

**FISHERIES
& AQUACULTURE
PIRSA**

PRIMARY INDUSTRIES AND REGIONS SOUTH AUSTRALIA, FISHERIES AND AQUACULTURE DIVISION MARINE LICENCE ASSESSMENT

AQ00397 (NEW)

FF00026, FF00027, FF00028, FF00029, FF00095, FF00096
(VARIATION)



**Government
of South Australia**

Primary Industries
and Regions SA

PRIMARY INDUSTRIES AND REGIONS SOUTH AUSTRALIA, FISHERIES AND AQUACULTURE DIVISION MARINE LICENCE ASSESSMENT

Application type:	New Licence and Variation (Movement x6)
Licence numbers:	AQ00397 (new) FF00026, FF00027, FF00028, FF00029, FF00095, and FF00096 (variation)
Licence types:	Finfish
Aquaculture zone policy	<i>Aquaculture (Zones – Fitzgerald Bay) Policy 2008</i>
Aquaculture zone	Fitzgerald Bay aquaculture zone (Western Fitzgerald sector)
Production system:	Sea-cages
Species:	See Table 2
Geographical location:	Upper Spencer Gulf
From:	General Manager, Aquaculture Policy and Environment Unit
Through:	Aquaculture Policy and Environment Unit Aquatic Animal Health Unit

The following is a licence assessment by PIRSA Fisheries and Aquaculture in relation to seven aquaculture licence applications received from Clean Seas Seafood Limited. In light of the assessment's findings, I am satisfied that the ecological impacts associated with the proposed development can be appropriately managed under the conditions of the attached draft aquaculture licences to be issued pursuant to the *Aquaculture Act 2001* and associated regulations. Note however, that in accordance with Section 52 of the *Aquaculture Act 2001*, the Minister for Primary Industries and Regional Development (the Minister) may vary licence conditions at any time to prevent or mitigate significant environmental harm or the risk of significant environmental harm.

Summary of additional licence conditions:

Two additional licence conditions were identified during the assessment of the applications:

- *The Licensee must provide the Minister with a written monthly report stating biomass (tonnes), number of fish and input of feed (tonnes) and GPS coordinates per sea-cage per site.*
- *The Licensee must undertake an environmental monitoring program of the sea floor in relation to the Licensed Site when directed by the Minister in writing and in a manner and form determined by the Minister.*

The conditions of the draft aquaculture licences and requirements of the *Aquaculture Regulations 2016* (the Regulations) are considered sufficient to manage potential environmental risks and ensure ecological sustainability.



Dr Adam Main

**GENERAL MANAGER, AQUACULTURE POLICY AND ENVIRONMENT UNIT
FISHERIES AND AQUACULTURE DIVISION**

31/4/19

CONTENTS

BACKGROUND	4
Site Location	5
Environmental Monitoring Program History	8
Site Characteristics	8
Biogeographical observations	8
DEVELOPMENT/OPERATIONAL CHARACTERISTICS	9
Farming Structures.....	9
Clean Seas Farming strategy for Fitzgerald Bay	10
ECOLOGICALLY SUSTAINABLE DEVELOPMENT ASSESSMENT	11
Method and interpretation	11
ESD risk assessment report.....	13
REFERENCES	25

TABLES

Table 1: Summary of the distance and direction of the proposed variations	5
Table 2: Summary of species for the new and existing sites	5
Table 3: Summary of the relevant physical characteristics of the site	8
Table 4: Summary of video transects	9
Table 5: Standard likelihood levels	11
Table 6: Standard consequence levels	12
Table 7: Risk matrix	12
Table 8: Risk rankings and associated required levels of management	12
Table 9: ESD risk assessment report for the consolidated site.....	13

FIGURES

Figure 1: Current and proposed location of sites within Fitzgerald Bay	6
Figure 2: Current and proposed location of sites within Fitzgerald Bay (labelled)	7
Figure 3: Mooring design for a sea-cage grid system	10
Figure 4: Location of biogeographical transects collected	26
Figure 5: Representative image of the benthic environment, indicating the presence of detached seagrass fronds	27
Figure 6: Representative image of the benthic environment, indicating the level of bioturbation	27

BACKGROUND

PIRSA Fisheries and Aquaculture (PIRSA) have received applications from Clean Seas Seafood Limited (Clean Seas) to move six aquaculture leases and corresponding licences (see table above) [1-6] within the Western Fitzgerald sector of the Fitzgerald Bay aquaculture zone, identified in the *Aquaculture (Zones – Fitzgerald Bay) Policy 2008* [7]. Registration details of the active licences applied to be moved are outlined below:

- FF00026 (Production Lease AL00034) – 20 ha, originally approved 1 February 2002
- FF00027 (Production Lease AL00035) – 20 ha, originally approved 1 February 2002
- FF00028 (Production Lease AL00036) – 20 ha, originally approved 1 February 2002
- FF00029 (Production Lease AL00037) – 20 ha, originally approved 1 July 2002
- FF00095 (Production Lease LA00119) – 10 ha, originally approved 9 July 2009
- FF00096 (Production Lease LA00120) – 10 ha, originally approved 9 July 2009

Additionally, PIRSA has received an application [8] from Clean Seas for the following new corresponding aquaculture licence within the same sector:

- AQ00397 (Production Lease LA00428) – 50 ha

The proposal involves the consolidation of the seven sites (six movements and one new site) within the Fitzgerald Bay aquaculture zone, so that they are abutting each other. The purpose of the applications is to create a single large licensed area, comprising of seven individual sites (six movements and one new licence) to allow for the use of a submerged grid system. If approved, between them, the sites would carry a maximum biomass of 2,250 tonnes of Yellowtail Kingfish (YTK) and would result in a total leased area of 150 hectares.

It should be noted that Clean Seas are also applying for one movement and one new site in the Eastern Fitzgerald sector to create a consolidated site with a total of 133 hectares. However, this ecologically sustainable development (ESD) risk assessment is addressing only the six proposed movements and one new licence which form a consolidated area within Western Fitzgerald sector of the Fitzgerald Bay aquaculture zone.

The intent of the Fitzgerald Bay aquaculture zone is to ensure the farming of finfish is undertaken in an environmentally and socially acceptable manner [7]. The objective of the Fitzgerald Bay zone policy is to specify the class of permitted aquaculture and to prescribe criteria for the leased area size and biomass of aquatic animals to be farmed in the zone. Biomass limits for the existing six sites will not change from what was originally assessed and approved and the total allocation of biomass will remain consistent with the total allowable biomass prescribed for the Western Fitzgerald sector of the Fitzgerald Bay aquaculture zone [7]. The applicant currently operates all of the aquaculture licences within the Western Fitzgerald Bay sector of the aquaculture zone.

Between 2008 and 2012, a licence-based and standardised Finfish Environmental Monitoring Program (FEMP) was undertaken by the South Australian Research and Development Institute (SARDI) Aquatic Sciences on behalf of the finfish industry, to monitor the ongoing impacts to benthic infaunal communities adjacent to farmed licensed sites. An environmental scorecard was developed for the assessment of environmental performance and to guide decision making in relation to environmental compliance. Results were presented using a 5-tiered system where “green”, the highest level, indicates an appropriate environmental outcome and “violet”, the lowest level, indicates that the result is in breach of the compliance limits. As part of the program, monitoring was undertaken at sites (FF00026, FF00029, FF00030 and FF00095) in the 2009/10 and 2010/11 periods and “green” results were obtained at all sites [9]. A SARDI report, presenting temporal (2005 – 2014) infaunal DNA data from the FEMP, which demonstrated that while there was temporal variation between sites at Fitzgerald Bay there was no differences between control and compliance sites [10].

Site Location

Table 1 provides a summary of the distance and direction for the six proposed site movements. It has been proposed that the six site movements and one new site will be established so that they are adjoining, in an area with a total size of 150 hectares.

Table 1: Summary of the distance and direction of the proposed site movements within the Western Fitzgerald sector of the Fitzgerald Bay aquaculture zone.

Lease Number	AL00034	AL00035	AL00036	AL00037	LA00119	LA00120
Licence Number	FF00026	FF00027	FF00028	FF00029	FF00095	FF00096
Approximate distance from current location	200m	2,900m	3,000m	1500m	2,830m	800m
Direction from current location	E	N	NW	N	N	NE

The current and proposed location of the aquaculture sites is shown in Figure 1 (regional context) and Figure 2. All six site movements will remain in the Western Fitzgerald sector of the Fitzgerald Bay aquaculture zone. Proposed locations are approximately 17 km northeast of the nearest substantial township of Whyalla, and approximately 6 km north of Point Lowly. The total area of the sites and associated biomass will not change as a result of the six site movements. However, the proposed new site will increase the total area of all sites in the sector to 150 hectares, which is the maximum prescribed area for the Western Fitzgerald sector. A summary of the total allowable biomass and the species for farming are detailed in Table 2.

Table 2: Summary of species for the proposed new site, and current approved site movements, as prescribed by the licences, within the Western Fitzgerald sector of the Fitzgerald Bay aquaculture zone.

Lease/ Licence number	Species	Biomass limits
LA00428 / AQ00397	<ul style="list-style-type: none"> Kingfish, Yellowtail <i>Seriola lalandi</i> 	<ul style="list-style-type: none"> 15 t/ha (finfish)
AL00034 / FF00026	<ul style="list-style-type: none"> Kingfish, Yellowtail <i>Seriola lalandi</i> Snapper <i>Pagrus auratus</i> 	<ul style="list-style-type: none"> 15 t/ha (finfish)
AL00035 / FF00027	<ul style="list-style-type: none"> Kingfish, Yellowtail <i>Seriola lalandi</i> Snapper <i>Pagrus auratus</i> 	<ul style="list-style-type: none"> 15 t/ha (finfish)
AL00036 / FF00028	<ul style="list-style-type: none"> Kingfish, Yellowtail <i>Seriola lalandi</i> Snapper <i>Pagrus auratus</i> 	<ul style="list-style-type: none"> 15 t/ha (finfish)
AL00037 / FF00029	<ul style="list-style-type: none"> Kingfish, Yellowtail <i>Seriola lalandi</i> Snapper <i>Pagrus auratus</i> 	<ul style="list-style-type: none"> 15 t/ha (finfish)
LA00119 / FF00095	<ul style="list-style-type: none"> Kingfish, Yellowtail <i>Seriola lalandi</i> 	<ul style="list-style-type: none"> 15 t/ha (finfish)
LA00120 / FF00096	<ul style="list-style-type: none"> Kingfish, Yellowtail <i>Seriola lalandi</i> 	<ul style="list-style-type: none"> 15 t/ha (finfish)

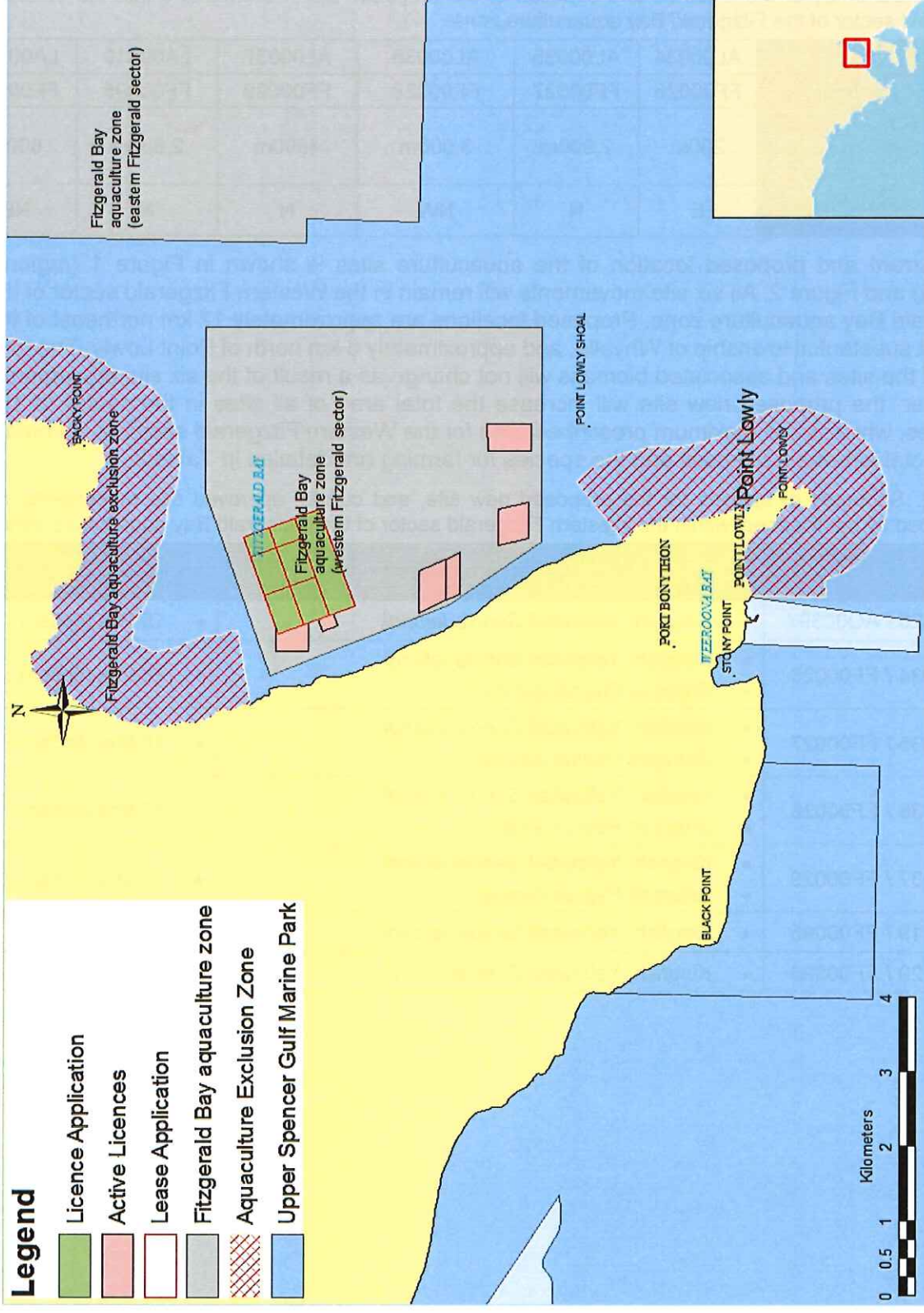


Figure 1: Current and proposed location of sites within the western Fitzgerald Bay sector of the Fitzgerald Bay aquaculture zone (regional context).

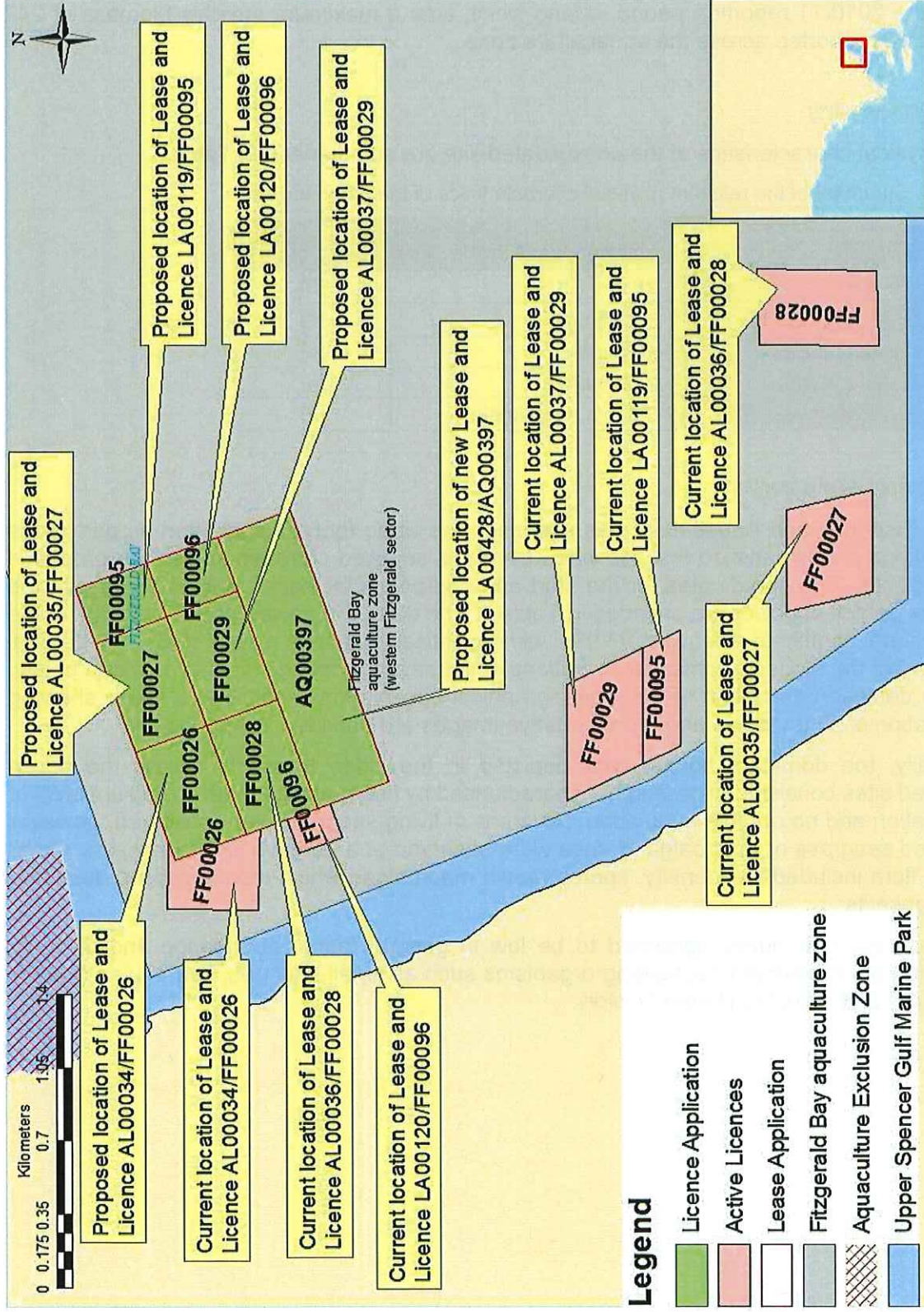


Figure 2: Current and proposed location of sites within the western Fitzgerald Bay sector of the Fitzgerald Bay aquaculture zone. Amended coordinates for each site can be found on the attached draft licences.

Environmental Monitoring Program History

A review of the Environmental Monitoring Program (EMP) history for the last three reporting periods (2014/15, 2015/16 and 2016/17) for each site of the six sites to be moved revealed that there has not been any stock on any for the sites in the Fitzgerald Bay aquaculture zone. Additionally, LA00428/AQ00397 is an application for a new site so no EMP data exists for the site. The applicant, Clean Seas, has not farmed finfish in the Fitzgerald Bay aquaculture zone since the 2010/11 reporting period, during which time a maximum monthly biomass of 242 tonnes was reported across the aquaculture zone.

Site Characteristics

The physical characteristics of the consolidated site are summarised in Table 3.

Table 3: Summary of the relevant physical characteristics of the proposed site

Development Characteristic	Description	Reference
Maximum fetch	28 km, SSE	[8]
Average annual wave height	1.2 metres	[8]
Minimum water depth	18 metres	[8]
Maximum tidal range	2.52 metres	[8]
Average water flow rate	0.3 m/s (0.58 knots)	[8]

Biogeographical observations

PIRSA Fisheries and Aquaculture has examined the video footage submitted as part of the applications and is satisfied that the video transects supplied correspond with the proposed site locations. The coordinates for the start and end-points for each transect along with the total site detection power are provided in Table 4. The detection power for all transects for the 150-hectare combined site was 93.9%, with a critical detection value of 3%. A general summary of the biogeographical observations of the seven proposed sites is provided below, while a detailed description of the biogeographical observations, including a figure showing the location of all transects and representative images are provided in Appendix 1.

Generally, the dominant habitat type depicted in the video transects across the seven proposed sites consisted of bare sand, characterised by fine grain size with a medium level of bioturbation and no notable undulation. No areas of living seagrass were observed, however detached seagrass or macroalgae fronds were observed at a low level in all transects. Other marine flora included low density, sparse brown macroalgae which also appeared detached in all transects.

The epifaunal community appeared to be low in general faunal abundance and diversity consisting of occasional filter feeding organisms such as small sponges, sea squirts (Family Ascidiidae) and razorfish (*Pinna bicolor*).

Table 4: Summary of video transects taken at the seven proposed sites for licences FF00026, FF00027, FF00028, FF00029, FF00095, FF00096 and AQ00397 (map datum WGS84 expressed in degrees, decimal minutes).

Transect No.	Transect start (latitude)	Transect start (longitude)	Transect end (latitude)	Transect end (longitude)	Transect length (m)
W T1	32°56.2562'S	137°45.9451'E	32°56.3043'S	137°45.9806'E	106
W T2	32°56.5573'S	137°46.0638'E	32°56.6242'S	137°46.0800'E	109
W T3	32°56.3551'S	137°46.0876'E	32°56.4107'S	137°46.0787'E	124
W T4	32°56.1517'S	137°46.1836'E	32°56.2284'S	137°46.1623'E	126
W T5	32°56.6177'S	137°46.2273'E	32°56.6854'S	137°46.2419'E	296
W T6	32°56.4133'S	137°46.2851'E	32°56.4721'S	137°46.2999'E	110
W T7	32°56.0675'S	137°46.4446'E	32°56.1114'S	137°46.4025'E	105
W T8	32°56.5145'S	137°46.4456'E	32°56.5791'S	137°46.4498'E	109
W T9	32°56.2355'S	137°46.4116'E	32°56.2873'S	137°46.3713'E	114
W T10	32°56.1741'S	137°46.5873'E	32°56.2473'S	137°46.5610'E	165
W T11	32°56.3700'S	137°46.5383'E	32°56.4560'S	137°46.5079'E	140
W T12	32°56.4062'S	137°46.7104'E	32°56.4750'S	137°46.7051'E	122

*Total site detection power the 150 hectare combined site = 93.9%, with a critical detection value of 3% (based on the Environment Protection Authority (EPA) Survey power calculator (version: 18 Feb 2016))

DEVELOPMENT/OPERATIONAL CHARACTERISTICS

Farming Structures

It is proposed that the seven sites will be developed using similar methods to that used extensively throughout the finfish sector in South Australia. The applicant has stated that a grid system, which can support up to 18 sea-cages at any one time, will be used at the proposed consolidated 150-hectare site. Figure 3 provides a representative diagram of the grid system.

Double collar sea-cages (polar circle pens) with a 44 m diameter each weighing 12.98 tonnes are proposed to be used. Cage netting will be constructed from nylon with net mesh size varying from 33 mm to 78 mm, with a maximum net depth of 10 metres (m) with each weighing approximately 2.2 tonnes. The proposed 18 sea-cages are to be secured to the grid system with 76 concrete mooring blocks, each weighing 3.0 tonnes (1.5 x 1.5 x 1.0 m) and 38 "stingray" style anchors, each weighing 250 kg (1.5 x 1.5 x 0.9 m) [8].

Each sea cage will contain bird net stands which are 4.0 m high and weigh 590 kg each. Each cage will utilise 32 net weights (weighing 140 kg each). The mooring system will incorporate six large grid floats weighing 150 kg each (2.2 x 1.6 m) and 30 small grid floats weighing 100 kg each (1.8 x 1.3 m) [8].

It has been proposed that the location of the sea cages will be placed in the deepest water available and orientated perpendicular to tidal flow to maximise water flow through the cages [8, 11]. This is expected to provide the best possible conditions to reduce the likelihood of disease (i.e. infestations of flukes and other pathogens) in an effort to minimise use of veterinary chemicals. The applicant has stated that the site has a minimum depth of 18 m; each sea cage would be fitted to ensure a minimum distance of 6 m between the bottom of the sea-cage and the seafloor is maintained [8]. Site boundaries will be marked with St Andrews Cross boundary markers.

It is proposed that the consolidated site will be serviced by a 15 tonne feed boat. Feeding rates will be similar to that currently undertaken at the operating finfish sites in Port Lincoln and Arno Bay and feed will consist of extruded dry pellets from local and international suppliers [8]. Feeding will occur from vessels using blowers initially and from a combination of blowers/centralised feeding systems (moored barge) in the future. Feeding will be monitored by video to assess for over feed.

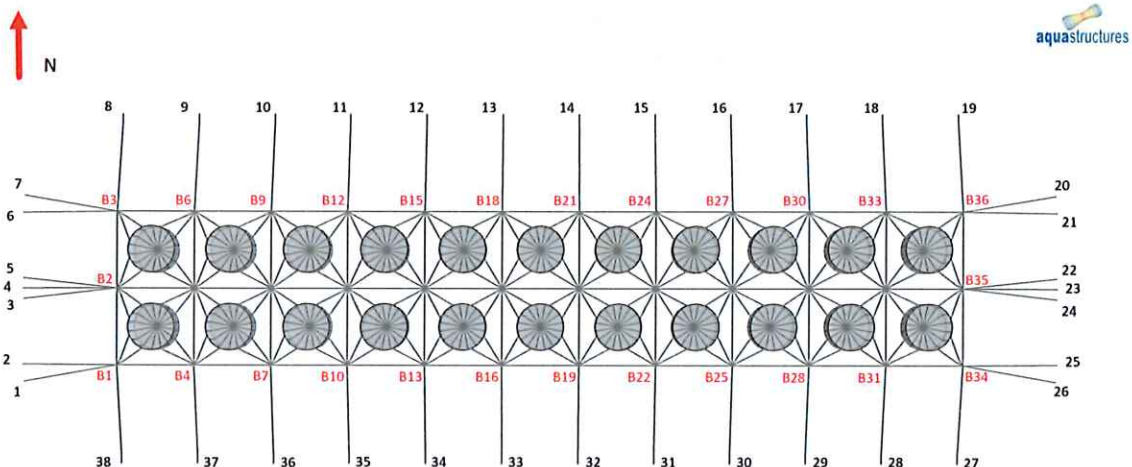


Figure 3: Mooring design for a sea-cage grid system, proposed for the western Fitzgerald Bay aquaculture sector [8]. Note that Clean Seas have confirmed that they will be using a maximum of 18 sea-cages (Jay Dent, Clean Seas, pers. comm. 20 March 2019).

The applicant has stated that nets will be cleaned in situ using commercial net washers according to standard industry practices. Cleaning of nets will be undertaken as required to prevent the establishment of macrofouling and to allow sufficient water movement. Nominally, this will occur approximately 1-2 times per week during summer and every 7-10 days during winter. The applicant has stated that general refuse, including used netting and broken infrastructure will be taken ashore and disposed at the local council landfill. Any mortalities will be removed from cages and taken to a rendering facility or fertiliser producer for disposal.

The applicant has stated that the site will be visited at least once a day (weather permitting) for above water inspections and every 1-4 days for below water inspections by dive teams. The proposed sites will be inspected for both mortality and any damaged infrastructure or debris in the vicinity of the site. Any materials considered as general refuse will be taken on shore and disposed of in council landfill. Mortalities and harvest waste are proposed to be disposed of at a rendering facility or fertiliser producer [8].

Clean Seas Farming strategy for Fitzgerald Bay

The proposed farming strategy [11] operates two sites for farming YTK in the aquaculture zone, one in the western sector (farming a maximum of 2,000 tonnes) the other in the eastern sector (farming a maximum of 2,250 tonnes).

It is anticipated that initial stocking of the western site with juveniles from the hatchery will commence in August 2019, and stock will be moved gradually to the eastern site during grading from October/November 2020 (15 months later). Stock will be held on the western site from August 2019 to July 2021 (24 months). Stock will be held on the eastern site from October 2020 to February 2022 (17 months). It is anticipated that the next year class will be introduced to the western site in October 2021 and destocked completely by August 2023.

The strategy provides for a period of four months during which fish from one year class will be held on both sites while being transferred, but for the majority of the production cycle, the strategy will lead to a separation of year classes between the two sites.

This strategy will result in the entire western site being fallowed for a period of three months every 27 months, with individual grids being fallowed for longer depending on when stock are moved to the eastern site. In addition, the strategy will result in the entire eastern site being fallowed for a period of ten months between stocking events, with individual grids being fallowed for longer depending on when stock are introduced [11].

ECOLOGICALLY SUSTAINABLE DEVELOPMENT ASSESSMENT

Method and interpretation

The ESD risk assessment for the seven applications is summarised in Table 9. Where the risk profile for individual proposed sites are considered equivalent, a combined risk has been undertaken for the seven proposed sites in each risk category. However, where the risk profile is considered different among sites (e.g. differing abundance of seagrass), separate risk assessments will be undertaken for each of the proposed sites. The ESD risk assessment should be read in conjunction with PIRSA's ESD Risk Assessment Guidelines [12], which provides explanations of each of the risks addressed. The primary aim of this assessment is to evaluate the potential ecological risks to the sustainable development of South Australia's resources from the approval of the proposed applications.

Given the number of applications within the Fitzgerald Bay aquaculture zone, consideration has been given to cumulative impacts associated with multiple applications. Therefore, the following risk assessment has been undertaken for a single 150-hectare area, farming a maximum of 2,250 tonnes of Yellowtail Kingfish (YTK).

The risk assessment method is based on the National Ecologically Sustainable Development framework, the Aquaculture 'How-To' Guide [13]. The framework was developed by the Fisheries Research and Development Corporation (FRDC) to be used consistently across fisheries and aquaculture sectors in Australia and is based on the Australia and New Zealand standard for risk management (AS/NZS 4360 1999) (now superseded by AS/NZS ISO 31000:2009 [13]). Each identified risk is assigned a risk ranking. To assign a risk ranking to an issue, two factors are determined – the likelihood that the particular event will occur and the potential consequence arising from that event. The likelihood and the consequence of a particular event are considered independently [13]. The combination of likelihood and consequence produces a risk value, which in turn is used to determine the risk ranking, associated with a particular issue [13].

The likelihood and consequence levels or categories outlined in the National ESD framework are used in this assessment (Tables 5 and 6, respectively). A risk value for each risk event is then derived by combining the likelihood of occurrence with the corresponding level of consequence using a risk matrix (Table 7). Finally, the risk value is used to determine the risk ranking (Table 8).

Table 3: Standard likelihood levels.

Level	Descriptor
Remote (1)	Never heard of, but not impossible
Rare (2)	May occur in exceptional circumstances
Unlikely (3)	Uncommon
Possible (4)	Some evidence to suggest this is possible
Occasional (5)	May occur
Likely (6)	Is likely to occur

Table 4: Standard consequence levels.

Level	Descriptor
Negligible (0)	Insignificant impacts. Impacts unlikely to be measurable at the scale of the stock, ecosystem, or community level against background variability.
Minor (1)	Possibly detectable but minimal impact on structure, function or dynamics.
Moderate (2)	Maximum appropriate/acceptable level of impact (e.g. full assimilation rate for nutrients).
Severe (3)	Wider, longer-term impacts (detectable at the stock, ecosystem, or community level).
Major (4)	Serious impacts with relatively long time frame likely to be needed to restore to an acceptable level.
Catastrophic (5)	Widespread and permanent/irreversible damage or loss will occur - possibility that problem cannot be fixed (e.g. extinction).

Table 5: Risk Matrix.

		Consequence					
		Negligible	Minor	Moderate	Severe	Major	Catastrophic
Likelihood		0	1	2	3	4	5
Remote	1	0	1	2	3	4	5
Rare	2	0	2	4	6	8	10
Unlikely	3	0	3	6	9	12	15
Possible	4	0	4	8	12	16	20
Occasional	5	0	5	10	15	20	25
Likely	6	0	6	12	18	24	30

The numbers in cells in the body of the above matrix are risk values, which are calculated by multiplying the likelihood value by the consequence value; the colours/shades correspond to risk rankings (see Table 8).

Table 6: Risk rankings and associated required levels of management.

Risk Rankings	Risk Values	Explanation & Likely Management Response
Negligible	0	Nil
Low	1 – 6	No specific additional management is needed, but low level monitoring of the issue may be required. Any current management should continue, as the risk ranking is based on the current management in place
Moderate	7 – 12	Additional information may be needed or the issue may require monitoring. Immediate management is required, but the issue should be the subject of continuous improvement with the aim of achieving a low risk ranking in the future.
High	13 – 18	Possible increases to management activities in addition to those already being applied. Needs to be monitored and any information deficiencies should be addressed.
Extreme	> 19	Increases in management activities in addition to those already being applied are strongly recommended.

Table 7: Ecologically Sustainable Development risk assessment report for FF00027, FF00027, FF00028, FF00029, FF00095, FF00096 and AQ00397.

Risk event	Likelihood x consequence	Risk ranking	Explanation and management response
Individual Facilities			
1 Construction of site and ongoing consequences of those structures			
1.1 Habitat effects (All sites)	Likely (6) x Negligible (0)	Negligible (0)	<p>Observations from biogeographical video transects provided as part of the applications identified the benthic environment of the consolidated site consisted predominantly of a bare, flat sandy substrate with low to medium levels of bioturbation. Marine flora consisted of very low density, sparse macroalgae, predominantly as detached fronds. No areas of live seagrass were identified in any of the transects, although detached seagrass fronds were present. Overall, the epifaunal community was low in abundance and diversity, consisting primarily of the occasional filter-feeding organism.</p> <p>It is likely that a small area of benthic habitat will be impacted by the placement of farming infrastructure through anchoring. The grid across the consolidated site will consist of 76 concrete blocks (1.5m x 1.5m) and 38 'stingray' type anchors (1.5m x 1.5m) which would cause a direct footprint area of approximately 256.5m². However, the direct impacts are considered to be localised and therefore minimal across the 150-hectare site. The consequence of ongoing habitat effects as a result of development at the proposed consolidated site is considered to be negligible, based on benthic habitat assessments of the sites and the results of the FEMP which demonstrated no differences between compliance and control sites [9].</p> <p>The water depth where the grid and associated sea-cages are to be placed is at least 18 m, ensuring at least six metres is maintained between the bottom of sea-cages and the sea floor. This will minimise the overall effects of scouring and allow for the dispersal of nutrients. Sea-cages will be configured perpendicular to tidal movements and will not be placed down current from each other to reduce the concentration of nutrient deposition over a particular area. Overfeeding and food wastage will be eliminated by implementing strict monitoring of fish Feed Conversion Ratios (FCRs) and also the use of underwater cameras to reduce overall feed input [8, 11]. To enable PIRSA to closely monitor biomass and nutrient input on the site, an additional licence condition will require the Licensee to provide the Minister with written monthly reports stating the biomass, number of fish, input of feed and GPS coordinates per sea-cage per site.</p> <p>It is a requirement under regulation 22 of the Regulations for all licensees to submit an annual EMP report, including information on feed type and quantity, biomass, escape of stock, disease, chemical use and interactions with protected animals. In addition to standard licence conditions, an extra condition is proposed to be added which will require the licensee to undertake an environmental monitoring program of the sea floor in relation to the Licensed Site when directed by the Minister in writing, and in a manner and form determined by the Minister.</p> <p>In February 2019, a SARDI funding application developed in conjunction with PIRSA, Clean Seas and the EPA (Project no. 2018-186) was approved for endorsement by the Fisheries Research and Development Corporation (FRDC). The project, supported by the South Australian Research Advisory Committee, will assess the influence of finfish aquaculture derived nutrients on seagrasses in Fitzgerald Bay. While the</p>

			<p>western Fitzgerald Bay site is located over a sandy benthic habitat, there are significant seagrass meadows along the coastline to the north-west, and this project aims to assess the regional impacts of finfish farming in the Fitzgerald Bay aquaculture zone.</p> <p>Multiple lines of evidence will be used to assess the current condition of seagrass meadows throughout the Fitzgerald Bay region prior to the introduction of YTK. This will identify whether the system is currently impacted by existing nutrient sources. Seagrass cover and habitat condition will be assessed using remote video transects at a minimum of three sites predicted to be affected by the aquaculture nutrient plume (to be determined from SARDI hydrodynamic and biogeochemical modelling) and three control sites. Included in the assessment will be methods used by the EPA to assess broader-scale regional patterns of change in seagrass habitats around SA, and earlier SARDI assessment of seagrass condition in Gulf St Vincent. Sampling will ideally occur in June/July 2019, immediately prior to the commencement of aquaculture, and then again two years later.</p> <p>In the unlikely event the project is not supported by FRDC, an environmental monitoring program will be developed in conjunction with Clean Seas, SARDI and the EPA to monitor seagrass in areas predicted to be affected by the aquaculture nutrient plume.</p> <p>It is considered that habitat effects due to the development of the proposed consolidated site is considered likely. However, the consequence is considered negligible based on the benthic habitat type. Consequently, the overall risk of habitat effects from the development at the proposed consolidated site is considered to be negligible.</p>
1.2 Alienation (All sites)	Likely (6) x Minor (1)	Low (6)	<p>The granting of an aquaculture lease provides the applicant with exclusive rights to the proposed site. Consequently, it is likely that alienation will occur if the applications are approved.</p> <p>An early notification letter containing the details of the proposed movements and new finfish site was sent to external stakeholders on 4 July 2018. Stakeholders were provided with two weeks to submit any comments to PIRSA. In addition to early notifications and in accordance with section 50(1)(b)(i) of the <i>Aquaculture Act 2001</i>, the application for the new corresponding licence (AQ00397) was publicly advertised in <i>The Advertiser</i> and the <i>Whyalla News</i> (local paper) on 30 August 2018 for a public consultation period of two weeks. During public notice, a number of submissions were submitted to PIRSA. Any issues regarding the proposed activity raised through the notification processes were considered by PIRSA during the assessment of the application.</p> <p>Given the objections regarding the proposed activity, it is considered that the consequence of any alienation resulting from the approval of these applications is minor. Moreover, this risk assessment relates to an existing aquaculture zone where finfish farming has historically taken place. Clean Seas is the only licence holder in the western Fitzgerald Bay sector, which will be fully allocated (in hectares) should this application be approved. As such, the proposed movements and new site are unlikely to impact other aquaculture operators. Given this information, the overall risk of alienation resulting from the proposed consolidated site is considered to be low.</p>
1.3 Erosion	N/A	N/A	Not applicable to marine based applications
1.4 Seepage	N/A	N/A	Not applicable to marine based applications

<p>1.5 Water flow (All sites)</p>	<p>Likely (6) x Minor (1)</p>	<p>Low (6)</p>	<p>It is considered likely that the development at the proposed consolidated site will have an effect on the water flow. The applicant has stated that sea-cages will be placed in a grid arrangement, with two rows of 11 sea-cages to be placed perpendicular to tidal flow, which will limit the overall impact to natural water movement [8, 11]. The applicant proposes a maximum of 18 sea-cages which would be placed in an area of approximately 11.1% of the 150 hectare consolidated site (16.7 hectares). The applicant has stated that the sea-cages will have the dimensions of 44 m diameter by a maximum of 10 m deep (total volume of 15,205 m³).</p> <p>The approximate volume of the 16.7 hectare area where the grid will be located is (167,000 m² x 18 m deep) or 3,006,000 m³. Based on the total sea-cage volume (334,510 m³), the sea-cages will occupy approximately 11.1% of the volume of the proposed grid area (16.7 hectares). In addition, sea-cages will be located on sites with a minimum of 18 m water depth, leaving a minimum of 6 m between the bottom of the cages and the sea floor. Sea-cages will be regularly cleaned (at least once per week) to allow for water movement through nets and other infrastructure.</p> <p>Although the impact of natural water flow due to development of infrastructure is considered likely, the consequence is considered minor, based on the relative volume of the structures compared to the site volume (11.1% of the grid area) and the distance to the seafloor. Therefore, the overall risk of impacts to the natural water flow experienced at the proposed new sites is considered to be low.</p>
<p>1.6 Shading (All sites)</p>	<p>Likely (6) x Negligible (0)</p>	<p>Negligible (0)</p>	<p>It is likely that some shading from farming structures will occur, in comparison to what would naturally be experienced over the proposed site area. The total area covered by the proposed 18 sea-cage grid system is approximately 33,451 m² (including interior of sea-cages occupied intermittently by stock). The proposed 18 sea-cage grid system will cover an area of 16.7 hectares. As such, the relative area of the structures compared to the overall area of the grid structure (16.7 hectares) is 20.0 %.</p> <p>As discussed in in risk event 1.1 – Habitat effects, the benthic habitat at the proposed sites is identified to contain predominantly bare sand with low diversity and abundance of algae and no observed live seagrass. Given both the environmental monitoring requirements (also discussed in risk event 1.1 – Habitat effects) and the relative percentage of coverage from the proposed development of the sites, the consequence of shading on the benthic environment is considered to be negligible. Accordingly, the overall risk of shading at the proposed consolidated site is considered to be negligible.</p>

<p>1.7 Rehabilitation (All sites)</p>	<p>Rare (2) x Moderate (2)</p>	<p>Low (4)</p>	<p>The primary risk in terms of rehabilitation is lease abandonment, where the lease owner does not rehabilitate a site. This may result in farming infrastructure, including sea-cages and anchors, remaining in situ where it can cause navigation hazards or habitat impacts. This is however considered to be a rare occurrence for the finfish aquaculture sector.</p> <p>It is a lease condition that the Lessee must rehabilitate the site, prior to the expiration of the lease. The rehabilitation, including the removal of all aquaculture structures, debris, rubbish and waste from the Leased area, must be performed by the Lessee at its cost to the reasonable satisfaction of the Minister. In addition, it is also a lease condition that the lessee must reinstate and rehabilitate the current Leased area at the Lessee's cost, prior to any variation.</p> <p>In addition to the above lease conditions, lessees must either provide a guarantee from its bankers in the amount of \$10,000.00 or contribute to an indemnity scheme established and or nominated by the Minister for the aquaculture industry for each lease held. Clean Seas have contributed \$40,000 to an indemnity scheme, which is held by PIRSA, and can be used to rehabilitate the sites to their former condition. Therefore, in the event the leases are not rehabilitated appropriately by the lessee, there are resources available to rehabilitate the sites.</p> <p>Given the above, the likelihood of the non-rehabilitation of the proposed sites is considered rare whilst the consequence is considered to be moderate. Accordingly, the overall risk of the sites not undergoing full rehabilitation after being vacated is considered to be low as there are management provisions in place, including PIRSA's site environmental audits and follow-up compliance inspections, to ensure site rehabilitation is undertaken if and when required.</p>
<p>1.8 Navigation (All sites)</p>	<p>Likely (6) x Negligible (0)</p>	<p>Negligible (0)</p>	<p>It is a lease requirement that the outer boundaries of each lease must be marked with navigational markers when any structures are present on each leased site. Navigation markers are expected to meet the requirements set for each individual lease type. The likelihood for the site facilities to pose a hazard to navigation is considered likely. However, the consequence of navigation issues is considered to be negligible, given the area is a Gazetted aquaculture zone and the requirement to install navigational markers. Hence, the overall risk of any navigational issues arising from the proposed sites is considered to be negligible.</p>
<p>1.9 Visual (All sites)</p>	<p>Unlikely (3) x Minor (1)</p>	<p>Low (3)</p>	<p>The proposed consolidated site is located approximately six kilometres from the nearest small settlement of Point Lowly, and within an existing aquaculture zone. Therefore, the likelihood that the proposed consolidated site would be visually unappealing from a community perspective from the town is unlikely.</p> <p>The proposed consolidated alignment of the sites means that aquaculture structures will not be spread over a large area which is considered to reduce any visual impact compared to infrastructure spread over a larger area. In the unlikely event of visual impacts from site infrastructure, the consequence is considered to be minor given the majority of the proposed sites are existing licences within an established aquaculture zone located six kilometres from the nearest populated coastline (Point Lowly). Accordingly, the overall risk of negative visual impacts resulting from site infrastructure being developed on site is considered to be low.</p>

2 Operating impacts			
The use of resources by the facility			
<p>2.1 Noise</p>	<p>Likely (6) x Negligible (0)</p>	<p>Negligible (0)</p>	<p>It is likely that noise will be generated by daily operation of dive and feed boats and feed blowers. However, it is unlikely that the noise generated by these operations will exceed that of other commercial vessels in the area, including the deep water bulk export port of Port Bonython that is located approximately six kilometres to the south of the proposed site; capable of berthing vessels to a capacity of 100,000 tonnes.</p> <p>The site is also approximately six kilometres from the nearest populated coastline (Point Lowly) and is situated within an existing aquaculture zone that has previously been actively farmed. Therefore, both the consequence and overall risk of excessive noise arising from the proposed aquaculture development are considered to be negligible.</p>
<p>2.2 Escape</p>	<p>Occasional (5) x Minor (1)</p>	<p>Low (5)</p>	<p>The likelihood of escape is considered occasional, based on reports of four escape events with an estimated loss of approximately 500 fish in the last 12 months. The applicant has stated that all above-water infrastructure will be inspected above every two days by company staff, with below-water inspections every four days by dive teams (weather permitting) as part of general operations. This aims to ensure the integrity of farming infrastructure and therefore minimise the risk of escape events.</p> <p>The risk to the environment as a result of escape is considered to be low since YTK are native to South Australia and wild populations can be found in Spencer Gulf. A report by Fowler <i>et al.</i> (2003) concluded it was likely that the YTK which researchers caught in northern Spencer Gulf were escaped YTK, based on body shape and ear-bone structure [14]. Sampling for this study occurred within weeks of three escape events (two reported on 31 January 2003, one on 6 April 2003) and that it took 17 fishing days to capture 77 YTK in northern Spencer Gulf. Two-thirds of YTK that were caught had empty stomachs and those that had fed exhibited feeding characteristics that suggested poor survival skills, such as eating plant material (for this carnivorous species). Reported sightings by the public and catches by the researchers, throughout Spencer Gulf, decreased after late March and early April, with most catches between late February and early March, suggesting YTK either moved from Spencer Gulf or died [14]. Given this and the native status of YTK, the consequence of stock escaping from the proposed site operations is considered to be minor.</p> <p>To prevent and/or minimise escape events, the applicant has submitted a strategy relating to escape of stock as required by the Regulations. All strategies are assessed for the frequency of site inspections during normal operating conditions and following extreme weather events; the ability of farming structures to contain stock and withstand anticipated weather conditions; and the applicant's management plan in the event of stock escapes. Furthermore, regulation 26 of the Regulations requires licensees to take all reasonable measures to contain or prevent the escape or further escape of stock if aquaculture stock has escaped, or a farming structure or other equipment has been damaged that may lead to the escape of aquaculture stock, after becoming aware of the escape or damage (as soon as practicable).</p> <p>Given the above, the likelihood of escape of stock is considered occasional whilst the consequence is considered to be minor. Accordingly, the overall risk of the escape of stock at the proposed consolidated site is considered to be low.</p>

<p>2.3 Chemicals and therapeutants</p>	<p>Likely (6) x Minor (1)</p>	<p>Low (6)</p> <p>It is likely that veterinary chemicals will be used on site since the applicant has proposed the use of hydrogen peroxide, praziquantel (PZQ) and oxytetracycline (OTC) under Ministerial approval and veterinarian supervision as potential treatments for disease [8]. The farming strategy proposed by Clean Seas to separate year classes in different sectors [11] minimises the risk from disease and parasitic infection (improved fluke control) by minimising the risk of infectivity to incoming stock from older fish already present on the site. It is anticipated by the applicant that separation of year classes removes the interaction between year classes, thereby reducing infection.</p> <p>Under the <i>South Australian Agricultural and Veterinary Products (Control of Use) Act 2002</i>, agricultural and veterinary chemicals defined under that Act must (unless authorised by a permit) be registered by the Australian Pesticides and Veterinary Medicines Authority (APVMA) prior to being sold, supplied and/or used in the State. Furthermore, any use of registered chemical products must be undertaken in accordance with a permit or labelled instruction to ensure that the environmental and food safety assessments accepted by the APVMA, which aim to protect environment and consumer health, are valid for that specific use.</p> <p>Hydrogen peroxide is currently permitted by the Australian Pesticides and Veterinary Medicines Authority (APVMA) as a bathe treatment in YTK aquaculture (permit no. PER 83276 – expires 30/11/2019). However, no permit currently exists for the use of PZQ or OTC in YTK aquaculture. In the event the applicant wishes to use of the off-label (or unregistered) chemicals, a veterinarian can prescribe a product for off-label use on trade animals pursuant to the <i>Agricultural and Veterinary Products (Control of Use) Act 2002</i>, although permits or full registration of that product with the APVMA are required to be pursued. Under regulation 10 of the Regulations, the use of a treatment or disinfectant that is not a registered veterinary product under the <i>Agricultural and Veterinary Products (Control of Use) Act 2002</i> requires the approval of the Minister. Regulation 10 provides for off-label use for one-off, irregular, emergency and experimental treatment, under veterinary prescription. Within PIRSA, off-label chemical use approval processes involving discharges to the environment are supported by an internal policy including guidelines for assessment of total environmental effects (including non-target species). Off-label use of veterinary chemicals has been successful in managing disease in YTK aquaculture, to allow the collection of data to support industry in applying to the APVMA for the ongoing use of PZQ and OTC in YTK aquaculture. It is noteworthy that Clean Seas have submitted applications to the APVMA for the ongoing use of PZQ in YTK aquaculture.</p> <p>If the use of other chemicals and therapeutants are required on site, licensees are required to report use when completing annually submitted EMP report, and must seek Ministerial approval for off-label (or unregistered) chemicals pursuant to regulation 10 of the Regulations. Ministerial approvals for the use of veterinary chemical products may include conditions such as peak daily use limits, environmental monitoring requirements, maximum discharge limits and reporting</p> <p>Given the legislative requirements of licensees in respect to the use of registered and non-registered chemical substances in aquaculture, including but not limited to the Regulations, the <i>Environment Protection (Water Quality) Policy 2015</i> and the <i>Agricultural and Veterinary Products (Control of Use) Act 2002</i>, the consequence of chemical use is considered to be minor. Accordingly, while chemical use is likely to occur on site the overall risk is considered to be low.</p>
--	-----------------------------------	---

<p>2.4 Entanglement or confinement</p>	<p>Rare (2) x Severe (3)</p>	<p>Low (6)</p>	<p>Entanglement or confinement of protected animals have previously been reported for the finfish sector, albeit rarely. Wildlife interactions that might occur with sea-cage farming in Spencer Gulf include interactions with seabirds, sharks and protected marine vertebrates [15]. In the last 12 months, five interactions have been reported with fur seals from the finfish sector, none of which resulted in a fatality. However, one interaction with a common seagull was reported which resulted in a fatality. In each case involving fur seals, animals were released alive or the animal swam out on its own accord.</p> <p>The nearest breeding Australian sea-lion colony (at Sir Joseph Banks group of islands) is located 220 km to the south of the site proposed consolidated site. According to the outcomes of the Marine Mammal Marine Protected Areas Working Group report, there are no restrictions in relation to finfish aquaculture greater than 15 km from a breeding seal colony. According to outcomes of the 2004 Marine Mammal Marine Protected Areas Working Group report, there are no restrictions in relation to finfish aquaculture greater than 15 km from a breeding seal colony.</p> <p>The consequences of an adverse interaction are considered severe, particularly where it leads to the death of an animal. To mitigate interactions, the applicant proposes daily checks for, and removal of, any dead and moribund fish from sea-cages (weather permitting) as a strategy to prevent attracting predators. Further, nets are intended to be checked daily for the presence of any holes and any damage will be repaired immediately. Regular net maintenance and keeping nets and ropes taut are measures proposed by the applicant to reduce predator interaction, damage and entanglement [8]. A seal jump fence around sea-cage pontoons is incorporated into the infrastructure but the applicant has stated that it is unlikely that it will be required (Jay Dent, Clean Seas, pers. comm. 20 March 2019).</p> <p>The applicant must abide by all licence conditions and the requirements of the Regulations relating to interactions with protected animals (regulations 18 and 27), through submission and, adherence to, an approved strategy and reporting requirements. The proposed mitigation measures and the legislative provisions around entanglements with, or confinement of protected animals reduce the risk of adverse impacts which is considered to be low.</p>
<p>2.5 Habitat effects</p>	<p>Likely (6) x Minor (1)</p>	<p>Low (6)</p>	<p>The benthic habitat is likely to be affected by various day-to-day farming practices, there are however procedural regimes in place to reduce impacts to the seafloor.</p> <p>Impacts to the habitat of the site caused by boating activities will be minor as no anchoring will occur during feeding or maintenance activities. Feeding practices will be monitored with video to avoid build-up of feed below sea-cages and daily intake will be assessed against a feed model [8]. In the event of feed falling through sea-cages, it is likely that scavengers will contribute to the removal of the excess feed [16]. The risk is further reduced because of the nature of the sandy benthic environment and general lack of epibenthic fauna and flora across the site.</p> <p>Fish may be harvested on site; however, waste will be minimal as all processing will occur onshore. In this event, all waste will be collected and returned to shore and disposed of at a rendering facility for the production of fertiliser [8]. Nets will be cleaned in-situ at least once per week using commercial net washers according to standard industry practice to prevent the establishment of tertiary biofouling. The frequency of cleaning will ensure limited accumulation of biofouling organisms and sedimentation. Where possible wastes will be collected [8].</p>

			<p>In a 2017 report containing infaunal monitoring of the aquaculture zone around Fitzgerald Bay undertaken by SARDI [10], statistical analyses of data collected indicated sites sampled within the Fitzgerald aquaculture zone had infaunal assemblages that fall within the range of insignificant variability when compared to reference sites. That is, there was no evidence in the data collected that finfish aquaculture is having an effect on infauna. Therefore, the consequence of habitat effects resulting from ongoing operations of the proposed site is considered to be minor.</p> <p>As required by regulation 25(e) of the Regulations, stocked sea cages must not be located in the same place that stocked sea cages have been located within the preceding 12 months unless otherwise approved in writing by the Minister. Clean Seas has proposed an overall farming strategy for the Fitzgerald Bay region which includes a fallowing regime for the grid system in the western Fitzgerald Bay sector. The fallowing regime includes a complete grid fallow of three months following destocking of a year class, with individual grid bays being fallowed for longer. The applicant will be required to apply to the Minister</p> <p>As detailed in risk event 1.1 – Habitat effects, an additional licence condition has been added to the draft licence which will require the licensee to undertake an environmental monitoring program of the sea floor in relation to the licensed site when directed by the Minister. This environmental monitoring program has been developed as a three-year FRDC research project, or, in the event that this is not supported, or is terminated, as an individual EMP developed in conjunction relevant parties. The results of the programs, along with annual EMP requirements, will allow impacts to the benthos from farming practices to be monitored and adaptively managed.</p> <p>Based on the above considerations, the overall risk of habitat impacts resulting from site operations is considered to be low.</p>
<p>2.6 Disease Management</p>	<p>Rare (2) x Moderate (2)</p>	<p>Low (4)</p>	<p>There are no notifiable diseases associated with YTK in Australia; however, there are some pathogens that are known to affect YTK aquaculture in SA which identified below.</p> <p>Farmed YTK can be seriously affected by blood fluke (<i>Paradeontofylax</i> spp.), skin fluke (<i>Benedenia seriolae</i>) and gill fluke <i>Zeuxapta seriolae</i> (gill fluke) [17]. The applicant has proposed the use of hydrogen peroxide (APVMA permitted product), and praziquantel under Ministerial approval as treatment measures for such infestations [8].</p> <p>The strategy proposed by Clean Seas to separate year classes on different leases further minimises the risk from disease and parasitic infection (improved fluke control) by minimising the risk of infectivity to incoming stock from older fish already present on the site. A separation of year classes removes the interaction between year classes and reduces the potential infection rates.</p> <p>There is also a known disease risk of infection by <i>Photobacterium</i> spp in South Australia. Clean Seas has proposed the use of oxytetracycline (having APVMA permit) to treat this infection. The use of chemicals and therapeutants follows a rigorous assessment process, which is discussed in risk event 2.3 – Chemicals and therapeutants.</p> <p>Regulation 14 of the Regulations stipulates that if a licensee knows, or ought reasonably to know, that an aquatic organism proposed to be introduced into the licence area is or may be affected with a disease, the licensee must ensure that the aquatic organism is not introduced into the licence area without the prior written approval of the Minister. Regulation 13 of the Regulations also requires licensees to report unusually</p>

			<p>high mortality rates. Given the above information, the overall risk of inappropriately managed prevention of, and treatment for, disease from the proposed consolidated site operations is considered to be low.</p>
Wastes generated from operation of the facility			
<p>2.7 Sedimentation</p>	<p>Likely (6) x Minor (1)</p>	<p>Low (6)</p>	<p>The probability of sedimentation occurring from a finfish farming operation is likely as YTK will be fed manufactured dry pellets. The maximum biomass proposed by the applicant for the consolidated 150 hectare site is 2,250 tonnes (= 15 tonnes/ha) [8].</p> <p>The ability of YTK to process the nutrients in the pellets (i.e. FCRs) is dependent on the water temperature and developmental stage of fish. In a final report on refining YTK feeds and feed management produced by SARDI [18], FCRs were reported as high as 1.45 in a summer temperature trial but as low as 4.43 in a winter temperature trial. Higher FCRs (the smaller the number the greater assimilation of available nutrients in feed and less waste) are likely to result in less suspended solids produced through faeces.</p> <p>Sedimentation resulting from uneaten food will be monitored through the use of video of feeding practices to mitigate against the build-up of excess feed beneath sea-cages [8]. Sedimentation from other particulate matter will be controlled through regular net cleaning to prevent the build-up of biofouling material.</p> <p>Mean water flow in the area is predicted at 0.58 knots [8]. Depth-averaged current speeds measured to the south of Point Lowly as part of the FRDC project 2009/046 investigating the carrying capacity of Spencer Gulf using hydrodynamic and biogeochemical modelling were 1.2 knots (maximum) with an average of 0.4 knots (M. Doubell, SARDI, pers. comm. 18 September 2018).</p> <p>Annual and ongoing EMP requirements of the licensee is considered sufficient to identify and adaptively manage any sedimentation impacts. Furthermore, regulation 25(e) of the Regulations require a 12-month fallowing period of stocked sea cages, unless otherwise approved by the Minister. Fallowing time allows any sedimentary material to be turned over by natural processes. The farming strategy submitted by Clean seas will result in the entire western site being fallowed for a period of three months every 27 months with individual grids being fallowed for longer depending on when stock are moved.</p> <p>Regulation 25(d) of the Regulations requires a minimum of three metres between farming structures and the seafloor which facilitates dispersal of nutrients/material, which is facilitated through the proposed site development (i.e. minimum of six metres between the bottom of sea-cages and the seafloor).</p> <p>Given the composition of the benthic habitat, the requirement to participate in a research program monitoring the impacts to nearby seagrass meadows (see risks 1.1 and 2.5 – Habitat effects), outcomes from previous infaunal monitoring, species biology (FCRs) and the relatively strong currents of the area, the overall risk of sedimentation at the proposed site is considered to be low.</p>
<p>2.8 Culture organism disposal</p>	<p>Rare (2) x Moderate (2)</p>	<p>Low (4)</p>	<p>In the event of termination or mortality of stock through site production, the waste created will need to be disposed of. In accordance with section 25 of the <i>Environment Protection Act 1993</i>, every fish farmer has a general environmental duty to take all reasonable and practical measures to prevent or minimise environmental harm resulting from an activity that pollutes, or might pollute, the environment on the aquaculture site. This includes the appropriate management of aquaculture mortalities.</p>

			<p>The applicant has stated that all waste created by cultured organisms will be stored will be returned to shore to be disposed of at a rendering facility or fertilizer producer. Therefore, the likelihood of impacts through improper disposal of mortalities of farmed organisms from site operations is considered to be rare.</p> <p>The consequence of improper disposal of culture organisms is considered to be moderate, as it is likely that any disposal of deceased organisms at sea would be assimilated through natural processes. Accordingly, the overall risk is considered to be low.</p>
<p>2.9 General refuse</p>	<p>Rare (2) x Moderate (2)</p>	<p>Low (4)</p>	<p>Subregulation 3(1) of the Regulations, defines aquaculture waste as 'waste generated in the course of carrying on aquaculture, but does not include waste created by living aquatic organisms'. Regulation 11 of the Regulations requires the licensee to ensure that aquaculture waste does not cause an unsightly or offensive condition at the licence area and that any such waste is secured or treated in a manner designed to prevent it being blown, washed or swept off the licence area. Furthermore, this regulation also requires a licensee to ensure that if aquaculture waste is blown, washed or swept off the licence area, it is recovered as soon as practicable. These requirements of licensees will ensure all reasonable measures are taken to prevent waste material entering the site or surrounding environment.</p> <p>The applicant has stated that the site will be accessed once or twice daily (weather permitting) with inspections of farming structures and stock undertaken. Any materials considered as general refuse will be taken to shore for disposal at the local council landfill, which for the City Council of Whyalla is the Mount Laura Waste and Resource Recovery Centre. Therefore, the likelihood of improper disposal of general refuse from site operations is considered to be rare.</p> <p>Annual EMP requirements provided by the Regulations require licensees to report the amount of general refuse produced on site, as well as provide details on the method of disposal. These requirements are designed to prevent, identify and adaptively manage any adverse environmental impacts from site operations. Given the above, the consequence of improper disposal of general refuse is considered moderate with the overall risk considered to be low.</p>
<p>2.10 Biofouling</p>	<p>Unlikely (3) x Moderate (2)</p>	<p>Low (6)</p>	<p>It is a standard licence condition, that 'The licensee shall in the event that it receives reasonable direction from the Minister to do so, cease and desist from any activity which in the reasonable opinion of the Minister may tend to cause environmental harm (as defined in the <i>Environment Protection Act 1993</i>)'. The removal of biofouling in accordance with the <i>Environment Protection Act 1993</i> is recommended to be undertaken on-shore, and all waste is to be disposed of at an EPA licensed disposal facility.</p> <p>However, shore-based cleaning of nets is not always practical and it likely to lead to increased stress to the stock and escape events while changing nets. While in situ cleaning of nets is not a preferred cleaning method, a high frequency of cleaning should ensure that any removed biofouling is primary in nature and minimal in volume and therefore the cleaning process is not likely to cause environmental harm (i.e. produce putrescible waste). The applicant has stated that the net will be cleaned in situ at least once per week using commercial net washers according to standard industry practice. Where possible, wastes will be collected and returned to shore, however in situ cleaning is considered to have a moderate consequence.</p> <p>Annual EMP reports submitted by licensees require information to be submitted regarding the amount of biofouling produced on site, as well as the methods used to dispose of biofouling. These EMPs are reviewed</p>

			annually, allowing any impacts to the benthos from farming practices, including the incorrect disposal of biofouling to be monitored and adaptively managed before any long-term impacts occur. The frequency of cleaning and low level of accumulated biofouling in between cleaning events is expected to reduce the risk of improper disposal of biofouling on site facilities, which is considered to be an overall low risk.
2.11 Water quality	N/A	N/A	This risk event relates to land-based applications only.
2.12 Processing	Rare (2) x Moderate (2)	Low (4)	The applicant has indicated there will be some harvest activities occurring on site on harvest vessels, however, no fish processing will occur on site. The applicant has stated that harvesting waste (such as guts and gills) will be taken to shore for disposal at a rendering facility. Given these measures for containing waste, the likelihood of improper disposal from processing practices is considered to be rare. If improper processing practices were to occur, the consequence of such activity is moderate, when considering disposal of processed fish waste is likely to be assimilated through natural processes (see risk event 2.8 – Culture organism disposal). Accordingly, the overall risk is considered to be low.
REGIONAL EFFECTS			
<p>The below risks consider potential impacts from a regional perspective, with the focus on the net effects of resulting from the addition of the consolidated site to the aquaculture zone, with consideration of the current level of aquaculture activity undertaken within the region.</p> <p>When an application is received for a site within an aquaculture zone of an established aquaculture zone policy area, many of the risks below (denoted as N/A) have already been considered in the development of the zone policy, and are therefore not addressed in the licence-based risk assessment. Specifically, a zone policy has prescribed limits for the maximum allocation of area and biomass, along with suitable species for aquaculture. These limits have been determined through scientific technical investigations on the benthic and pelagic environments within the zone, which determine the capacity of a zone, suitability of the area for aquaculture and the cumulative impacts of aquaculture.</p> <p>This risk assessment is for an area of water in the <i>Aquaculture (Zones – Fitzgerald Bay) Policy 2008</i> and is consistent with its statutory requirements. That is, it is proposed to occur within a prescribed zone (western Fitzgerald Bay aquaculture zone), and within the hectare and biomass limits prescribed for that zone.</p>			
3 Water use quality and quantity			
3.1 Nutrients	N/A	N/A	N/A
3.2 Sedimentation	N/A	N/A	N/A
3.3 Chemicals	N/A	N/A	N/A
3.4 Flow	N/A	N/A	N/A
4 Ecological community structure and biodiversity			
4.1 Listed migratory and threatened species	N/A	N/A	N/A
4.2 Sensitive habitats	N/A	N/A	N/A

4.3 Behavioural changes	N/A	N/A	N/A	N/A	Yellowtail Kingfish fingerlings will be produced at Clean Seas land-based facility on Eyre Peninsula and transferred directly to the site. The likelihood that fish will be translocated between regions is therefore considered to be remote. Given the legislative provisions of the Regulations around moving fish that may be affected with disease, the low risk of poor disease management (discussed in risk event 2.6 – Disease management), the consequence and of this activity is considered to be minor. Accordingly, the overall risk posed by the translocation of stock is considered to be low.
4.4 Translocations between regions	Remote (1) x Minor (1)	Low (1)	N/A	N/A	
4.5 Phytoplankton	N/A	N/A	N/A	N/A	
4.6 Benthic communities	N/A	N/A	N/A	N/A	
5 Physical structures, construction and tenure					
5.1 Loss of access	N/A	N/A	N/A	N/A	
5.2 Effect on human cultural heritage areas	N/A	N/A	N/A	N/A	
5.3 Navigation	N/A	N/A	N/A	N/A	
6 Production					
6.1 Disease	Remote (1) x Minor (1)	Low (1)	N/A	N/A	Significant (endemic) diseases relating to YTK have been previously identified in risk event 2.6 – Disease management. The applicant has proposed the use of hydrogen peroxide, oxytetracycline and praziquantel under Ministerial approval and veterinarian supervision as treatment measures for those conditions, the use of which has been considered in risk event 2.3 – Chemicals and therapeutants. Given the considerations outlined in risk events 2.3 and 2.6, the fact that YTK are native to State waters and the requirements of regulations 13 and 14 of the Regulations (relating to notification of unusually high mortalities and containment of stock suspected to be affected without disease), the consequence of disease spread is considered to be minor. Given the strategies proposed by Clean Seas for aquatic animal health monitoring and treatment, and the legislative requirements of licensees in terms of disease occurrences, the overall risk of disease spreading from one site to another is considered to be low.
6.2 Disposal of waste	N/A	N/A	N/A	N/A	

REFERENCES

- [1] Clean Seas Seafood Limited, Jay Dent (2018). AL00034/FF00026 – Application of vary conditions (movement) of an aquaculture lease.
- [2] Clean Seas Seafood Limited, Jay Dent (2018). AL00035/FF00027 – Application of vary conditions (movement) of an aquaculture lease.
- [3] Clean Seas Seafood Limited, Jay Dent (2018). AL00036/FF00028 – Application of vary conditions (movement) of an aquaculture lease.
- [4] Clean Seas Seafood Limited, Jay Dent (2018). AL00037/FF00029 – Application of vary conditions (movement) of an aquaculture lease.
- [5] Clean Seas Seafood Limited, Jay Dent (2018). LA00119/FF00095– Application of vary conditions (movement) of an aquaculture lease.
- [6] Clean Seas Seafood Limited Tuna, Jay Dent (2018). LA00120/FF00096 – Application of vary conditions (movement) of an aquaculture lease.
- [7] PIRSA Fisheries and Aquaculture (2011). *Aquaculture (Zones – Fitzgerald Bay) Policy 2008*.
- [8] Clean Seas Seafood Limited, Jay Dent (2018). Application for a new marine aquaculture lease.
- [9] Preliminary Results for FEMP – SARDI to PIRSA (2013).
- [10] Tanner, J.E., Giblot-Ducray, D. and Loo M.G.K. (2017). Temporal Analysis of Infaunal DNA Data from the Tuna and Finfish Environmental Monitoring programs, 2005-2014. Report prepared for PIRSA Fisheries and Aquaculture. South Australian Research and Development Institute (Aquatic Sciences), Adelaide. SARDI Publication No. F2016/000392-1. SARDI Research Report Series No. 916. 24pp.
- [11] Clean Seas Seafood Limited Farming strategy for Fitzgerald Bay dated February 2018.
- [12] PIRSA Fisheries and Aquaculture (2009). PIRSA Fisheries and Aquaculture Division's Ecologically Sustainable Development (ESD) Risk Assessment Guidelines. Primary Industries and Resources South Australia, 45 pp.
- [13] Standards Australia and Standards New Zealand. (2009) AS/NZS ISO 31000:2009 Risk management - Principles and guidelines. Joint Australian/New Zealand Standard, Joint Technical Committee OB-007, Risk Management. Sydney, Australia and Wellington, New Zealand. 24 pp.
- [14] Fowler, A.J., Ham, J.M. and P.R. Jennings (2003). Discriminating between cultured and wild kingfish (*Seriola lalandi*) in South Australia. South Australian Research and Development Institute (Aquatic Sciences), Adelaide. SARDI Publication No. RD03/0159.
- [15] Harrison, S. (2003). Interactions between seabirds and tuna farms near Port Lincoln. Flinders University. Honours thesis, pp 27.
- [16] Svane, I. and Barnett, J. (2007). The occurrence of benthic scavengers and their consumption at SBT farms off Boston and Rabbit Islands, Port Lincoln, South Australia: a preliminary study. P169-180 In Fernandes, M., Lauer, P., Cheshire, A., Svane, I., Putro, S., Mount, G., Angove, M., Sedawie, S., Tanner, J., Fairweather, P., Barnett, J. & A. Doonan 2007. Aquafin CRC - Southern Bluefin Tuna Aquaculture Subprogram: Tuna Environment Subproject Evaluation of Waste Composition and Waste Mitigation. Aquafin CRC Project 4.3.2 (FRDC Project No. 2001/103).
- [17] Diggles, B. K. and Hutson, K. (2007). Diseases of kingfish (*Seriola lalandi*) in Australasia. *Aquaculture Health International*. 3. 12-14.
- [18] Stone, D.A.J., D'Antignana, T.D. and Bansemer, M.S (2016). Final Report. Refining Yellowtail Kingfish feeds and feed management. Prepared by the South Australian Research and Development Institute (Aquatic Sciences, Adelaide. AS-CRC Project No. 2013/730. 144pp.

Appendix 1: Biogeographical description of the consolidated 150-hectare site

Twelve transects were undertaken at the proposed location for the 150-hectare consolidated site, ranging from 106 m to 296 m in length (total site transect length = 1626 m). Using the EPA survey power calculator, a detection power of 93.9% was achieved at a critical feature cover of 3%. The location of each transect are shown in Figure 4 below.

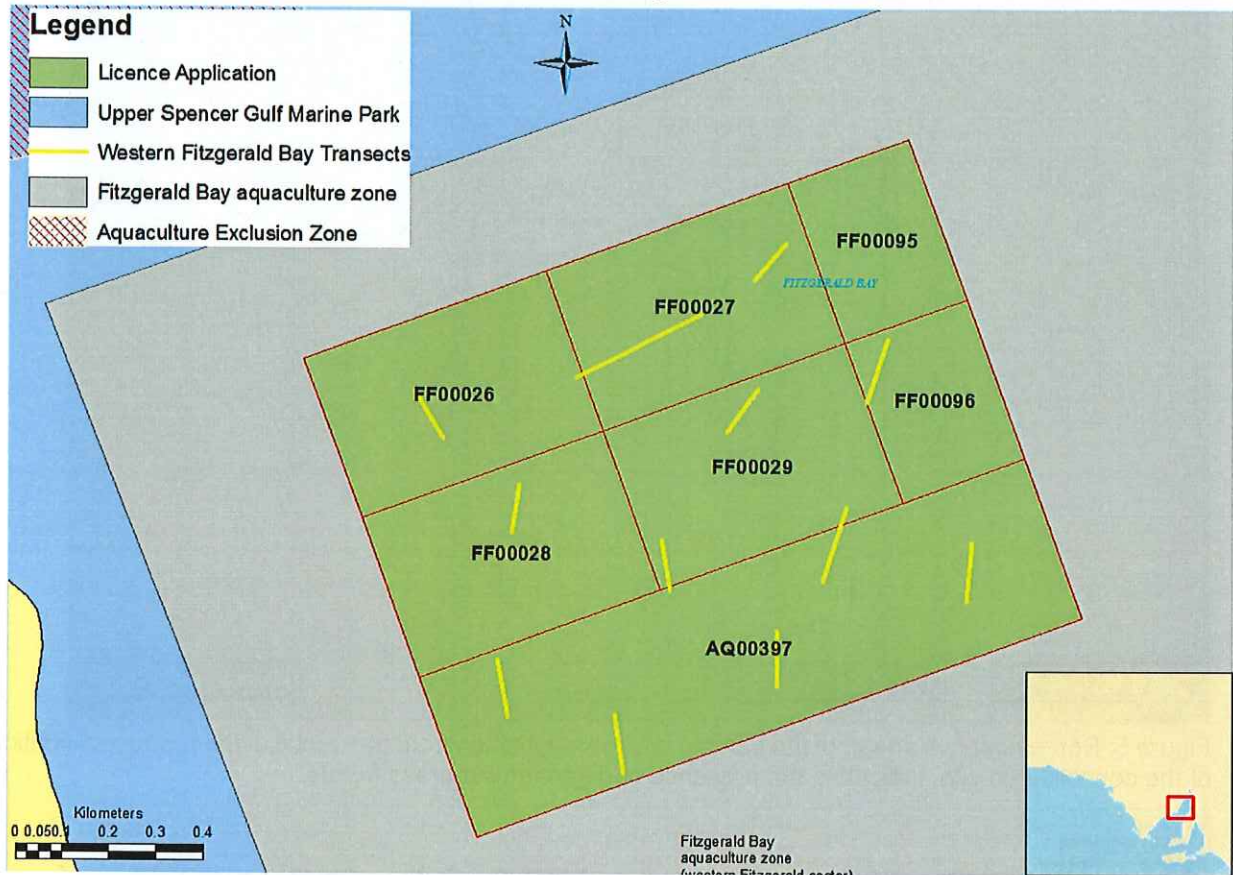


Figure 4: Location of the biogeographical transects taken for the proposed 150-hectare consolidated site.

The 12 video transects depicted a benthic environment, consisting of a fine grained sandy substrate with very slight undulation. The dominant habitat type of “bare sand” was observed in all transects. No areas of live seagrass were observed in any of the 12 video transects. Although, detached seagrass fronds (species indistinguishable) at various states of decomposition were noted at a very low level, indicating the presence of seagrass in the region (Figure 5). Other marine flora included very low density, predominantly detached, macroalgae. The epifaunal community appeared to be generally low in abundance and diversity and consisted of occasional filter feeding organisms such as sea squirts (Family Ascidiidae) and razorfish (*Pinna bicolor*). A medium level of bioturbation was predominant throughout the video transects (Figure 6).



Figure 5: Representative image of the benthic environment taken from transect 8 at the proposed location of the consolidated site, indicating the presence of detached seagrass fronds.



Figure 6: Representative image of the benthic environment taken from transect 5 at the proposed location of the consolidated site, indicating a medium level of bioturbation.