conservation Park (Figure 16). The Sir Joseph Banks Group Conservation Park includes twenty islands in Spencer Gulf, South Australia. With the exception of Spilsby (which remains privately owned), the islands of the Banks group were incorporated into a proclaimed Conservation Park between 1967 and 1974. The Sir Joseph Banks Group Conservation Park contains ecologically significant benthic and pelagic biodiversity, representative of South Australia's unique Flindersian (transitional warm-cold temperate waters) marine flora and fauna. The park is on the Register of the National Estate.

Approximately 38 km to the south-west of the proposed Lincoln (outer) sector is the Neptune Islands Conservation Park. The park consists of all islands in the North and South Neptunes, except the

southernmost island which was one of South Australia's last staffed Lighthouse Reserves (Edyvane, 1999). The park is listed on the Register of the National Estate (Parsons Brinckerhoff and SARDI Aquatic Sciences, 2003).

Approximately 22 km to the south of the proposed Lincoln (outer) sector is the Gambier Islands Conservation Park which includes Wedge Island, South West Rock, Peaked Rocks and North Islet. The Gambier Isles are not subject to human induced change and exhibit a range of habitats and nursery areas (Parsons Brinckerhoff and SARDI Aquatic Sciences, 2003).

There are no aquatic reserves under the *Fisheries Management Act 2007* within the proposed Lincoln (outer) sector.

4.7 Matters of National Environmental Significance

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

A search of the Protected Matters Database was conducted (22 July 2011) on the Australian Government Department of Department of Sustainability, Environment, Water, Population and Communities website (2011) using the Protected Matters Search Tool (www.environment.gov.au/epbc/pmst) to obtain a list of threatened and migratory species that are considered to potentially occur in the region. This data is derived primarily from general distribution maps, and accordingly, it is likely that at least some of the species listed will not occur.

The resultant report listed 37 threatened species (Table 4), 33 migratory species, 67 marine species, 12 whales and other cetaceans, 10 invasive species and 4 nationally important wetlands. Many migratory species, consisting of bird, marine mammals and shark, occur within this region. The legislative framework dealing with these species is described in Appendix D3.

There are a number of species known to occur in the region that are specifically protected by the EPBC Act including 12 migratory bird species; fork-tailed swift (*Apus pacificus*), great egret or white egret (*Ardea alba*), cattle egret (*Ardea ibis*), Amsterdam albatross (*Diomedea amsterdamensis*), Tristan albatross (*Diomedea dabbenena*), Gibson's albatross (*Diomedea gibsoni*), Caspian tern (*Sterna caspia*), white-bellied sea-eagle (*Haliaeetus leucogaster*), white-throated needletail (*Hirundapus caudacutus*), rainbow bee-eater (*Leipoa ocellata*), oriental plover or oriental dotterel (*Charadrius veredus*) and Latham's snipe or Japanese snipe (*Gallinago hardwickii*).

Seabirds may be adversely affected by activity around any feeding, roosting or nesting sites in the area. However, section 19 of the *Aquaculture Regulations 2005* specifies that each licence holder must have a written strategy approved by the Minister to minimise adverse interactions with seabirds. In addition, risks posed by the aquaculture activity are assessed at the time of individual licence application through the ESD Assessment process consistent with the National ESD Framework (Fletcher *et. al.*, 2004).

Syngnathid fishes (e.g. seahorses, sea-dragons and pipefish) are protected under the provisions of section 71 of the *Fisheries Management Act 2007*. Syngnathid fishes are likely to be present, especially in the seagrass, algal and reef assemblages. It is known that at least some seahorses are abundant around finfish cages, using them as an alternative habitat to seagrass beds and algal assemblages. There is evidence of the presence of the leafy seadragon (*Phycodurus eques*) in the Lower Eyre Peninsula area (Department of Environment and Natural Resources, 2010). The risk of adverse impacts to leafy seadragons is low as cages will not be placed over dense seagrass beds and algal assemblages.

The Sir Joseph Banks Group of islands provides breeding and haul-out areas for Australian sea-lions (*Neophoca cinerea*) and the New Zealand fur-seal (*Arctocephalus forsteri*) approximately 20 km to the south east of Lower Eyre Peninsula. A major Australian sea-lion colony exists at Dangerous Reef

located approximately 50 km to the south of Lower Eyre Peninsula. In addition there are four migratory marine species listed under the EPBC Act; Bryde's whale (*Balaenoptera edeni*), pygmy Right whale (*Caperea marginata*), dusky dolphin (*Lagenorhynchus obscurus*) and killer whale (*Megaptera novaeangliae*).

Marine waters adjacent to Lincoln National Park contain areas of significant heritage and cultural significance (geographical monuments of Cape Catastrophe, Memory Cove and Cape Donington) as well as significant great white shark (*Carcharodon carcharias*) populations (including areas that are significant for breeding females), seabird breeding areas and as breeding and habitat areas for New Zealand Fur Seals (*Arctocephalus forsteri*) and Australian sea-lions. The area is also utilised by a range of cetaceans including Southern Right Whales (*Eubalaena australis*).

All marine mammals (and sharks) have the potential to become entangled in nets or mooring lines. However, section 19 of the *Aquaculture Regulations 2005* specifies that each licence holder must have a written strategy approved by the Minister to minimise adverse interactions with marine mammals (and sharks). In addition, risks posed by the aquaculture activity are assessed at the time of application through the ESD Assessment process consistent with the National ESD Framework.

In November 2002 Cabinet approved the establishment of a Marine Mammal-Marine Protected Areas Aquaculture Working Group (MM-MPA AWG) to develop management arrangements to address the proximity of aquaculture developments to core areas of proposed marine protected areas and significant marine wildlife habitats such as seal colonies and whale breeding areas.

The MM-MPA AWG concluded that the only aquaculture activity to pose a risk to seal/sea lion colonies is finfish aquaculture, and the only seal/sea lion colonies at risk from finfish aquaculture are breeding colonies of Australian sea-lions. The New Zealand fur-seal also interacts with aquaculture operations, is not considered to be at risk from finfish aquaculture, and as such it is proposed that no restrictions will apply in relation to the New Zealand fur-seals.

Cabinet considered the MM-MPA AWG report and in 2005 noted the following recommendations in order to reduce the potential risk to Australian sea-lion breeding colonies from finfish aquaculture:

- Finfish aquaculture located within 5 km of any Australian sea lion non breeding haul-out sites will not be approved;
- Finfish aquaculture will not be approved within 15 km of the eight major Australian sea lion breeding colonies (namely The Pages, Dangerous Reef, Seal Bay, West Waldegrave Island, Olive Island, Franklin Islands, Purdie Island and Nicolas Baudin Island);
- Finfish aquaculture to be located between 5 to 15 km of minor Australian sea lion breeding colonies will have a risk assessment applied during the licence assessment process specifically related to sea lions; and
- Over 15 km, there will be no restrictions in relation to finfish aquaculture.

The proposed aquaculture zone complies with the distances recommended by the MM-MPA AWG. In 2009 SARDI undertook a study considering the foraging habits and spatial movements of sea lions within the Lower Eyre Peninsula area. Although sea lion colonies in these areas are found within close proximity to tuna farms, the report did not indicate any serious interactions or tendencies of tracked sea lions to interact with tuna farms in the area (Goldsworthy *et. al.*, 2009).

A workshop discussing shark interactions with aquaculture was held in Adelaide in October 2004. Representatives from industry, aquaculture structure manufacturing companies, the South Australian Government and other State Governments (including environment protection, research, 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 cages do not appear to be attracting sharks to the 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.”
- 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 2005* (Regulations 19 and 20).

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) employs 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 South Australia on seal interactions with finfish farms. 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.

Table 3. The 16 entries retrieved from South Australian Heritage Places Database (as at 22 July 2011).

Locality	Status Date	Details	Local Government Area	Heritage ID
Port Lincoln	4-Mar-93	Former Windmill Base (sometime Pioneer Mill Museum)	Port Lincoln	14219
Lake Hamilton Via Port Lincoln	14-Feb-85	Former Lake Hamilton Eating House	Lower Eyre Peninsula	10216
Port Lincoln	4-Mar-93	Hawson's Grave Hawson Square	Port Lincoln	14220
Poonindie	5-Apr-84	Former Poonindie Mission Cemetery	Lower Eyre Peninsula	12592
Poonindie	28-Nov-85	Former Superintendent's Residence former Poonindie Mission	Lower Eyre Peninsula	12593
Poonindie	28-Nov-85	Former Bakehouse Complex & Well former Poonindie Mission	Lower Eyre Peninsula	12595
Poonindie	28-Nov-85	Former Schoolhouse (supposed) former Poonindie Mission	Lower Eyre Peninsula	12596
Poonindie	27-Sep-90	St Matthew's Anglican Church former Poonindie Mission	Lower Eyre Peninsula	12591
Sleaford Bay via Port Lincoln	23-Sep-82	Former Fishery Bay Whaling Station	Lower Eyre Peninsula	10223
Port Lincoln	23-Apr-92	'Arrandale' (Dwelling Cottage and Stables)	Port Lincoln	14217
Port Lincoln	21-Oct-93	Port Lincoln Railway Station	Port Lincoln	14608
Sheringa	23-Apr-92	Round Lake Washing Pool	Elliston	14202
Port Lincoln	1-Sep-83	Port Lincoln Police Station & Courthouse	Port Lincoln	10219
White Flat via Port Lincoln	4-Mar-93	Tod Reservoir	Lower Eyre Peninsula	14213
Port Lincoln	24-Mar-83	Dwelling ('Ravendale House')	Port Lincoln	10914
South Neptune Islands	15-Dec-94	South Neptune Island Lighthouse Complex & Neptune Islands Conservation Park	Unincorporated SA	14421

Table 4. The 37 threatened species listed by the Department of Sustainability, Environment, Water, Population and Communities for the Lower Eyre Peninsula region (as at 22 July 2011).

Common Name(s)	Species	Status	Type of Presence
Amsterdam albatross	<i>Diomedea exulans amsterdamensis</i>	Endangered	Species or species habitat may occur within area
Tristan albatross	<i>Diomedea exulans exulans</i>	Endangered	Foraging, feeding or related behaviour may occur within area
Gibson's albatross	<i>Diomedea exulans gibsoni</i>	Vulnerable	Species or species habitat may occur within area
wandering albatross	<i>Diomedea exulans (sensu lato)</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
malleefowl	<i>Leipoa ocellata</i>	Vulnerable	Species or species habitat likely to occur within area
southern giant-petrel	<i>Macronectes giganteus</i>	Endangered	Species or species habitat may occur within area
northern giant-petrel	<i>Macronectes halli</i>	Vulnerable	Species or species habitat may occur within area
western whipbird	<i>Psophodes nigrogularis leucogaster</i>	Vulnerable	Species or species habitat known to occur within area
soft-plumaged petrel	<i>Pterodroma mollis</i>	Vulnerable	Species or species habitat may occur within area
southern emu-wren (eyre peninsula)	<i>Stipiturus malachurus parimeda</i>	Vulnerable	Species or species habitat likely to occur within area
Buller's albatross	<i>Thalassarche bulleri</i>	Vulnerable	Species or species habitat may occur within area
shy albatross, Tasmanian shy albatross	<i>Thalassarche cauta cauta</i>	Vulnerable	Species or species habitat may occur within area
black-browed albatross	<i>Thalassarche melanophris</i>	Vulnerable	Species or species habitat may occur within area
Campbell albatross	<i>Thalassarche melanophris impavida</i>	Vulnerable	Species or species habitat may occur within area
blue whale	<i>Balaenoptera musculus</i>	Endangered	Species or species habitat may occur within area

Common Name(s)	Species	Status	Type of Presence
woylie	<i>Bettongia penicillata ogilbyi</i>	Endangered	Species or species habitat known to occur within area
southern right whale	<i>Eubalaena australis</i>	Endangered	Species or species habitat known to occur within area
Wopilkara or greater stick-nest rat	<i>Leporillus conditor</i>	Vulnerable	Species or species habitat likely to occur within area
greater bilby	<i>Macrotis lagotis</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
Australian sea-lion	<i>Neophoca cinerea</i>	Vulnerable	Breeding known to occur within area
jumping-jack wattle	<i>Acacia enterocarpa</i>	Endangered	Species or species habitat likely to occur within area
fat-leaved wattle	<i>Acacia pinguifolia</i>	Endangered	Species or species habitat likely to occur within area
whibley wattle	<i>Acacia whibleyana</i>	Endangered	Species or species habitat likely to occur within area
greencomb spider-orchid or rigid spider-orchid	<i>Caladenia tensa</i>	Endangered	Species or species habitat likely to occur within area
southern seaheath	<i>Frankenia plicata</i>	Endangered	Species or species habitat likely to occur within area
silver daisy-bush	<i>Olearia pannosa subsp. pannosa</i>	Vulnerable	Species or species habitat likely to occur within area
west coast mintbush or limestone mintbush or red mintbush	<i>Prostanthera calycina</i>	Vulnerable	Species or species habitat likely to occur within area
tufted bush-pea	<i>Pultenaea trichophylla</i>	Endangered	Species or species habitat likely to occur within area
annual stackhousia or annual candles	<i>Stackhousia annua</i>	Vulnerable	Species or species habitat likely to occur within area
bead glasswort	<i>Tecticornia flabelliformis</i>	Vulnerable	Species or species habitat likely to occur within area
metallic sun-orchid	<i>Thelymitra epipactoides</i>	Endangered	Species or species habitat likely to occur within area

Common Name(s)	Species	Status	Type of Presence
loggerhead turtle	<i>Caretta caretta</i>	Endangered	Species or species habitat likely to occur within area
green turtle	<i>Chelonia mydas</i>	Vulnerable	Species or species habitat likely to occur within area
leatherback turtle or leathery turtle or luth	<i>Dermochelys coriacea</i>	Endangered	Species or species habitat known to occur within area
great white shark	<i>Carcharodon carcharias</i>	Vulnerable	Species or species habitat known to occur within area

4.8 Commercial and Recreational Fishing

The offshore area bounded by Gambier Islands in the south, Thistle Island to the south-west, Sir Joseph Banks group of islands to the north-west and Yorke Peninsula to the east are important spawning areas for King George whiting (Parsons Brinckerhoff and SARDI Aquatic Sciences, 2003).

This area is of moderate overall importance for the Marine Scalefish Fishery. Most species caught in any abundance in South Australia are found in this area. Australian salmon, snapper and a number of other species caught in the marine scalefish fishery are the most predominant catch in the area, with smaller amounts of Southern calamari, King George whiting and garfish also taken. The area to the west of the Sir Joseph Banks group of islands is a significant commercial sardine catch area (Ward *et al.*, 2008).

The south-central and south-eastern sections of the Upper Spencer Gulf region are significant prawn catch areas, predominately in waters deeper than 20 m. The proposed Lincoln (outer) sector covers blocks 89 and 92 for the Spencer Gulf prawn fishery. Prawn catches have been recorded from these areas since 1989/90, with a maximum adjusted catch of approximately 127.3 tonnes from block 92 in 1990/90. Adjusted catch for block 92 since 2001/02 has averaged approximately 4.4 tonnes.

The area is also used by abalone divers and lobster fishermen. For the proposed Lincoln (outer) sector, lobster fishing is associated with hard substrate around Buffalo Rock and south of Spilsby Island.

The Sir Joseph Banks group of islands is also popular with recreational fishers and the charter fishing industry frequent the waters within the boundaries of the Lincoln (outer) sector.

A state-wide recreational fishing survey carried out by PIRSA Fisheries in 2007/08 provided further data on the use of these waters by South Australian residents who recreationally fished. The survey data was collected across 'regions' with the relevant data for the Lower Eyre Peninsula being referred to as fishing region 7 (Jones, 2009).

The survey indicated that the waters south of Tumby Bay to Point Bolingbroke are relatively popular. They attracted approximately 15% of the fishing events in fishing region 7 during 2007/08 (Jones, K., pers. comm., 5 August 2009).

The waters east of Sir Joseph Banks were less frequently used by the recreational fishers surveyed, with a usage by recreational fishers of 1% for these waters in the same period.

The 'Spencer Gulf/Coffin Bay' region is relatively popular with the charter boat fishing industry. There are currently 21 licence holders utilising the area, with King George whiting being the main species targeted (Knight, M., pers. comm., 6 August 2009). The 'Spencer Gulf/Coffin Bay' Region accounted for 31% of fish harvested by the Charter Boat Fishery in the period July 2008 to June 2009 (Knight, 2010).

4.9 Historic Shipwrecks

One of the Principles of Development Control in the Land Not Within a Council Area (Coastal Waters) (LWCA(CW)) Development Plan requires that "marine aquaculture development must be located at least 550 m from a proclaimed shipwreck". Whilst aquaculture within an aquaculture zone delineated within the LWCA(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 *Historic Shipwrecks Act 1976* (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, Lacedepe Bay, Rivoli Bay and Anxious Bay – which are covered under the *Historic Shipwrecks Act 1981* (SA).

Shipwrecks proclaimed under the *Historic Shipwrecks Act 1981* or the Commonwealth *Historic Shipwrecks Act 1976* are located off the coast of Port Lincoln. In accordance with the requirement of the Land Not Within a Council Area (Coastal Waters) Development Plan all aquaculture development within a zone must be located at least 550 m from a proclaimed shipwreck.

Presently, thirty five shipwrecks have been recorded in the Jussieu and Gambier bio-units by the Department for Environment and Heritage. Of these thirty five, eleven are in and around the Sir Joseph Banks Group, two are at Dangerous Reef, five within Thorny Passage and seventeen within the bays of Port Lincoln. Three of these shipwrecks are protected under the South Australian *Historic Shipwrecks Act 1981* (Rodda *et al.*, 2009). There are no known shipwrecks within the proposed Lincoln (outer) sector.

4.10 Shipping and Navigation

Flinders Ports manages the port waters at Port Lincoln in accordance with the *Harbors and Navigation Act 1993*. The boundary of the port is described in Schedule 3a of the *Harbors and Navigation Regulations 1994*.

Aquaculture development within a zone should avoid commercial shipping movement patterns or activities associated with existing jetties and wharves.

Aquaculture leases and/or licences stipulate that navigation marks be installed whenever structures are located in the leased area, it is therefore considered aquaculture infrastructure should not pose a navigational hazard.

The proposed amendments to the Lincoln aquaculture exclusion zone and the Lincoln (inner) sector aim for a better alignment with existing shipping channels. The aquaculture exclusion zone will, wherever possible, include a 100m buffer with those existing shipping routes.

Also, as part of the creation of the Lincoln (outer) sector, discussions have been held between PIRSA and the Department for Transport, Energy and Infrastructure to establish a preferred route for commercial boats travelling from Port Lincoln, Whyalla, Wallaroo and potentially Sheep Hill. The proposed Lincoln (outer) sector is located at least 100 m from this preferred route.

The Department of Defence has been contacted regarding the proximity of exercise areas to the proposed outer sector. It has been confirmed by Defence that naval operations are carried out in and around Thistle Island and Dangerous Reef and the proposed outer sector will not impinge on these exercise areas.

The issue of oil spill contingency plans was raised at the interagency referral meeting on 11 May 2011. Flinders Ports has an oil spill contingency plan and PIRSA would consult with Flinders Ports if one were to occur. PIRSA Fisheries and Aquaculture is currently amending provisions under the Act to enable more efficient and streamlined approaches to dealing with emergencies including approaches to the movement of leases and licences when in emergency situations (see division 5 – *Aquaculture (miscellaneous) Amendment Bill 2010*).

4.11 Tourism

Port Lincoln is a thriving regional community. With a population of some 15,000 people, its fishing and aquaculture industries, coupled with the regions mild Mediterranean style climate and unique geography, make it a popular tourist destination.

The waters surrounding Port Lincoln are home to sea lions, dolphins, southern right whales and a plethora of shellfish and fish species. The abundant and varied marine life brings many people to Port Lincoln and its surrounds, undertaking recreational fishing, dive experiences with dolphins, sea-lions, sharks and southern bluefin tuna, not to mention the self-drive seafood and aquaculture trail which is the only one of its type in Australia.

Other tourism activities within the Port Lincoln area include sailing, bushwalking and surfing as well as visiting the Lincoln National Park and Sir Joseph Banks Group Conservation Park. The distinct flora and fauna found in this area coupled with the beauty and variety found in the geography make these popular tourist destinations. Yacht races occur in the middle of the proposed Lincoln (outer) sector and in Louth Bay (Adelaide to Lincoln Yacht race and others).

In the year to September 2011 there were an estimated 321,000 overnight visitors to the Eyre Peninsula region, staying approximately 1.7 million nights. Of this number 74% were intrastate visitors, 22% interstate visitors and 4% were international visitors. On average overnight visitors stayed 5.3 nights, with international visitors averaging 8.2 nights, interstate visitors 6.1 nights and intrastate visitors 5.0 nights. The most popular activities included going to the beach, fishing, visiting national parks and bushwalking (Gary Haines, pers. comm., 6 January 2012)².

4.12 Sites of Scientific Importance

There are no recorded geological monuments located within the Jussieu and Gambier bio-unit (http://www.minerals.pir.sa.gov.au/geology/geological_monuments).

4.13 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 Regulation 11 of the *Aquaculture Regulations 2005* requires licensees to report unusually high mortality rates. These industry specific requirements are aimed to provide an effective monitoring system that has the sensitivity and specificity to identify mortalities resulting from the introduction of an exotic or newly emerging disease pathogen, without capturing the mortalities that are ordinarily experienced annually during the 6–12 week post transfer.

Disease reporting requirements as stipulated in the *Aquaculture Regulations 2005* and *Livestock Act 1997* are considered adequate to monitor and adaptively manage any emerging production disease risks.

5 REGIONAL IMPACT ASSESSMENT

Matters raised in the 2013 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 2013 Policy within the region.

² SATC analysis of IVS and NVS data – Eyre Peninsula, January 2012

5.1 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, sardine and abalone fishing), and concerns around the potential for interactions with water quality and sensitive species and habitats.

The following groups may be affected by the proposed zoning and 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 NGOs, 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 has sought and/or invited input and guidance from these parties throughout the consultation process.

5.2 Consultation Undertaken in Relation to Regional Issues

Following preparation of the 2013 Policy and 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 2013 Policy (section 12(4)(a) of the Act).

The following bodies are prescribed:

- South Australian Native Title Services Limited;
- Conservation Council of South Australia Incorporated;
- Local Government Association of South Australia;
- Seafood Council SA;
- Fisheries Council of South Australia;
- South Australian Aquaculture Council;
- South Australian Recreational Fishing Advisory Council;
- 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
- Environment Protection Authority (EPA).

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

- Industry leaders, Department for Transport, Energy and Infrastructure (DTEI), SA Tourism Commission (SATC), South Australian Research and Development Institute, Department of Environment Water and Natural Resources (DEWNR), Department for Water, Coast Protection Board, Department of Health, Aboriginal Affairs and Reconciliation Division, Native Title Unit, Community and Local Government Relations, Office of Regional Affairs, PIRSA Legal Unit, PIRSA

Fisheries and Aquaculture, Fisheries Compliance Services, Rural Solutions SA, District Council of Lower Eyre Peninsula, Eyre Regional Development Board, and relevant Lower Eyre Peninsula Community groups.

The 2013 Policy and Report describing the zoning proposal are distributed to key stakeholders as the basis for consultation. These documents are available on the PIRSA Fisheries and Aquaculture website for 2 months.

Public notices are placed in *The Advertiser*, *Port Lincoln Times* and *Koori Mail* seeking comment from members of the public.

To provide stakeholders with the opportunity to speak directly with PIRSA Fisheries and Aquaculture, public briefings in the region are organised to take place during the 2 month consultation period.

Additionally, all existing lease and licence holders in the aquaculture zone area will be advised during the 2 month consultation period of the policy proposal by letter.

The following stakeholder group meetings and discussions have been held:

Date	Name of Meeting	Attendees
17 December 2010	Interagency Meeting – Proposed Lower Eyre Peninsula Aquaculture Zone Policy	Representatives from EPA, PIRSA Fisheries & Aquaculture, DEWNR, DTEI, SATC
20 January 2011	Personal communication	Andrew Carr (PIRSA Fisheries Compliance)
19 July 2011	Personal communication	Peter Welch (Marine Fishers Association) Peter Noble (Charter Boat Owners Association)
11 May 2011	Interagency Meeting – Proposed Lower Eyre Peninsula Aquaculture Zone Policy	Jenny Cassidy (DTEI), Peter Hanson (Flinders Ports), Tara Ingerson (EPA), Coby Matthews (EPA), Matt Nelson (EPA), Sam Gaylard (EPA), Warwick Noble (EPA), Alison Wright (DEWNR), Gary Haines (South Australian Tourism Commission), James Bennett (PIRSA), Peter Lauer (PIRSA), Stephen Madigan (PIRSA), Manue Sloan (PIRSA)
12 July 2011	Personal communication	Brian Jeffriess (Australian Southern Bluefin Tuna Industry Association), David Ellis (Australian Southern Bluefin Tuna Industry Association)
19 July 2011	Personal communication	Peter Welch (Marine Fishers Association), Peter Noble (Charter Boat Owners Association)
20 July 2011	Personal communication	Simon Clark (Spencer Gulf & West Coast Prawn Fishermen's Association), Justin Phillips (South Australian Rock Lobster Association Committee), Paul Watson (South Australian Sardine Industry Association)

Date	Name of Meeting	Attendees
22 July 2011	Personal communication	Samara Miller (Australian Abalone Growers Association)
21 November 2011	Public meeting at Ravendale Sports Centre, Port Lincoln	Members of public
5 November 2011 to 14 January 2012	Public consultation period	All members of the public
26 March 2012	Aquaculture Advisory Committee (AAC) meeting	AAC members

5.3 Potential Effects

The 2013 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 2013 Policy area. Aquaculture has a number of potential economical, social and environmental effects. These are included in the following section. All comments are invited that could improve this information.

Lower Eyre Peninsula has a number of advantages over potential alternative locations where developers might seek to expand or initiate operations.

Specific favourable attributes of the proposed aquaculture zone include:

- The waters off Lower Eyre Peninsula where the proposed aquaculture zones are to be located have suitable physical characteristics.
- Local industry support services including boat launching.
- Substantial infrastructure including roads, electricity, telecommunications and, especially in Port Lincoln, fish processing, cold chain facilities and fish waste management facilities.

For existing farmers in the Lower Eyre Peninsula and Lower Eyre Peninsula area, favourable factors include:

- Familiarity with local waters, infrastructure, institutional conditions, and commercial networks.
- Proximity to existing operations, reducing travel and communications costs.
- Established relationships with service, input providers and workforce participants.
- Optimal environmental conditions for safe operation and maximum productivity (e.g. wave height, currents).

If zoning does not occur in the Lower Eyre Peninsula area, future aquaculture development would rely on the pilot lease application process (albeit subject to the Development Plan policy) and the full economic potential of the industry is unlikely to be achieved. This is not a strategic planning process and is less streamlined, less efficient, and could lead to an unplanned or ad hoc approach to resource use.

5.3.1 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, 2011). 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 such as; inland ventures using recycled water, integrated multi-trophic aquaculture and aquaponic-type production systems.

Aquaculture can provide significant investment and employment opportunities to rural and regional economies. A report by EconSearch (2011) estimated the direct output of aquaculture in South Australia in 2009/10 to be \$272 million (\$194 million on-farm and \$78 million in downstream activities). Direct employment was estimated to be in excess of 1,700 full time equivalent positions (FTE) in 2009/10 with 1,665 flow-on jobs, giving total employment of 3,441 FTE, with around 71% of these jobs generated in regional South Australia. The tuna and oyster sectors accounted for the majority of employment in the Eyre Peninsula region (74%). Southern bluefin tuna farming is the largest single sector in the state's aquaculture industry accounting for 53% (\$102.2 million) of the state's gross value of aquaculture production in the 2009/10 financial year (Econsearch 2011).

Most evidence of the economic benefits of aquaculture zoning is qualitative rather than quantitative.

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.
- Optimizing 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 Department of Planning and Local Government 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 proposed Lincoln (outer) aquaculture zone sets a limit of 14,000 tonnes of southern bluefin tuna that can be farmed. The benefits that an industry of that size allowed under this policy could have, has not been modelled. However, given that it is more than double the amount allowed under the 2007 Policy for the Lincoln (inner) zone the potential economic impact is substantial. The expansion of aquaculture in the Lower Eyre Peninsula area arising from the aquaculture zone policy will have “downstream” implications for existing businesses in terms of maintenance and support services, including the first level of transport, processing, marketing and handling of aquaculture production.

5.3.2 Social Effects

The aquaculture industry has developed rapidly in recent years. Through its relatively large requirement for labour and material inputs, the industry has shown the potential to increase the complexity and diversity of local economies. In general, the demand for local labour, goods and services from aquaculture development may assist in offsetting the contraction of other local industries and thus avoid a range of other economic and social pressures associated with declining regional economies.

In addition to the regional impacts generated by recurrent expenditures in the aquaculture sector, further economic impacts are generated by the investment of profits in new or under resourced local ventures

by aquaculture operators. For example, the current profitability in the tuna farming sector underpins the very substantial local investment by tuna farmers in the local cannery, shipyard, marinas, property (e.g. hotels) and other industries (e.g. yellowtail kingfish aquaculture and viticulture).

Tourism activities associated with the aquaculture sector (e.g. recreational fishing and farm tours) provide a further source of income and employment for regional economies with a well developed aquaculture sector (e.g. the Eyre Peninsula region).

The aquaculture sector, particularly the tuna industry, is characterised by a high level of innovation. These innovative ideas have been directed towards value adding opportunities in the tuna industry itself (e.g. fresh fish direct marketed to Japan) and to the development of new aquaculture industries (e.g. yellowtail kingfish farming).

The success of the tuna industry, in particular, has been a catalyst for the development of significant research (e.g. the Australian Seafood Cooperative Research Centre) and education resources (e.g. the Lincoln Marine Science Centre at Port Lincoln) within South Australia.

It has been as a result of the research and monitoring programs that the tuna industry now has the confidence to operate further offshore.

One of the challenges for both the 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 proposed Lincoln (outer) aquaculture zone in that it is situated offshore to minimise noise and visual impacts and it contains a broad aquaculture exclusion zone encompassing the Sir Joseph Banks group of islands. There has been history of aquaculture and seafood production in the Lower Eyre Peninsula region and this has brought benefits to the local communities in the form of 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 Lower Eyre 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 (Dore *et. al.*, 2000).

5.3.3 Environmental Effects

With the exception of the proposed Lincoln (outer) sector and a potential increase (pending in the maximum aggregate biomass of supplementary fed aquatic animals (other than prescribed wild caught tuna) and bivalve molluscs able to be farmed in the proposed Louth Bay aquaculture zone, there is no additional aquaculture proposed for areas covered by the 2007 Policy.

Regional impacts to water quality that affect seagrass are difficult to measure and even more difficult to attribute to the source(s). The 2013 Policy recommends conservative biomass limits for finfish to maintain water quality within the water quality criteria specified by the *Environment Protection (Water Quality) Policy 2003*. These finfish carrying capacity models are developed by SARDI so that no more than what the environment can assimilate will be farmed on the area (Fitzgibbon, 2007). Research underway in Innovative Solutions for Aquaculture Planning and Management 2 (IS-2) 'Carrying Capacity for Spencer Gulf' will provide better models for assessing carrying and assimilative capacity at the gulf scale and in turn setting biomass limits to mitigate adverse regional impacts to water quality.

The farming of filter feeding bivalves and macro algae has the potential to offset some of the soluble nutrient waste streams from farmed supplementary fed species. Currently there is no empirical data to calculate the magnitude of this offset and further research is required. Consequently, research currently underway is examining how macroalgal culture can mitigate nutrient inputs from finfish farming via the Premier's Science Research Fund project titled "Development of a Sustainable Australian Macroalgal Aquaculture Industry". The project aims to establish South Australia as a lead state in Australia in macroalgal farming and associated research and development. An objective of the research is to turn nutrient enriched waste water streams into a resource for macroalgal production whilst also delivering environmental benefits to coastal waters.

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). These assessments consider the risk of a variety of impacts to the environment at both the site and regional level. Additionally, the environmental impacts from aquaculture are monitored as part of an Environmental Monitoring Program specific to the class of aquaculture undertaken and stipulated in the *Aquaculture Regulations 2005*. 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.

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APPENDIX A – GLOSSARY OF TERMS

<i>Adaptive Management</i>	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.
<i>Assimilative capacity</i>	The capacity of a natural body of water to receive wastewaters without deleterious effects to aquatic life.
<i>Benthic</i>	Of or relating to or happening on the bottom under the ocean/lake.
<i>Biodiversity</i>	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.
<i>Biomass</i>	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. 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).
<i>Bivalve mollusc</i>	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.
<i>Broodstock</i>	Aquatic organisms from which subsequent generations are intended to be produced for the purpose of aquaculture.
<i>Carrying capacity</i>	The maximum population of a given organism that a particular environment can sustain.
<i>Closures</i>	Prohibition of fishing during particular times or seasons (temporal closures) or in particular areas (spatial closures), or a combination of both.
<i>Depauperate</i>	Lacking species variety.
<i>Ecologically sustainable development (ESD)</i>	ESD is described in the <i>Aquaculture Act 2001</i> as: 'Development is ecologically sustainable if it is managed to ensure that communities provide for their economic, social and physical well-being while— (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 mitigated. In making decisions as to whether development is ecologically sustainable or to ensure that development is ecologically sustainable— (a) long-term and short-term economic, environmental, social and equity considerations should be effectively integrated; and (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'.
<i>Ecosystem</i>	A dynamic complex of plant, animal, fungal, and microorganism communities and the associated non-living environment interacting as an ecological unit.



<i>Habitat</i>	The place or type of site in which an organism naturally occurs.
<i>Harvest</i>	A productivity measuring technique relating to the yield of seasonal aquaculture produce.
<i>Infauna</i>	Aquatic organisms (animals only) that live within particulate media such as sediments or soil.
<i>Mapcode</i>	Fishing area defined for catch and effort statistics
<i>Marine Park</i>	Means an area established as a marine park under Part 3 Division 1 of the <i>Marine Parks Act 2007</i> .
<i>Marine protected area (MPA)</i>	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.
<i>Mean High Water Springs</i>	The line representing the average of all high water observations at the time of spring tide over a period of 19 years.
<i>Organic enrichment</i>	The supply of organic material (eg waste feed, faeces) to the seafloor.
<i>Population</i>	A group of individuals of the same species, forming a breeding unit and sharing a habitat.
<i>Spatial</i>	Of or relating to space.
<i>Stakeholder</i>	An individual or a group with an interest in the conservation, management and use of a resource.
<i>Stock</i>	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.
<i>Supplementary fed</i>	Supplementary feeding is the giving of feed to aquatic organisms to supplement any naturally available food.

APPENDIX B – LIST OF ACRONYMS

AAC	Aquaculture Advisory Committee
ANZECC	Australian and New Zealand Environment Conservation Council
ATAB	Aquaculture Tenure Allocation Board
CCSBT	Commission for the Conservation of Southern Bluefin Tuna
CRC	Cooperative Research Centre
DAAR	Department for Aboriginal Affairs and Reconciliation
DAC	Development Assessment Commission
DEWNR	South Australian Department of Environment and Natural Resources
DTEI	Department for Transport, Energy and Infrastructure
DFW	Department for Water
EMP	Environmental Monitoring Program
EPA	Environment Protection Authority
EPBC Act	The Commonwealth <i>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
LGA	Local Government Association
MHWS	Mean High Water Springs
MPA	Marine Protected Area
NPW Act	<i>National Parks and Wildlife Act 1972</i>
NRM	Natural Resource Management
PIRSA	Department of Primary Industries and Regions, South Australia
SARDI	South Australian Research and Development Institute
SATC	South Australian Tourism Commission
The Minister	Minister for Agriculture, Food and Fisheries

APPENDIX C – MAPS AND COORDINATES

A written description of the proposed aquaculture and exclusion zones is provided in the 2013 Policy.

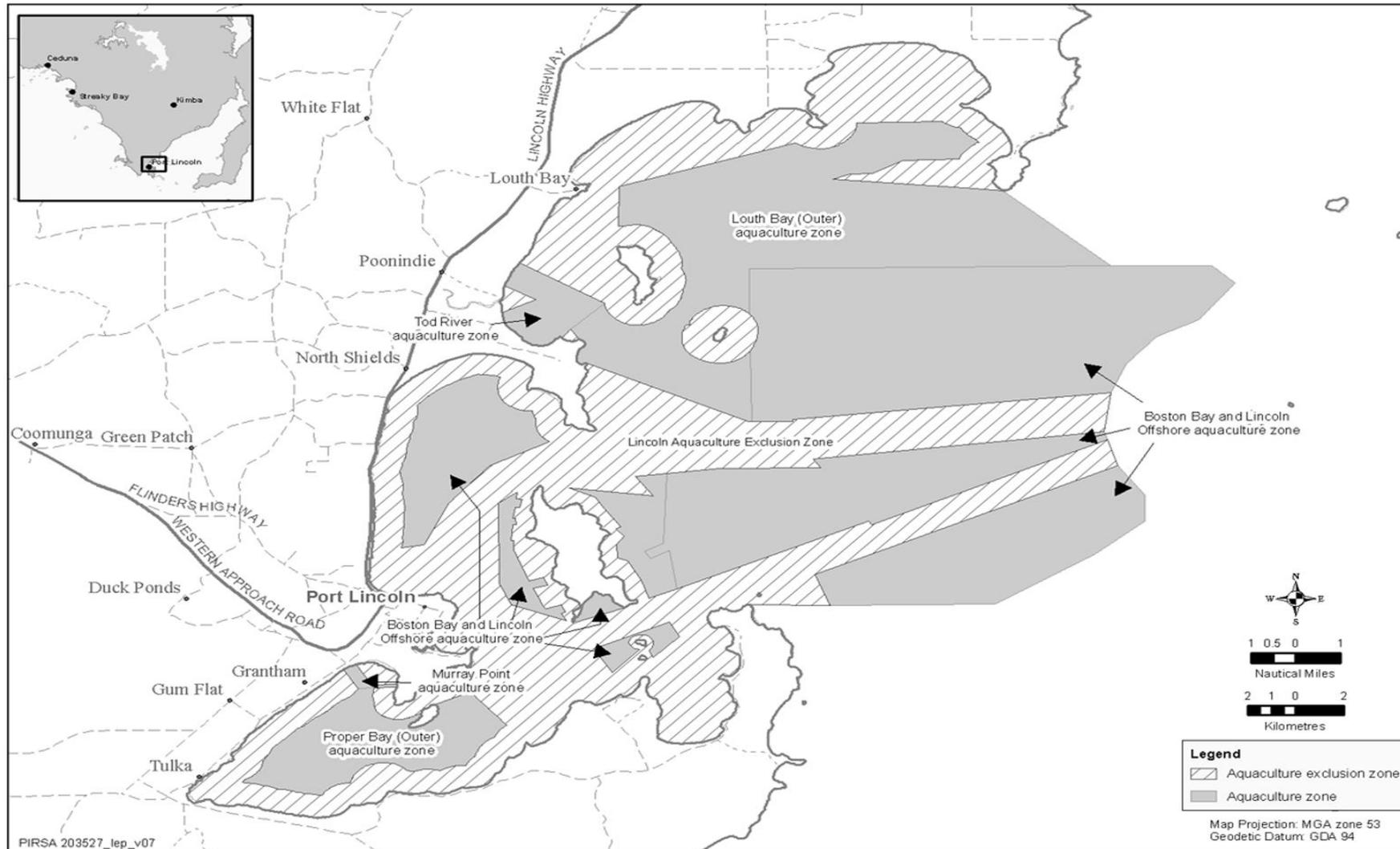


Figure 1. Current aquaculture zones under the 2007 Policy.

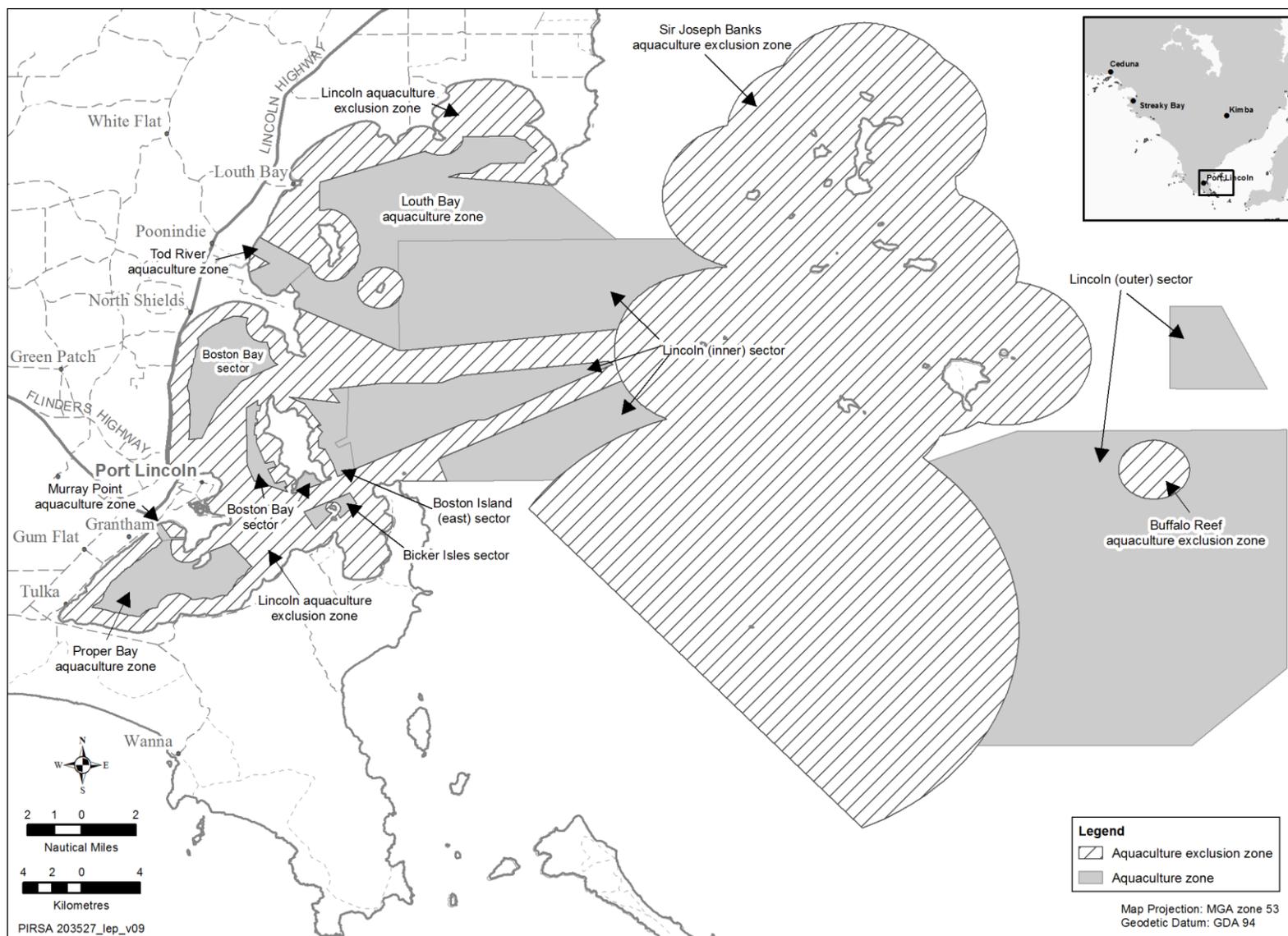


Figure 2. Overview of aquaculture zones and exclusion zones proposed for the Policy.

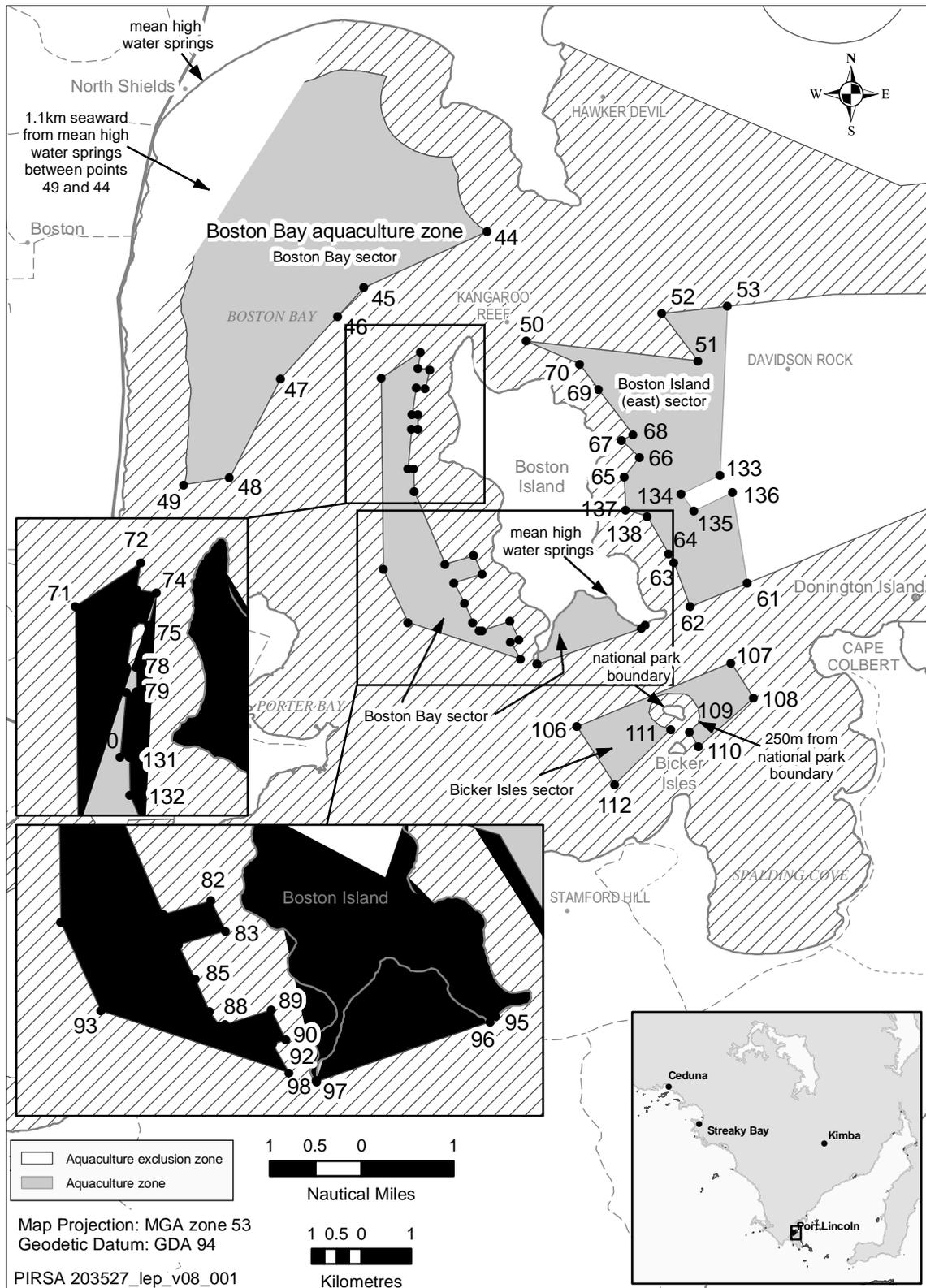


Figure 3. Boston Bay aquaculture zone showing Boston Bay, Bicker Isle and Boston Island (east) sectors.

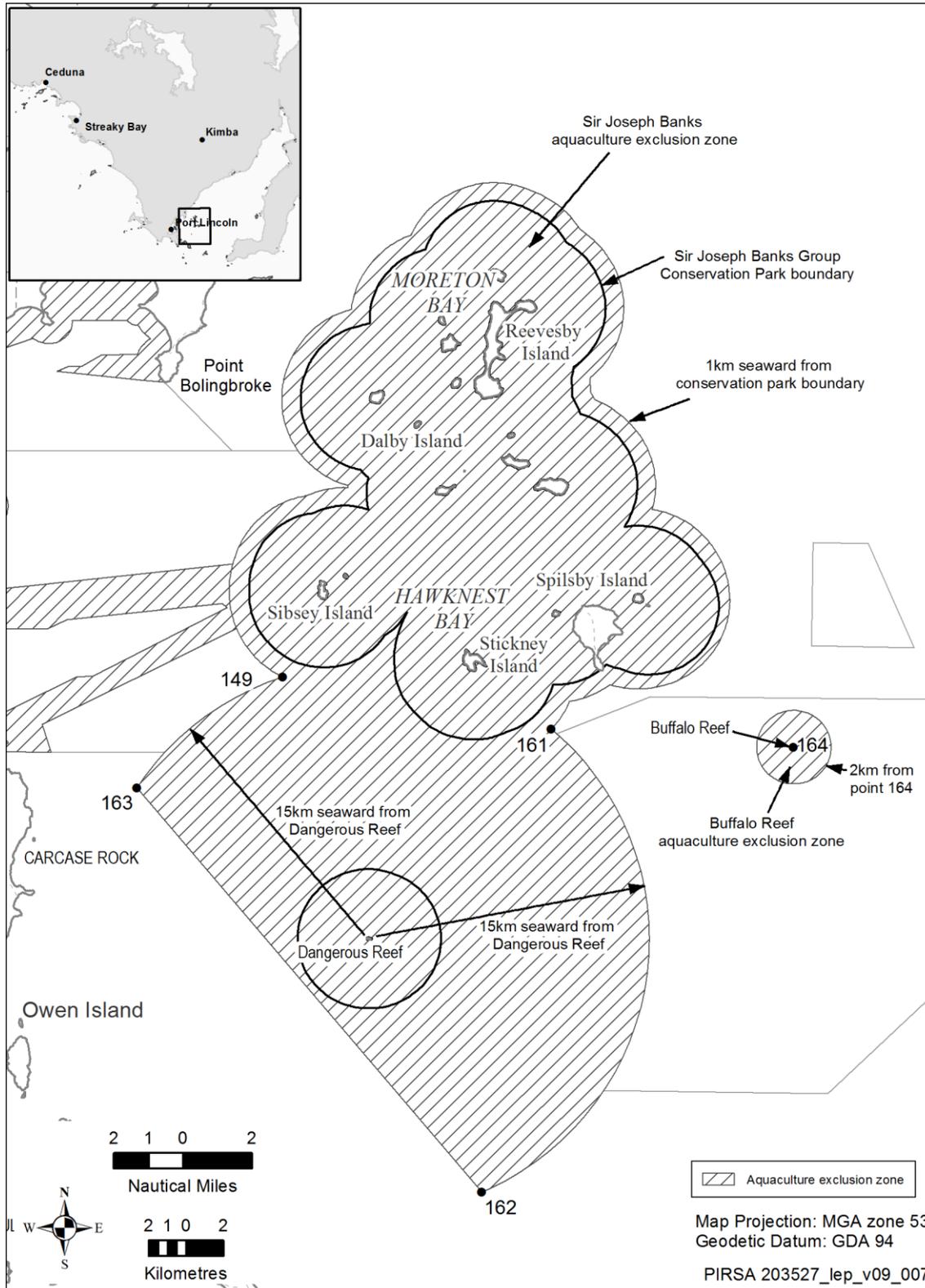


Figure 4. Sir Joseph Banks and Buffalo Rock aquaculture exclusion zones.

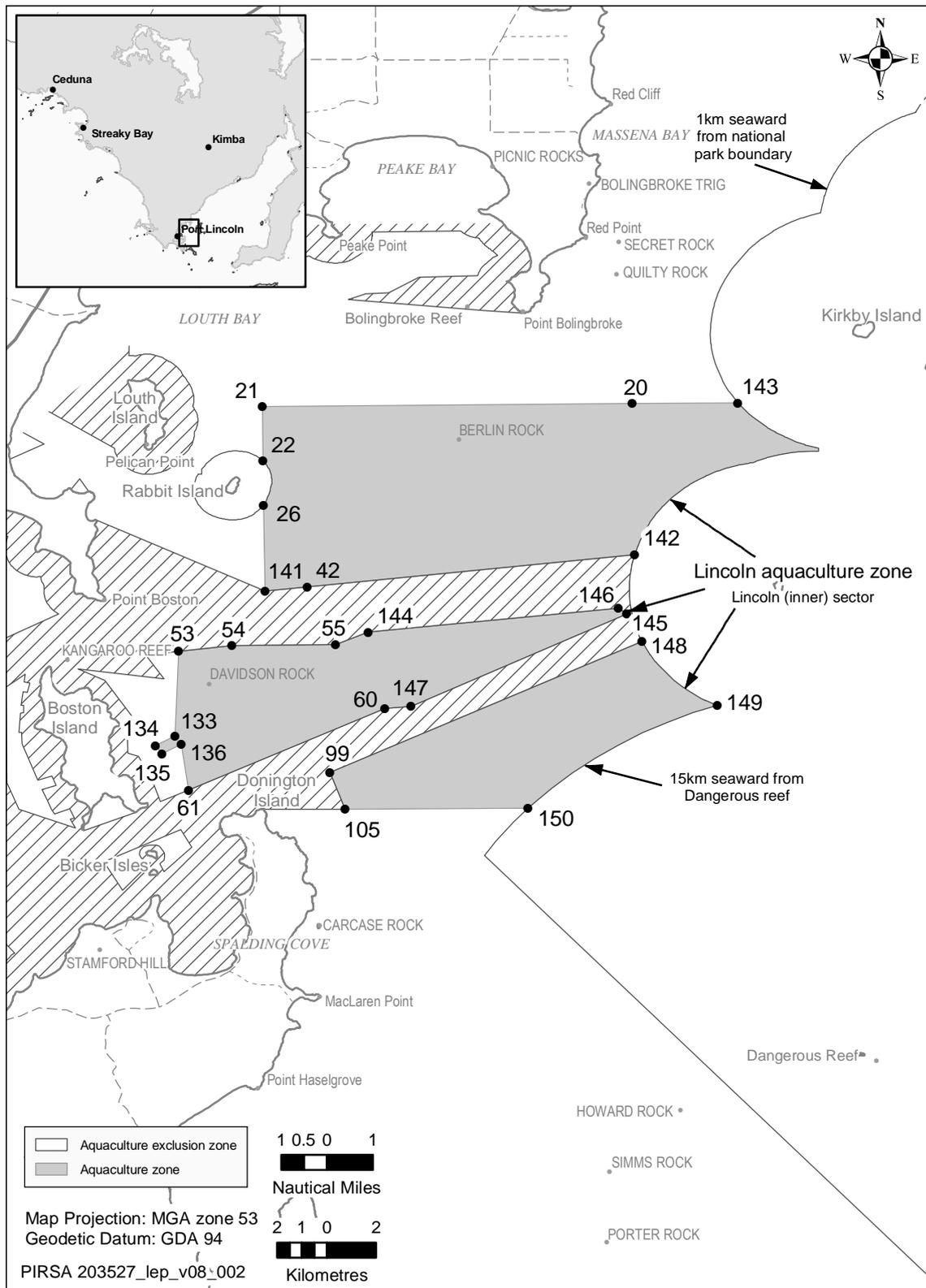


Figure 5. Lincoln aquaculture zone showing Lincoln (inner) sector.

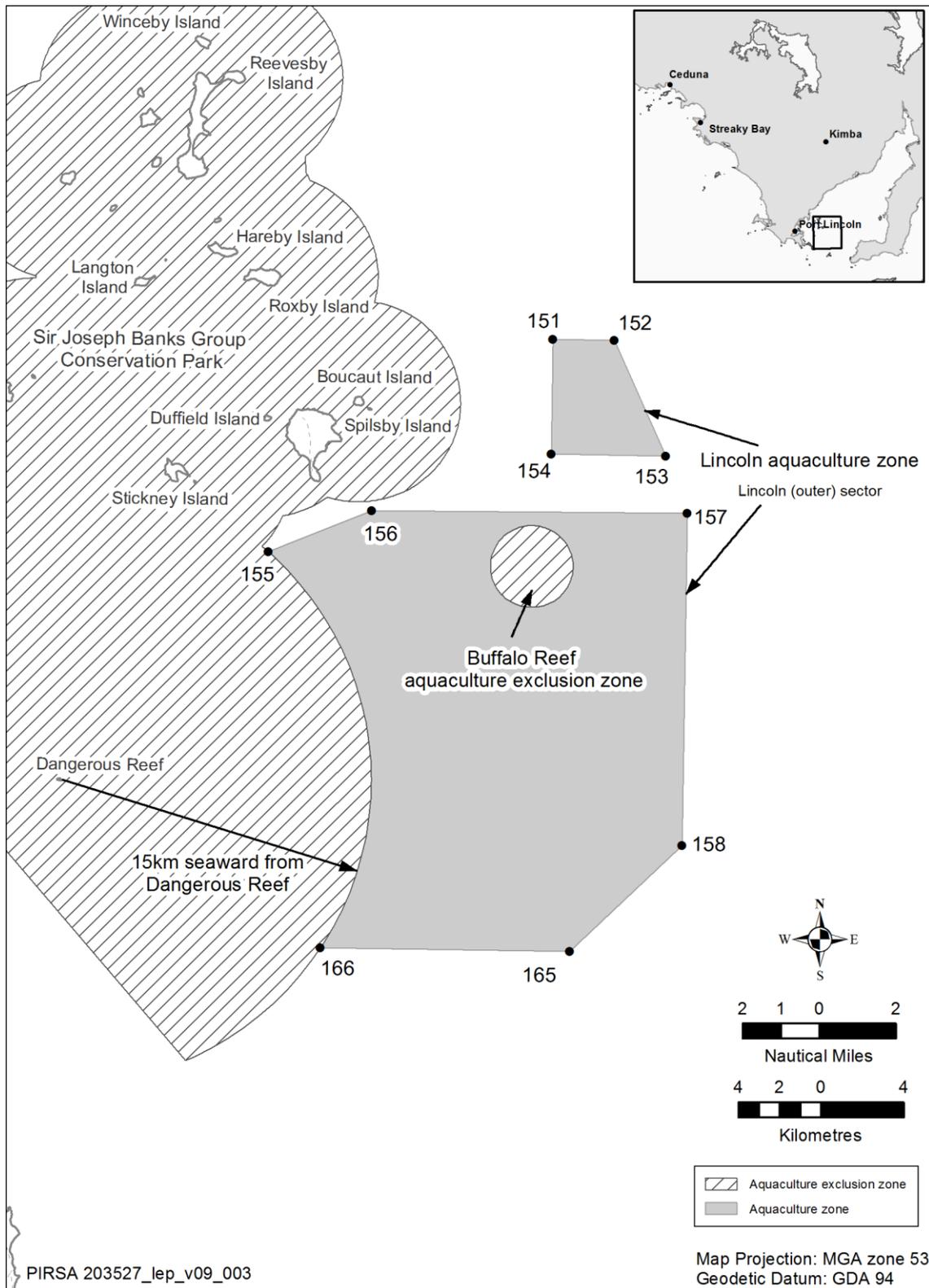


Figure 6. Lincoln aquaculture zone showing Lincoln (outer) sector.

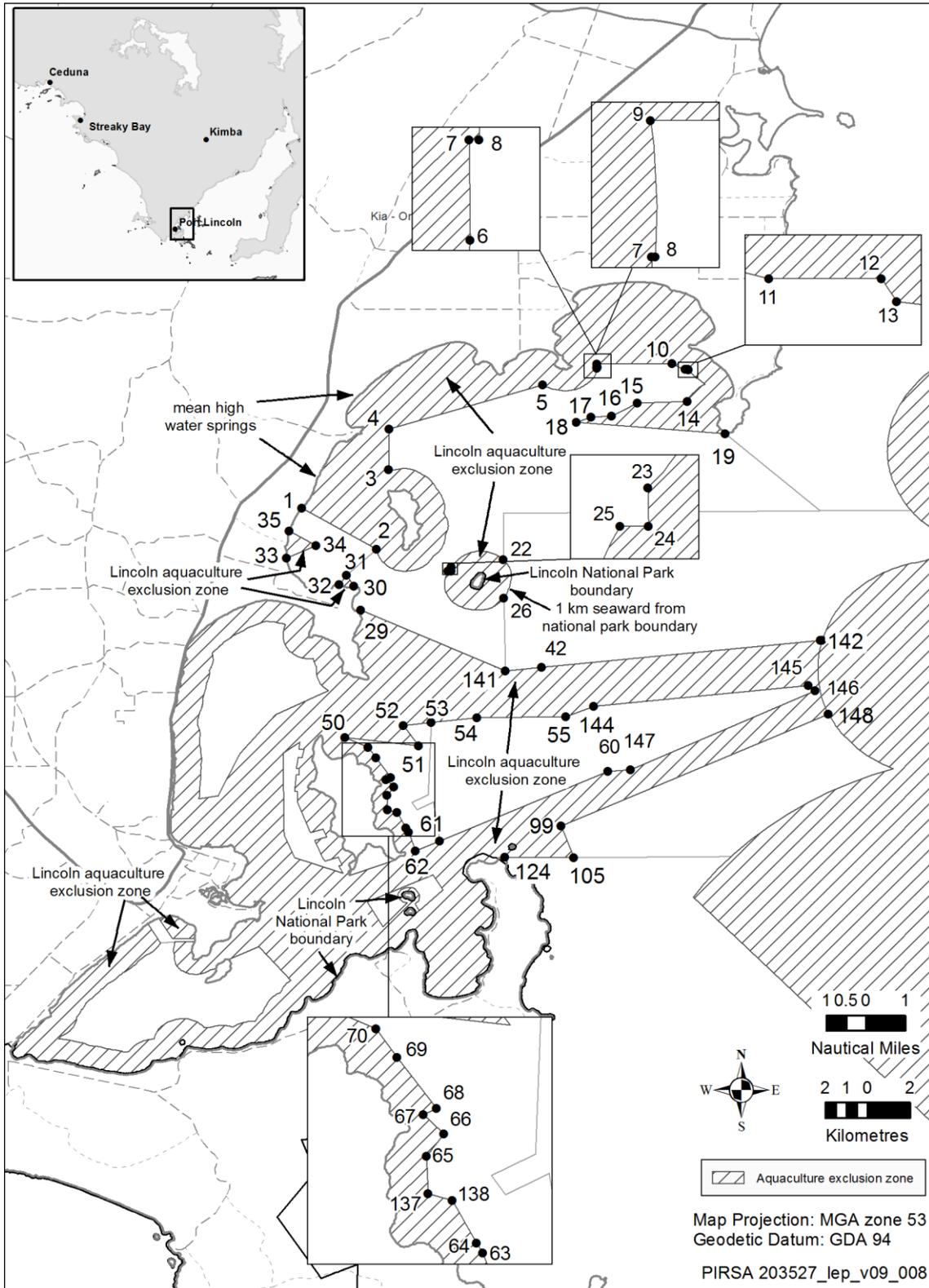


Figure 7. Lincoln aquaculture exclusion zone.

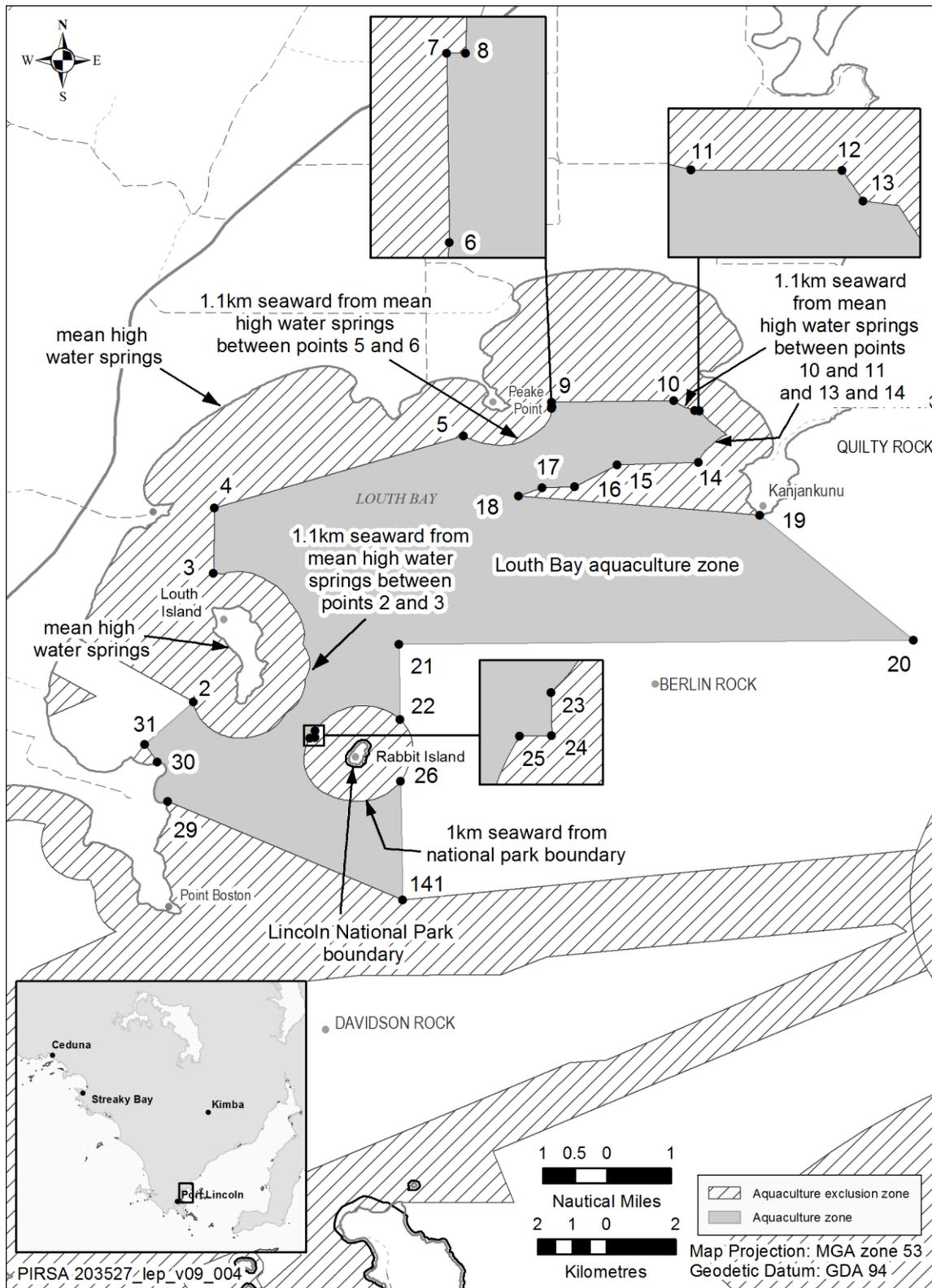


Figure 8. Louth Bay aquaculture zone.

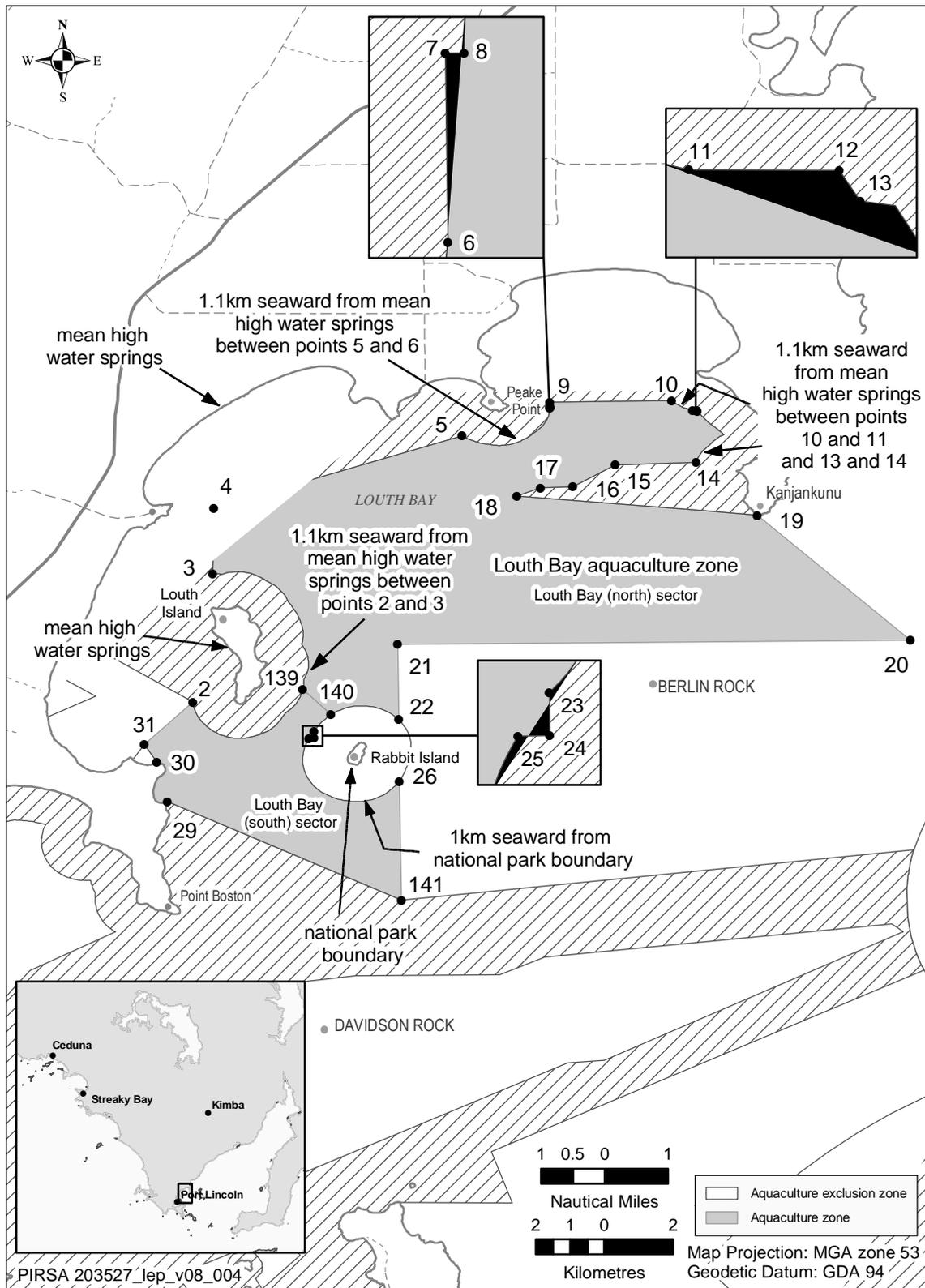


Figure 9. Amended Louth Bay aquaculture zone showing Louth Bay (north) sector and Louth Bay (south) sector.

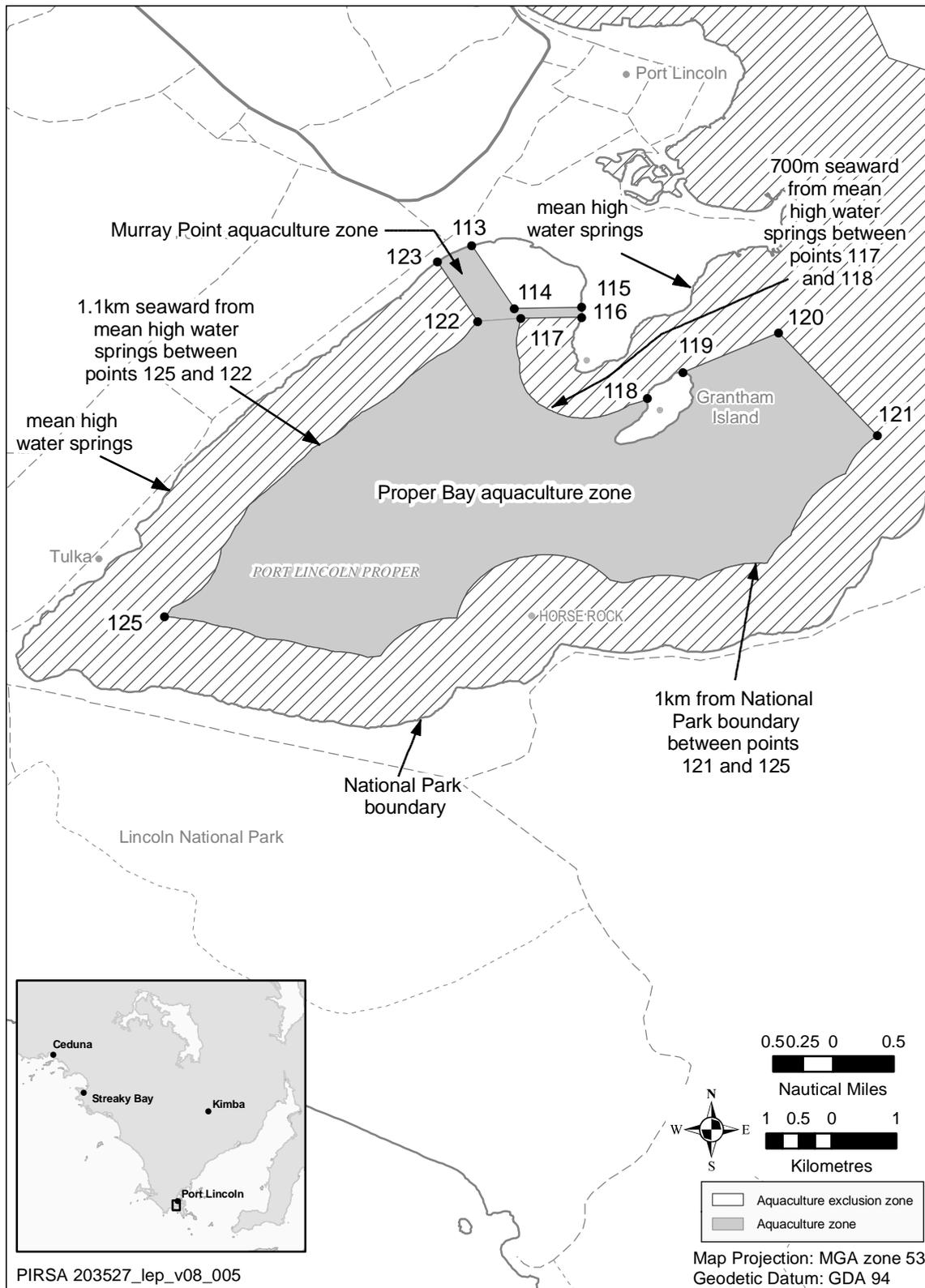


Figure 10. Murray Point and Proper Bay aquaculture zones.

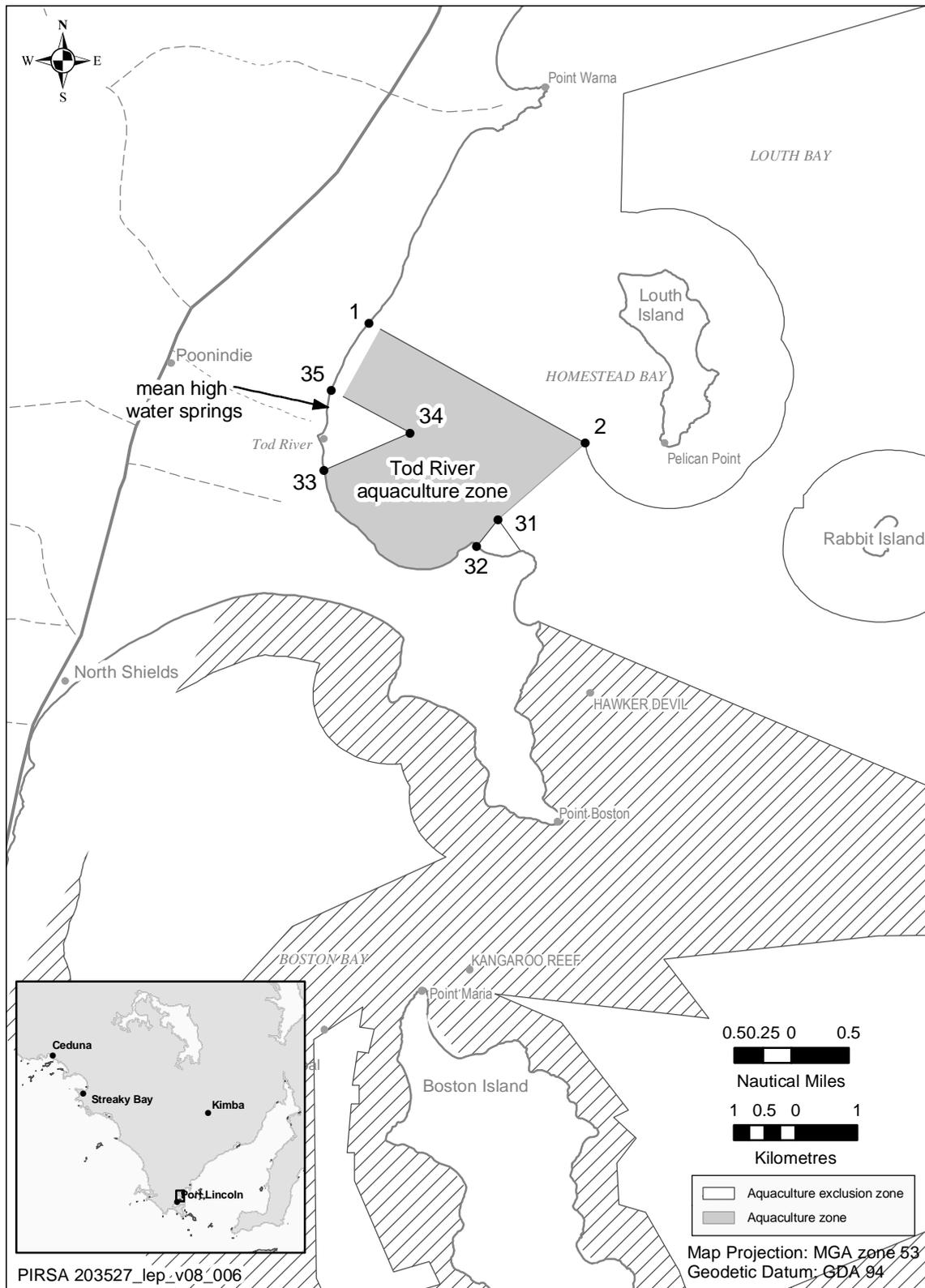


Figure 11. Todd River aquaculture zone.

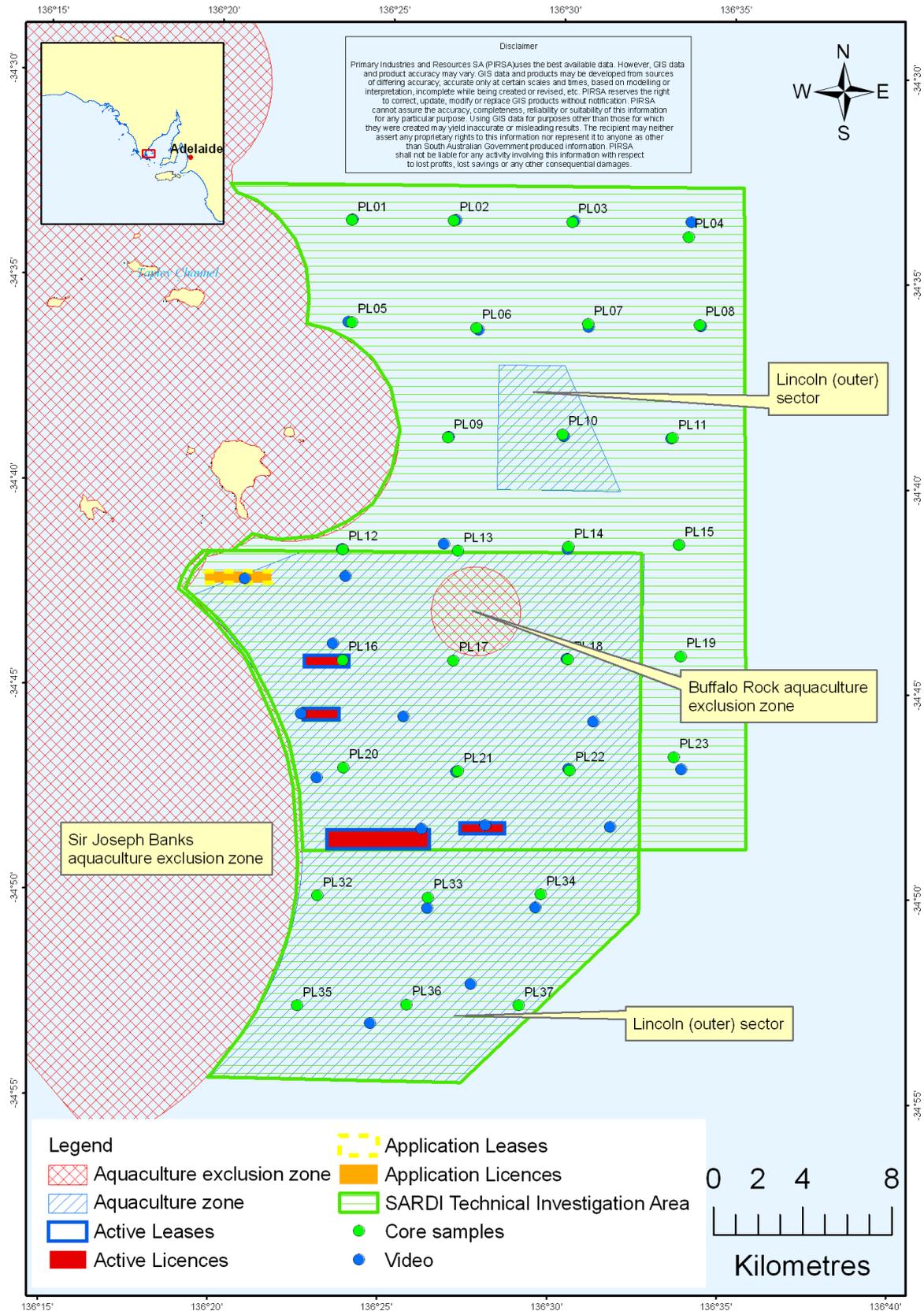


Figure 12. Overlay of the proposed aquaculture and exclusion zones and the SARDI technical investigation area showing the spatial distribution of epibenthic sampling locations.

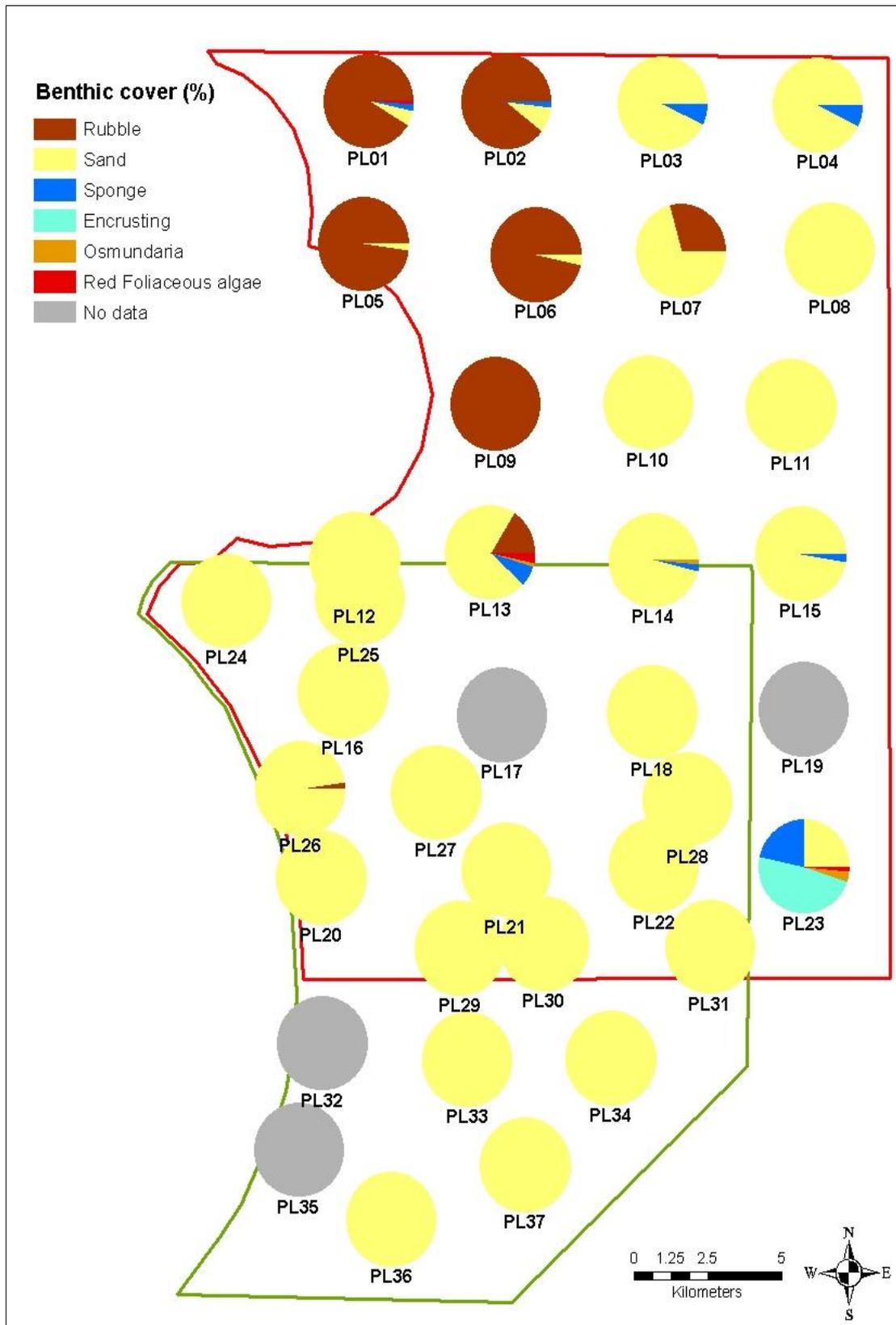


Figure 13. Percentage cover of benthic habitats and assemblages at Lincoln (outer) sector. Taxa that comprise <1% at any one site are not shown. Pie charts are centred on the relative geographic locations of each site with zone boundaries shown as per Figure 12.

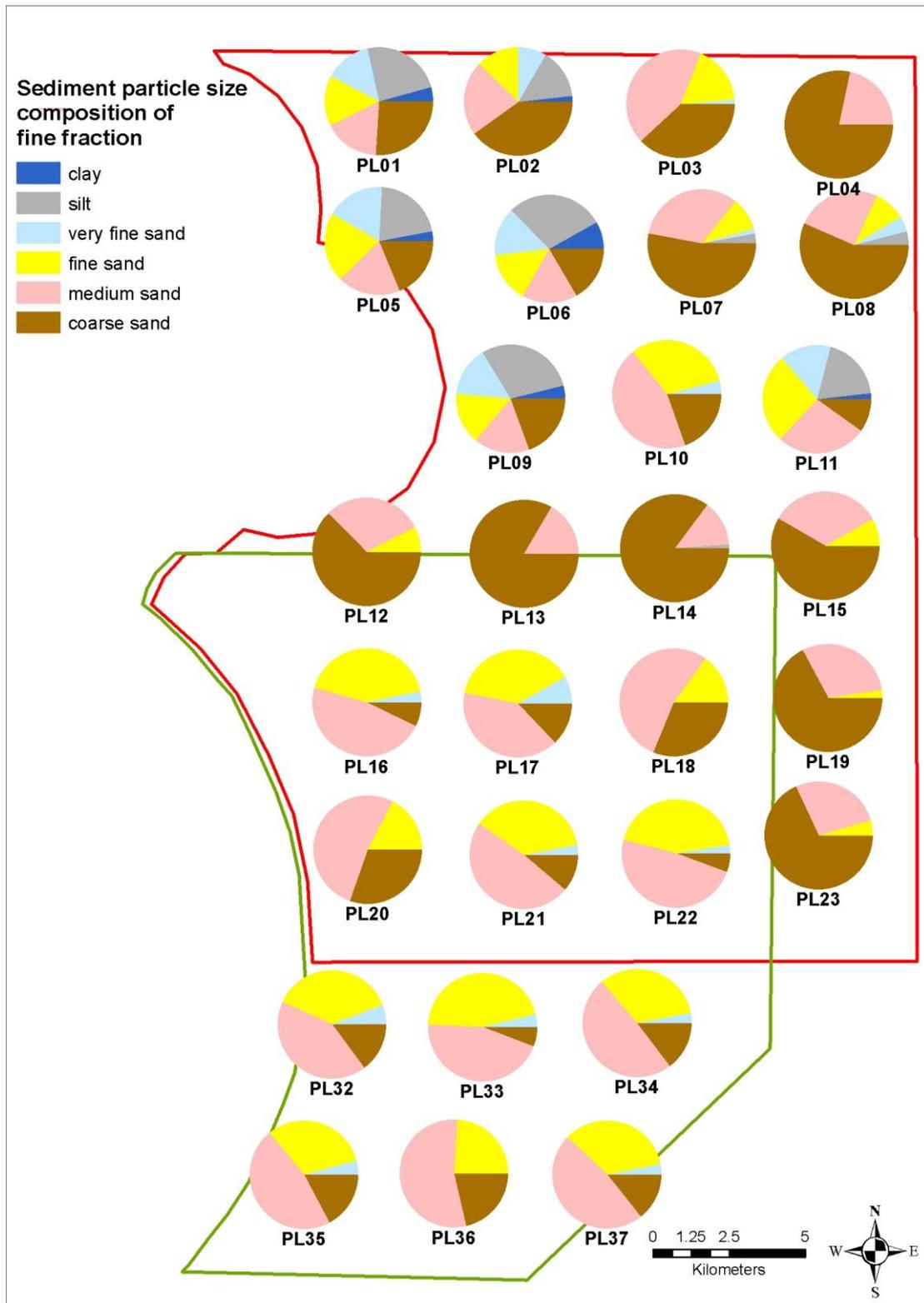


Figure 14. Sediment particle size composition of the fine (<1 mm) sediment fraction for the 29 sites in the Lincoln (outer) sector. Zone boundaries (red and green lines) shown as per Figure 12.

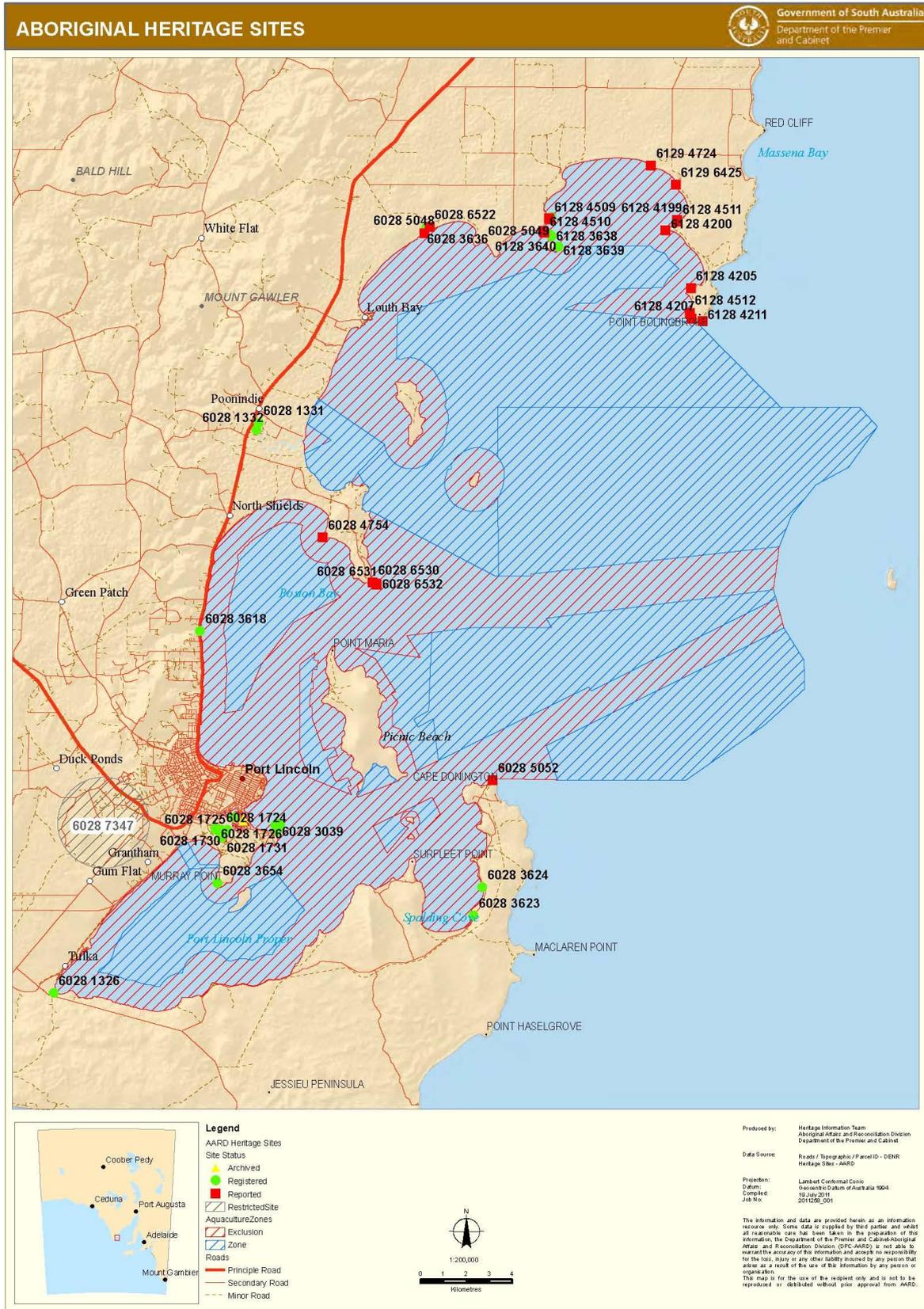


Figure 15. Approximate location of Aboriginal archaeological sites determined from the Register of Aboriginal Sites and Objects administered by the Department of the Premier and Cabinet-Aboriginal Affairs and Reconciliation Division.

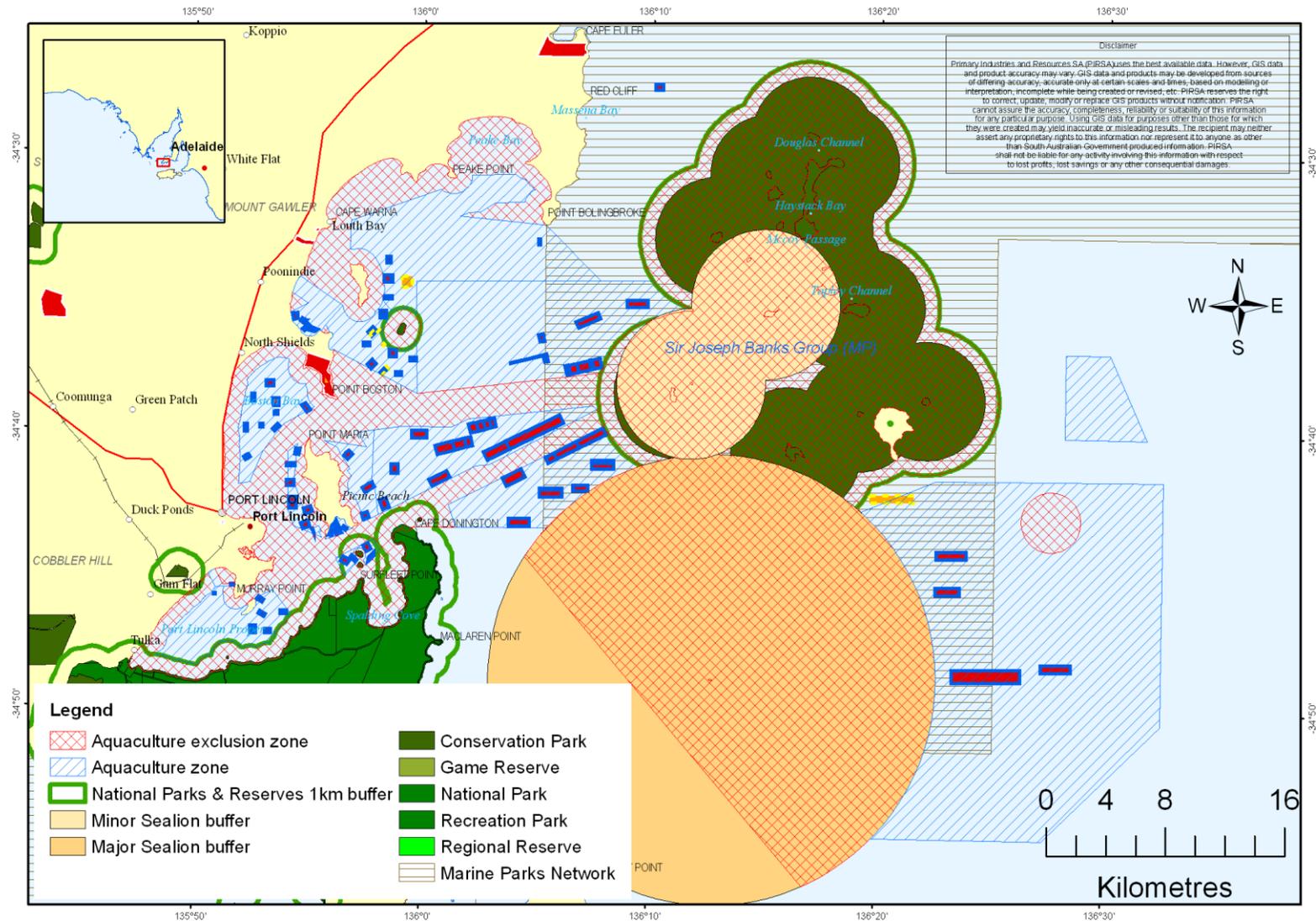
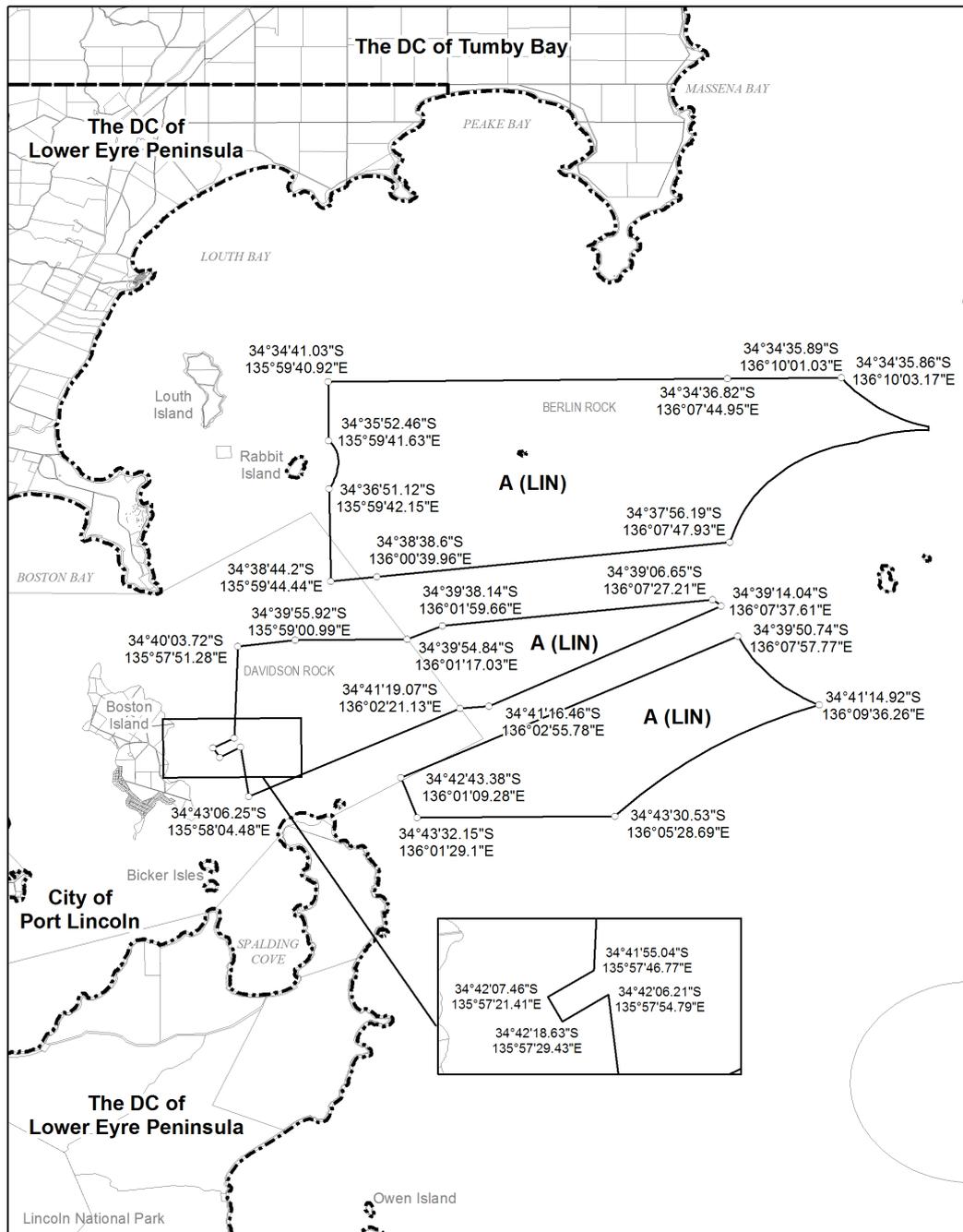
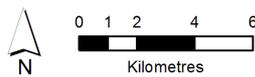


Figure 16. Overlay of the proposed aquaculture and exclusion zones with National Parks and Reserves and Marine Park Network.



**LAND NOT WITHIN A COUNCIL AREA
(COASTAL WATERS)
LINCOLN (INNER)
MAP LNWCA(CW)/?**

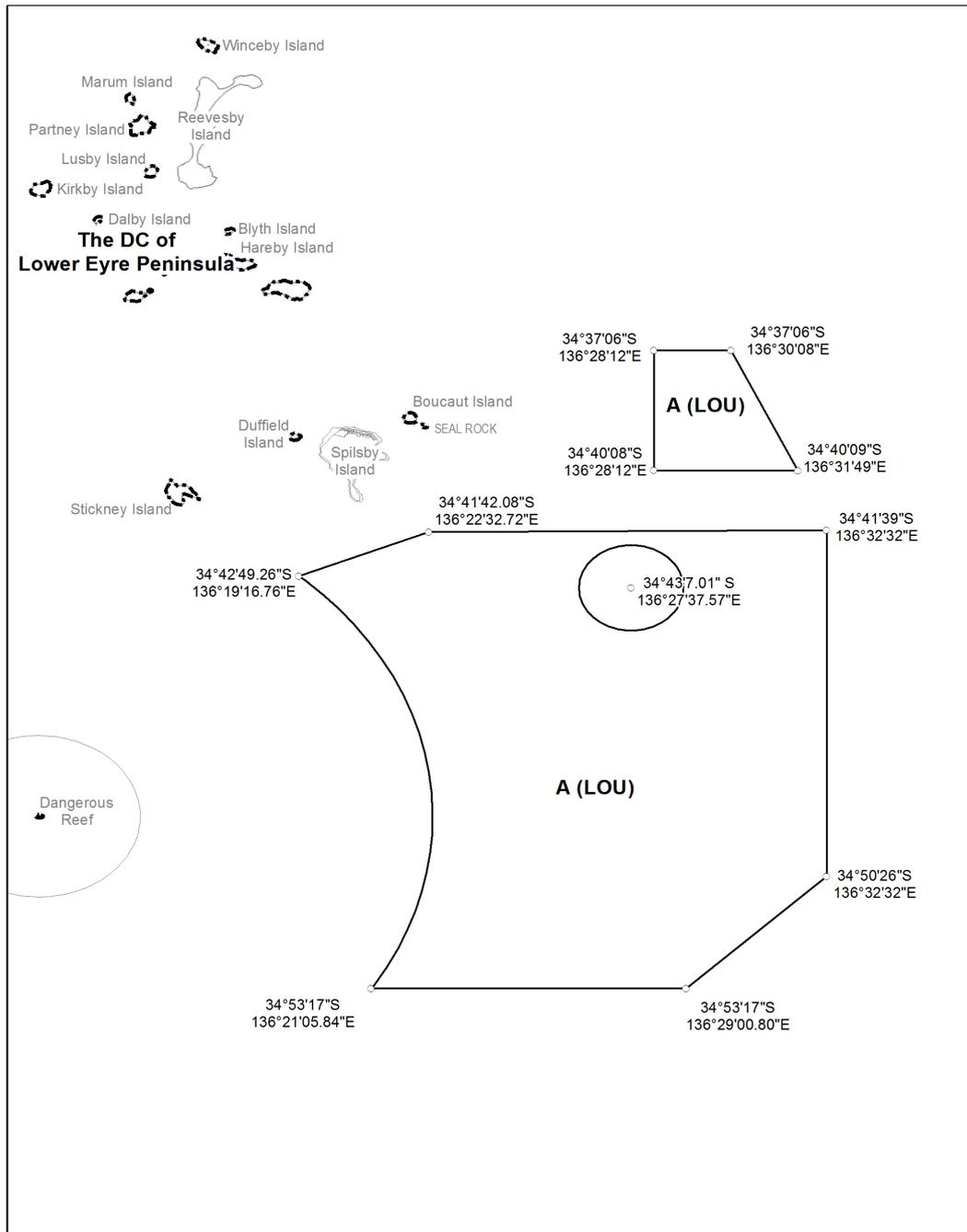
- A** Aquaculture (Lincoln (inner)) Zone
- Zone Boundary
- - - - Development Plan Boundary



NOTE: Geographical Coordinates are from the GDA 94 Datum

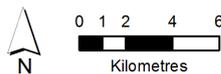
PIRSA 203527_lep_v08_lnwca(lin)

Figure 17. Zoning map to delineate the extent of the Lincoln (inner) sector under the Land Not Within A Council Area (Coastal Waters) development plan.



**LAND NOT WITHIN A COUNCIL AREA
(COASTAL WATERS)
LINCOLN (OUTER)
MAP LNWC(A)CW)/?**

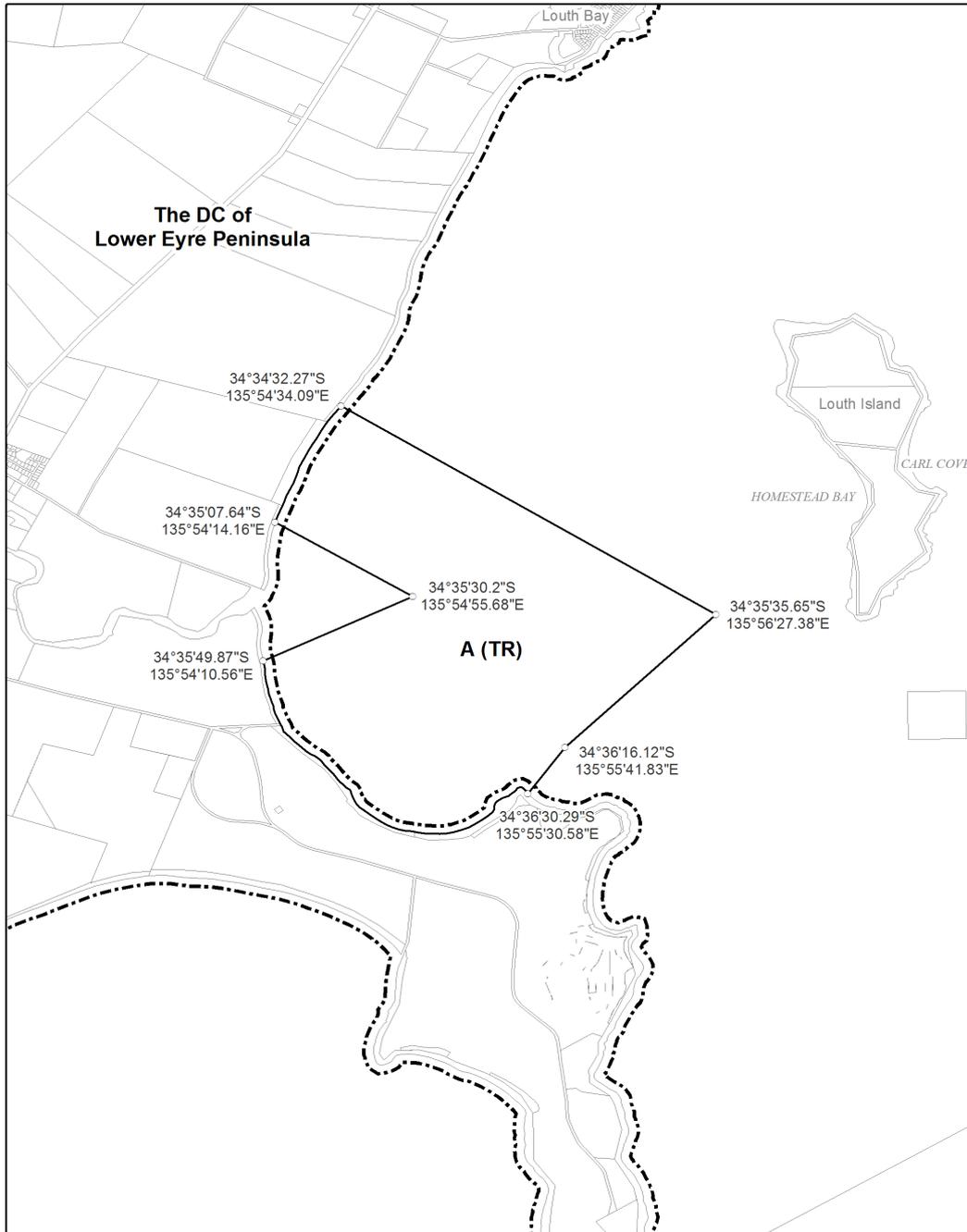
- A** Aquaculture (Lincoln (outer)) Zone
- Zone Boundary
- - - - Development Plan Boundary



NOTE: Geographical Coordinates are from the GDA 94 Datum

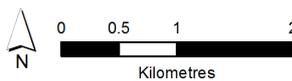
PIRSA 203527_lep_v09_inwca(lou)

Figure 18. Zoning map to delineate the extent of the Lincoln (outer) sector for the under the Land Not Within A Council Area (Coastal Waters) development plan.



**LAND NOT WITHIN A COUNCIL AREA
(COASTAL WATERS)
TOD RIVER
MAP LNWCA(CW)?**

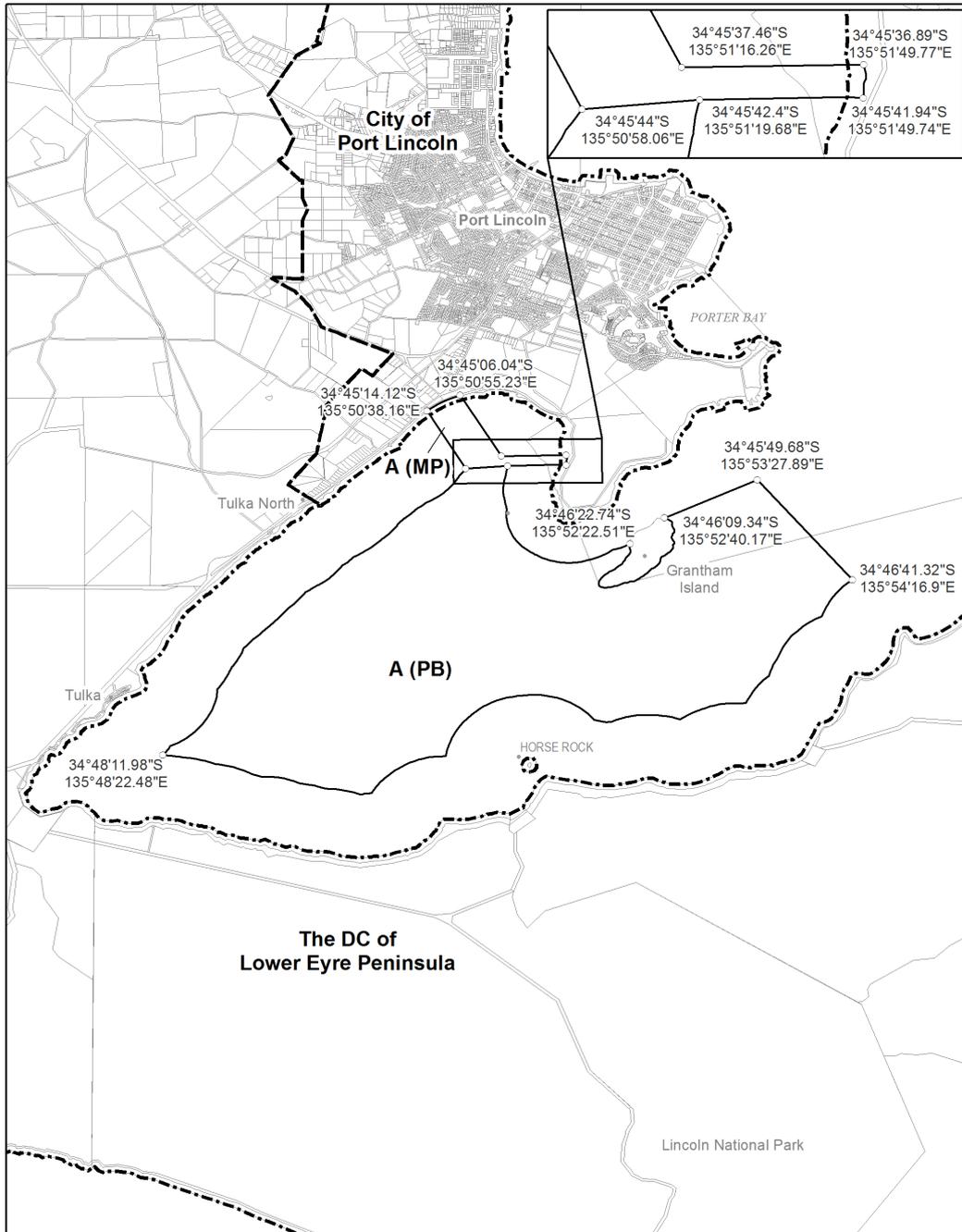
- A** Aquaculture (Tod River) Zone
- Zone Boundary
- - - - Development Plan Boundary



NOTE: Geographical Coordinates
are from the GDA 94 Datum

PIRSA 203527_lep_v08_lnwca(tr)

Figure 20. Zoning map to delineate the extent of the Todd River aquaculture zone under the Land Not Within A Council Area (Coastal Waters) development plan.



**LAND NOT WITHIN A COUNCIL AREA
(COASTAL WATERS)
PROPER BAY / MURRAY POINT
MAP LNWCA(CW)?**

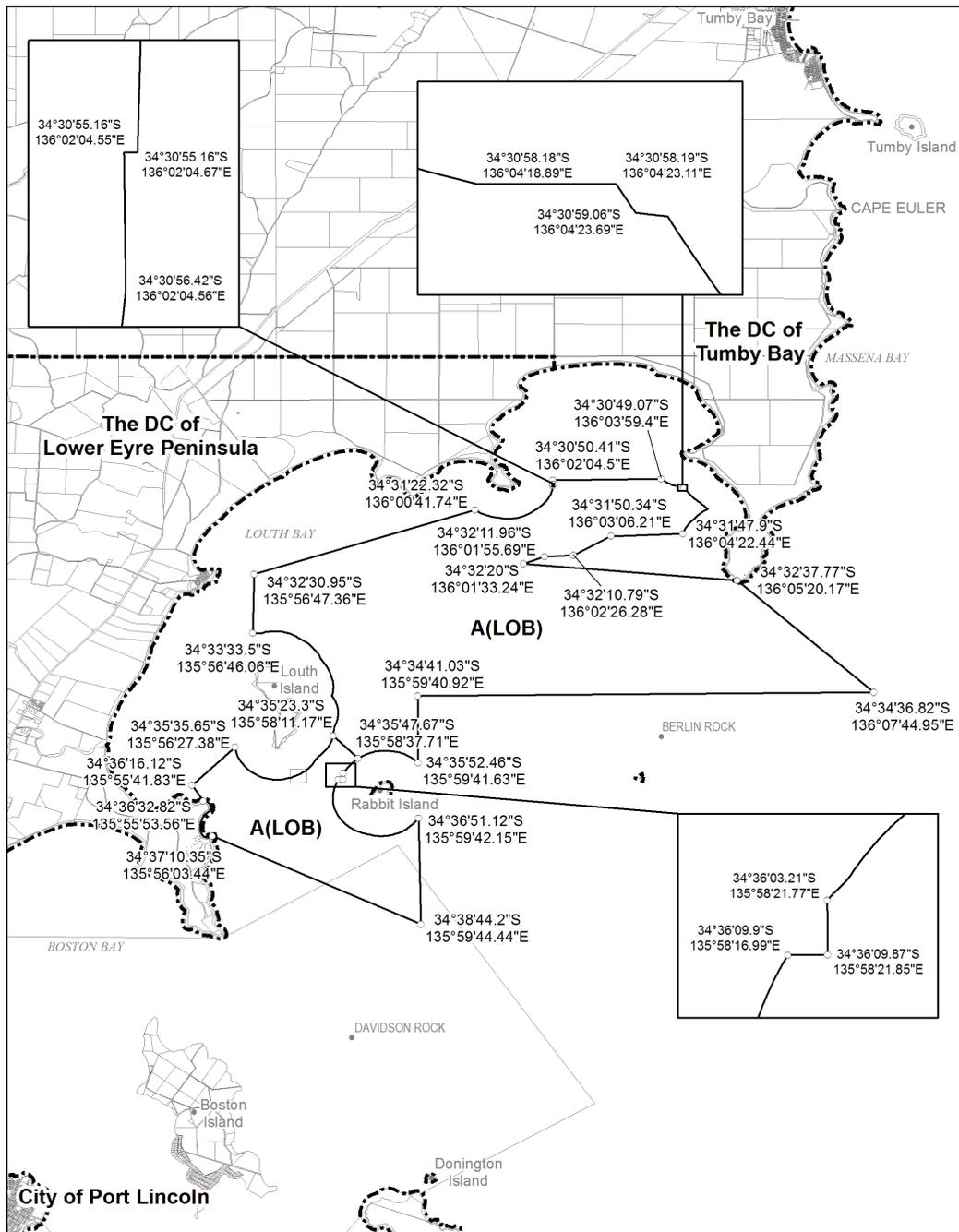
A Aquaculture (Proper Bay/Murray Point) Zone
 — Zone Boundary
 - - - Development Plan Boundary
 0 0.5 1 2 3
 Kilometres



NOTE: Geographical Coordinates are from the GDA 94 Datum

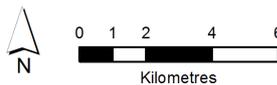
PIRSA 203527_lep_v08_lnwca(pb_mp)

Figure 21. Zoning map to delineate the extent of the Murray Point and Proper Bay aquaculture zones under the Land Not Within A Council Area (Coastal Waters) development plan.



- A** Aquaculture (Louth Bay) Zone
- Zone Boundary
- - - - Development Plan Boundary

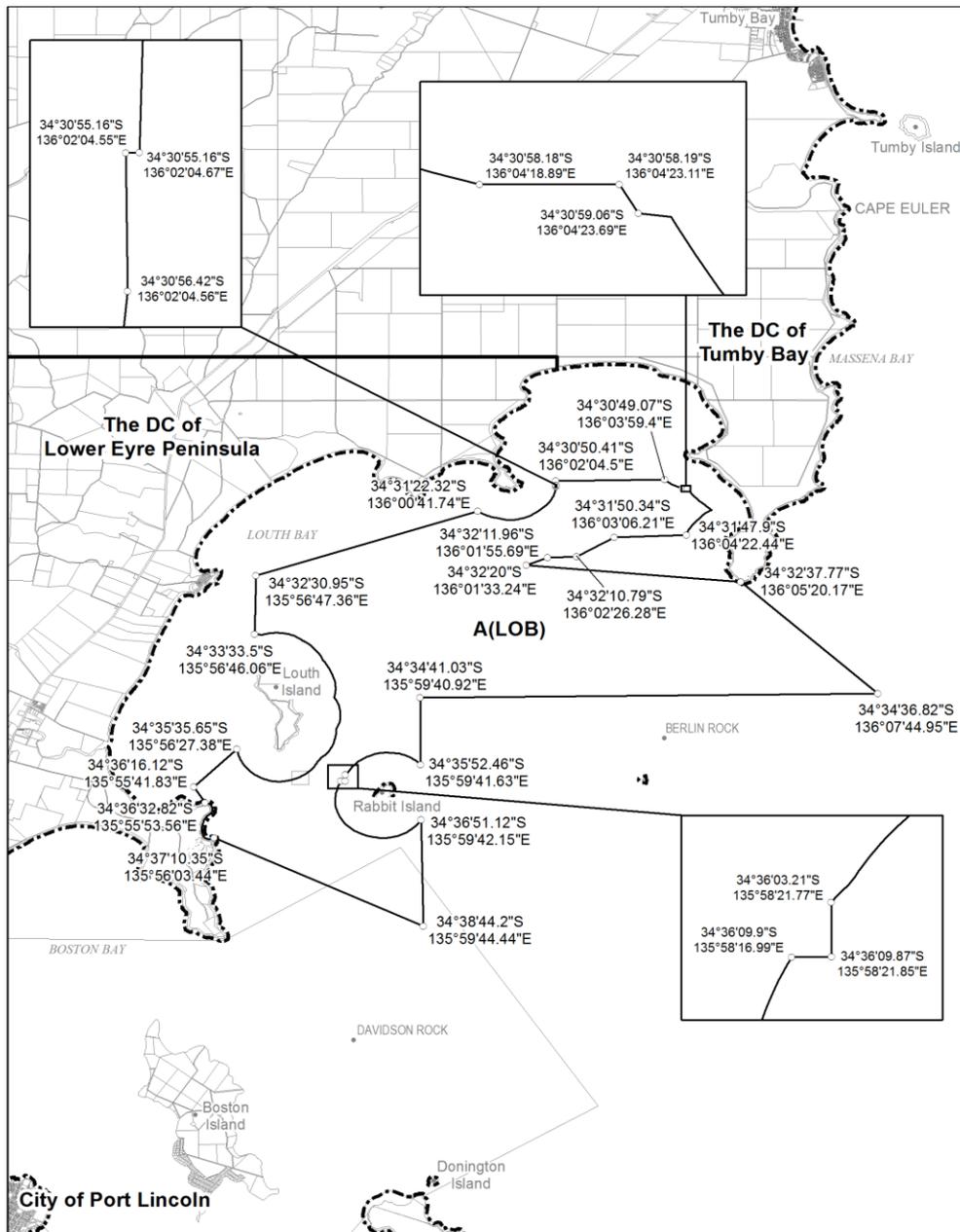
**LAND NOT WITHIN A COUNCIL AREA
(COASTAL WATERS)
LOUTH BAY
MAP LNWCA(CW)?**



NOTE: Geographical Coordinates are from the GDA 94 Datum

PIRSA 203527_lep_v08_lnwca(lob)

Figure 22. Zoning map to delineate the extent of the Louth Bay aquaculture zone under the Land Not Within A Council Area (Coastal Waters) development plan.



**LAND NOT WITHIN A COUNCIL AREA
(COASTAL WATERS)
LOUTH BAY
MAP LNWCA(CW)?**

A Aquaculture (Louth Bay) Zone
 — Zone Boundary
 - - - Development Plan Boundary

0 1 2 4 6
Kilometres

NOTE: Geographical Coordinates are from the GDA 94 Datum

PIRSA 203527_lep_v09_lnwca(lob)

Figure 23. Zoning map to delineate the extent of the amended Louth Bay aquaculture zone under the Land Not Within A Council Area (Coastal Waters) development plan.

APPENDIX D1 – BACKGROUND INFORMATION

Legislation / Policy	Objectives	Consistency
South Australia's Strategic Plan	<p>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 Plan is built on the following objectives:</p> <ul style="list-style-type: none"> Growing Prosperity Improving Wellbeing Attaining Suitability Fostering Creativity and Innovation Building Commitments Expanding Opportunities <p>The Plan contains 98 targets across the six objectives to measure progress towards achieving these goals.</p>	<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 1.1 – Economic Growth • Target 1.5 – Business Investment • Target 1.10 – Jobs • Target 1.14 – Total Exports
<p>Planning Strategy for Regional South Australia (January 2003 – amended Dec 2007)</p> <p>(DPLG document)</p>	<p>The Planning Strategy for Regional South Australia (January 2003, as amended December 2007) contains a number of strategies to support future growth in regional South Australia.</p> <ul style="list-style-type: none"> • Building and/or supporting sustainable communities; • Being more efficient and sustainable; • Diversifying primary production into new areas to replace or complement existing activities; • Adding value by greater processing of produce within South Australia instead of exporting produce in its raw state; • Facilitating sustainable tourism development to achieve economic, social and environmental benefits for the state; and • Integrated and sustainable management of natural resources in a manner that maintains ecological processes. 	<p>The 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.</p>
<i>Development Act 1993</i>	<p>The <i>Development Act 1993</i> and <i>Development Regulations 2008</i> detail the processes for making and assessing development applications.</p>	<p>This Policy is consistent with these provisions in that it seeks to ensure the ecologically sustainable development of the marine-based aquaculture industry</p>

Legislation / Policy	Objectives	Consistency
<p><i>Development 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 part of the state. 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>The policies and zoning in Development Plans need to be changed and updated over time. The <i>Development Act 1993</i> provides the legislative framework for undertaking amendments to a Development Plan. Amendments can be instigated by either the relevant Council or the Minister for Urban Development and Planning. The document used to propose changes to a Development Plan is called a Development Plan Amendment (DPA).</p> <p>The <i>Development Regulations 2008</i> recognise aquaculture zones identified in an aquaculture policy prepared under the <i>Aquaculture Act 2001</i>, classing them as a Category 1 development. The <i>Aquaculture Act 2001</i> and Regulations also enable the Minister for Urban Development and Planning to amend a development plan in accordance with an approved aquaculture policy under the <i>Aquaculture Act 2001</i>.</p> <p>Recent amendments to the <i>Development Act 1993</i> mean that aquaculture is not "development" under that Act if it is located within an aquaculture zone and within the LNWCA(Coastal Waters) Development Plan. Aquaculture within the designated aquaculture zone will not be subject to development assessment. However, aquaculture proposed outside of this zone will remain subject to full development assessment.</p> <p>More information on the Land Not Within a Council Area (Coastal Waters) Development Plan can be sourced by contacting the Department of Planning and Local Government on 08 8303 0600.</p>	<p>and recognises and respects other users of the marine resource.</p>

Legislation / Policy	Objectives	Consistency
<p><i>Aboriginal Heritage Act 1988</i></p>	<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 <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.</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>Resolution of native title claims by either consent determination or by recognition of an ILUA is a key focus in South Australia and is a key target in South Australia's Strategic Plan. Specifically, target 3.15 of the Strategic Plan aims to resolve 75% of native title claims in South Australia by 2014.</p>	<p>The Native Title Unit of the Attorney General's Department are consulted during the development of aquaculture 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. In the case of this proposed Lower Eyre Peninsula aquaculture zone policy it is Barngarla group (represented by Phillip Teitzel).</p> <p>As part of the individual lease application process (within and outside of aquaculture 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).</p>
<p>Australia's Ocean Policy (Cth)</p>	<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>	<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.</p>

Legislation / Policy	Objectives	Consistency
<p><i>Marine Parks Act 2007</i></p>	<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 will be 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 either Restricted Access Zones or Sanctuary Zones in order to provide the necessary level of protection for marine biodiversity and habitats. Both of these zones preclude commercial fishing, recreational fishing and aquaculture operations.</p>	<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 and a draft Memorandum of Administrative Agreement between PIRSA and the Department of Environment and Natural Resources. Together these support the relationship and likely interactions between proposed marine parks and aquaculture developments in South 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>In accordance with section 11(3a) of the <i>Aquaculture Act 2001</i> the Policy seeks to further the objects of the <i>Marine Parks Act 2007</i> and has been prepared with regard to the agreement between DEWNR and PIRSA.</p>
<p><i>Natural Resources Management Act 2004</i></p> <p>Eyre 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 Policy lies within the Eyre Peninsula Natural Resources Management Board. The Policy must take into consideration issues raised within the Eyre Peninsula Natural Resources Management Plan (NRM Plan). As the proposed aquaculture zone relates only to marine aquaculture there are no matters of water allocation, groundwater or surface water, specific to the</p>

Legislation / Policy	Objectives	Consistency
		aquaculture zone. The policy is consistent with the Eyre Peninsula NRM Plan.
<p><i>Environment Protection Act 1993</i></p> <p><i>Environment Protection (Water Quality) Policy 2003</i></p>	<p>The Objects of the <i>Environment Protection Act 1993</i> (EP Act) include the promotion of the principles of ecologically sustainable development, and in particular, to prevent, reduce, minimise and, where practicable, eliminate harm to the environment. The EP Act provides that communities must be able to provide for their economic, social and physical well being.</p> <p>The principle object of the <i>Environment Protection (Water Quality) Policy 2003</i> (Water Quality Policy) established under the EP Act is to achieve the sustainable management of waters by protecting or enhancing water quality while allowing economic and social development. In particular, the Policy requires all reasonable and practicable measures to be taken to avoid the discharge or deposit of waste into any waters or onto a place from which it is reasonably likely that waste will enter any waters. The Policy prescribes water quality criteria that must not be contravened and prohibits the discharge or deposition of pollutants into any waters that results in:</p> <ul style="list-style-type: none"> • Loss of sea grass or other native aquatic vegetation; or • Reduction in numbers of any native species of aquatic animal or insect; or • Increase in numbers of any non-native species of aquatic animals or insect; or • Reduction in numbers of aquatic organisms necessary to a healthy aquatic ecosystem; or • Increase in algal or aquatic plant growth; or • Water becoming toxic to vegetation on land; or • Water becoming harmful or offensive to humans, livestock or native animals; or • Increased turbidity or sediment levels. 	<p>This Policy is consistent with the provisions of the EP Act 1993 and the Water Quality Policy as it seeks to minimise or prevent harm to the environment associated with aquaculture.</p>
<p><i>Harbors and Navigation Act 1993</i></p>	<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; 	<p>Under the <i>Aquaculture Act 2001</i>, aquaculture policies can be prescribed in State waters. These policies 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.</p> <p>Section 20 of the <i>Aquaculture Act 2001</i> provides that the grant of aquaculture leases is subject to the</p>

Legislation / Policy	Objectives	Consistency
	<ul style="list-style-type: none"> • 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>concurrence of the Minister responsible for administration of the <i>Harbors and Navigation Act 1993</i>.</p>
<p><i>Coast Protection Act 1972</i></p>	<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; • 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. 	<p>The 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>
<p><i>Native Vegetation Act 1991</i></p>	<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 	<p>The Policy is consistent with these objectives as it seeks to minimise impacts on native vegetation through appropriate siting of aquaculture zones and the establishment of aquaculture exclusion zones around sensitive habitats.</p>

Legislation / Policy	Objectives	Consistency
	<p>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> <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><i>Historic Shipwrecks Act 1976 (Cth)</i></p> <p><i>Historic Shipwrecks Act 1981 (SA)</i></p>	<p>Any shipwreck or relic that is older than 75 years is protected under the <i>Historic Shipwrecks Act 1976 (Cth)</i>, which covers water off the South Australian coast from the low water mark or the agreed baselines but does not include State internal waters – ie the River Murray, Gulf St. Vincent, Spencer Gulf, Encounter Bay, Lacedpede Bay, Rivoli Bay and Anxious Bay – which are covered under the <i>Historic Shipwrecks Act 1981 (SA)</i>.</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>	<p>The Policy is consistent with these requirements and provides for a greater distance from historic shipwrecks of 550 m which is requirement of the Land Not Within A Council Area (Coastal Waters) Development Plan under the <i>Development Act 1993</i>.</p>
<p><i>National Parks and Wildlife Act 1972</i></p>	<p>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.</p>	
<p><i>Fisheries Management Act 2007</i></p>	<p>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 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.</p>	<p>To minimise adverse interactions with seabirds and large marine vertebrates, section 19 of the <i>Aquaculture Regulations 2005</i> 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 <i>et al.</i>, 2004).</p>

APPENDIX D2 – AQUACULTURE ZONING FRAMEWORK

The Policy defines the broad framework for aquaculture management within the defined aquaculture zones, including the prescribed criteria that apply to each aquaculture zone/sector. More detailed considerations such as the size of each lease, the farming structures permitted on each licence and the stocking densities for different species is assessed and managed at the individual lease and licence level. Such management tools do not form part of the zoning policy.

Approval of leases and licenses in aquaculture zones will be subject to the provisions of the *Aquaculture Act 2001* (the Act) and the *Aquaculture Regulations 2005*, and relevant lease and licence conditions. An assessment of individual site suitability (including an Environmental Sustainability Development Assessment) and criteria outlined by the Aquaculture Tenure Allocation Board are considered during the assessment. Ongoing environmental monitoring provides information that is an important input to the adaptive management of aquaculture. Further information about licensing is provided in part D4 and D5 of this Appendix.

Carrying Capacity and Assimilative Capacity

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. 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, 2007). This data exists for Yellowtail Kingfish and mulloway cultured in SA (Clark and Seymour, 2007; Fitzgibbon *et al.*, 2007), but the necessary research has not been carried out for other cultured species. Where new research is published, PIRSA Fisheries and Aquaculture will incorporate this new knowledge into their assessment and calculations.

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 nutrient 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 temperature (Parsons Brinkerhoff and SARDI Aquatic Sciences, 2003; Mount *et al.*, 2007). Nevertheless, algae aquaculture has been recommended as a means by which the negative effects of effluent may be minimised and the environmental impact of other aquaculture activities reduced (Chopin *et al.*, 2001; Buschmann *et al.*, 2007).

Class of aquaculture

Classes of aquaculture under previous aquaculture zone policies referred to groups of species e.g. bivalve molluscs; finfish; tuna etc. Under a modified format, classes of aquaculture now relate to the feeding requirements of aquatic organisms i.e. whether the organisms are supplementary fed or not supplementary fed. Grouping the classes of aquaculture around feed inputs better focuses the policy on the key determinant of environmental impact, namely, the amount of nutrient that is released into the environment. The modified format also provides greater flexibility to adaptively manage aquaculture activity through the conditions placed on individual licences.

The classes of aquaculture that may be permitted under policies are:

- the farming of prescribed wild caught tuna;
- the farming of aquatic animals (other than prescribed wild caught tuna) in a manner that involves regular feeding (e.g. finfish and abalone);
- the farming of bivalve molluscs (e.g. oysters, scallops, mussels, razorfish); and
- the farming of algae.

The first two of these involve the supplemental feeding of farmed animals, whereas no supplemental feeding is associated with the latter two classes. Only the suitable classes of aquaculture are incorporated into an aquaculture zone policy e.g. *Aquaculture (Zones – Cape D’Estrees) Policy 2006* specifies the farming of molluscs (other than filter feeding molluscs) and algae only.

Biomass limits

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 each aquaculture zone i.e. the maximum biomass of organisms farmed under a particular class of aquaculture at any one time. Environmental impacts are also managed by monitoring impacts on an on-going basis, through the environmental monitoring and reporting requirements stipulated in the *Aquaculture Regulations 2005*.

The Policy sets biomass limits for the farming of supplementary fed aquatic animals in terms of a tonnage of finfish biomass equivalents. The net amount of nutrient released by various types of supplementally fed organisms differs, with finfish aquaculture generating the highest amount of discharge compared, for example, with abalone. Because there is still insufficient scientific information to accurately predict the amounts of nutrients that would be released by non-fish species, this policy takes a generally cautious approach in setting biomass limits by assuming that amounts of nutrients released by all farmed organisms that are supplementally fed would be similar to that of finfish. However, in order to accommodate future use of information on nutrient release by non-fish species, the proposed policy adopts the concept of finfish biomass equivalents, where upper biomass limits are expressed and benchmarked in terms of an amount of biomass that would have an environmental impact equivalent to a stated biomass of finfish.

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 filter feeders 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 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.

In the case of bivalve molluscs, the Minister cannot increase the maximum biomass limit unless satisfied, after consultation with relevant aquaculture industry groups, that such an increase would not compromise the overall productivity of existing bivalve mollusc farming operations in the area.

APPENDIX D3 – 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, which include white shark (*Carcharodon carcharias*), more commonly known as the great white shark. 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.

All marine mammals and sharks have the potential to become entangled in nets or mooring lines and 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 section 19 of the *Aquaculture Regulations 2005* 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 Fisheries Management Act. Syngnathid fish are likely to be present, especially in the seagrass, algal and reef assemblages.

Framework specific to finfish aquaculture

In November 2002 Cabinet approved the establishment of a Marine Mammal-Marine Protected Areas Working Group (MM-MPAWG) to develop management arrangements to address the proximity of aquaculture developments to core areas of proposed marine protected areas and significant marine wildlife habitats such as seal colonies and whale breeding areas.

The MM-MPAWG concluded that the only aquaculture activity to pose a risk to seal/sea lion colonies is finfish aquaculture, and the only seal/sea lion colonies at risk from finfish aquaculture are breeding colonies of Australian sea-lions.

Although New Zealand Fur seals also interact with aquaculture operations, they were not considered to be at risk from finfish aquaculture, due to their increasing population and expansion in distribution around the coastline. As such it was proposed that no further management restrictions would apply in relation to the New Zealand Fur seals.

Cabinet considered the MM-MPAWG report and, in 2005, noted the following recommendations in order to reduce the potential risk to Australian Sea-lion breeding colonies from finfish aquaculture:

- Finfish aquaculture located within 5 km of any Australian sea-lion breeding sites will not be approved;
- Finfish aquaculture will not be approved within 15 km of the eight major Australian sea lions breeding colonies (namely The Pages, Dangerous Reef, Seal Bay, West Waldegrave Island, Olive Island, Franklin Islands, Purdie Island and Nicolas Baudin Island);



- Finfish aquaculture to be located between 5 to 15 km of minor Australian sea lion breeding colonies will have a risk assessment applied to during the licence assessment process specifically related to seals; and
- Over 15 km, there will be no restrictions in relation to finfish aquaculture.

APPENDIX D4 – LESSEE AND LICENSEE OBLIGATIONS

The *Aquaculture Act 2001* (the Act) is the main piece of legislation governing the management, control and development of the aquaculture sector. The Act 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 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 2005* establishes an environmental assessment, monitoring and management framework for all sectors of aquaculture.

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

Applications for leases within an aquaculture zone must be allocated through a process approved by the Aquaculture Tenure Allocation Board (ATAB). 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. Once the tenure has been provisionally granted, a licence assessment will be undertaken.

The competitive allocation process ensures a fair and efficient means of allocating the State's marine aquaculture resources.

Applications for pilot leases outside an aquaculture zone are not subject to a competitive allocation process, however the ATAB is notified of all pilot lease applications.

Management obligations are those requirements an aquaculture operator must undertake according to the Act 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/NZ) 4360:2004 (now superseded by 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. It should be noted that, in accordance with Section 52 of the Act, 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 consideration.

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). The EMP requirements are stipulated in the *Aquaculture Regulations 2005* for each sector. Once a licence is approved, an EMP is tailored to each class of aquaculture to allow for the ongoing monitoring by licence holders of a variety of physical and biological factors considered relevant to measuring the environmental effects of the aquaculture venture.

Marine-based Aquaculture:

The annual Environmental Monitoring Program includes ongoing monitoring of:

- benthic assessment (colour videotape of the sea floor and written record);
- amount and type of supplemental feed (if applicable to the species farmed);
- biomass maintained on the site;
- aquaculture waste (securing, treating, recovering);
- use of chemicals (amount, frequency and purpose);
- requirement to mark-off area and maintain structures or equipment used to mark-off area;
- farming structures (marking, mooring, maintaining, locating, and recovering);
- interaction 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;
- notification and reporting of unusually high mortality rate and duty to isolate unaffected organisms.

Land-based Aquaculture

The annual Environmental Monitoring Program includes (depending on the licence class of A, B or C) the ongoing monitoring of:

- water quality testing (category B and C only);
- intake water source, method of extraction, water type (i.e. fresh, brackish etc.) and volume used per month;
- where, how discharged, if treated and volume each month of water discharged;
- amount and type of supplemental feed (if applicable to the species farmed); and
- use of chemicals (amount, frequency and purpose).

Additional requirements to be monitored can be determined from the licence assessment process on a case by case basis, or based on the results of Environmental Monitoring Program reporting.

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 Regulations under the Act. 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 2005*, Regulation 19). The strategy must detail operational requirements under the following categories:

- Mammal interactions
- Great white shark interaction
- Protected species interactions
- Maintenance of infrastructure
- Site surveillance

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 (culture technique, technology and specific environment of the application). Regulations under the Act 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 2008*.

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.

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 Act 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 2005*, Regulation 19). This strategy is required by the Minister to prevent and control the risk of escaped stock to the wild. This strategy must include methods under the following categories:

- Health monitoring
- Escape monitoring
- Dealing with escapes
- Maintenance of infrastructure
- Site surveillance
- Reporting Requirements

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.

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. 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 the site.

APPENDIX D5 – 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. 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.

The following research projects have been completed:

a) *Environmental audits of marine aquaculture* – The project examined the impacts of Yellowtail Kingfish aquaculture in Fitzgerald Bay, and of land-based abalone aquaculture around South Australia, on a range of environmental variables. The results indicated that the environmental impacts of both sectors are minimal using current production techniques. Additionally, the project included a pilot study on light availability to seagrass beds off Cape Jaffa in the South East of the state. The results indicated that any aquaculture undertaken in this region would have to be conducted in a manner which minimises light reduction to seagrasses. Finally, research was conducted into 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.

b) *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. Based on satellite tracking studies of the Australian sea lion in southern Spencer Gulf, there was limited spatial overlap in the major areas used by seals and the tuna farming zone. A questionnaire survey of tuna farmers confirmed that operational interactions with seals are a continuing problem, although there were opposing views on whether they are increasing or decreasing. Australian sea lions were considered to be responsible for most attacks on tuna. New Zealand fur seals were not considered a threat to farmed tuna, being too small to attack them successfully. 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. With respect to farm interactions, procedures for minimising finfish mortality attributable to seals include incorporation of seal fences on the pens, regular and frequent net maintenance and, removal of tuna carcasses. Also, efforts should be made to improve procedures for recording causes of death of farmed finfish to monitor the consequences from seal interactions.

c) *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 physiology of Yellowtail Kingfish and mullet was studied, with the focus on determining their oxygen consumption under a variety of environmental conditions. This

information is important for the modelling, as it allows for an estimate of how much of the feed is metabolized by the fish. The outcomes of this work will allow PIRSA Fisheries and Aquaculture to make more informed decisions on total allowable biomass within the Fitzgerald Bay aquaculture zone, as well as optimal stocking densities for individual leases. These models can also be adapted to environmental conditions for other aquaculture zones. As well as PIRSA Fisheries and Aquaculture, farm managers will be able to utilize the seafloor deposition model to investigate patterns of sedimentation within a lease, allowing for decisions on how best to arrange pens so as to minimise localised seafloor sedimentation and where to place pens for fallowing.

d) *Parasite interactions between wild and farmed Yellowtail Kingfish* – The project studied the potential for parasite interactions between wild and farmed kingfish, ways of distinguishing wild from farmed kingfish and assessing migratory behaviour of wild kingfish. Wild fish migrate past kingfish sea cages in Fitzgerald Bay in summer. This knowledge creates the potential to better manage parasite infestation during periods of increased interaction between farmed and wild kingfish. Given that parasite eggs hatch more quickly in warmer sea temperatures, surveillance and management effort for infections by monogenean parasites should be concentrated on this period. Although few reliable methods are available to distinguish natural fish from farmed fish, marking otoliths has emerged as a potential tool that could be used to discriminate any farm escapees from wild fish. The key outcomes of this project included the development of standard sampling methods for ongoing assessment of parasite prevalence and intensity in wild and farmed kingfish. These sampling techniques are expected to be incorporated into an ongoing sampling program for effective parasite management. Farm management practices to reduce the impact of parasites include regular net changes and strategically timed treatments across entire farm leases.

e) *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.

f) *Development of rapid environmental assessment and monitoring techniques* – The project is 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.

A second suite of projects (Innovative Solutions 2 (IS-2)) is underway. The proposed projects are categorised into four areas: (1) environmental standards, (2) biosecurity, (3) new technologies and (4) climate change. The IS-2 suite of projects has been designed to provide information aimed at further supporting PIRSA's ongoing efforts to improve its ecosystems based approach to aquaculture resource management. The first project that commenced under IS-2 is entitled 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 biogeochemical 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.

Current aquaculture industry practices in South Australia were developed when the marine finfish sector was smaller and when the tuna industry was larger and had not developed technology for hatchery rearing stock. It is now time for PIRSA's biosecurity controls to be comprehensively reviewed

This project proposes 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.

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.